

Effectiveness of a Community-Based Breastfeeding Intervention in Ethiopia: a Cluster Randomized Controlled Trial.

Misra Abdulahi Ahmed

Dissertation for the degree of Philosophiae Doctor (PhD)

Department of Community Medicine and Global Health

Institute of Health and Society

Faculty of Medicine

University of Oslo

2021

© Misra Abdulahi Ahmed, 2021

*Series of dissertations submitted to the
Faculty of Medicine, University of Oslo*

ISBN 978-82-348-0091-7

All rights reserved. No part of this publication may be reproduced or transmitted, in any form or by any means, without permission.

Print production: Graphics Center, University of Oslo.

Dedications

It is with genuine gratitude and warm regard that I dedicated my dissertation work to my mother, Mrs Amina Dawud, my niece Rinas Mohammed, my brothers Mohammed Abdulahi and Shamil Abdulahi, my sisters Hawa Abdulahi and Zahra Abdulahi and my husband Muktar Beshir.

ACKNOWLEDGEMENTS

First and foremost, I would like to express my heartfelt gratitude to my supervisory team, Director Jeanette H. Magnus and Professor Atle Fretheim, for their unwavering support and encouragement throughout my PhD journey. I have learned much on this journey and you have each contributed. I am grateful for your continuous advice, suggestions, and constructive input on various drafts. Your timely feedback and fruitful guidance helped me all the time for each paper and writing of this thesis. Working under your supervision was a fantastic experience that will help me to grow as an independent researcher in my future career. I feel incredibly fortunate to have had the opportunity to learn from you both. Most especially, I thank my principal supervisor Dr Jeanette who always steered me in the right direction and provided opportunities for personal improvement and career development. My heartfelt gratitude goes to Professor Atle for his support, guidance, and sharing of knowledge throughout the project.

Besides my supervisors, I was also fortunate enough to work with my professional colleague, Alemayehu Argaw. I learned a lot from his insightful comments and encouragement during statistical analysis, but also from the hard questions which incited me to widen my perspectives. Every conversation we had about the data had taught me something new. He always has been there to support me when I brought questions for discussions and his timely feedback to endless queries.

The current work was supported by NORAD (Norwegian Agency for Development Cooperation) under the NORHED-Program, agreement no. ETH-13/0024. I am extremely grateful for the financial assistance given to me in completing my PhD.

My gratitude also goes to Kunuz, Nasir, Aklilu, and Neima from the Jimma zone health office, as well as Abdulgefar, Roza, Simegn, and Zerihun from the Mana district health office, for making the implementation of the intervention easier. I am also thankful to all of the Health Extension Workers for their assistance in managing the flow of study participants during the recruitment and data collection process, as well as all of the women development army leaders who participated in the community trial as peer supporters. I would like to thank the study participants for their time and commitment and for providing us with all the necessary details during the follow-up period and for allowing the measurement of their children. This research would not have been possible without their help.

Line Løw, Louise, Vibeke Christie, Ida, Gry and Morten deserve special thanks for their efforts as research coordinators, administrative staff, and the IT department. Their administrative skills and constant support during my studies are greatly appreciated. A special thank you goes to Line for always hosting me in Oslo, inviting me to her home, and making me feel welcome. You are one of the best people I know in Oslo. Thank you to my PhD colleagues and friends in Norway for their unwavering friendship. There are a lot of you, and the list goes on. Your friendship means a lot to me, and I hold everyone of you in high regard. I would also like to express my gratitude to NRS GH, the Norwegian Research School of Global Health, for providing me with opportunities to attend courses and conferences.

Thanks to Mr Jemal, Dr Gemechis, and Mr Kamil for your help in the forward-backward translation of the Scales and also for taking part in the panel discussion. Dr Diriba Fufa and Dr Mohammed Beshir, thank you for participating in the panel discussion and providing your expert opinion on the scales. Thank you in particular to the 30 Public Health faculty members who contributed to the rating of the translated and original scales. I would also like to express my gratitude to the data collectors, as well as my colleagues Mr Mamusha Aman and Mr Jemal Ahmed, who provided supervision during the data collection process.

I would like to thank Dr Muluemebet Abera - Dean of the Faculty of Public Health at Jimma University whose feedback was integral in developing the intervention trial, Dr Gurmesa Tura for reviewing the study protocol and providing useful insights on the planned interventions, and Dr Zewde Birhanu for the valuable suggestions during tool validation. My colleague Dr Bitiya Admassu, thank you for being there for me and your insightful remarks on the thesis are greatly appreciated.

I would like to thank my amazing parents and family. I am indebted to my mom-Amina Dawud, for your prayers that sustained me thus far, and my sisters (Hawa and Zahra) for your endless love and support. Words cannot express how grateful I am to my eldest brother Mohammed; you are not only a brother but also a father to me as you have raised me like your child. You have always had a significant role in the momentum of my life, particularly in terms of your persistent desire to continue my education and advance in my work. I appreciate everything you have done to enable me to complete this PhD and you are the one who has shaped me into the person I am now. My heartfelt thanks also go to my wonderful brother Shamil who has always believed in my abilities and provided so much love, support, and encouragement; I could never have managed

this journey without you. My niece, Rinas Mohammed, you have patiently stood by my side throughout this endeavour. You were my housekeeper, my children's kindergarten teacher, and a source of motivation for me throughout my PhD. Thank you for keeping our home functioning and a happy place. Without your presence in my life, I would not have been able to complete my PhD.

Finally, I would like to express my sincere gratitude to my husband, Muktar, for his love, support, and encouragement during this journey. Thank you so much for showing such an interest in my work, providing me with feedback, and continually adding new perspectives to the numerous drafts of the papers and the thesis. You are an inspiration to me! My beloved daughters Tesnim and Kewser and sons Musab, and Omar, I would like to express my thanks for being such good boys and girls always cheering me up. I appreciate your patience with me when I didn't give you the time you required and when I was gone for coursework. I adore each of you! Your strength and optimism are inspiring and I am so looking forward to being able to spend more time with you again.

Table of Contents

ACKNOWLEDGEMENTS.....	1
LIST OF TABLES.....	6
LIST OF FIGURES.....	6
ACRONYMS AND DEFINITIONS	7
SUMMARY.....	8
LIST OF PUBLICATIONS INCLUDED IN THE THESIS	10
1. INTRODUCTION.....	11
2. BACKGROUND.....	15
2.1 Trends of early initiation and exclusive breastfeeding.....	15
2.2 Determinants of breastfeeding.....	16
3. LITERATURE REVIEW.....	19
3.1 Instruments to measure breastfeeding knowledge and attitudes	19
3.2 Determinants of breastfeeding knowledge and attitudes.....	20
3.3 Breastfeeding promotion strategies.....	20
3.3.1 Community-based Breastfeeding promotion interventions.....	21
3.3.2 Community-based breastfeeding promotion interventions in sub-Saharan Africa	22
3.3.3 Community-based breastfeeding promotion interventions in Ethiopia.....	23
3.3.4 Breastfeeding promotion intervention and infant growth.....	24
3.3.5 Breastfeeding promotion intervention and infant morbidity.....	25
3.3.6 Breastfeeding promotion intervention and maternal knowledge and attitude.....	25
4. THEORETICAL/CONCEPTUAL FRAMEWORK.....	27
5. AIM AND OBJECTIVES OF THE THESIS.....	29
6. METHODS.....	30
6.1 Study setting	30
6.2 Study design.....	30
6.2.1 Design and study sample (Study 1 and 2).....	30
6.2.2 Design and study sample (Study 3).....	31
6.2.3 Sample size and power calculation (Study 3)	32
6.2.4 Randomization (Study 3).....	32
6.2.5 Recruitment	32
6.2.6 Inclusion and exclusion criteria.....	33
6.2.7 Intervention (Study 3).....	33
6.2.8 Outcome variables (Study 1 and 2).....	40
6.2.9 Outcome variables and covariates (Study 3)	40
6.2.10 Statistical methods.....	41

6.2.11	Missing data handling (Study 3).....	43
6.2.12	Ethical considerations.....	44
7.	RESULTS	45
8.	DISCUSSION.....	50
8.1	Methodological considerations of cross-sectional studies (Study 1 and 2)	50
8.1.1	Internal validity (Study 1 and 2).....	50
8.1.2	External validity (Study 1 and 2)	51
8.2	Methodological considerations of the breastfeeding intervention trial (Study 3).....	51
8.2.1	Internal validity (Study 3).....	52
8.2.2	External validity (Study 3)	54
8.3	Discussion of Main findings	54
8.3.1	Adaptation and Validation of the Breastfeeding Knowledge and attitude Questionnaire ..	54
8.3.2	Determinants of knowledge and attitudes towards breastfeeding	56
8.3.3	Effectiveness of breastfeeding education and support interventions	58
8.4	Conclusions	61
8.5	Policy implications	61
8.6	Future research implications	62
	References	64
	Appendices.....	73
	Papers 1-3	73

LIST OF TABLES

Table 1 Summary of studies published in Ethiopia before initiation of the current study.....	26
Table 2 The TIDieR (Template for Intervention Description and Replication) Checklist	37
Table 3 Overview of differences between the BFESI and routine care	38
Table 4 Median and median percentage scores for the overall and nine domains of BFKQ-AO (Table from paper I).....	47
Table 5 Baseline characteristics of study participants1 (Modified table from paper III).....	49

LIST OF FIGURES

Figure 1: Trends of the rates of exclusive breastfeeding in low-income and middle-income countries, by country income group, and world region, 2000–2019.	15
Figure 2: Trends in early initiation of breastfeeding and exclusive breastfeeding in Ethiopia, 2000-2016.	16
Figure 3: Determinants of breastfeeding and the components of an enabling environment for breastfeeding - a conceptual model.	18
Figure 4: Social-ecological theory, Modified from Bronfenbrenner and Carter [101]	28
Figure 5: Google Maps directions of Jimma zone, Oromia regional state. Ethiopia	30
Figure 6: Trial profile for breastfeeding education and support intervention	31
Figure 7: Portion of counselling cards used for the breastfeeding education and support intervention	34
Figure 8: Study timeline and major milestones for breastfeeding education and support intervention in Jimma Zone	39

ACRONYMS AND DEFINITIONS

BFKQ	Breastfeeding Knowledge Questionnaire
EBF	Exclusive breastfeeding
HEWs	Health Extension Workers
IIFAS	Iowa Infant Feeding Attitude Scale
WDA	Women Development Army

SUMMARY

Background: Peer-led breastfeeding education and support provided during the antenatal and postnatal periods are known to improve breastfeeding practices. However, there is a paucity of evidence on the effectiveness of such interventions in the Ethiopian context.

Aims: This thesis aimed to adapt and validate existing breastfeeding knowledge and attitudes instruments that were used elsewhere (study 1), determine the baseline levels of breastfeeding knowledge and attitudes with their predictors to guide the design of an intervention (study 2), and evaluate the effectiveness of a breastfeeding education and support intervention on early initiation and exclusive breastfeeding practices, and infant growth in a rural setting in Southwest Ethiopia (study 3).

Methods: Translating and back translating in Afan Oromo, an Ethiopian language, we assessed the content, construct, and criterion validity as well as the internal consistency of the Breastfeeding knowledge questionnaire and Iowa infant feeding attitude scale. Then we determined the baseline levels of maternal knowledge and attitudes towards breastfeeding and the predictors and used these findings to guide the breastfeeding education and support intervention. Finally, we designed and conducted a cluster-randomized controlled single-blind two-arm trial in the Mana district in 36 randomly selected clusters to evaluate the effectiveness of peer-led breastfeeding education and support. The intervention was provided to women in the 18 intervention clusters by Women development army leaders. The participants received two prenatal visits during the 8th and 9th months and eight postnatal visits on the first or second, sixth or seventh, and fifteenth days, and then monthly until the child was five months old. In studies 1 and 2, we included 468 pregnant women who were enrolled in the study. In the third study, we included 421 women who were interviewed at month one follow-up and 409 women who were interviewed at month six follow-up.

Results: We found that both Afan Oromo versions of the Breastfeeding knowledge questionnaire and the Iowa infant feeding attitude scale are reliable and valid tools for measuring maternal breastfeeding knowledge and attitudes in this population. In addition, we found that the majority of the women had neutral attitudes towards breastfeeding and only half of them had adequate knowledge about breastfeeding. Further, only maternal occupation was associated with knowledge whereas, maternal age, parity, antenatal care visits, and knowledge scores were

associated with attitudes. Moreover, the intervention increased the prevalence of early initiation and exclusive breastfeeding practices and improved attitudes towards breastfeeding. Although we observed a higher maternal knowledge about breastfeeding in the intervention group, the difference was not statistically significant. Except for a higher mid-upper arm circumference and a lower prevalence of respiratory infection over the past two weeks in the intervention group, we did not find a statistically significant intervention effect on other infant growth outcomes or morbidity.

Conclusions: Both the Afan Oromo versions of the Breastfeeding knowledge questionnaire and the Iowa infant feeding attitude scale were found to be valid and reliable instruments for assessing breastfeeding knowledge and attitudes in an Ethiopian context. At baseline, most of the pregnant women had adequate knowledge about breastfeeding and neutral attitudes towards breastfeeding. There was a low level of maternal knowledge and neutral attitudes towards breastfeeding. Training Women development army leaders as peers to provide breastfeeding education and support significantly increased the incidence of early initiation and exclusive breastfeeding, and improved maternal attitudes towards breastfeeding.

LIST OF PUBLICATIONS INCLUDED IN THE THESIS

Study 1: Adaptation and validation of the Iowa infant feeding attitude scale and the breastfeeding knowledge questionnaire for use in an Ethiopian setting *International Breastfeeding Journal* 15, 24 (2020). <https://doi.org/10.1186/s13006-020-00269-w>

Misra Abdulahi, Atle Fretheim, Alemayehu Argaw & Jeanette H. Magnus

Study 2: Determinants of knowledge and attitudes towards breastfeeding using validated instruments in pregnant women from a rural setting in Ethiopia. *International Journal of Environmental Research and Public Health* 2021; 18(15):7930. <https://doi.org/10.3390/ijerph18157930>

Misra Abdulahi, Atle Fretheim, Alemayehu Argaw & Jeanette H. Magnus

Study 3: Breastfeeding education and support to improve early initiation and exclusive breastfeeding practices and infant growth: a cluster randomized controlled trial from a rural Ethiopian setting. *Nutrients* 2021, 13(4), 1204; <https://doi.org/10.3390/nu13041204>

Misra Abdulahi, Atle Fretheim, Alemayehu Argaw & Jeanette H. Magnus

1. INTRODUCTION

In 2017, there were 2.5 million neonatal deaths globally, and the majority occurred in low- and middle-income countries and mainly from preventable causes [1]. Compelling evidence exists for a direct relationship between suboptimal breastfeeding and the risk of neonatal deaths, and about 1.4 million child deaths are attributed to suboptimal breastfeeding alone [2]. A recent Lancet review on breastfeeding pays particular attention to the protection, promotion, and support of breastfeeding as crucial steps in achieving several Sustainable Development Goals, notably Goal 3, which aims to improve the health and wellbeing of all people of all ages [3]. Breastfeeding plays an important role in achieving a wide range of Sustainable Development Goals. For example, it is core to achieving Goals 1 (end poverty), 8 (promote economic growth), and 10 (reduce inequalities), with an estimated total income loss of US\$302 billion annually due to cognitive deficits following suboptimal infant feeding practices [4]. Breastfeeding is also a vital source of nutrition for children as it can save their lives and contribute to improved health outcomes for both children and mothers, hence endorsing Goal 2 (end hunger) [3]. Breastfeeding has also been linked to better intelligence quotients and educational attainment which helps to accomplish Goal 4 on education [3]. Critical equality issues including birth spacing and workplace rights are also related to breastfeeding and the achievement of Goal 5 on gender equality [3]. Finally, breastfeeding does not require the use of industry for its production, and it is produced and consumed with a minimal ecological footprint, contributing to the achievement of Goal 12 on sustainable consumption [4]. Put together, these pieces of evidence provide important insights into the critical role of breastfeeding. As a result, the World Health Organization and the United Nations Children’s Fund recommend that children should initiate breastfeeding within the first hour of birth and be exclusively breastfed for the first six months of life – that is, having no other foods or liquids including water, given to them. From the age of 6 months, children should begin eating safe and adequate complementary foods while continuing to breastfeed for up to two years and beyond [5, 6].

To date, studies have demonstrated the benefits of early initiation of breastfeeding on infant mortality and morbidity. More specifically, early initiation of breastfeeding within an hour after birth is shown to have a significant impact on neonatal mortality [7, 8]. For example, a review by Khan et al. showed that compared to neonates who breastfed within the first hour after birth, neonates who started to breastfeed after the first hour of life had twice the risk of dying in the

first month of life [8]. Similarly, a recent meta-analysis of five studies from four countries shows that infants who initiated breastfeeding between 2 and 23 hours after birth had a 33% greater risk of dying than those who were breastfed within an hour. For newborns who started breastfeeding 24 hours or more after birth, the risk of dying was doubled [7]. Correspondingly, it has been demonstrated that a delay in breastfeeding initiation has been linked to an increased risk of developing common infections. In Tanzania, for example, a study indicated that children who are not put to the breast within the first hour after birth have a higher risk of cough and nearly 50% higher risk of breathing difficulties in the first six months of life [9].

Furthermore, it is now well established that early initiation of breastfeeding requires immediate skin-to-skin contact, which helps regulate the newborn's body temperature and allows beneficial bacteria from their mother's skin to colonize their bodies to protect them from infectious diseases and help build babies' immune systems [4]. Furthermore, colostrum, the breastmilk produced in the first few days after birth is rich in antibodies and white blood cells, which protect against infection; it also helps prevent jaundice, contains growth factors that help in the maturation of the intestine, and is rich in Vitamin A [10]. Early initiation of breastfeeding has also been shown to have several health benefits for mothers such as stimulating the production and release of hormones, which helps contract the uterus, expel the placenta, and thus reduce the risk of postpartum bleeding (6).

The other breastfeeding practice which is associated with several benefits is exclusive breastfeeding (EBF). It is estimated that scaling up EBF universally could prevent 823,000 child deaths and 20,000 maternal deaths from breast cancer each year [3]. Moreover, evidence from various systematic reviews demonstrates that breastfeeding is associated with a reduced risk of hospitalisation due to diarrheal and respiratory disease [11] and protects against otitis media [12], and dental disease [13, 14] in the short term. The long-term benefits of breastfeeding include reduced risk of obesity and type 2 diabetes [15], and enhanced intelligence [16]. Also, breastfeeding reduces the risks of breast and ovarian cancers, and type 2 diabetes and also has a role in birth spacing through lactational amenorrhea [17]. It has been estimated that even modest increases in the number of exclusively breastfed infants could have considerable cost savings for the health service [4].

Despite these well-documented benefits of breastfeeding, the rates of optimal breastfeeding practices are far below the international recommendations target. Only 42% of newborns globally are put to the breast within 1 hour after birth [18], and in low- and middle-income countries, only 37% of infants younger than six months are exclusively breastfed [3]. This rate of EBF is far below the World Health Organization's Global Nutrition Target of 70% by 2030 [19].

In Ethiopia, even though the World Health organization's recommendations have been endorsed and efforts to promote breastfeeding have been made, as evidenced by policies and national strategic plans, the prevalence of early initiation of breastfeeding and EBF for the first six months of life is below the national targets. According to the 2016 Ethiopian Demographic and Health Survey, only 73% of mothers initiated breastfeeding early and only 58% of children under the age of six months were exclusively breastfed [20]. EBF rates drop significantly after birth, from 74% between 0-1 months to 36% at 4-5 months. Despite being higher than the global rate, Ethiopia's current early initiation and EBF rates are still below the Ethiopian Health Sector Transformation Plan's 2020 national target of 90% and 72%, respectively [21]. Furthermore, optimal breastfeeding is identified as one of the high-impact nutrition interventions to reduce malnutrition among children in the national nutrition program II 2016-2020 [22]. It aims to increase early breastfeeding initiation and EBF from 58% in 2016 to 80% in 2020. However, given that the EBF rate was just 59% in 2019, it was unlikely to achieve 80% in 2020 [23]. In addition, Ethiopia is not among the countries that are projected to meet the World Health Organization's Global Nutrition Target of 70% by 2030 [19]. Therefore, implementing effective breastfeeding promotion interventions in the country is a crucial step to improve breastfeeding practices.

Evidence from systematic reviews shows that peer-support interventions provided during prenatal and postnatal periods can improve the rates of early initiation and EBF [24, 25]. However, there is a paucity of evidence on the effectiveness of such interventions in Ethiopia. To this end, we designed a cluster randomized controlled trial to evaluate the effectiveness of breastfeeding education and support to improve early initiation, EBF, and infant growth in rural Ethiopian settings.

Knowledge and attitudes are among the modifiable variables that influence breastfeeding practices [26]. Therefore, an intervention aimed at improving early initiation and EBF by improving maternal knowledge and attitudes needs valid and reliable instruments to measure

these outcomes. However, in Ethiopia, there is a lack of such instruments. Thus, there was a need to adapt and validate the Iowa Infant Feeding Attitude Scale (IIFAS) and breastfeeding knowledge questionnaire (BFKQ) in Afan Oromo (the local language). Moreover, understanding the levels and important underlying determinants of maternal knowledge and attitudes towards breastfeeding helps guide the development of context-specific interventions aimed at increasing the rates of optimal breastfeeding practices. Thus, an intervention aimed at improving breastfeeding knowledge and attitudes must first assess the baseline levels of breastfeeding knowledge and attitudes and their predictors to guide the planned intervention and track the change.

There are three studies in this thesis. Study 1 assessed the validity and reliability of instruments for measuring breastfeeding knowledge and attitudes so that we can measure the baseline and endline levels to determine the effect of the intervention in improving maternal knowledge and attitudes. Study 2 assessed the baseline levels and predictors of knowledge and attitudes, which were used to design the breastfeeding education and support intervention. Study 3 evaluated the effectiveness of breastfeeding education and support in improving early initiation, EBF, infant growth, knowledge and attitudes, and childhood morbidity.

This thesis is divided into eight sections. The first section, the current section, provides a brief introduction to the benefits and an overview of the proportion of early initiation of breastfeeding and EBF. The next section is the background information on the trends and determinants of early initiation and EBF. The literature review section follows with these topics: breastfeeding promotion strategies, community-based breastfeeding promotion interventions in the global, sub-Saharan Africa, and Ethiopia contexts, instruments used to measure breastfeeding knowledge and attitudes, and determinants of breastfeeding knowledge and attitudes. The social-ecological model, which represents the various levels at which breastfeeding promotion intervention might be directed, is presented in the fourth section. The objectives of the current study are outlined in section five. Section six describes in detail the research methods, the intervention, and ethical considerations. Section seven summarizes the key research findings. The discussion of methodological considerations and the main findings continues in section eight. Based on the main findings, the eighth section finishes with conclusions and recommendations for future research.

2. BACKGROUND

2.1 Trends of early initiation and exclusive breastfeeding

Global trends: The global rate of early initiation of breastfeeding has increased from 37% in 2005 to 42% in 2017 [18]. Countries with the largest changes in the prevalence of early initiation of breastfeeding between 2005 and 2017 were Georgia (36.6% to 68.7%), Belarus (21.1% to 53%), Serbia (17.5% to 50.8%) and Burkina Faso (19.6% to 41.6%). On the other hand, Dominican Republic (60.5% to 38.1%), Viet Nam (44.0% to 26.5%), Jordan (37.2% to 18.6%) and Montenegro (25.0 to 14.4%) are countries where the prevalence of early initiation has decreased between 2005 and 2018 [18].

Low and Middle-Income Countries: According to the most recent Lancet report, a time-series analysis of data from 113 countries revealed that in low and middle-income countries EBF in the first six months of life increased by 0.70 percentage points annually, from 35.4% in 2000 to 48.6% in 2019 [27]. In upper-middle-income countries, the increase was especially noticeable with the rate more than doubled from less than 17% in 2000 to almost 37% in 2019, whereas in low- and lower-middle-income countries the rate increased by a little over 10 percentage points (figure 1). EBF in the first six months of life were around 40% in eastern and southern Africa, South Asia, Latin America and the Caribbean in 2000, and has since increased to 50% or more in 2019. Except in the Middle East and North Africa, where there was a fall of roughly 13 percentage points, increases were reported in all regions (figure 1). This rate is close to the global target of 50% by 2025 although it is far below the target of 70% by 2030 [28].

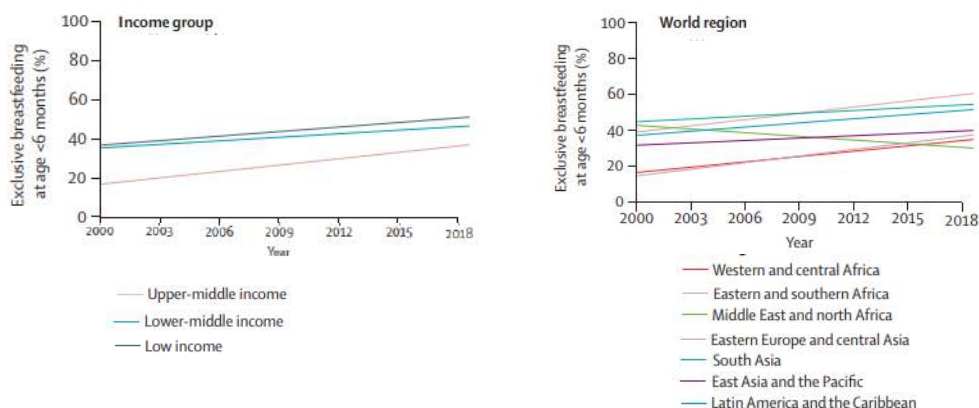


Figure 1: Trends of the rates of exclusive breastfeeding in low-income and middle-income countries, by country income group, and world region, 2000–2019.

Reprinted from The Lancet Child Adolescent Health, 387, Neves et al. Rates and time trends in the consumption of breastmilk, formula, and animal milk by children younger than 2 years from 2000 to 2019: analysis of 113 countries? Copyright (2021), with permission from Elsevier.

Ethiopia: Breastfeeding practice is nearly universal in Ethiopia where more than 90% of children are breastfed at some point. According to the trend analysis of DHS data from 2000 to 2016 by Ahmed et al. [29] the prevalence of early initiation of breastfeeding increased from 48.8% (95% CI 45.4, 52.2%) in 2000 to 75.7% (95% CI 73.0, 78.0%) in 2016 (Figure 2). However, EBF did not make considerable improvements throughout these years, with 54.5% (95% CI 49.9, 59.0%) in 2000 and 59.9% (95% CI 55, 64.5%) in 2016. Over the past two decades, inconsistent breastfeeding trends have been seen in Ethiopia. For example, the percentage of early initiation of breastfeeding increased from 51% in 2000 to 69% in 2005 but this rate decreased to 52% in 2011. Then, the rate of early initiation sharply increased to 73% in 2016 and 78% in 2019. Similarly, the rate of EBF increased sharply from 38% in 2000 to 66% in 2005. However, this rate decreased to 52% in 2011 and then increased to 58% in 2016 and 59% in 2019. Similar to the global and low and middle-income countries, the current rates of early initiation and EBF in Ethiopia are far below the World Health Organization's recommendation [28].

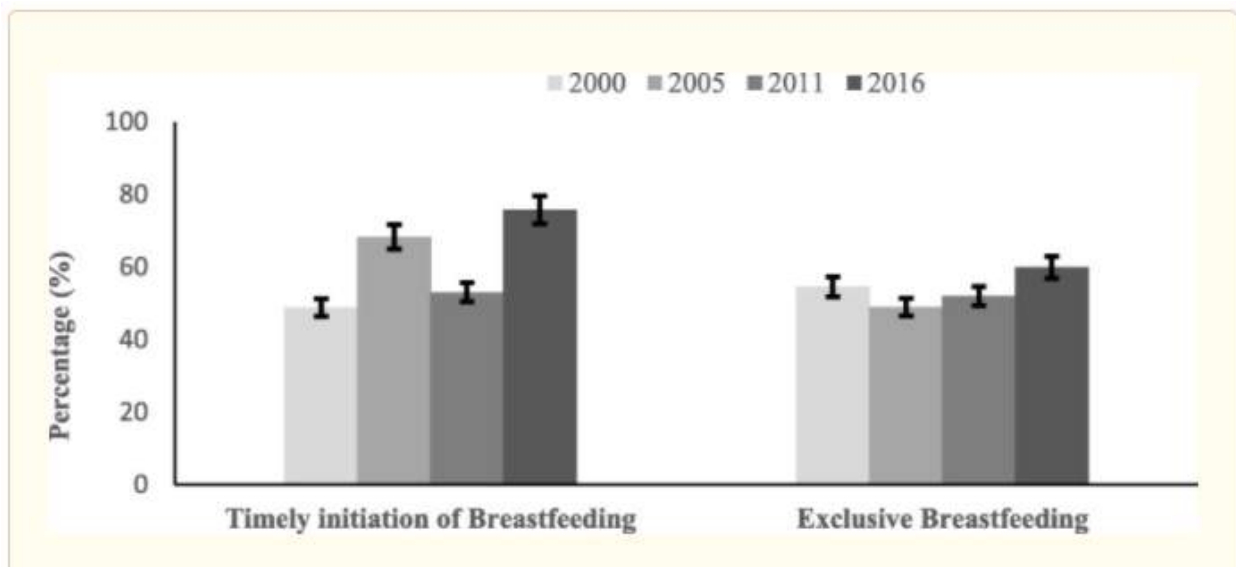


Figure 2: Trends in early initiation of breastfeeding and exclusive breastfeeding in Ethiopia, 2000-2016.

Reprinted from the International breastfeeding journal, Ahmed et al. Trends and determinants of early initiation of breastfeeding and exclusive breastfeeding in Ethiopia from 2000 to 2016. Copyright (2021), with permission from Springer Nature.

2.2 Determinants of breastfeeding

Although nearly all women are biologically capable of breastfeeding, except very few with severely limiting medical conditions [30], breastfeeding practices are affected by a wide range of historical, socioeconomic, cultural, and individual factors. Identifying the determinants of

breastfeeding is necessary for informing the design of interventions to support breastfeeding. Accordingly, Rollins et al [4] have prepared a conceptual framework that elucidates how breastfeeding practices are affected at multiple levels (Figure 3).

This model classifies the determinants into three distinct parts as structural, setting-related, and individual level. First, the structural level determinants are factors related to the socio-cultural attitudes and market contexts with the intent of protecting breastfeeding by ensuring the proper use, marketing, and distribution of breast milk substitutes. Examples of these determinants are regulations on commercials for formula milk or the acceptance of breastfeeding in public. There is evidence of an increase in the rates of breastfeeding in countries that have adopted and implemented the legislation relating to the International Code of breastmilk substitute [31, 32]. The next level in the model is the setting determinants which include health systems and services, family and community, and workplace and employment. Healthcare workers' knowledge and skills to support breastfeeding, maternal and infant health conditions and hospital practices that result in delayed initiation of breastfeeding, prelacteal supplementation, and free samples of breastmilk substitutes, the practices and experience of female relatives, attitudes and preferences of fathers and appropriate maternity leave are all factors that affect breastfeeding practice [4]. The last level in the model is the individual level determinants which include the mother and infant attributes and their relationship. At this individual level, breastfeeding practice is influenced by personal characteristics such as maternal age, education, weight, and health status and by characteristics of the baby that includes sex, wellbeing, and temperament - whether the baby is thought to be satisfied and content. In addition to maternal and infant attributes, advice and practices that undermine maternal confidence and self-efficacy negatively affect breastfeeding [33]. Moreover, poor breastfeeding positioning and latching and inadequate support particularly during the first weeks after birth and anticipation of breastfeeding difficulties are common reasons for stopping breastfeeding [34].

Further, a systematic review in low and middle-income countries by Kavle et al [35] identified sixteen barriers to EBF and grouped them into three categories: (i) prenatal barriers ; (ii) barriers at childbirth and during the first day of life; and (iii) barriers in the first 6 months of life. The prenatal barriers include lack of or late attendance at antenatal care, poor maternal knowledge of EBF, maternal health and attitudes, and lack of intention to practice EBF. Barriers at childbirth and during the first day of life were delivery outside a health facility, delivery by caesarean

section, timing of initiation of breastfeeding, prelacteal feeding and colostrum feeding practices. Barriers during the first 6 months of life include maternal employment, perceptions of poor infant behaviour, health and cues of feeding problems, perceptions of insufficient breast milk, perceived inadequate maternal nutrition, breastfeeding problems, counselling on breastfeeding, and family and community support for EBF.

The model developed by Rollins et al further illustrates interventions that can influence breastfeeding at various levels. The structural level interventions are social mobilization and mass media. Settings-level interventions are legislation, policy, financing, and enforcement while individual-level interventions are counselling, support, and lactation management. Given that majority of the barriers mentioned by Kavle et al. [35] may be addressed at the individual level in terms of correcting misconceptions, improving knowledge and attitudes, improving skills to overcome breastfeeding problems, and the significance of support, the current study focused on individual-level intervention, such as providing individual-level education and peer support, which is considered critical particularly during the first few weeks after childbirth to continue EBF.

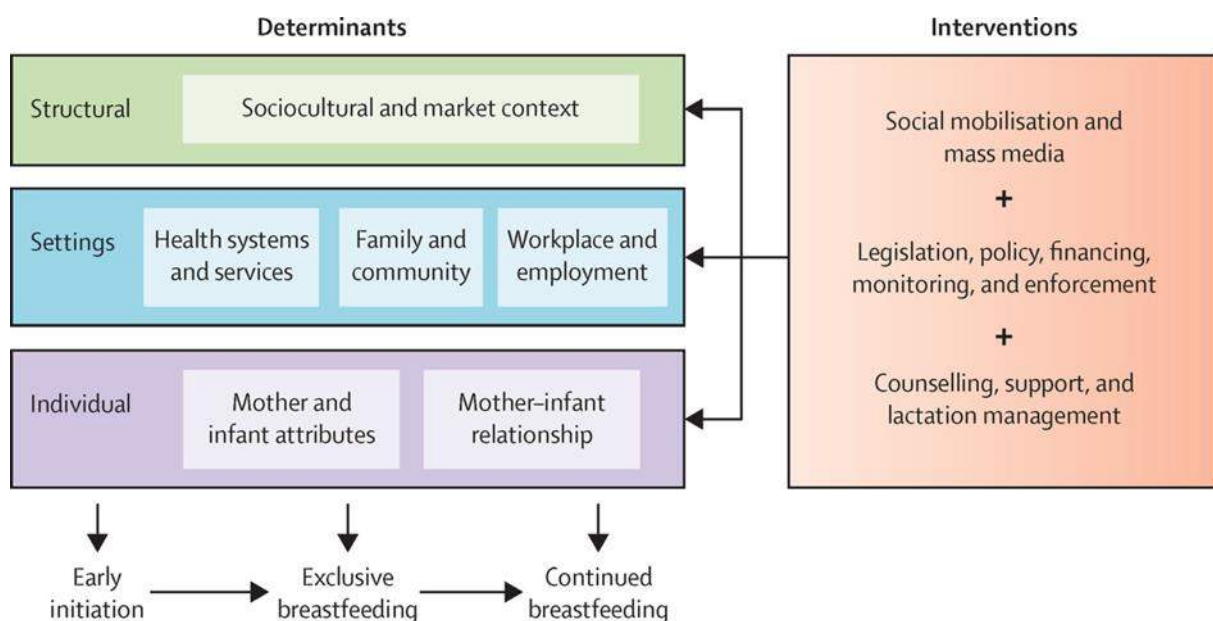


Figure 3: Determinants of breastfeeding and the components of an enabling environment for breastfeeding - a conceptual model.

Reprinted from The Lancet, 387, Rollins et al. *Why invest, and what it will take to improve breastfeeding practices?* p 491-504, Copyright (2021), with permission from Elsevier.

3. LITERATURE REVIEW

The first part of this section summarizes the current knowledge about breastfeeding knowledge and attitudes measuring instruments and the determinants of breastfeeding knowledge and attitudes. This is followed by a section that summarizes breastfeeding promotion strategies including previous community-based breastfeeding promotion research from around the world, with a particular focus on studies conducted in Sub-Saharan Africa and Ethiopia. The summary includes studies on effectiveness evaluations of community-based peer-led breastfeeding support on breastfeeding practices, infant growth, infant morbidity and maternal knowledge and attitude that were published before 2017 representing the state of knowledge at the time our project started. New articles published from 2017 onwards are included in the discussion section. The first part of the review that focuses on breastfeeding promotion is organized and presented in three sections: global, sub-Saharan Africa and Ethiopia.

3.1 Instruments to measure breastfeeding knowledge and attitudes

The quality and sensitivity of instruments used to measure outcomes determine the strength of the evidence to support interventions [36] and the quality of a measuring instrument is connected to its reliability and validity [37]. Interventions aimed at improving the knowledge and attitudes towards breastfeeding requires objective, reliable and valid instruments to measure these outcomes [36]. Our decision to use the IIFAS was based on a systematic review of maternal knowledge and attitudes toward breastfeeding, which suggests that attitudes toward infant feeding should be assessed using the IIFAS, which is a standard and validated instrument. Regarding the knowledge questionnaire, we conducted a literature search for a valid and reliable instrument that measures maternal knowledge about breastfeeding and we found two instruments: a United States developed Breastfeeding Knowledge Questionnaire [38], and a questionnaire developed and validated in Malaysia [39]. We chose the latter because it has more information on colostrum, breastmilk expression, management of breast problems and practical aspects of breastfeeding. The psychometric properties of the IIFAS were established in various settings including the USA [40], Canada [41], Australia [42], Japan [43], China [44], Romania [45], Scotland [46], UK [47], Ireland [48], Spain [49] and Lebanon [50]. We adapted and validated these two existing instruments for use in our setting: IOWA Infant Feeding Access Scale (IIFAS) and the breastfeeding knowledge questionnaire (BFKQ).

3.2 Determinants of breastfeeding knowledge and attitudes

Recent developments in breastfeeding research have heightened the need for understanding the levels and important underlying determinants of maternal knowledge and attitudes towards breastfeeding that help to develop context-specific interventions aimed at improving breastfeeding practices. Psychosocial factors, such as a mother's knowledge and attitudes were identified along with sociodemographic characteristics as determinants of EBF practice [51]. Further, women's breastfeeding knowledge and attitudes are known to influence their decision to breastfeed [52]. Women who lack sufficient knowledge do not practice breastfeeding, because they do not comprehend its benefits [53]. Furthermore, favourable maternal attitudes toward breastfeeding are a stronger predictor of breastfeeding initiation and duration than sociodemographic factors [40, 46, 54-58]. Therefore, women's knowledge and attitudes are crucial individual-level variables that should be targeted for behavioural change interventions because they are modifiable factors that are associated with breastfeeding practices. In Ethiopia, existing studies have attempted to recognize the critical role played by maternal knowledge and attitudes as predictors of breastfeeding practices [59, 60]. Surprisingly the effect of maternal knowledge and attitudes towards breastfeeding practices remains unclear, as these studies vary greatly in their depth, in terms of the quantity and content of the questions used. Therefore, we measured the baseline level and identified predictors of knowledge and attitudes toward breastfeeding among women who enrolled in our study, because one of the goals of the research project was to assess changes in the level of knowledge and attitudes toward breastfeeding. Moreover, the findings were used to guide the design of the planned intervention.

3.3 Breastfeeding promotion strategies

Interventions for breastfeeding promotion have been implemented using different strategies in various settings including policy-based, health facility-based and community-based approaches. Over the past decades, many international-level policies have been promulgated as global efforts in promoting breastfeeding. These include the 1978 Alma Ata international conference [61], the International Code of Marketing Breast-Milk Substitutes adopted by World Health Assembly in 1981 [62], the Maternity Protection Conventions put in place by International Labour Organization in 1919 [63, 64], the 1990 Innocenti Declaration on the Protection, Promotion and Support of breastfeeding [65], the 1991 Baby-Friendly Hospital Initiative [66], 2003 World Health

Organizations/United Nations Children’s Fund Global Strategy for Infant and Young Child Feeding [6] and the 2005 Innocenti Declaration on Infant and Young Child Feeding [67].

At the health facility level, the Baby-Friendly Hospital Initiative launched in 1991 is a global strategy that promotes breastfeeding in maternity wards around the time of delivery using the ten-step models for successful breastfeeding [5]. The effectiveness of this strategy is established in developed countries [68], and its effectiveness might be limited in developing countries like Ethiopia where the majority of deliveries occur at home.

Another significant implementation strategy of breastfeeding promotion is community-based interventions that have been employed in different parts of the world during pregnancy and/or the postnatal period in a variety of forms. For example, targeting individuals or groups through health facilities or home visiting programmes, and using professional education/counselling or peer counselling/support are various forms through which breastfeeding promotion can be implemented. Community-based breastfeeding promotion is one of the most widely used implementation strategies to improve rates of optimal breastfeeding practices in areas where most deliveries take place at home. The following parts of the thesis move on to describe the global, sub-Saharan and Ethiopia’s experience with community-based intervention strategies.

3.3.1 Community-based Breastfeeding promotion interventions

Community-based interventions are considered important strategies for delivering key maternal and child survival interventions [69], reducing disparities in childhood pneumonia and diarrhoea deaths [70], and improving intervention compliance, such as iron supplementation, among pregnant mothers [71]. Similarly, a recent report published in *The Lancet* identified community-based approaches, including household service delivery, as particularly effective strategies for scaling up breastfeeding promotion and support and reaching the populations most at risk [72]. In various parts of the world, community-based breastfeeding promotion interventions have been employed through home visiting programmes, with professional education/counselling or peer counselling/support. Although health professionals can promote breastfeeding practices by offering community-based education or counselling, this is not possible in resource-constrained contexts where such practitioners are scarce. There has recently been an increase in interest in engaging community women as peer counsellors/support for breastfeeding education and support as an alternative to a community health worker [73-75].

Peer support is defined by Dennis as the provision of emotional, appraisal, and informational assistance by a created social network member who possesses experiential knowledge of a specific behaviour or stressor, similar characteristics as the target population, and the ability to address a health-related issue [76]. Breastfeeding peer support can be offered in varying ways: by health professionals or laypeople, trained or untrained, in a hospital or community setting. It can be offered to groups of women or one-to-one, it can involve mother-to-mother support, and it can be offered proactively by contacting women directly, or reactively, by waiting for women to get in touch. Peer support programs may use face-to-face interaction and/or telephone, and it can involve only one contact or regular, ongoing contact over several months [77].

Several systematic reviews of breastfeeding promotion have been undertaken on the role of community-based approaches. According to a Cochrane review of 73 breastfeeding promotion trials in 29 countries, community-based breastfeeding promotion interventions involving all forms of support were found to increase both the duration and exclusivity of breastfeeding [77]. Moreover, it has been reported that the support was effective when delivered face-to-face by trained lay or professional personnel, during antenatal or postnatal care with ongoing scheduled visits and in settings with high initiation rates. Another systematic review found that education alone is not effective and that combined prenatal and postnatal support with high intensity (>5 contacts) directed at individuals had the highest impact on EBF in developing countries [24, 25].

3.3.2 Community-based breastfeeding promotion interventions in sub-Saharan Africa

In sub-Saharan Africa, breastfeeding promotion interventions have been implemented through community-based strategies that involve community health workers or community-based peer counsellors. The majority of trials where home visits were included in the intervention used community health workers. In Ghana, Tanzania, and Uganda, for example, early initiation and EBF were examined as outcome variables in various interventions that investigated the effects of home visits by community health workers on newborn care and survival [78-82]. However, in these trials, EBF was measured either on the 3rd or 28th day after delivery. Two studies in South Africa [83, 84] that delivered integrated community-based packages for maternal and newborn care through home visits, as well as another Kenyan community-based study [85] used community health workers for their intervention. Although the Kenyan and one South African study measured EBF at six months, as recommended by World Health Organization, the other South African study measured it at three months. Only a few studies in Sub-Saharan Africa have

investigated the effectiveness of community-based peer counselling/support interventions for promoting optimal breastfeeding practices; these trials recruited women from the community and trained them as peer counsellors for interventions delivered via home visits [73-75]. Although the aforementioned studies show that community health workers can be used to promote breastfeeding, these frontline workers are frequently overloaded with the preventive and curative services they must provide to their communities. Further, selecting peer counsellors from a community who are not affiliated with a health system raises questions about the feasibility and sustainability of scaling up the intervention. Furthermore, most of the prior trials described above focused solely on teaching and did not assess support for lactating women in-depth, which is critical for the EBF practice to continue.

3.3.3 Community-based breastfeeding promotion interventions in Ethiopia

Before proceeding to examine the community-based intervention strategy in the local context, it is important to explain the healthcare structure of the country. Ethiopia's healthcare system has been restructured into a three-tier system: primary, secondary and tertiary levels of care [86]. Primary hospitals, health centres, and health posts comprise the primary level of care. Five satellite health posts (the lowest-level health system facility at the village level) plus a referral health centre make up the primary health care unit [86]. The government launched the health extension program in 2003 to increase rural communities' access to primary health care through the expansion of health posts and the training of health extension workers (HEWs) [87]. HEWs train model families on 16 health extension program elements over several weeks for a total of 96 hours after receiving training and being deployed to health posts. A woman from a model household is chosen to lead five other women in her community (known as women development army leaders, WDA leaders) in implementing good practices such as vaccinating their children, sleeping beneath mosquito bed nets, building separate latrines, and practicing family planning [88].

The perinatal care provided at health facilities includes the four focused antenatal visits, delivery care, and five contacts of postnatal care [89]. Health workers encourage women to initiate breastfeeding within one hour and counsel them on correct positioning as part of routine newborn care. They also advise women to exclusively breastfeed their baby for six months. Despite being an ideal place for breastfeeding promotion, the potential for using health facilities as a place of intervention is limited because most rural Ethiopian women deliver at home and

very few women attend postnatal visits. For instance, in 2016 only 20% of deliveries in rural areas took place at an institution [20]. Conversely, the current community-based child nutrition program is delivered as an outreach strategy to reach populations living in rural areas through HEWs and WDA leaders [22]. The main components of the current community-based nutrition program include monthly growth monitoring and promotion for children under 24 months, biannual vitamin A supplementation and deworming, and a quarterly screening for acute malnutrition. Furthermore, during the monthly growth monitoring sessions and antenatal and postnatal care at health posts or through home visits, HEWs are responsible for providing feeding counselling to women though they do not have a fixed schedule for this. However, the HEWs are over-burdened with their assigned daily routine tasks [90], which hinder them from providing the support lactating women need, particularly during the immediate postpartum period when women may give up breastfeeding or introduce supplements.

In an attempt to further improve infant and young child feeding practices, large-scale behaviour change interventions were also conducted by the global nutrition initiative Alive and Thrive and The Community Based Maternal and Newborn Health and Nutrition projects. The Alive and Thrive project, for instance [91], has implemented large-scale social and behaviour change communication interventions in four regions of Ethiopia, and further assessed the effects of the interventions on Infant and Young Child Feeding practices and anthropometry in two of the regions. The Muskoka Initiative Consortium-Knowledge Management Initiative used the existing structure of HEWs and WDAs to implement an EBF intervention, [92]. Further to this, the local intervention trial in Hawassa involved a single prenatal educational session for women in the intervention group [93]; single-session intervention studies such as this do not necessarily bring substantial changes to infant feeding practice. Even though these studies have addressed breastfeeding as their outcome, they have methodological issues such as weak study designs, and the implementation strategies also differ (Table 1).

3.3.4 Breastfeeding promotion intervention and infant growth

The literature on breastfeeding promotion intervention and growth outcomes has reached different conclusions. A recent systematic review by Giugliani et al. found that breastfeeding promotion interventions were not associated with significant changes in weight or length [94]; however, this review included very few studies from sub-Saharan Africa. Likewise, several other studies from sub-Saharan African countries show conflicting evidence of the interventions on

infant growth. For instance, a trial in South Africa indicated that a home visiting intervention increased infant weight and length-for-age z-scores [95]. In contrast, a study in Guinea Bissau found that the promotion of exclusive breastfeeding resulted in significantly lower weight at 4–6 months of age in the intervention group [96]. Further, except for a slightly lower ponderal growth (weight-for-length z-scores) in Uganda and Burkina Faso in the intervention arms, there were minimal differences in mean anthropometric indicators in a study done in South Africa, Uganda, and Burkina Faso [97].

3.3.5 Breastfeeding promotion intervention and infant morbidity

Numerous studies have attempted to explain the effect of breastfeeding promotion intervention on morbidity. A review by Chapman et al showed that peer counselling interventions significantly reduced the incidence of infant diarrhoea [98]. Contrary to this, a study in three sub-Saharan African countries [75] and another study in Guinea-Bissau [96] showed that breastfeeding promotion interventions did not affect diarrhoeal morbidity. However, a factorial trial in Malawi by Lewyka demonstrated that volunteer peer counselling has reduced the overall infant morbidity [73].

3.3.6 Breastfeeding promotion intervention and maternal knowledge and attitude

In reviewing the literature, there are relatively few studies on the effectiveness of breastfeeding promotion on knowledge and attitude. A study by Susin et al. on Brazilian couples found that postpartum breastfeeding education increased breastfeeding knowledge and that women with higher breastfeeding knowledge were significantly more likely to continue breastfeeding for six months, implying that improving breastfeeding knowledge can positively influence breastfeeding outcomes [99]. Similarly, a multi-component breastfeeding support intervention provided in hospital and home settings in Lebanon demonstrated that the experimental group's breastfeeding knowledge was significantly improved at six months, despite no changes in breastfeeding attitude [100].

Given this background, we designed a community-based peer-led breastfeeding education and support intervention to evaluate its effectiveness in a cluster-randomized controlled trial. We delivered a prenatal and postnatal intervention through the established WDA system. Based on the literature, we considered the following outcomes as the most important ones: early initiation of breastfeeding, EBF, and infant growth.

Table 1 Summary of studies published in Ethiopia before initiation of the current study

Author, Year	Place	Study design	Intervention	Limitations
Belay S. et al. 2013 [93]	Health institutions of Hawassa city	Quasi-experimental study	<ul style="list-style-type: none"> ✓ Women in the intervention group received one session of prenatal BF education which lasts for 20 minutes 	<ul style="list-style-type: none"> ➤ The study design lacks true randomization ➤ The intervention group received only one educational session prenatally ➤ The intervention did not include breastfeeding support
Barwick M et al. 2015 [92]	Three kebeles in East and West Hararghe	A qualitative study (case study)	<ul style="list-style-type: none"> ✓ EBF intervention was a part of a package of a larger health initiative that focused on diarrhoea and malaria treatment, hygiene, sanitation and other health interventions. ✓ It was implemented through various activities, such as home visits, the use of educational materials, training of influential community and family members, and radio messages. ✓ Identified contextual factors that influenced the successful implementation of EBF interventions 	<ul style="list-style-type: none"> ➤ The study did not include a control group. ➤ The intervention did not include prenatal and postnatal breastfeeding support ➤ Outcome data were not collected from women who received the intervention rather both baseline and endline data captured regional representation of health behaviours ➤ The fact that it was part of other health initiatives limits the extent to which conclusions can be drawn solely about EBF implementation
Kim SS et al. 2016 [91]	Southern Nations, Nationalities and Peoples Region and Tigray	A pre-and post-intervention adequacy evaluation study	<ul style="list-style-type: none"> ✓ The intervention included <ul style="list-style-type: none"> Behavior change interventions, Nutrition integrated into the frontline health workers training guideline and family education & counselling take action booklet Routine Community Health Management Information Systems and Program Review process strengthened through collaborative ✓ Stop gap procurement and logistic support of maternal and newborn health and nutrition commodities such as iron and misoprostol. 	<ul style="list-style-type: none"> ➤ This design does not allow for causal inference ➤ The intervention did not include prenatal and postnatal breastfeeding support ➤ Endline Infant and young child feeding outcome data were not measured from the same children assessed at baseline limiting measurement of change over time.

The next section describes the use of the social-ecological framework to illustrate the various factors that influence breastfeeding practices at different levels and how these factors can be addressed in breastfeeding promotion intervention to improve the rates of breastfeeding practices.

4. THEORETICAL/CONCEPTUAL FRAMEWORK

Social-Ecological Model

The Social-Ecological Model (SEM) is a theory-based paradigm for defining behavioural and organizational leverage points and intermediaries for health promotion within organizations, as well as for understanding the multifaceted and interactive impact of personal and environmental influences that determine behaviours [101]. This model was developed to promote public health by not only focusing on the behaviours themselves but also by addressing all levels of social and environmental factors that affect an individual's health behaviours. The model systematically categorizes these factors into five levels [102]: The individual or the intrapersonal level includes knowledge, attitudes, behaviour, self-concept, skills, and other individual factors that influence decision-making. The interpersonal level involves interpersonal relationships between individuals including formal and informal social networks and social support systems such as family, friends, neighbours, and colleagues who can be important sources of influence. The community-level includes the communities in which individuals operate including the relationships among various formal and informal social networks. The organizational level refers to the influences of established institutions and their structure and processes for operation. Lastly, the policy level refers to the regulatory policies, procedures, and laws that are set at the local, state, and national levels that influence decision-making. Interventions that are directed at each of these levels can, directly and indirectly, influence an individual's behaviours.

The SEM model can be a valuable framework for describing factors affecting breastfeeding practices at different levels and where interventions can be targeted. The outer level, or macrosystem/public policy (society/culture), includes national guidelines/recommendations, laws, legislation, and regulations that address breastfeeding. The community-level includes cultural norms, beliefs and support available for breastfeeding. The organizational level includes the health facility's breastfeeding policy and practice, and the training of health workers and peer counsellors. The microsystem or interpersonal level includes family and friends. Finally, the inner or individual level is typically understood as the mother-infant dyad (Figure 4). The model provides direction for the multiple interventions needed at different levels to increase rates and duration of breastfeeding. According to the model, individual knowledge, attitudes, and behaviour are shaped by interactions between the individual woman, her family and friends, and

her wider historical, social, political, economic, institutional, and community contexts. Thus, effective breastfeeding interventions use a combination of interventions at different levels of the model, and interventions that aim to improve women’s knowledge, attitudes, and behaviour towards breastfeeding can be directed at one or more of these levels.

In the planned study, the intervention focused on the individual and interpersonal levels. At the interpersonal level, WDA leaders were trained as peer educators and supporters to provide breastfeeding education and support to women in the intervention clusters. We anticipated that the education and support provided to women would improve the knowledge, attitudes and confidence of each woman. We anticipated that this would improve the breastfeeding practices i.e the incidence of early initiation and EBF. We also assumed that, at the institution level, the training of WDA leaders as peer educators and supporters was considered a capacity-building process for health institutions particularly the health posts as these women complement the work of HEWs.

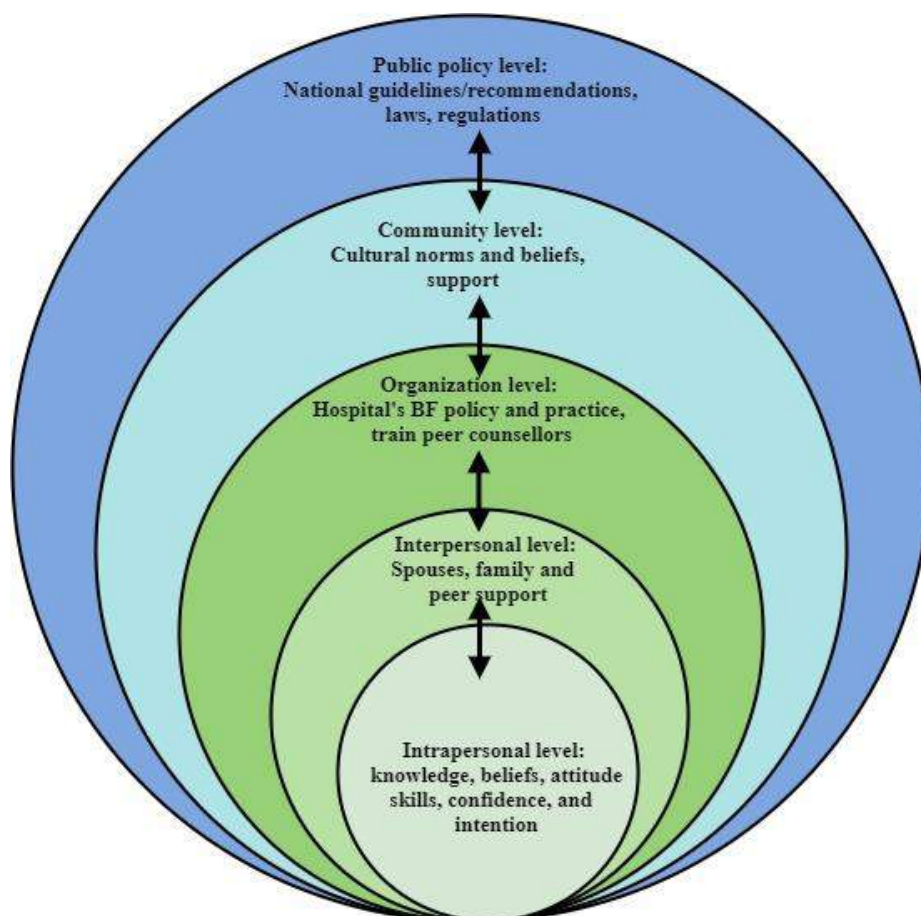


Figure 4: Social-ecological theory, Modified from Bronfenbrenner and Carter [101]

5. AIM AND OBJECTIVES OF THE THESIS

Aim

The overall aim of the thesis was to assess the effectiveness of Breastfeeding Education and Support Intervention on early initiation of breastfeeding, exclusive breastfeeding and infant growth.

Objectives

- 1) To adapt and validate Afan Oromo versions of the Iowa Infant Feeding Attitude Scale and the Breastfeeding Knowledge Questionnaire for use in an Ethiopian Setting
- 2) To determine the level and predictors of breastfeeding knowledge, and the attitudes of women towards breastfeeding practices
- 3) To develop and assess the effectiveness of Breastfeeding Education and Support Intervention on early initiation of breastfeeding, exclusive breastfeeding and infant growth embedded in the Ethiopian public health system. Secondary outcomes were changes in women's knowledge and attitudes towards breastfeeding from the baseline to six months and information on infant morbidity.

Research hypothesis

We hypothesised that a breastfeeding education and support intervention is superior to routine care in improving early initiation of breastfeeding, exclusive breastfeeding and infant growth in a rural Ethiopian setting.

6. METHODS

6.1 Study setting

The study was conducted in Mana district, one of the 21 districts found in Jimma zone, Oromia region, Southwest Ethiopia. The district is located 368 km from Addis Ababa and 22km from Jimma town. Agriculture is the main form of livelihood in the study community with coffee accounting for 80% of the main crops produced in the area. According to the Mana District Health Office, the district had a total population of 197, 911 in 2019. The district is administratively divided into 1 urban and 25 rural kebeles (the smallest administrative unit). There are 7 health centres, 26 health posts, 11 private clinics, 3 private pharmacies, 68 health extension workers and 121 health care providers of different professions in the district.

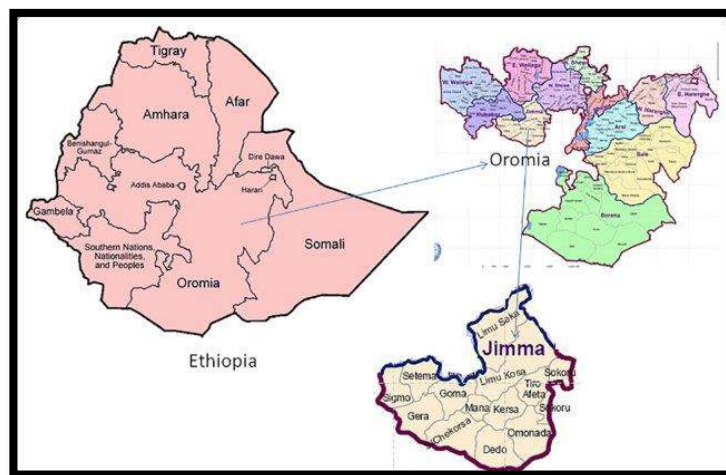


Figure 5: Google Maps directions of Jimma zone, Oromia regional state. Ethiopia Retrieved September 4, 2021, from <https://goole.com/maps/dir/Jimma>,

6.2 Study design

6.2.1 Design and study sample (Study 1 and 2)

We conducted a cross-sectional study with data from the baseline survey of the 468 pregnant women enrolled in our trial. Since one of the aims of the intervention was to improve breastfeeding practices by improving the knowledge and attitudes of the women, we first adapted and validated Afan Oromo versions of the IIFAS-AO and the BFKQ-AO (Study 1) to use them to measure the potential change in the levels of knowledge and attitude at six month due to the intervention. Then, to help us guide the design of the intervention and determine changes in women's knowledge and attitudes towards breastfeeding after the intervention, we assessed the baseline knowledge and attitudes levels and their predictors (Study 2).

6.2.2 Design and study sample (Study 3)

We employed a cluster-randomized controlled single-blind two-arm trial designed to evaluate the effectiveness of the Breastfeeding Education and Support Intervention on early initiation, EBF and infant growth in Ethiopia [103]. Out of 468 pregnant women (n intervention = 249; control = 219) enrolled at the beginning of the study, 47 were excluded at the one-month postpartum follow-up (n intervention = 28; control = 19) and 12 at the six-month postpartum follow up (n intervention = 9; control = 3). Eventually, we had outcome data from 421 (90.0%) mother-child pairs at the one-month postpartum follow-up (n intervention = 221; control = 200) and 409 (87.4%) mother-child pairs at the six-month postpartum follow-up (n intervention = 212; control = 197) (Figure 6).

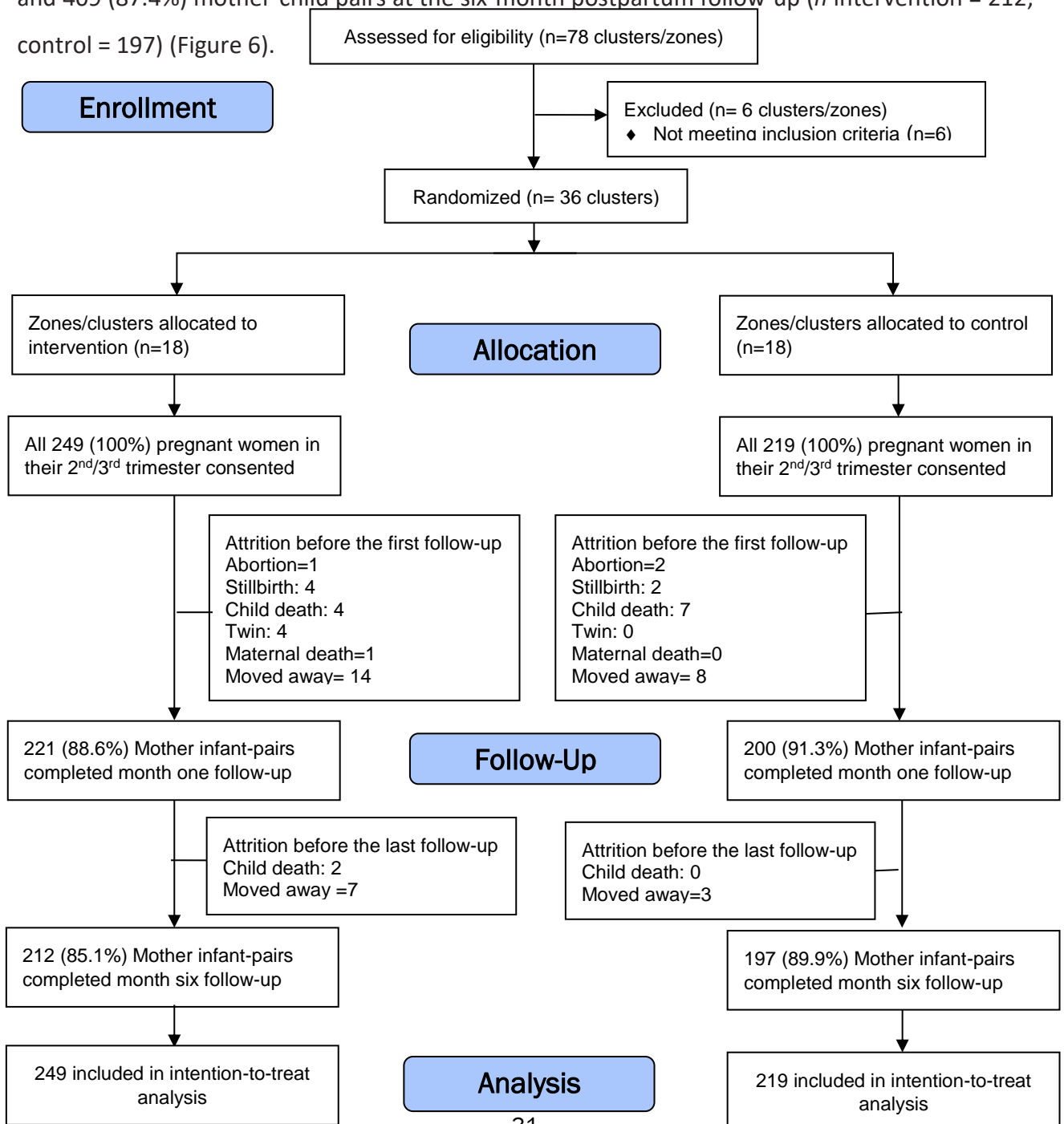


Figure 6: Trial profile for breastfeeding education and support intervention

6.2.3 Sample size and power calculation (Study 3)

We anticipated that the intervention would increase the proportion of EBF by 20 percentage points, from 58% (based on Ethiopian Demographic and Health Survey 2016) to 78%. To detect this difference, with 80% power, and 5% type I error, we estimated a need for 173 pregnant women per group, taking into account the intracluster correlation coefficient of 0.1 from a study conducted in Uganda [104]. We inflated the sample size from 346 to 432 to accommodate for a potential 20% attrition rate.

6.2.4 Randomization (Study 3)

From the 78 sub-districts found in Mana district, we selected 36 sub-districts. The identification of 36 sub-districts in which there was no similar ongoing intervention or projects that were not adjacent to each other in order to avoid contamination was conducted by a person working at Mana district who knew the geography of the district very well. The selected 36 sub-districts were then randomly assigned to either an intervention (n=18) or the control group (n=18). The allocation schedule for random assignment of clusters was done through computer-generated numbers by a statistician that was blinded to study groups and did not participate in the research. Allocation concealment was not done for study participants, as they would certainly know if they were in the intervention group or not. Only data collectors were masked to the allocation assignment.

6.2.5 Recruitment

After cluster randomization, all pregnant women in their second or third trimester residing in the selected clusters were identified by reviewing Health Extension Worker's (HEWs) antenatal care logbook. Besides, we used WDA leaders to identify pregnant women in their networks to minimize the chance of missing any pregnant women. All pregnant women were invited to a meeting at the health post where the nature and purpose of the trial and eligibility criteria were explained including their right to withdraw from the study at any time. They were then asked if they would like to participate. Once they agreed, we conducted an enrolment interview to assess if the women fulfilled the eligibility criteria.

6.2.6 Inclusion and exclusion criteria

Inclusion criteria during pregnancy were being pregnant in the second or third trimester, living in the selected cluster and having no plans to move away during the intervention period, and willingness to be visited by supervisors and data collectors. After delivery, the study exclusion criteria were the presence of severe psychological illness which could interfere with consent and study participation, serious illness or clinical complications warranting hospitalization, the occurrence of maternal death, abortion, stillbirth, infant death, twin gestation, preterm birth (at <37 weeks gestation), or any child congenital malformation that could interfere with breastfeeding. In this study we did not consider the HIV serostatus of the women for two reasons: firstly, the prevalence of HIV in rural Ethiopia was very low (0.6%) when this study was designed in 2016 [105], and secondly, we considered inquiring their status and disclosing it to peer-supporters as unethical.

6.2.7 Intervention (Study 3)

Training of peer supporters

As per the definition of peer support [76], for this trial, WDA leaders who could read and write the local language, aged 24-39 years, with experience of motherhood and breastfeeding and within the same locality as the women they supported were selected. We opted to use WDA leaders as peer supporters in this trial for several reasons. Firstly, they are already part of the country's healthcare system relieving the HEWs of much of the burden of outreach activities; secondly, they are found in every rural village of the country [86]; thirdly, they are role models admired and emulated by other women in their community for having adopted healthy lifestyles [106]; and lastly, WDA leaders are trained and supervised by the HEWs. Consequently, if the intervention is proven successful, the government may easily scale it up to other regions by using the WDAs as breastfeeding peer supporters at a low cost.

The WDA leaders from the intervention sub-districts were trained for 5 days as peer supporters by a nutritionist and a nurse who had previous training on breastfeeding. World Health Organization/United Nations Children's Fund/United States Agency for International Development manuals were used to prepare training manuals of the Ethiopian context in the Afan Oromo language [107-109]. Furthermore, a manual and counselling cards were prepared

from the above guidance documents to equip WDA leaders with the ability to educate and support study participants (Figure 7).

	<p>Nutrition for pregnant woman</p> <ul style="list-style-type: none"> → During your pregnancy, eat one extra small meal or “snack” (extra food between meals) each day to provide energy and nutrition for you and your growing baby. → You need to eat the best foods available, including milk, fresh fruit and vegetables, meat, fish, eggs, grains, peas and beans. → Drink water whenever you are thirsty. → Taking tea or coffee with meals can interfere with your body’s use of the foods. Limit the amount of coffee you drink during pregnancy. → During pregnancy, special nutrients will help your baby grow well and be healthy.
	<p>Delivery in facility</p> <ul style="list-style-type: none"> → Hold your newborn skin-to-skin immediately after birth. This will keep your baby warm and breathing well, help him/her reach the breast easily, and help you and your baby feel close. → Begin breastfeeding within the first hour of birth. Early breastfeeding helps the baby learn to breastfeed while the breast is still soft, and helps reduce your bleeding. → Colostrum, the thick yellowish milk, helps protect your baby from illness and helps remove the first dark stool. → Breastfeed frequently to help your breast milk ‘come in’ and to ensure plenty of breast milk. → Do not give water or other liquid/fluids to your baby during the first day after birth. They are not necessary and are dangerous for your newborn.
	<p>Proper positioning and attachment</p> <ul style="list-style-type: none"> → Good attachment helps to ensure that your baby suckles well and helps you to produce a good supply of breast milk. → Good attachment helps to prevent sore and cracked nipples. → Breastfeeding should not be painful. → Get help to improve the attachment if you experience pain. <p>The 4 signs of good positioning:</p> <ul style="list-style-type: none"> → The baby’s body should be straight, not bent or twisted, but with the head slightly back → The baby’s body should be facing the breast not held flat to your chest or abdomen, and he or she should be able to look up into your face → The baby should be close to you → You should support the baby’s whole body, not just the neck and shoulders, with your hand and forearm
	<p>The 4 signs of good attachment:</p> <ul style="list-style-type: none"> → Baby’s mouth is wide open → Baby’s chin is touching mother’s breast → You can see more of the darker skin (areola) above the baby’s mouth than below → Baby’s lower lip is turned outwards

Figure 7: Portion of counselling cards used for the breastfeeding education and support intervention

Breastfeeding education and peer support

The development of the Breastfeeding Education and Support Intervention (BFESI) was guided by the evidence from systematic reviews on the effectiveness of breastfeeding peer support interventions [24, 25]. According to a systematic review by Imdad et al [24], both prenatal and postnatal counseling were important for EBF at 6 months, while a review by Jolly et al [25], showed that peer support with high intensity (≥ 5 planned contacts) was effective. In addition, according to the social-ecological model, individual knowledge, and attitudes are intrapersonal level factors that influence behaviour [102]. Therefore, in addition to the above evidence on the characteristics of effective breastfeeding promotion intervention, we used the baseline finding on knowledge and attitude to identify areas that needed to be emphasised during the intervention period to enhance knowledge and attitude levels and thereby hopefully improve the rates of early initiation and exclusive breastfeeding practice.

The BFESI encompassed two prenatal and eight postnatal home visits. Women in the intervention group received two prenatal home visits in the 8th and 9th months and eight postnatal visits scheduled on the first/second, sixth/seventh, and fifteenth days, and thereafter monthly until the infant was five months old. During the two prenatal visits, peer supporters encouraged delivery at the nearby health centre, emphasized the importance of initiating breastfeeding within 1 h of delivery, feeding colostrum first, and discouraged the use of traditional pre-lacteal foods (items given to newborns before breastfeeding is established such as raw butter, plain water and milk-other than breast milk), and post-lacteal foods. In addition, the mothers were advised to eat one extra meal during pregnancy to support lactation. Discussions were supplemented by instructional materials and hands-on demonstrations of proper breastfeeding positions and latching. During the three postnatal visits in the first two weeks following childbirth, peer-supporters emphasised frequent and on-demand breastfeeding and discouraged giving the child any traditional pre-lacteal foods or post-lacteal food items if they had already been offered to the child. They also observed the newborn's positioning, latching, and feeding, resolving any breastfeeding problems and providing appropriate feedback to the women, all while encouraging the mothers to continue EBF for six months. During these sessions, women were advised to eat two extra meals during breastfeeding from a variety of foods available in their area to provide energy and nutrition for themselves and their babies while also ensuring adequate breast milk supply. From the visit at month one, peer-supporters began

emphasizing approaches for preparing for work and managing breast milk (expressing and storing breast milk), in addition to the above components. They also discussed the lactation amenorrhea method and other options for family planning. Hands-on guidance was offered only when it was necessary. During each visit, personal cleanliness and domestic hygiene were promoted, as well as washing hands before feeding, after using the toilet, and after changing a baby's diaper. Women were encouraged to ask questions about any of the topics discussed. Peer supporters also paid extra visits if the women had problems with breastfeeding, such as engorgement, cracked nipple or inadequate breastmilk, which could make it impossible for them to continue breastfeeding. Each visit lasted 20-40 minutes. Therefore, in addition to the informational/educational support outlined above, the women also received emotional, appraisal, and instrumental support aimed at improving their attitudes and confidence helping them to continue performing the behaviour by overcoming any breastfeeding problems or challenges they may experience. The TIDieR (Template for Intervention Description and Replication) Checklist is used to guide the description of the intervention (Table 2).

Women in the control group received routine care during the prenatal and postnatal period, as offered to women by HEWs and WDA leaders working in their cluster. In Ethiopia, as part of their standard/routine prenatal and postnatal care, the HEWs provide four focused prenatal visits, build a personalized birth preparedness and complication readiness plan, accompany a woman to a health facility during delivery, and conduct four postnatal visits [110]. HEWs are also expected to deliver the following key breastfeeding and nutrition messages to women during monthly growth monitoring sessions or antenatal or postnatal care visits as part of the community-based nutrition program: the importance of antenatal care, maternal nutrition during pregnancy and breastfeeding, early initiation of breastfeeding, proper positioning and attachment, EBF for six months, breastfeeding on demand, and complementary feeding [107]. WDA leaders also help HEWs by educating and mobilizing communities to use key available health services and dissemination of essential health messages like infant and young child feeding practices. A comparison between the intervention and routine care is presented in Table 3 below.

Table 2 The TIDieR (Template for Intervention Description and Replication) Checklist

Item number	Item	Where located **	
		Primary paper (page or appendix number)	Other † (details)
	BRIEF NAME		
1.	Provide the name or a phrase that describes the intervention.	35	_____
	WHY		
2.	Describe any rationale, theory, or goal of the elements essential to the intervention.	35	_____
	WHAT		
3.	Materials: Describe any physical or informational materials used in the intervention, including those provided to participants or used in intervention delivery or in training of intervention providers. Provide information on where the materials can be accessed (e.g. online appendix, URL).	33-34	_____
4.	Procedures: Describe each of the procedures, activities, and/or processes used in the intervention, including any enabling or support activities.	35-36	_____
	WHO PROVIDED		
5.	For each category of intervention provider (e.g. psychologist, nursing assistant), describe their expertise, background and any specific training given.	33	_____
	HOW		
6.	Describe the modes of delivery (e.g. face-to-face or by some other mechanism, such as internet or telephone) of the intervention and whether it was provided individually or in a group.	35	_____
	WHERE		
7.	Describe the type(s) of location(s) where the intervention occurred, including any necessary infrastructure or relevant features.	30	_____
	WHEN and HOW MUCH		
8.	Describe the number of times the intervention was delivered and over what period of time including the number of sessions, their schedule, and their duration, intensity or dose.	35-36	_____
	TAILORING		
9.	If the intervention was planned to be personalised, titrated or adapted, then describe what, why, when, and how.	N/A	_____
	MODIFICATIONS		
10.‡	If the intervention was modified during the course of the study, describe the changes (what, why, when, and how).	N/A	_____
	HOW WELL		
11.	Planned: If intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity, describe them.	38	_____
12.‡	Actual: If intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned.	38	_____

Note. N/A = an item is not applicable for the intervention being described

Table 3 Overview of differences between the BFESI and routine care

Activities	Intervention	Routine care
Training on breastfeeding	The peer supporters (the local WDA leaders) received 40 hours training based on the WHO manual	HEWs receive comprehensive training on maternal and child health care with less than half-day dedicated to breastfeeding No general breastfeeding training for WDA leaders
Frequency of visits	Scheduled two prenatal and eight postnatal visits	HEWs are expected to provide four prenatal and postnatal visits but do usually not make the recommended home visits as they are occupied with multiple duties WDA leaders conduct home visits to mobilize families and disseminate generic health messages when necessary
Timing of visit	Both prenatal and postnatal period	HEWs are expected to make prenatal and postnatal visits WDA leaders conduct home visits when necessary, no scheduled visit
Extra visits based on the need of women	The peer supporters were available to provide support to the women whenever needed	No such support was provided by HEWs and WDA leaders
Supervision	The peer supporters received scheduled supportive supervision	No such supervision for WDA leaders

To assess adherence to the intervention, each pregnant woman and peer supporter were given a sheet to tally the number and timing of visits and the papers were collected by the supervisors during the two follow-up visits. Accordingly, 189 (75.9%) of the 221 women who were available for the initial follow-up at month one following delivery received both prenatal appointments, and 152 (80%) of the visits were completed on time; 32 (12.9%) of the women received only one scheduled prenatal visit. Moreover, 150 (70.8%) of the 212 women who were available for the last follow-up visit received all eight scheduled postnatal visits, and 119 (79.3%) of the visits were completed on time. However, 35 women received seven visits, with 29 (82.9%) of those visits being on time, whereas 27 women received six visits, with 20 (74.1%) being on time.

Compensation

This was an unpaid trial. Each participant received two bars of soap at recruitment, as is typically done in other research projects. HEWs received mobile airtime for helping in the recruitment of

participants. Moreover, during home-to-home data collection, 50 ETB was paid to people who guided data collectors to participants' homes. Women Development Army leaders received 300 ETB per month as compensation for transport while providing the intervention.

Data collection

Data were collected at three time points during enrolment, at month 1 and month 6. Enrolment took place from May 2017 to September 2017. After delivery, data collection occurred at around month 1 (± 2 weeks) and month 6 (± 2 weeks). At baseline, we gathered data on demographic and socio-economic characteristics, information on various maternal factors, and maternal knowledge and attitudes towards breastfeeding. At one month postpartum, information gathered included pregnancy outcome and other study exclusion criteria, and maternal practice on early initiation of breastfeeding, including information about colostrum and pre-lacteals feeding. Data collected at six months postpartum included maternal knowledge and attitudes towards breastfeeding, EBF practice, infant anthropometry measurements, and morbidity. Data were collected by trained nurses and all instruments were used after the translation of English versions into the Afan Oromo language.

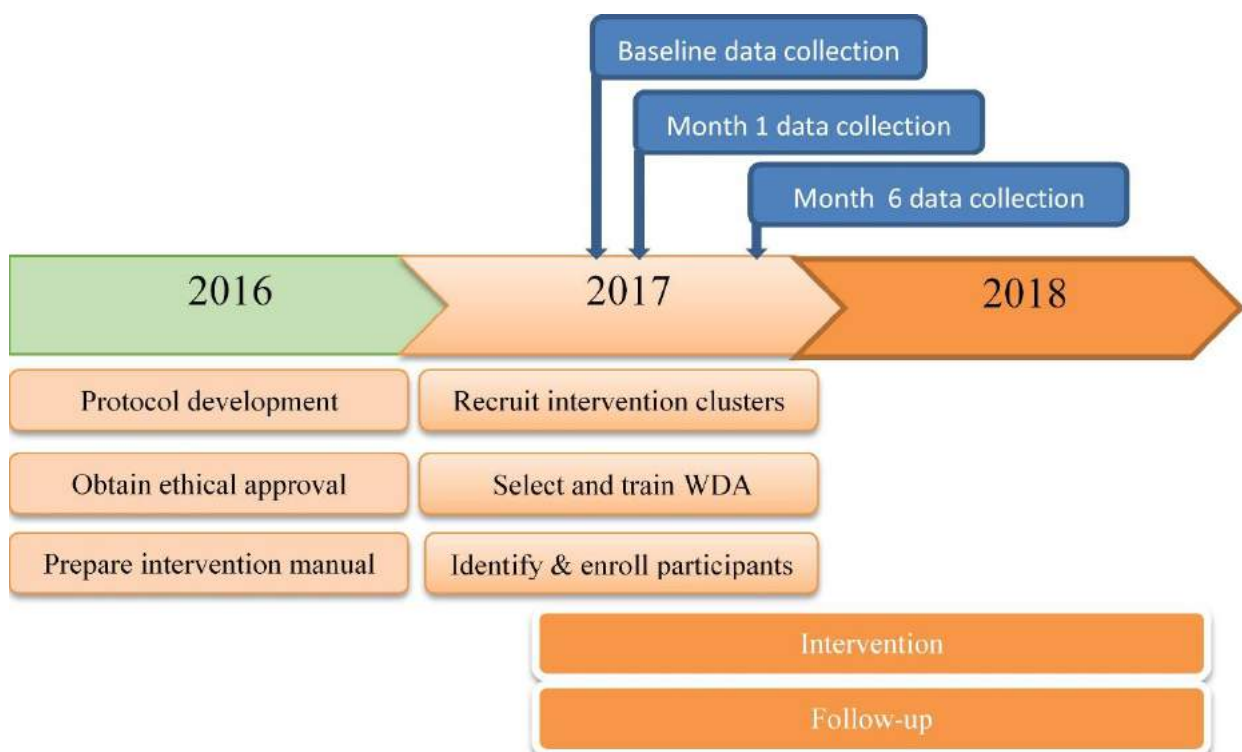


Figure 8: Study timeline and major milestones for breastfeeding education and support intervention in Jimma Zone

6.2.8 Outcome variables (Study 1 and 2)

The outcome variable for study 1 was the validity and reliability of the Afan Oromo versions of the BFKQ and the IIFAS. The outcome variables of study 2 were the levels and determinants of the scores from the BFKQ-AO and the IIFAS-AO.

6.2.9 Outcome variables and covariates (Study 3)

We used the Consolidated Standards of Reporting Trials (CONSORT) extension for cluster trials [111] for reporting the cluster randomised trial. The primary outcomes were early initiation of breastfeeding, EBF and infant growth. Secondary outcomes were knowledge and attitudes towards breastfeeding and infant morbidity measured at month six after delivery. Early initiation of breastfeeding and EBF practices were defined according to the World Health Organization's Infant and Young Child Feeding indicators [112]. Briefly, to measure the early initiation of breastfeeding, women were asked how soon they put their newborn to the breast after delivery. If their response was ≤ 1 hour, it was considered an optimal early initiation practice. EBF practice was defined as feeding the infant no other food or drink, not even water, except breast milk for the first 6 months of life, but allowing the infant to receive oral rehydration solution, drops and syrups (vitamins, minerals and medicines). To measure EBF practice, women were asked for how many months they exclusively breastfed their index child followed by whether they were currently giving their infants any food/drink other than breast milk. If their answer was "yes" to the second question, they were asked the age at which the food/drink was started. Thus, we used the above questions to determine if the child had been exclusively breastfed since birth.

Two independent teams of BSc nurses did anthropometric measurements of infant length, weight, and mid-upper arm circumference at the residential place of the study participants. Both teams conducted all measurements in duplicate and recorded them on separate forms so that the first measurement could not influence the second. Then, a supervisor compared the duplicate measurements and whenever there was a difference of ≥ 0.5 kg for weight, ≥ 1.0 cm for length, and ≥ 0.5 cm for mid-upper arm circumference both teams repeated the measurement. The infant's recumbent length was measured to the nearest 1 mm using a length board SECA 417 (Hamburg, Germany) while lying flat on his/her back, head in the centre of the head positioner, legs fully extended, and toes pointed up. Weight was measured to the nearest 1.0 g using an electronic scale (SECA 876, Hannover, Germany). First, the mother was weighed separately, then

the infant was weighed together with the mother, and the tare of the weight was ascertained by the mother/child function. MUAC was measured on the left arm at the mid-point between the elbow and the shoulder using non-stretchable tape to the nearest 0.1 cm (MUAC S0145610, UNICEF).

We used the average value of the duplicate anthropometry measurements for analysis, and length-for-age, weight-for-length and weight-for-age z scores were calculated based on the World Health Organizations's 2006 Child Growth Standards using the Stata *zscore06* command [113]. We determined child stunting, wasting and underweight from the respective z-score values using a cut-off <-2 SD from the median.

We used the Afan Oromo (AO) versions of the BFKQ and the IIFAS to assess maternal knowledge and attitudes towards breastfeeding, which were culturally adapted and validated in the same population. For the knowledge level, we used a cut-off of \geq the median for a good level of knowledge, since the breastfeeding knowledge questionnaire adopted from Malaysia does not have a cut-off point that suggests an optimal knowledge level. For attitudes, we used the recommended cut-off of ≥ 70 scores for positive attitudes towards breastfeeding [40].

Gestational age was determined based on self-reported last menstrual period, at enrolment. We used the 15th day of the month if women did not remember the exact date of the month. First, we determined the estimated date of delivery from the last menstrual period. Then we subtracted the difference between the estimated date of delivery and the actual date of delivery from 280 days. Finally, we divided the total number of days by 7 to determine the gestational age in weeks. Infant morbidity during the two weeks before the final follow-up was assessed through the maternal report. We used a sixteen-item household asset questionnaire adapted from the Ethiopian Demographic and Health Survey to assess Household wealth status [20], and principal components analysis to generate a household asset score [114]. We used the Household Food Insecurity Access Scale from the Food and Agriculture Organization to assess Household food security status [115]

6.2.10 Statistical methods

Double data entry was carried out using Epi-data version 3.1 (EpiData Association) and STATA version 13.0 was used for consistency checks and statistical analysis. We evaluated data normality by visual inspection of histograms and Q-Q plots and measures of kurtosis and

skewness. Descriptive statistics were summarized using frequency and percentages for categorical variables, and means \pm SD for normally distributed continuous variables.

Study 1 Content validity of the instruments was assessed by experts in the field while the construct validity was confirmed in two steps: exploratory factor analysis and confirmatory factor analysis. The exploratory factor analysis was carried out to extract the factors and the confirmatory factor analysis was done to confirm the exploratory factor analysis measurement model. The relationship between the indicator variables and their latent variables was assessed using structural equation modelling. The overall fit of the model was evaluated by the following measures: the ratio of χ^2 to the degree of freedom [116], Root Mean Squared Error of Approximation [117, 118], Comparative Fit Index [118], Tucker-Lewis Index $>$ [119], and Standardized Root Mean Square Residual [118]. The receiver operating characteristic curve was used to evaluate the predictive validity of two instruments in predicting women's intention of breastfeeding for at least 24 months. The area under the curve >0.9 was considered highly accurate whereas area under the curve 0.7-0.9 was considered as moderate accuracy. For criterion validity, we carried out regression analysis to identify the association between IIFAS-AO and BFKQ-AO Using Pearson's χ^2 -test.

The main goal of this study was not to reduce the IIFAS items as the IIFAS items have been examined in many previous studies in different contexts [40-50]. Hence, we used the criterion suggested by Nanshi et al. [43] to retain items in this study. Items were considered invalid if they had a negative loading on the first factor, if their alpha coefficient increased by more than 0.10 when omitted or if items had a corrected item-total correlation less than 0.07 [40]. The suitability of the data for factor analysis was assessed using the Kaiser-Meyer-Olkin measure of sample adequacy (KMO $>$ 0.5) and Bartlett's test of sphericity (P-value $<$ 0.05). Internal consistency reliability of the instruments was determined by calculating Cronbach's alpha values for the total scale of both IIFAS-AO and BFKQ-AO instruments and the subscales of BFKQ-AO. Cronbach's alpha coefficient with alpha values ≥ 0.70 was considered satisfactory [120].

Study 2 We run a bivariate analysis between the study outcomes breastfeeding knowledge and attitudes scores and their potential predictors to identify candidate predictors for the subsequent multiple linear regression models. Based on the result of the bivariate analysis, we then fitted multiple linear regression models to identify the independent predictors of

breastfeeding knowledge and attitudes scores. To take into account the clustering of subjects by study sub-districts, we applied a robust variance estimation. Further, we standardized knowledge and attitudes scores based on the distribution of our data and therefore, results are expressed as standardized regression coefficients and 95% CIs. We performed multicollinearity tests on the models using the variance inflation factor to assess problems of multicollinearity with values less than ten. The test results were statistically significant with values less than ten considered acceptable. We assessed model goodness of fit using adjusted R² values. All tests were two-tailed, and statistically significant association was considered at a p-value <0.05.

Study 3 We compared baseline characteristics of participants between study groups using an independent sample t-test for continuous variables and a chi-square test for the categorical variables. We estimated the effects of the intervention using linear regression models for the continuous outcomes and linear probability models for the binary outcomes. The use of linear probability models for binary outcomes is well established and allows for a straightforward interpretation of the average intervention effect expressed as risk difference using percentage points [121]. However, for the rare outcomes of child stunting, wasting and underweight we fitted logistic regression models. We applied robust standard error estimation in all models taking into account the clustering of subjects by sub-districts. Both unadjusted and adjusted group differences were estimated with the following covariates used in the adjusted estimates: maternal age, educational status, wealth index, parity, IIFAS and household food insecurity status. A statistical significance was declared at a p-value <0.05.

6.2.11 Missing data handling (Study 3)

For this particular study, all analyses were performed based on the intention-to-treat principle. Intention to treat analysis is a golden standard for analyzing the results of randomized trials. However, conducting this analysis requires including all trial participants in the analysis in the groups to which they were initially assigned. Therefore, when there are lost to follow-up participants with missing dependent variables and if the proportion of missing data is greater than 5%, imputation is the only option for running intention to treat analysis [122]. Therefore, we performed a multiple imputation using chained equation, which is a state-of-the-art method that can handle a wide range of data types. For this purpose, we run multiple imputations of hundred rounds of missing data for cases lost to follow-up to estimate the regression coefficients under the assumption of “missing at random” for Study 3. However, we have also performed the

complete case analysis to compare it with the intention-to-treat analysis to see if there is a difference in the estimates.

6.2.12 Ethical considerations

The Regional Committees for Medical and Health Research Ethics South-East Norway reviewed and waived the protocol (2016/1726 REC South East, Section D) for ethics. Ethical approval was obtained from Jimma University (RPGC/381/2016) and Oromia Regional Health Bureau (BEF/AHBFHI/1-8/2349). All participants received written and oral information regarding the trial (Appendix), were informed of their right to withdraw at any time without sufficient reasons or preconditions and were informed about the potential risks and benefits of the intervention before consenting. Written consent or fingerprint was obtained from all participants according to their literacy status, and they were assured of their confidentiality. All participants were given the research team's contact information in case they had questions or concerns at any time during the study. This trial was registered under ClinicalTrials.gov NCT 03030651 on January 25, 2017.

We obtained informed consent from each woman in a 2-stage procedure before inclusion in the trial. First, we obtained verbal consent to get their approval of having data collectors visit them for more information about the trial. Then we obtained written consent from women who consented to data collection. Using the information sheet, data collectors explained all trial procedures from inclusion criteria to the last follow-up and allowed participants to ask questions. According to their literacy status, women who were willing to consent either signed or put their fingerprints. Breastfeeding education and support were provided to all women in intervention clusters whether they participated in data collection or not. Unless a clear reason for non-participation in a scheduled visit was given, data collectors made three attempts to visit the mother-infant pair before a visit was considered missing. All mothers were revisited until the last scheduled visit, irrespective of the number of missed visits, unless there was a clear reason for termination.

7. RESULTS

Herein, we present the validation of the breastfeeding knowledge and attitudes questionnaire, levels of knowledge and attitudes, and the effectiveness of community-based breastfeeding education and support intervention on early initiation and exclusive breastfeeding practices as a summary of the results of the three separate studies. Detailed findings from each study that used different analytic approaches can be found in the enclosed published articles.

We found that both the BFKQ-AO and the IIFAS-AO instruments are valid and reliable tools as indicated by their Cronbach's alpha for internal consistency, model fit indices for construct validity, and the area under the curve values for predictive validity. In addition, the majority of the pregnant women had neutral attitudes towards breastfeeding and only half of them had adequate knowledge about breastfeeding. Further, while the maternal occupation was the only factor that determined maternal knowledge, maternal age, parity, antenatal care visits and knowledge scores were factors that determined maternal attitudes towards breastfeeding. Breastfeeding education and support intervention has improved early initiation, EBF and attitudes but not knowledge. Further, except for a higher mid-upper arm circumference and a lower prevalence of respiratory infection, we did not find a significant intervention effect on other outcomes of infant growth and morbidity.

Content validity: Content validity of the scales was confirmed by a panel of the expert committee and pre-test of the tools with items to be dropped or rephrased as well as the addition of new items determined by the study's context.

Construct validity: The Kaiser-Meyer-Olkin values of 0.76 for the BFKQ-AO and 0.71 for IIFAS-AO, and Bartlett's test of sphericity showing statistical significance for BFKQ-AO (χ^2 (df) = 3965 (561), $P < 0.001$) & for IIFAS-AO (χ^2 (df) = 1207 (136) &, $P < 0.001$) has confirmed the suitability of the data for factor analysis. To establish the construct validity of the BFKQ-AO, first, we conducted an exploratory factor analysis to determine the number of items to be retained and the analysis revealed that 34 items with 9 domains of BFKQ-AO were retained. Then, we performed a confirmatory factor analysis of the nine domains of BFKQ-AO suggested from the exploratory factor analysis which showed an acceptable model fit with χ^2 to the degree of freedom= 2.11, Root Mean Squared Error of Approximation (95% CI) = 0.049 (0.045, 0.053), Comparative Fit Index= 0.845, Tucker-Lewis Index= 0.823, Standardized Root Mean Square Residual= 0.060 and

Coefficient of Determination= 0.999 confirming the construct validity. Furthermore, the convergent validity of the measuring model was confirmed by the statistically significant ($P < 0.05$) association between items and their respective latent construct variables and the correlations among latent construct variables. In a factor analysis of the IIFAS-AO, six components were extracted accounting for 58.1% of the variance where the first factor explained 19.7% of the total variance. The factor loadings and scree plot test of IIFAS suggested the unidimensionality of the tool.

Predictive validity: For the sensitivity and specificity in predicting the intention of breastfeeding for ≥ 24 months, the area under the curve was 82% for the IIFAS-AO score and 79% for the BFKQ-AO score.

Reliability: Cronbach's alpha was 0.79 for the BFKQ-AO and 0.72 for IIFAS-AO suggesting an acceptable internal consistency of both instruments.

Once we adapted and validated the two instruments in the local context, we then determined the baseline levels of knowledge and attitudes and their determinants to help us guide the intervention. In our sample, the mean \pm SD of the overall IIFAS-AO score was 65.7 ± 7.6 points, with a range of 36 to 85 points. Furthermore, the overall BFKQ-AO score had a mean \pm SD of 24.6 ± 4.29 points, ranging from 3 to 34 points.

Because the original Malaysian questionnaire lacked a cut-off point for optimal knowledge level, we used a cut-off above or below the median to dichotomize the knowledge levels, while attitudes were categorized as follows: (1) positive to breastfeeding (IIFAS score 70–85), (2) neutral (IIFAS score 49–69) and (3) positive to formula feeding (IIFAS score 17–48) [40]. Accordingly, we found that nearly half of the women (47.6%) had a low level of knowledge while 60.9% had neutral attitudes toward breastfeeding. Women scored high on the following knowledge domains: advantage to baby, the advantage to mother, effective feeding, duration of feeding, and practical aspect of breastfeeding. However, they have scored low on colostrum, breast milk expression, problems with breastfeeding, and breast engorgement domains (Table 4).

Additional analysis: We also conducted a supplemental analysis retrospectively to categorize knowledge levels. First, we used a cut-off point above or below the mean value and we obtained

a similar result as with the median cut-off. We also categorized knowledge levels into three based on Food and Agriculture Organization's suggested threshold for recommending the need for nutrition-education intervention: (1) need urgent intervention ($\leq 70\%$), (2) intervention should be considered (71-89%) and (3) no need/difficult to justify ($\geq 90\%$) [123]. Based on this classification, we found that 35.5% of women scored below 70%, 55.8% scored 71-89%, and 8.76% scored $\geq 90\%$. Accordingly, 91.2% of the women required nutrition-education intervention, specifically breastfeeding education intervention in our circumstance.

Table 4 Median and median percentage scores for the overall and nine domains of BFKQ-AO (Table from paper I)

Subscales	No. of items	Median score (IQR)	Median percentage score (IQR)
Advantage to baby	4	4.00 (3.00, 4.00)	100 (75.0, 100)
Advantage to mother	5	5.00 (4.00, 5.00)	100 (80.0, 100)
Colostrum	2	1.00 (0.00, 2.00)	50.0 (0.0, 100)
Effective feeding	4	4.00 (4.00, 4.00)	100 (100, 100)
Breastmilk expression	6	4.00 (2.00, 4.00)	66.7 (33.3, 66.7)
Duration of feeding	4	4.00 (3.00, 4.00)	100 (75.0, 100)
Problem with breastfeeding	2	0.00 (0.00, 1.00)	0.00 (0.00, 50.0)
Breast engorgement	3	2.00 (1.00, 3.00)	66.7 (33.3, 100)
Practical aspects of breastfeeding	4	3.00 (3.00, 3.00)	75.0 (75.0, 75.0)
Over all BFKQ-AO	34	26.0 (23.0, 27.0)	76.5 (67.6, 79.4)

In multiple linear regression model, maternal occupation was the only predictor of the overall BFKQ-AO score (2.94 SD; 95% CI, 1.28, 4.59 SD; $P=0.009$) whereas age (0.57 SD; 95% CI, 0.24, 0.90 SD; $P=0.001$), parity (-0.24 SD; 95%CI, -0.47, -0.02SD; $P=0.034$), antenatal care visits (0.41 SD; 95% CI, (0.07, 0.74 SD; $P=0.017$) and the BFKQ-AO score (0.08 SD; 95% CI, 0.06, 0.09 SD; $P<0.000$) were the predictors of the IIFAS-AO score.

These findings were used to guide the BFESI where the knowledge areas in which women scored lower were included in the teaching material and women development army leaders were trained to emphasize more on the benefits of colostrum, breastmilk expression and storage, proper positioning and attachment and how to solve breast problems such as engorgement. Besides providing such informational support which improves women's knowledge, the Women Development Army leaders also provided emotional, appraisal and practical support which

would help women build confidence thereby making them develop positive attitudes towards breastfeeding.

Finally, we evaluated the effectiveness of the intervention on selected outcomes. Baseline characteristics of the study participants were similarly distributed between the two groups except for the household food insecurity access scale and IIFAS scores (Table 5). We found that, compared to the control, Breastfeeding Education and Support Intervention significantly increased prevalence of early initiation of breastfeeding by 25.9% (95% CI: 14.5, 37.3%; $P = 0.001$) and EBF by 14.6% (95% CI: 3.77, 25.5%; $P = 0.010$). Correspondingly, the intervention resulted in a significantly higher maternal breastfeeding attitudes (*Effect size (ES): 0.85 SD; 95% CI: 0.70, 0.99 SD; $P < 0.001$*). However, although the intervention group had a higher level of maternal breastfeeding knowledge score, this was not statistically significant. (*ES: 0.15 SD; 95% CI: -0.10, 0.41 SD; $P = 0.173$*). No significant intervention effect was found on other infant growth outcomes (weight-for-age z scores, length-for-age z scores, weight-for-length z scores) except that the intervention group had a significantly higher mid-upper arm circumference (*ES: 0.25 cm; 95% CI: 0.01, 0.49 cm; $P = 0.041$*). Similarly, except for a lower prevalence of respiratory infection over the past two weeks in the intervention group (*ES: -6.90%; 95% CI: -13.3, -0.61; $P = 0.033$*) we did not find a significant intervention effect on other morbidity outcomes. The complete case analysis, based on the study participants for whom data on outcome were available, yielded comparable effect estimates to the intention to treat analysis model findings.

Table 5 Baseline characteristics of study participants¹ (Modified table from paper III)

Variables	Intervention (n = 249)	Control (n = 219)
Maternal age, years		
15-19	22 (8.84)	28 (12.8)
20-34	212 (85.1)	178 (81.3)
35-40	15 (6.02)	13 (5.9)
Maternal educational status		
Illiterate	150 (60.2)	136 (62.1)
Can read and write	31 (12.5)	32 (14.6)
Primary education	19 (7.63)	10 (4.57)
Secondary education	49 (19.7)	41 (18.7)
Married	249 (53.2)	219 (46.8)
Housewife/farmer	233 (93.6)	206 (94.1)
Wealth quantiles		
Lowest	49 (19.6)	45 (20.6)
Second	45 (18.1)	49 (22.4)
Middle	47 (18.9)	46 (21.0)
Fourth	52 (20.9)	42 (19.1)
Highest	56 (22.5)	37 (16.9)
Birth interval ≥ 24 mo	188 (94.47)	164 (94.80)
Primipara	46 (18.5)	40 (18.3)
Household food security status		
Food secure	142 (57.0)	134 (61.2)
Mildly food insecure	58 (23.3)	29 (13.2)
Moderately food insecure	31 (12.5)	38 (17.4)
Severely food insecure	18 (7.23)	18 (8.22)
Have history of breastfeeding	198 (94.3)	172 (93.5)
IIFAS score	66.5 ± 6.93	64.8 ± 8.31
BFKQ score	24.7 ± 3.80	24.4 ± 4.81
Received ANC visit for the index baby	216 (98.6)	199 (98.5)
Received at least four ANC visits	109 (50.6)	106 (53.3)

¹Values are means ± SDs or proportions

ANC, Antenatal Care; BFKQ, Breast Feeding Knowledge Questionnaire; IIFAS, Iowa Infant Feeding Attitude Scale

8. DISCUSSION

8.1 Methodological considerations of cross-sectional studies (Study 1 and 2)

For this project, we have used different analytical approaches. Thereby, in this section of the thesis, the methodological considerations are discussed separately for each of the three studies.

8.1.1 Internal validity (Study 1 and 2)

In studies 1 and 2, we used data from our baseline survey, which implies a cross-sectional design. In epidemiological studies, there are two main types of errors: random error and systematic error [124]. Random error is defined as the variability in the data that cannot be readily explained. Systematic error (bias) is referred to as errors that arise from the way study participants are selected (selection bias), the way variables are measured (information bias), or failure to control for factors that can impact both exposure and outcome (confounding). In contrast to random errors, which lead to larger variance and imprecise estimates, systematic errors or bias may result in incorrect estimates.

Systematic error

Selection bias has been described as a systematic error that may arise from how subjects are selected for the study [125]. This may occur if the participants in a study are systematically different from those who are not participating due to non-response or dropout. If the association between exposure and outcome is different among participants and nonparticipants there is a selection bias. For studies 1 and 2, we used data from our baseline survey. At baseline, data were collected from all pregnant women in their second or third trimester who resided in 36 randomized sub-districts in the Mana district. We used the HEWs antenatal care logbook to identify all pregnant women who fulfilled our inclusion criteria. In addition, WDA leaders helped in identifying pregnant women who were not registered on the antenatal care logbook, minimizing the chance of missing women. We believe that these processes reduced the risk of selection bias.

Information bias occurs when there are flaws in measuring exposure, covariates, or outcome variables [126]. We have tried to minimize information bias by ensuring that data on covariates and outcome variables are collected identically.

Confounding implies that an observed association is actually between the outcome and a covariate other than the exposure under study [125]. It occurs when all or part of an apparent association between exposure and the outcome is accounted for by other variables that affect the outcome and are not themselves affected by the exposure [126]. In study 1, we merely assessed the presence of an association between the BFKQ-AO and the IIFAS-AO with socio-demographic variables. Hence, we did not make any adjustments to control for confounding variables. However, multiple linear regression models were used to adjust for potentially present confounders in study 2.

Random error

Random error is a type of error that can be reduced by increasing the sample size of the study. For study 1, considering the recommendation of 10 observations per variable for factor analysis, a sample size of 468 subjects was enough to validate the BFKQ-AO and IIFAS-AO tools with a total of 46 and 17 items, respectively [127]. Similarly, the sample size of 468 was considered sufficient for Study 2 that had eight independent variables.

8.1.2 External validity (Study 1 and 2)

External validity refers to the extent to which the findings can be generalized from the study sample to the target population. To generalize the results, the study population should be representative of the total population. However, because women in this study were demographically homogeneous, the findings may not apply to women in other regions of the country. Further, the cross-sectional nature of the study design makes it impossible to establish causal relationships. Furthermore, the majority of our rural Ethiopian participants had little or no formal education and very few of them participate in private business, making it difficult to establish a statistically significant association between attitude and educational or occupation status.

8.2 Methodological considerations of the breastfeeding intervention trial (Study 3)

We opted for a cluster randomized controlled trial design as randomization is viewed as the gold standard approach for evaluating the effects of interventions [128]. The main advantage of a cluster randomized controlled trial is that it reduces the risk of contamination across trial groups [129]. A cluster randomized controlled trial allocates clusters of people, or intact social units,

rather than individuals, to intervention and control groups, and outcomes can be measured on individuals within those clusters [130].

The Cochrane Collaboration's tool for assessing the risk of bias in trials classifies bias into six: selection bias, performance bias, detection bias, attrition bias, reporting bias and other biases [131]. *Internal validity* refers to the degree to which a study's data collection, analysis and interpretation are free from bias [126]. When a study is considered to be internally valid, the *external validity* or the generalizability of the findings to the more general target population can be assessed [125].

8.2.1 Internal validity (Study 3)

Randomized controlled trials have been used in the past in behavioural interventions and have several advantages in minimizing biases. *Selection bias* (also referred to as *allocation bias*) in the context of a randomized trial, concerns systematic differences between baseline characteristics of the groups that are compared. The randomized controlled trial design minimizes the risk of selection bias by two main features: random sequence generation and allocation concealment. In a randomized controlled trial, participants are randomly assigned to intervention and comparison groups, meaning that known and unknown confounding variables that may affect the outcome should be evenly distributed to the two groups, provided the sample size is sufficiently large. Sequence generation is a technique for allocating participants to intervention and comparison groups based on some chance (random) process [131]. Foreknowledge of forthcoming allocation at the time participants are recruited to the trial may cause selective enrolment of participants due to manipulation or because participants allocated to one treatment group may tend to refuse participation more than those allocated to the group(s) and thus bias the allocation [131]. Allocation concealment is a technique used to prevent foreknowledge of intervention assignment among those recruiting participants to a trial. Furthermore, the schedule for random assignment must be implemented rigorously to prevent foreknowledge of intervention assignment among those recruiting participants to a trial. Randomisation and concealment of the allocation sequence prevent selection bias.

In a cluster randomised trial, the potential for selection bias can be high, as allocation of treatment is predetermined for each member of the cluster [130]. In such trials, both individuals who carry out the randomization of clusters and recruitment of participants should be blind to

allocation status to reduce selection bias [132]. In this study, the random sequence was generated using a computer-generated random number, and the generation of the allocation sequence and randomization of clusters was done by a statistician who was blind to study groups and was not involved in the project. Moreover, we identified and recruited the clusters before randomisation, concealed the allocation from the person who gave permission for the clusters to be included in the trial and the HEWs who recruited the pregnant women in their clusters, and included all pregnant women in their second and third trimesters within each cluster. Therefore, we consider that the risk of selection bias as low in this study.

Performance bias is systematic differences between the groups in the care that is provided, or in exposure to factors other than the interventions of interest, typically as a result of lack of blinding [131]. Thus, lack of blinding threatens validity, particularly in a study that examines effectiveness of an intervention, as non-blinded participants could report their behaviour differently leading to social desirability bias. In this study, due to the nature of the trial, blinding or masking was not feasible for study participants or the personnel who delivered the intervention. Self-reported subjective outcomes such as breastfeeding practice and morbidity outcomes may therefore be affected by social desirability bias. The accuracy of self-reported outcome measures could perhaps have been assessed by measuring social desirability, but this was not done in our case.

Detection bias is systematic differences between groups in how outcomes are determined which may occur due to a lack of blinding of outcome assessors [131]. In our study, data collectors were masked to the sub-district allocation by not being informed about the allocation, not being part of trial implementers, and not being residents in any of the sub-districts. Moreover, the statistician performing the main data analysis was not involved in the implementation of the intervention. Therefore, we consider that the risk of detection bias was low.

Attrition bias is systematic differences between the intervention and comparison groups in withdrawals from the study [131]. In our study, 87.4% of the participants completed the trial and all losses to follow-up were addressed. The loss to follow-up rate was similar between the intervention and control groups. Although there was baseline balance in covariates except for IIFAS-AO and household food insecurity access scale, we cannot exclude the possibility that characteristics of those who lost to follow-up to participate may have differed between the study arms.

Reporting bias is systematic differences between reported and unreported findings [131]. We have reported analyses and outcomes according to the protocol and specified any deviations.

Random error

The most important strategy to minimise random error is to have a large sample size. The sample size for the current study was calculated with the goal of increasing EBF from 58% to 78%. We estimated that 173 pregnant women per group would be required to detect this difference with 80% power, 5% type I error and taking intracluster correlation into account. To account for a possible 20% attrition rate, we increased the sample size from 346 to 432. All in all, we consider the risk of bias to be low and our findings to be internally valid.

8.2.2 External validity (Study 3)

A key strength of this study is that it was a community-based, cluster-randomized trial, conducted in a real-world community setting. Participants of this study are from rural coffee-growing areas, the majority of them lack formal education, and are from food-secure households. Therefore, we believe that the results are likely to be generalizable to other similar community settings in Ethiopia. In terms of generalizability to other sub-Saharan African countries, many of them have community Health Workers similar to the Ethiopian HEWs. Ethiopia, on the other hand, has integrated WDA leaders into the country's healthcare system who shares the responsibilities of the HEWs in their villages. The community-based nutrition program implementation involves both the HEWs and the WDA leaders. In this study, we trained WDA leaders who live close to their neighbourhoods and are regarded as role models in their community, as peer supporters. Therefore, whether our findings could be generalized across sub-Saharan African countries will largely be determined by how the community health systems are organized.

8.3 Discussion of Main findings

8.3.1 Adaptation and Validation of the Breastfeeding Knowledge and attitude Questionnaire

Maternal knowledge and attitudes towards breastfeeding are factors that affect the decision to breastfeed including the initiation and duration [26, 52, 53, 56, 58]. Therefore, as one of the objectives of this thesis was to evaluate if breastfeeding education and support intervention improve knowledge and attitudes, we adapted and validated instruments to measure the

breastfeeding knowledge and attitudes of the women as there is a dearth of such instruments in Ethiopia.

The adaptation and validation procedures of the instruments were based on the conceptual framework proposed by Beaton et al. [133]. The initial step involves the forward-backward translation of the instruments. Following translation, the instruments' content validity must be assessed. In most recent studies, content validity has been assessed qualitatively through an expert committee [37] and quantitatively through the content validity index since there is no statistical test to assess it. In our study, the content validity of the instruments was assessed by consultations with a panel of experts. Following consultation with experts, we employed a method developed by Sperber et al. [134] for establishing semantic equivalence and validating the translated instrument in which 30 members of the faculty of public health ranked the original and back-translated versions in terms of language comparability and interpretation similarity.

The other type of validity assessed in this study was construct validity. One aspect of construct validity is structural validity. Confirmatory factor analysis is preferred over exploratory factor analysis to assess structural validity because confirmatory factor analysis can be used to test explicit hypotheses about an instrument's structure, whereas exploratory factor analysis is primarily used to explore the dimensionality of a set of items, and to identify items to revise or eliminate [135]. Regarding construct validity, while the Malay study used exploratory factor analysis to assess the construct validity of BFKQ-AO, we used confirmatory factor analysis to confirm the measurement model suggested by the exploratory factor analysis and found that all model fit indices including χ^2 to the degree of freedom, Root Mean Squared Error of Approximation, Comparative Fit Index, Tucker-Lewis Index, Standardized Root Mean Square Residual, and Coefficient of Determination were higher than the acceptable standard, confirming construct validity of BFKQ-AO. Moreover, consistent with the finding from Lebanon [136], the construct validity of BFKQ-AO was further confirmed by the significant positive association between the participants' BFKQ-AO and IIFAS-AO scores. Similar to the study in Hungary by Ungvary et al [137], in the current study, the construct validity of the 17 items of IIFAS-AO was confirmed by the Factor analysis. Only studies in Iran [138] and Greece [139] used confirmatory factor analysis for structural validity evaluation. The unidimensionality of the IIFAS-AO was confirmed by factor analysis.

In terms of criterion validity, predictive validity is used to determine if the scores of the instruments can predict future outcome/practice. Previous studies that validated IIFAS assessed its ability to predict intention, initiation and duration of breastfeeding, but this was not assessed in the original Malay version BFKQ study. In the current study, we did not predict the intention to breastfeed because all of the women in the study intended to breastfeed their babies. Similarly, we did not predict the actual duration of exclusive breastfeeding because the intervention would affect the actual breastfeeding practices of the groups. Thus, we assessed the ability of the instruments to predict the maternal intention of breastfeeding duration since all women intended to breastfeed. Accordingly, the prediction accuracy, i.e. area under the curve value of 0.79 revealed that the BFKQ-AO had good predictive validity for the duration of breastfeeding in our population. In addition, in concert with a study in Spain [140], the IIFAS-AO was valid in predicting breastfeeding duration with the area under the curve value of 0.82 in our study.

When it comes to reliability, we assessed internal consistency which evaluates whether the domains of an instrument measure the same characteristic, among the categories of reliability [141]. Consistent with the original study finding, we found that both the BFKQ-AO and the IIFAS-AO had acceptable internal consistency as indicated by Cronbach's alpha value of $>.70$ [39, 40]. Moreover, the Cronbach's alpha of IIFAS-AO reported in the current study corroborates the findings of many previous studies published after 2016 in Iran [138], Hungary [137], Spain [140], Canada [142] and Greece [139] except for the study carried out in Turkey [143] where α was 0.67.

8.3.2 Determinants of knowledge and attitudes towards breastfeeding

The collaborative nature of the studies offers the advantage of applying the method sequentially. Once we had determined that the instruments were valid and reliable in measuring knowledge and attitudes toward breastfeeding, we used the baseline survey to determine the levels and determinants of knowledge and attitudes of women towards breastfeeding to guide the breastfeeding education and support intervention.

In our study, we found that nearly half of the women had inadequate knowledge about breastfeeding. Furthermore, while the overall median percentage score was 76.5%, which is similar to the findings of the Malaysian study [39], the Ethiopian women scored lower in the domains of colostrum, breastmilk expression, problems with breastfeeding, and breast

engorgement. In the present study, knowledge about breastfeeding was found to be higher among women who were involved in small trades or private employment. This also accords with the expectation that employment is associated with improved general knowledge and education.

Most of the women in the current study had neutral attitudes towards breastfeeding and this broadly supports the findings from a Greece study [139]. In contrast to earlier findings in Iran [138], Turkey [143] and Spain [140], however, our study was unable to demonstrate positive attitudes towards breastfeeding. A possible explanation for this inconsistent result may be due to the culture/tradition and context as well as potential nuances in the translation of the instrument into the local language as well as sample characteristics.

We found that younger women had higher attitudes scores; however, a study in Greece found that older women had higher IIFAS scores [139]. In our context, it's likely that younger women had a higher IIFAS score because they don't have as many children, giving them more time to breastfeed their babies.

In the current study, although not statistically significant, the attitudes score observed among women who attended primary and secondary school was low compared to the illiterate ones. Contrary to this, in Turkey [143], Iran [138] and Greece [139] women who attended secondary school and above had a higher attitudes score. The reason for this discrepancy is not clear but it is possible that those who are educated may involve in small businesses or private jobs leading to negative attitudes towards breastfeeding among these women due to lack of time.

In our study of rural women, we found that those who worked in small businesses or private jobs had more unfavourable attitudes toward breastfeeding than those who stayed at home with their children, but this difference was not statistically significant. Similar to our finding, a study by Chen et al. found that there were no significant differences in infant feeding attitudes by working status [51]. Conversely, studies in Ireland and United Arab Emirates reported that employed women had high IIFAS scores [48, 144]. The absence of a statistically significant association between occupation and attitude could be explained by the fact that the majority of rural Ethiopian women are housewives (only 6.2% are involved in small business/private jobs), making it difficult to detect a potentially statistically significant association between attitude towards breastfeeding and occupation.

Multiparous women are expected to have positive attitudes towards breastfeeding due to their previous experience with other pregnancies as they may have received more information on breastfeeding. In the current study, multiparous women had negative attitudes toward breastfeeding unlike findings from Spain, where multiparous women had higher attitudes scores [140]. This result could be related to household duties, high infant mortality and morbidity, food hardship, and limited time to breastfeed, wherein all contribute to negative sentiments among rural Ethiopian multiparous women. Women with fewer children, on the other hand, may have time and be more concentrated on their babies.

In our study, the IIFAS-AO scores of pregnant women who had 4 or more antenatal care visits were higher. It is conceivable that these women were exposed to more prenatal breastfeeding education and counselling. Furthermore, in keeping with a recent study from Lebanon [136], higher scores of breastfeeding knowledge were significantly associated with a higher attitudes score.

8.3.3 Effectiveness of breastfeeding education and support interventions

We developed a breastfeeding education and support intervention based on evidence from systematic reviews and findings from the baseline survey and tested its effectiveness in improving early initiation and EBF practices, as well as infant growth, in a rural Ethiopian setting using a cluster-randomized controlled study design.

Breastfeeding practices

We found that the intervention significantly increased the prevalence of early initiation and EBF until six months. This finding is in line with findings from a systematic review in low and middle-income countries by Shakya et al. where community-based peer support increased early initiation of breastfeeding within an hour and EBF at six months [145]. Our results are consistent with a systematic review by Olufunlayo et al. where infants in the intervention group were more likely to be exclusively breastfed than controls [146]. According to these reviews, the interventions were effective when delivered one-to-one, during antenatal and post-natal periods and when intensity was between four to eight contacts/sessions, as our intervention. Furthermore, the current study findings reflect those of Kimani-Murage et al. who also found that home-based counselling increased the rate of EBF although this was not statistically significant [147]. In addition, our findings, when compared to other studies such as Community

Based Maternal and Neonatal Health and Nutrition projects in regions of Ethiopia, Senegal, and Kenya, show that incorporating nutrition interventions within an ongoing health program improves EBF significantly [148]. Further, because WDA leaders are role models who are admired in their community [106], their status as a peer may have facilitated effective communication and contributed to the success of the intervention.

Infant growth

Comparison of the current study findings with other studies on infant linear or ponderal growth consistently demonstrates an absence of statistically significant intervention effects. For example, a review by Guigliani et al in 2015 concluded that interventions for breastfeeding promotion were associated with small, nonsignificant increases in weight and length/height Z scores [94]. Similarly, a recent systematic review in low and middle-income countries by Lassi et al. reported that breastfeeding interventions had no effect on growth outcomes [149].

The absence of statistically significant intervention effects on growth outcomes might be linked to several factors. First, the effect of multiple testing could explain why the intervention had no significant effect on other infant growth outcomes except mid-upper arm circumference [150]. When we compare treatment groups multiple times, the probability of finding a difference just by chance increases with the number of times we compare them. Second, in resource-poor settings, inadequate EBF is one of the factors that contribute to growth faltering but is not the only one [151]. Third, growth faltering often begins in utero and continues for at least the first 2 years of postnatal life [152]. Fourth, growth faltering becomes more prominent after six months of age when infants start complementary feeding [153]. Therefore, we suggest that breastfeeding promotion interventions that are directed at improving infant growth be complemented with other interventions that address other risk factors for growth faltering beginning in the first 1000 days of life.

Childhood morbidity

Childhood morbidity is one of the most important outcomes of breastfeeding support interventions, as there is considerable evidence implying that breastfeeding reduces the incidence and severity of acute illnesses, including diarrhoea and pneumonia [3]. In our study, we assessed the effectiveness of the interventions on morbidity outcomes and found a lower prevalence of respiratory infection in the intervention group. However, the prevalence of

diarrheal disease was not statistically different between the two groups. This finding is contrary to that of Chapman et al. [98] and a trial from India [154] which revealed that peer counselling was found to reduce the prevalence of diarrhoea. However, our finding is still broadly consistent with earlier studies such as the PROMISE EBF trial and another study in Guinea-Bissau where diarrhoea was not significantly different between the intervention and control groups [75, 96]. This suggests that although EBF is one prevention strategy for diarrhoeal disease, it is not the only strategy [155]. In low and middle-income countries, water, sanitation, and hygiene interventions were shown to reduce the risk of diarrheal morbidity by 27-53% indicating that breastfeeding promotion interventions need to be complemented with such strategies [156]. Moreover, the prevalence of diarrhoea shows seasonal variation, where some pathogens are more prevalent during rainy seasons contaminating water sources [157]. Thus, we adjusted for seasons to see if it had a confounding role. In this regard, although most endline data were collected during the rainy season, the estimate for the diarrheal disease was statistically different between the two groups after adjustment.

Breastfeeding knowledge and attitudes

We anticipated that the intervention would improve maternal knowledge through the informational support provided to women, while the emotional support would increase their self-confidence and the practical support would improve their skills and all of these would together help women develop positive attitudes towards breastfeeding. We found that the intervention significantly improved the attitudes towards breastfeeding. However, the level of breastfeeding knowledge increased in both the intervention and control groups and there was no statistical difference between the two groups. This finding contradicts a recent systematic review by Rana et al which found that breastfeeding education and support improve caregivers' knowledge [158]. The lack of intervention effect on knowledge while attitudes improved significantly suggests that for a behaviour change, not only knowledge and personal intention to act but also the availability of social support is important [159]. Moreover, as reflected in the theory of planned behaviour, the peer-led education and support provided by the WDA leaders might have influenced the women to develop positive attitudes and a greater sense of confidence and commitment, leading to the adoption of the behaviour even without much gain in knowledge [33, 160].

8.4 Conclusions

This study has shown that the adapted breastfeeding knowledge questionnaire and the lowa Infant Feeding Attitude Scales were found to be valid and reliable instruments to measure maternal knowledge and attitudes towards breastfeeding in an Ethiopian context. This is the first report on the psychometric properties of the instruments from a representative sample of rural women in sub-Saharan Africa. One of the most significant findings to emerge from this study is that at baseline, most of the pregnant women had adequate knowledge about breastfeeding and neutral attitudes towards breastfeeding. The significance of maternal occupation in predicting knowledge score is supported by the current finding while age, parity, antenatal care visits and knowledge score predicted the attitudes score. The evidence from our interventional study strengthens the idea that breastfeeding education and support lead to a substantial increase in the prevalence of early initiation and EBF. Although this study couldn't detect a significant difference in knowledge level between the two groups, the intervention significantly improved maternal attitudes. In terms of growth and morbidity outcomes, we did not find a significant intervention effect except for a higher mid-upper arm circumference and a lower prevalence of respiratory infection in the intervention group.

8.5 Policy implications

The findings of this study have several relevant policy implications for Ethiopian policymakers. First, the Federal Ministry of Health and Regional Health Bureaus should make ensuring an appropriate system to integrate training of Women Development Army leaders as peer supporters in nutrition strategy a priority. Second, continued efforts are needed to make exclusive breastfeeding a common practice among rural women; a key policy priority should therefore be to plan for the long-term integration of breastfeeding education and support intervention into the components of the national nutrition strategy by respective policymakers. Lastly, the current intervention can be scaled up to other regions of the country at a low cost for the following reasons: the WDA leaders are already included in the country's health system with no need to recruit new peer supporters from the community; they are functioning in each village of rural Ethiopia; they are role models admired and copied by other women in their community for having adopted healthy lifestyles, HEWs are the ones who train and supervise these women meaning that no additional persons are needed to train and supervise them, the frequent visits would be feasible as the WDA leaders live close to their community compared to the HEWs.

8.6 Future research implications

- The BFKQ-AO and the IIFAS-AO were validated in rural Ethiopia which does not represent the urban areas and several questions remain unanswered including whether the tools are applied to educated, working and better off urban women. Therefore, future research is warranted to assess the applicability of these instruments in the urban settings of the country by involving women from diverse socio-economic and demographic backgrounds. Similar strategies can be used for the translation of the instruments to other local languages.
- The IIFAS is known to predict the intention, initiation and duration of breastfeeding. In the current study, since all women intended to breastfeed and the actual duration of EBF would be affected by the intervention, we predicted intention for the duration of breastfeeding for at least 24 months. Thus, a greater focus on the ability of both instruments to predict intention and the actual duration of EBF practice in longitudinal data could produce interesting findings that account more for the long-term effects of breastfeeding.
- A one-week repeated dietary recall has been suggested as a method with high sensitivity and specificity for EBF [161]. In this study, we interviewed the women only once to assess the prevalence of EBF which might not be optimal concerning this issue. Hence, what might be needed in future studies is to measure EBF in the weekly interval.
- In the current study, some variables that could have been useful to explain growth outcomes such as birth weight and maternal anthropometry were not measured due to the cost associated with it. Future work on breastfeeding promotion interventions that look mainly into infant growth is needed to fully understand the benefits of breastfeeding in this regard.
- Self-reported subjective outcomes such as breastfeeding practice and morbidity outcomes may be affected by social desirability bias. Future studies that measure such outcomes could assess the accuracy of self-reported outcome measures by measuring social desirability.
- For scales that are used to assess change, information about the reliability of change scores ideally should be assessed and reported with a value for the Smallest Detectable Change or Reliable Change Index. More information on the reliability of change scores at the end of the interventions would help us to establish a greater degree of accuracy on this matter.
- Process evaluation of intervention provides the necessary details to inform policy and practice. Conducting a process evaluation along with outcome evaluation could ensure that the intervention is delivered and implemented as planned to indicate the dose delivered, dose

received and reached. However, in this study, we did not conduct a process evaluation due to an inadequate budget. Therefore, future interventions with process evaluation are encouraged to better inform policy and future practice.

- Future similar studies that include cost-effectiveness analysis of intervention could be useful to decision-makers.
- Assessing the perception of women who participated in the intervention and the women development army leaders who provided the intervention would give important information on how to improve the intervention for future scale-up.
- The feasibility of integrating the current intervention into the existing primary healthcare system in Ethiopia should be investigated.

References

1. UNICEF, WHO, World Bank, UN-DESA. Levels & Trends in Child Mortality: Report 2018, Estimates Developed by the UN Inter-agency Group for Child Mortality Estimation: United Nations Children's Fund; 2018.
2. Black RE, Allen LH, Bhutta ZA, Caulfield LE, de Onis M, Ezzati M, et al. Maternal and child undernutrition: global and regional exposures and health consequences. *The Lancet*. 2008;371(9608):243-60.
3. Victora CG, Bahl R, Barros AJ, França GV, Horton S, Krasevec J, et al. Breastfeeding in the 21st century: epidemiology, mechanisms, and lifelong effect. *The Lancet*. 2016;387(10017):475-90.
4. Rollins NC, Bhandari N, Hajeebhoy N, Horton S, Lutter CK, Martines JC, et al. Why invest, and what it will take to improve breastfeeding practices? *Lancet (London, England)*. 2016;387(10017):491-504.
5. World Health Organization. Guideline: protecting, promoting and supporting breastfeeding in facilities providing maternity and newborn services: World Health Organization; 2017. Available from: <https://apps.who.int/iris/bitstream/handle/10665/259386/9789241550086-eng.pdf> (Accessed on June 08, 2020).
6. World Health Organization, United Nations Children's Fund. Global strategy for infant and young child feeding., WHO, Geneva. 2003. Available from: <https://apps.who.int/iris/bitstream/handle/10665/42590/9241562218.pdf?sequence=1> (Accessed on September08, 2020).
7. Smith ER, Hurt L, Chowdhury R, Sinha B, Fawzi W, Edmond KM. Delayed breastfeeding initiation and infant survival: A systematic review and meta-analysis. *PloS one*. 2017;12(7):e0180722.
8. Khan J, Vesel L, Bahl R, Martines JC. Timing of breastfeeding initiation and exclusivity of breastfeeding during the first month of life: effects on neonatal mortality and morbidity--a systematic review and meta-analysis. *Maternal and child health journal*. 2015;19(3):468-79.
9. Smith ER, Locks LM, Manji KP, McDonald CM, Kupka R, Kisenge R, et al. Delayed Breastfeeding Initiation Is Associated with Infant Morbidity. *The Journal of pediatrics*. 2017;191:57-62.e2.
10. UNICEF. Scientific Rationale: Benefits of Breastfeeding'. New York, United Nations Children's Fund. 2012.
11. Horta BL, Victora CG, World Health O. Short-term effects of breastfeeding: a systematic review on the benefits of breastfeeding on diarrhoea and pneumonia mortality. Geneva: World Health Organization; 2013 2013.
12. Bowatte G, Tham R, Allen KJ, Tan DJ, Lau M, Dai X, et al. Breastfeeding and childhood acute otitis media: a systematic review and meta-analysis. *Acta paediatrica (Oslo, Norway : 1992)*. 2015;104(467):85-95.
13. Tham R, Bowatte G, Dharmage SC, Tan DJ, Lau MX, Dai X, et al. Breastfeeding and the risk of dental caries: a systematic review and meta-analysis. *Acta paediatrica (Oslo, Norway : 1992)*. 2015;104(467):62-84.
14. Peres KG, Cascaes AM, Nascimento GG, Victora CG. Effect of breastfeeding on malocclusions: a systematic review and meta-analysis. *Acta paediatrica (Oslo, Norway : 1992)*. 2015;104(467):54-61.
15. Horta BL, Loret de Mola C, Victora CG. Long-term consequences of breastfeeding on cholesterol, obesity, systolic blood pressure and type 2 diabetes: a systematic review and meta-analysis. *Acta paediatrica (Oslo, Norway : 1992)*. 2015;104(467):30-7.
16. Horta BL, Loret de Mola C, Victora CG. Breastfeeding and intelligence: a systematic review and meta-analysis. *Acta paediatrica (Oslo, Norway : 1992)*. 2015;104(467):14-9.
17. Chowdhury R, Sinha B, Sankar MJ, Taneja S, Bhandari N, Rollins N, et al. Breastfeeding and maternal health outcomes: a systematic review and meta-analysis. *Acta paediatrica (Oslo, Norway : 1992)*. 2015;104(467):96-113.
18. UNICEF/WHO. Capture the Moment--Early initiation of breastfeeding: The best start for every newborn 2018. Available from: <https://www.unicef.org/eca/media/4256/file/Capture-the-moment-EIBF-report.pdf> (Accessed on June 08, 2020).

19. Bhattacharjee NV, Schaeffer LE, Hay SI. Mapping inequalities in exclusive breastfeeding in low- and middle-income countries, 2000-2018. 2021.
20. Central Statistical Agency (CSA) [Ethiopia] and, ICF. Ethiopia demographic and health survey. Addis Ababa, Ethiopia, and Rockville, Maryland, USA: CSA and ICF; 2016. Available from: <https://dhsprogram.com/pubs/pdf/FR328/FR328.pdf> (Accessed on March 31, 2021).
21. Ministry of Health Ethiopia. Health sector transformation plan (2015/16–2019/20): Federal Ministry of Health Addis Ababa, Ethiopia; 2015. Available from: https://www.globalfinancingfacility.org/sites/gff_new/files/Ethiopia-health-system-transformation-plan.pdf (Accessed on 05 November 2021).
22. Federal Democratic Republic of Ethiopia. National Nutrition Programme II: 2016–2020. Addis Ababa, Ethiopia: Federal Democratic Republic of Ethiopia. Available from: <http://extwprlegs1.fao.org/docs/pdf/eth190946.pdf> (Accessed on March 31, 2021).
23. Ethiopian Public Health Institute [Ethiopia] and ICF. Ethiopia Mini Demographic and Health Survey: Key Indicators. Rockville, Maryland, USA 2019. Available from: <https://dhsprogram.com/pubs/pdf/FR363/FR363.pdf> (Accessed on March 31, 2021).
24. Imdad A, Yakoob MY, Bhutta ZA. Effect of breastfeeding promotion interventions on breastfeeding rates, with special focus on developing countries. *BMC public health*. 2011;11 Suppl 3:S24.
25. Jolly K, Ingram L, Khan KS, Deeks JJ, Freemantle N, MacArthur C. Systematic review of peer support for breastfeeding continuation: metaregression analysis of the effect of setting, intensity, and timing. *BMJ*. 2012;344:d8287.
26. Dungy C, Losch M, Russell D. Maternal attitudes as predictors of infant feeding decisions. *Journal of the Association for Academic Minority Physicians: the official publication of the Association for Academic Minority Physicians*. 1994;5(4):159-64.
27. Neves PAR, Vaz JS, Maia FS, Baker P, Gatica-Domínguez G, Piwoz E, et al. Rates and time trends in the consumption of breastmilk, formula, and animal milk by children younger than 2 years from 2000 to 2019: analysis of 113 countries. *The Lancet Child & Adolescent Health*.
28. World Health Organization/United Nations Children's Fund. The extension of the 2025 Maternal, Infant and young Child nutrition targets to 2030 - WHO/UNICEF discussion-paper May 2021. Available from: <https://data.unicef.org/resources/extension-of-2025-maternal-infant-young-child-nutrition-targets-2030/> (accessed on November 11, 2021).
29. Ahmed KY, Page A, Arora A, Ogbo FA. Trends and determinants of early initiation of breastfeeding and exclusive breastfeeding in Ethiopia from 2000 to 2016. *International breastfeeding journal*. 2019;14:40-.
30. World Health Organization. Acceptable medical reasons for use of breast-milk substitutes: World Health Organization; 2009. Available from: https://apps.who.int/iris/bitstream/handle/10665/69938/WHO_FCH_CAH_09.01_eng.pdf?ua=1 (Accessed September 24, 2020).
31. Barennes H, Slesak G, Goyet S, Aaron P, Srour LM. Enforcing the International Code of Marketing of Breast-milk Substitutes for Better Promotion of Exclusive Breastfeeding: Can Lessons Be Learned? *Journal of human lactation : official journal of International Lactation Consultant Association*. 2016;32(1):20-7.
32. McFadden A, Kenney-Muir N, Whitford H, Renfrew M. Breastfeeding: Policy Matters. Identifying Strategies to Effectively Influence Political Commitment to Breastfeeding: A Review of Six Country Case Studies. Save the Children London, UK; 2015.
33. Avery A, Zimmermann K, Underwood PW, Magnus JH. Confident commitment is a key factor for sustained breastfeeding. *Birth (Berkeley, Calif)*. 2009;36(2):141-8.
34. Odom EC, Li R, Scanlon KS, Perrine CG, Grummer-Strawn L. Reasons for earlier than desired cessation of breastfeeding. *Pediatrics*. 2013;131(3):e726-e32.
35. Kavle JA, LaCroix E, Dau H, Engmann C. Addressing barriers to exclusive breast-feeding in low- and middle-income countries: a systematic review and programmatic implications. *Public health nutrition*. 2017;20(17):3120-34.

36. Chambers J, McInnes R, Hoddinott P, Alder E. A systematic review of measures assessing mothers' knowledge, attitudes, confidence and satisfaction towards breastfeeding. *Breastfeeding review* : professional publication of the Nursing Mothers' Association of Australia. 2007;15 3:17-25.
37. Kimberlin CL, Winterstein AG. Validity and reliability of measurement instruments used in research. *American journal of health-system pharmacy* : AJHP : official journal of the American Society of Health-System Pharmacists. 2008;65(23):2276-84.
38. Grossman LK, Harter C, Hasbrouck C. Testing mothers' knowledge of breastfeeding: instrument development and implementation and correlation with infant feeding decision. *Journal of Pediatric & Prenatal Nutrition*. 1991;2(2):43-63.
39. Tengku Ismail TA, Sulaiman Z. Reliability and validity of a Malay-version questionnaire assessing knowledge of breastfeeding. *The Malaysian journal of medical sciences* : MJMS. 2010;17(3):32-9.
40. Mora Adl, Russell DW, Dungy CI, Losch M, Dusdieker L. The Iowa Infant Feeding Attitude Scale: Analysis of Reliability and Validity. *Journal of Applied Social Psychology*. 1999;29(11):2362-80.
41. Twells LK, Midodzi WK, Ludlow V, Murphy-Goodridge J, Burrage L, Gill N, et al. Assessing Infant Feeding Attitudes of Expectant Women in a Provincial Population in Canada: Validation of the Iowa Infant Feeding Attitude Scale. *Journal of Human Lactation*. 2014;32(3):NP9-NP18.
42. Cox KN, Giglia RC, Binns CW. The influence of infant feeding attitudes on breastfeeding duration: evidence from a cohort study in rural Western Australia. *International breastfeeding journal*. 2015;10(1):25.
43. Nanishi K, Jimba M. Reliability and Validity of the Japanese Version of the Iowa Infant Feeding Attitude Scale: A Longitudinal Study. *Journal of Human Lactation*. 2014;30(3):346-52.
44. Ho YJ, McGrath JM. A Chinese version of Iowa Infant Feeding Attitude Scale: reliability and validity assessment. *International journal of nursing studies*. 2011;48(4):475-8.
45. Wallis AB, Brinzaniuc A, Chereches R, Oprescu F, Sirlincan E, David I, et al. Reliability and validity of the Romanian version of a scale to measure infant feeding attitudes and knowledge. *Acta Paediatrica*. 2008;97(9):1194-9.
46. Dungy CI, McInnes RJ, Tappin DM, Wallis AB, Oprescu F. Infant feeding attitudes and knowledge among socioeconomically disadvantaged women in Glasgow. *Maternal and child health journal*. 2008;12(3):313-22.
47. Wilkins C, Ryan K, Green J, Thomas P. Infant feeding attitudes of women in the United Kingdom during pregnancy and after birth. *Journal of human lactation* : official journal of International Lactation Consultant Association. 2012;28(4):547-55.
48. Sittlington J, Stewart-Knox B, Wright M, Bradbury I, Scott JA. Infant-feeding attitudes of expectant mothers in Northern Ireland. *Health education research*. 2007;22(4):561-70.
49. Tomas-Almarcha R, Oliver-Roig A, Richart-Martinez M. Reliability and Validity of the Reduced Spanish Version of the Iowa Infant Feeding Attitude Scale. *Journal of Obstetric, Gynecologic, & Neonatal Nursing*. 2016;45(5):e26-40.
50. Charafeddine L, Tamim H, Soubra M, de la Mora A, Nabulsi M. Validation of the Arabic Version of the Iowa Infant Feeding Attitude Scale among Lebanese Women. *Journal of Human Lactation*. 2016;32(2):309-14.
51. Chen S, Binns CW, Liu Y, Maycock B, Zhao Y, Tang L. Attitudes towards breastfeeding - the Iowa Infant Feeding Attitude Scale in Chinese mothers living in China and Australia. *Asia Pacific journal of clinical nutrition*. 2013;22(2):266-9.
52. Leshi O, Samuel FO, Ajakaye MO. Breastfeeding knowledge, attitude and intention among female young adults in Ibadan, Nigeria. *Open Journal of Nursing*. 2016;6(1):11-23.
53. Mahmud NA. Knowledge of Breastfeeding: A descriptive study among mothers in Kirkuk Governorate. *Iraqi National Journal of Nursing Specialties*. 2011;24(2).
54. Chen C-H, Chi C-S. Maternal intention and actual behavior in infant feeding at one month postpartum. *Acta paediatrica taiwanica*. 2003;44(3):140-4.
55. Jessri M, Farmer AP, Maximova K, Willows ND, Bell RC, Team AS. Predictors of exclusive breastfeeding: observations from the Alberta pregnancy outcomes and nutrition (APRON) study. *BMC pediatrics*. 2013;13(1):77.

56. Scott JA, Binns CW, Oddy WH, Graham KI. Predictors of breastfeeding duration: evidence from a cohort study. *Pediatrics*. 2006;117(4):e646-e55.
57. Sonko A, Worku A. Prevalence and predictors of exclusive breastfeeding for the first six months of life among women in Halaba special woreda, Southern Nations, Nationalities and Peoples' Region/SNNPR/, Ethiopia: a community based cross-sectional study. *Archives of Public Health*. 2015;73(1):53.
58. Thulier D, Mercer J. Variables associated with breastfeeding duration. *Journal of Obstetric, Gynecologic & Neonatal Nursing*. 2009;38(3):259-68.
59. Egata G, Berhane Y, Worku A. Predictors of non-exclusive breastfeeding at 6 months among rural mothers in east Ethiopia: a community-based analytical cross-sectional study. *International breastfeeding journal*. 2013;8(1):8.
60. Mekuria G, Edris M. Exclusive breastfeeding and associated factors among mothers in Debre Markos, Northwest Ethiopia: a cross-sectional study. *International breastfeeding journal*. 2015;10(1):1.
61. Organization WH. Declaration of Alma-Ata: International Conference on Primary Health Care, Alma-Ata, USSR, 6–12 September 1978 1978. Available from: https://www.who.int/publications/almaata_declaration_en.pdf (Accessed on July 30, 2020).
62. World Health Organization. International code of marketing of breast-milk substitutes: World Health Organization; 1981. Available from: <https://apps.who.int/iris/handle/10665/40382> (Accessed on November 11, 2021).
63. International Labour Office. Maternity and Paternity at Work 2014. Available from: https://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/---publ/documents/publication/wcms_242615.pdf (Accessed on September 30, 2020).
64. International Labour Office. Maternity at work: a review of national legislation: findings from the ILO database of conditions of work and employment laws. International Labour Office, Geneva 2010. Available from: https://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/---publ/documents/publication/wcms_124442.pdf (Accessed on September 30, 2020).
65. Unicef. Innocenti Declaration on the Protection, Promotion and Support of Breastfeeding, 1 August 1990, Florence, Italy: Unicef; 1990. Available from: <http://waba.org.my/v3/wp-content/uploads/2019/04/1990-Innocenti-Declaration.pdf> (Accessed on September 30, 2020).
66. World Health Organization. Implementation guidance: protecting, promoting and supporting breastfeeding in facilities providing maternity and newborn services: the revised baby-friendly hospital initiative 2018. Available from: <https://www.unicef.org/media/95191/file/Baby-friendly-hospital-initiative-implementation-guidance-2018.pdf> (Accessed on November 11, 2021).
67. UNICEF. Innocenti Declaration on Infant and Young Child Feeding 2005. Available from: https://www.unicef-irc.org/publications/pdf/declaration_eng_p.pdf (Accessed on March 11, 2020).
68. Pérez-Escamilla R, Martínez JL, Segura-Pérez S. Impact of the Baby-friendly Hospital Initiative on breastfeeding and child health outcomes: a systematic review. *Maternal & child nutrition*. 2016;12(3):402-17.
69. Haines A, Sanders D, Lehmann U, Rowe AK, Lawn JE, Jan S, et al. Achieving child survival goals: potential contribution of community health workers. *Lancet (London, England)*. 2007;369(9579):2121-31.
70. Bhutta ZA, Das JK, Walker N, Rizvi A, Campbell H, Rudan I, et al. Interventions to address deaths from childhood pneumonia and diarrhoea equitably: what works and at what cost? *Lancet (London, England)*. 2013;381(9875):1417-29.
71. USAID. Community-based distribution for routine Iron/folic acid supplementation in pregnancy. Maternal and Child Health Integrated Program, USAID, Nairobi 2014. Available from: https://www.mchip.net/sites/default/files/MCHIP%20Brief_community%20IFA.pdf (accessed 08 April 2021).
72. Bhutta ZA, Das JK, Rizvi A, Gaffey MF, Walker N, Horton S, et al. Evidence-based interventions for improvement of maternal and child nutrition: what can be done and at what cost? *Lancet (London, England)*. 2013;382(9890):452-77.
73. Lewycka S, Mwansambo C, Rosato M, Kazembe P, Phiri T, Mganga A, et al. Effect of women's groups and volunteer peer counselling on rates of mortality, morbidity, and health behaviours in mothers

and children in rural Malawi (MaiMwana): a factorial, cluster-randomised controlled trial. *Lancet* (London, England). 2013;381(9879):1721-35.

74. Ochola SA, Labadarios D, Nduati RW. Impact of counselling on exclusive breast-feeding practices in a poor urban setting in Kenya: a randomized controlled trial. *Public health nutrition*. 2013;16(10):1732-40.

75. Tylleskar T, Jackson D, Meda N, Engebretsen IM, Chopra M, Diallo AH, et al. Exclusive breastfeeding promotion by peer counsellors in sub-Saharan Africa (PROMISE-EBF): a cluster-randomised trial. *Lancet* (London, England). 2011;378(9789):420-7.

76. Dennis C-L. Peer support within a health care context: a concept analysis. *International journal of nursing studies*. 2003;40(3):321-32.

77. McFadden A, Gavine A, Renfrew MJ, Wade A, Buchanan P, Taylor JL, et al. Support for healthy breastfeeding mothers with healthy term babies. *Cochrane Database of Systematic Reviews*. 2017(2).

78. Kirkwood BR, Manu A, ten Asbroek AH, Soremekun S, Weobong B, Gyan T, et al. Effect of the Newhints home-visits intervention on neonatal mortality rate and care practices in Ghana: a cluster randomised controlled trial. *Lancet* (London, England). 2013;381(9884):2184-92.

79. Penfold S, Manzi F, Mkumbo E, Temu S, Jaribu J, Shamba DD, et al. Effect of home-based counselling on newborn care practices in southern Tanzania one year after implementation: a cluster-randomised controlled trial. *BMC pediatrics*. 2014;14(1):187.

80. Hanson C, Manzi F, Mkumbo E, Shirima K, Penfold S, Hill Z, et al. Effectiveness of a Home-Based Counselling Strategy on Neonatal Care and Survival: A Cluster-Randomised Trial in Six Districts of Rural Southern Tanzania. *PLoS medicine*. 2015;12(9):e1001881-e.

81. Waiswa P, Pariyo G, Kallander K, Akuze J, Namazzi G, Ekirapa-Kiracho E, et al. Effect of the Uganda Newborn Study on care-seeking and care practices: a cluster-randomised controlled trial. *Global health action*. 2015;8:24584-.

82. Mangwi Ayiasi R, Atuyambe LM, Kiguli J, Orach CG, Kolsteren P, Criel B. Use of mobile phone consultations during home visits by Community Health Workers for maternal and newborn care: community experiences from Masindi and Kiryandongo districts, Uganda. *BMC public health*. 2015;15(1):560.

83. Ijumba P, Doherty T, Jackson D, Tomlinson M, Sanders D, Swanevelder S, et al. Effect of an integrated community-based package for maternal and newborn care on feeding patterns during the first 12 weeks of life: a cluster-randomized trial in a South African township. *Public health nutrition*. 2015;18(14):2660-8.

84. Tomlinson M, Doherty T, Ijumba P, Jackson D, Lawn J, Persson LA, et al. Goodstart: a cluster randomised effectiveness trial of an integrated, community-based package for maternal and newborn care, with prevention of mother-to-child transmission of HIV in a South African township. *Tropical medicine & international health : TM & IH*. 2014;19(3):256-66.

85. Kimani-Murage EW, Norris SA, Mutua MK, Wekesah F, Wanjohi M, Muhia N, et al. Potential effectiveness of Community Health Strategy to promote exclusive breastfeeding in urban poor settings in Nairobi, Kenya: a quasi-experimental study. *Journal of developmental origins of health and disease*. 2016;7(2):172-84.

86. Sudhakar M, Woldie M, Yitbarek K, Abamecha F, Tamirat A. Primary Care Systems Profiles and Performance (PRIMASYS): Ethiopian Case study. *Alliance Heal Policy Syst Res*. 2017.

87. Banteyerga H. Ethiopia's health extension program: improving health through community involvement. *MEDICC review*. 2011;13(3):46-9.

88. Maes K, Closser S, Vorel E, Tesfaye Y. Using community health workers: Discipline and Hierarchy in Ethiopia's Women's Development Army. *Annals of Anthropological Practice*. 2015;39(1):42-57.

89. Federal Ministry of Health of Ethiopia. Essential Health Services Package for Ethiopia. Addis Ababa: Federal Ministry of Health, Ethiopia. 2005.

90. Wang H, Tesfaye R, NV Ramana G, Chekagn CT. Ethiopia health extension program: an institutionalized community approach for universal health coverage. *World Bank Studies*. Washington, DC: World Bank.: The World Bank; 2016.

91. Kim SS, Rawat R, Mwangi EM, Tesfaye R, Abebe Y, Baker J, et al. Exposure to large-scale social and behavior change communication interventions is associated with improvements in infant and young child feeding practices in Ethiopia. *PloS one*. 2016;11(10):e0164800.
92. Barwick M, Barac R, Zlotkin S. An examination of exclusive breastfeeding implementation in Ethiopia and Mali: factors influencing change. CARE Canada; Save the Children Canada; Plan International Canada: Ontario, Canada. 2015.
93. Belay S, Haidar J. Effect of prenatal education on breastfeeding initiation and exclusive breast feeding rate in selected health institutions of Hawassa city, the capital of SNNPR, Ethiopia. *East African Journal of Public Health*. 2013.
94. Giugliani ER, Horta BL, Loret de Mola C, Lisboa BO, Victora CG. Effect of breastfeeding promotion interventions on child growth: a systematic review and meta-analysis. *Acta paediatrica (Oslo, Norway : 1992)*. 2015;104(467):20-9.
95. Rotheram-Borus MJ, Tomlinson M, le Roux IM, Harwood JM, Comulada S, O'Connor MJ, et al. A cluster randomised controlled effectiveness trial evaluating perinatal home visiting among South African mothers/infants. *PloS one*. 2014;9(10):e105934.
96. Jakobsen MS, Sodemann M, Biai S, Nielsen J, Aaby P. Promotion of exclusive breastfeeding is not likely to be cost effective in West Africa. A randomized intervention study from Guinea-Bissau. *Acta Paediatrica*. 2008;97(1):68-75.
97. Engebretsen IM, Jackson D, Fadnes LT, Nankabirwa V, Diallo AH, Doherty T, et al. Growth effects of exclusive breastfeeding promotion by peer counsellors in sub-Saharan Africa: the cluster-randomised PROMISE EBF trial. *BMC public health*. 2014;14:633.
98. Chapman DJ, Morel K, Anderson AK, Damio G, Perez-Escamilla R. Breastfeeding peer counseling: from efficacy through scale-up. *Journal of human lactation : official journal of International Lactation Consultant Association*. 2010;26(3):314-26.
99. Susin LR, Giugliani ER, Kummer SC, Maciel M, Simon C, da Silveira LC. Does parental breastfeeding knowledge increase breastfeeding rates? *Birth (Berkeley, Calif)*. 1999;26(3):149-56.
100. Nabulsi M, Tamim H, Shamsedine L, Charafeddine L, Yehya N, Kabakian-Khasholian T, et al. A multi-component intervention to support breastfeeding in Lebanon: A randomized clinical trial. *PloS one*. 2019;14(6):e0218467.
101. Bronfenbrenner U. Toward an experimental ecology of human development. *American psychologist*. 1977;32(7):513.
102. McLeroy KR, Bibeau D, Steckler A, Glanz K. An ecological perspective on health promotion programs. *Health education quarterly*. 1988;15(4):351-77.
103. Abdulahi M, Fretheim A, Magnus JH. Effect of breastfeeding education and support intervention (BFESI) versus routine care on timely initiation and exclusive breastfeeding in Southwest Ethiopia: study protocol for a cluster randomized controlled trial. *BMC pediatrics*. 2018;18:313.
104. PROMISE-EBF. a multicentre community-based cluster-randomised behavioural-intervention trial in sub-Saharan Africa, webappendix.
105. ICF. CSACEa. Ethiopia Demographic and Health Survey 2016: HIV Report. Addis Ababa, Ethiopia, and Rockville, Maryland, USA: CSA and ICF. 2018.
106. Provost C. Ethiopia's Model Families Hailed as Agents of Social Transformation. *The Guardian* 2014. Available from: <http://www.theguardian.com/globaldevelopment/2014/jan/09/ethiopiamodel-families-social-transformationhealthcare>, accessed October 15, 2020.
107. USAID. Training of Trainers Manual for Counseling on Maternal, Infant, and Young Child Nutrition. Ethiopia: United States Agency for International Development December 2011. Available from: http://iycn.wpengine.netdna-cdn.com/files/IYCN_MIYCN_Ethiopia_Counseling_TOT_Manual_1211.pdf (Accessed February 20, 2016).

108. World Health Organization. Infant and young child feeding counselling: an integrated course 2006. Available from: <https://www.who.int/nutrition/publications/infantfeeding/9789241594745/en/> (Accessed on February 20, 2016).
109. World Health Organization. Breastfeeding Counselling a Training Course 1993. Available from: https://www.who.int/maternal_child_adolescent/documents/who_cdr_93_3/en/ (Accessed on February 20, 2016).
110. Caglia J, Kearns A, Langer A. Health Extension Workers in Ethiopia: Delivering Community-Based Antenatal and Postnatal Care. Boston, MA: Maternal Health Task Force. 2014.
111. Marion K Campbell GP, Diana R Elbourne, Douglas G Altman, for the CONSORT Group. Consort 2010 statement: extension to cluster randomised trials. *BMJ*. 2012;345:e5661.
112. World Health Organization. Indicators for assessing breast-feeding practices: report of an informal meeting, 11-12 June 1991, Geneva, Switzerland: World Health Organization; 1991. Available from: https://apps.who.int/iris/bitstream/handle/10665/62134/WHO_CDD_SER_91.14.pdf?sequence=1&isAllowed=y (Accessed on February 20, 2016).
113. Leroy JL. zscore06: Stata command for the calculation of anthropometric z-scores using the 2006 WHO child growth standards. Statistical Software Components S457279: Boston College Department of Economics; 2011.
114. Vyas S, Kumaranayake L. Constructing socio-economic status indices: how to use principal components analysis. *Health policy and planning*. 2006;21(6):459-68.
115. Coates J, Swindale A, Bilinsky P. Household Food Insecurity Access Scale (HFIAS) for measurement of food access: indicator guide: version 3. Washington, D.C.: Food and Nutrition Technical Assistance Project, Academy for Educational Development. 2007.
116. Tinsley HEA, Brown SD, editors. Handbook of Applied Multivariate Statistics and Mathematical Modeling. San Diego, CA, US: Academic Press; 2000. xxviii, 721-xxviii, p.
117. Geng G, Zhu Z, Suzuki K, Tanaka T, Ando D, Sato M, et al. Confirmatory factor analysis of the Child Feeding Questionnaire (CFQ) in Japanese elementary school children. *Appetite*. 2009;52(1):8-14.
118. Hu Lt, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*. 1999;6(1):1-55.
119. Tucker LR, Lewis C. A reliability coefficient for maximum likelihood factor analysis. *Psychometrika*. 1973;38(1):1-10.
120. Polit DF, Beck CT. *Nursing Research : Principles and Methods*. Philadelphia: Lippincott Williams & Wilkins; 2004.
121. Wooldridge JM. *Econometric analysis of cross section and panel data*. Cambridge, MA, USA.: The MIT press; 2002.
122. Pedersen AB, Mikkelsen EM, Cronin-Fenton D, Kristensen NR, Pham TM, Pedersen L, et al. Missing data and multiple imputation in clinical epidemiological research. *Clin Epidemiol*. 2017;9:157-66.
123. Marías Y, Glasauer P. Guidelines for assessing nutrition-related knowledge, attitudes and practices: Food and Agriculture Organization of the United Nations (FAO); 2014.
124. Kleinbaum DG, Sullivan KM, Barker ND. *A pocket guide to epidemiology: Springer Science & Business Media*; 2007.
125. Laake P, Benestad HB. *Research in medical and biological sciences: From planning and preparation to grant application and publication: Academic Press*; 2015.
126. Porta M. *A dictionary of epidemiology: Oxford university press*; 2014.
127. Williams B, Brown, T., & Onsman, A. . Exploratory factor analysis: A five-step guide for novices *Australasian Journal of Paramedicine*, Retrieved from 2012;8(3).
128. Schulz KF, Altman DG, Moher D, the CG. CONSORT 2010 Statement: updated guidelines for reporting parallel group randomised trials. *BMC Medicine*. 2010;8(1):18.
129. Campbell MK, Mollison J, Steen N, Grimshaw JM, Eccles M. Analysis of cluster randomized trials in primary care: a practical approach. *Family Practice*. 2000;17(2):192-6.
130. Campbell MK, Piaggio G, Elbourne DR, Altman DG. Consort 2010 statement: extension to cluster randomised trials. *BMJ : British Medical Journal*. 2012;345:e5661.

131. Higgins JPT, Altman DG, Gøtzsche PC, Jüni P, Moher D, Oxman AD, et al. The Cochrane Collaboration's tool for assessing risk of bias in randomised trials. *BMJ*. 2011;343:d5928.
132. Eldridge S, Ashby D, Bennett C, Wakelin M, Feder G. Internal and external validity of cluster randomised trials: systematic review of recent trials. *BMJ (Clinical research ed)*. 2008;336(7649):876-80.
133. Beaton DE, Bombardier C, Guillemin F, Ferraz MB. Guidelines for the process of cross-cultural adaptation of self-report measures. *Spine*. 2000;25(24):3186-91.
134. Sperber AD, Devellis RF, Boehlecke B. Cross-cultural translation: Methodology and validation. *Journal of cross-cultural psychology*. 1994;25(4):501-24.
135. Polit DF. Assessing measurement in health: Beyond reliability and validity. *International journal of nursing studies*. 2015;52(11):1746-53.
136. Tamim H, Ghandour LA, Shamsedine L, Charafeddine L, Nasser F, Khalil Y, et al. Adaptation and validation of the Arabic version of the infant breastfeeding knowledge questionnaire among Lebanese women. *Journal of Human Lactation*. 2016;32(4):682-8.
137. Ungváry R, Ittész A, Bóné V, Török S. Psychometric properties of the original and short Hungarian version of the Iowa infant feeding attitude scale. *International breastfeeding journal*. 2021;16(1):54.
138. Ghasemi V, Ebadi A, Kariman N, Ozgoli G, Saei Gharenaz M, Rashidi Fakari F, et al. Translation and Psychometric Evaluation of the Iranian Version of Iowa Infant Feeding Attitude Scale (IIFAS). *International Journal of Pediatrics*. 2018;6(11):8549-59.
139. Iliadou M, Lykeridou K, Prezerakos P, Tzavara C, Tziaferi SG. Reliability and Validity of the Greek Version of the Iowa Infant Feeding Attitude Scale Among Pregnant Women. *Materia socio-medica*. 2019;31(3):160-5.
140. Cotelo M, Movilla-Fernandez MJ, Pita-Garcia P, Novio S. Infant Feeding Attitudes and Practices of Spanish Low-Risk Expectant Women Using the IIFAS (Iowa Infant Feeding Attitude Scale). *Nutrients*. 2018;10(4).
141. Streiner DL. Starting at the Beginning: An Introduction to Coefficient Alpha and Internal Consistency. *Journal of Personality Assessment*. 2003;80(1):99-103.
142. AlKusayer NM, Midodzi WK, Newhook LA, Burrage L, Gill N, Halfyard B, et al. Psychometric Assessment and Precision Remodeling of the Iowa Infant Feeding Attitude Scale to Improve Clinical Use and Efficacy Among Prenatal Women in Canada. *Journal of human lactation : official journal of International Lactation Consultant Association*. 2018;34(1):20-9.
143. Topal S, Yuvaci HU, Erkorkmaz U, Cinar N, Altinkaynak S. The determination of infant feeding attitudes among Turkish mothers using the Iowa Infant Feeding Attitude Scale. *JPMA The Journal of the Pakistan Medical Association*. 2017;67(10):1567-73.
144. Al Ketbi MI, Al Noman S, Al Ali A, Darwish E, Al Fahim M, Rajah J. Knowledge, attitudes, and practices of breastfeeding among women visiting primary healthcare clinics on the island of Abu Dhabi, United Arab Emirates. *International breastfeeding journal*. 2018;13(1):1-14.
145. Shakya P, Kunieda MK, Koyama M, Rai SS, Miyaguchi M, Dhakal S, et al. Effectiveness of community-based peer support for mothers to improve their breastfeeding practices: A systematic review and meta-analysis. *PloS one*. 2017;12(5):e0177434.
146. Olufunlayo TF, Roberts AA, MacArthur C, Thomas N, Odeyemi KA, Price M, et al. Improving exclusive breastfeeding in low and middle-income countries: A systematic review. *Maternal & child nutrition*. 2019;15(3):e12788.
147. Kimani-Murage EW, Griffiths PL, Wekesah FM, Wanjohi M, Muhia N, Muriuki P, et al. Effectiveness of home-based nutritional counselling and support on exclusive breastfeeding in urban poor settings in Nairobi: a cluster randomized controlled trial. *Globalization and health*. 2017;13(1):90.
148. Kung'u JK, Pendame R, Ndiaye MB, Gerbaba M, Ochola S, Faye A, et al. Integrating nutrition into health systems at community level: Impact evaluation of the community-based maternal and neonatal health and nutrition projects in Ethiopia, Kenya, and Senegal. *Maternal & child nutrition*. 2018;14:e12577.
149. Lassi ZS, Rind F, Irfan O, Hadi R, Das JK, Bhutta ZA. Impact of Infant and Young Child Feeding (IYCF) Nutrition Interventions on Breastfeeding Practices, Growth and Mortality in Low- and Middle-Income Countries: Systematic Review. *Nutrients*. 2020;12(3).
150. Ilakovac V. Statistical hypothesis testing and some pitfalls. *Biochemia Medica*. 2009;19(1):10-6.

151. Christian P, Lee SE, Donahue Angel M, Adair LS, Arifeen SE, Ashorn P, et al. Risk of childhood undernutrition related to small-for-gestational age and preterm birth in low- and middle-income countries. *International journal of epidemiology*. 2013;42(5):1340-55.
152. de Onis M, Branca F. Childhood stunting: a global perspective. *Maternal & child nutrition*. 2016;12 Suppl 1(Suppl 1):12-26.
153. World Health Organization. *Infant and young child feeding: model chapter for textbooks for medical students and allied health professionals*: World Health Organization; 2009. Available from: https://apps.who.int/iris/bitstream/handle/10665/44117/9789241597494_eng.pdf (Accessed on November 08, 2020).
154. Bhandari N, Bahl R, Mazumdar S, Martinez J, Black RE, Bhan MK. Effect of community-based promotion of exclusive breastfeeding on diarrhoeal illness and growth: a cluster randomised controlled trial. *Lancet (London, England)*. 2003;361(9367):1418-23.
155. Fischer Walker CL, Friberg IK, Binkin N, Young M, Walker N, Fontaine O, et al. Scaling up diarrhea prevention and treatment interventions: a Lives Saved Tool analysis. *PLoS medicine*. 2011;8(3):e1000428.
156. Darvesh N, Das JK, Vaivada T, Gaffey MF, Rasanathan K, Bhutta ZA. Water, sanitation and hygiene interventions for acute childhood diarrhea: a systematic review to provide estimates for the Lives Saved Tool. *BMC public health*. 2017;17(4):101-11.
157. Chao DL, Roose A, Roh M, Kotloff KL, Proctor JL. The seasonality of diarrheal pathogens: A retrospective study of seven sites over three years. *PLoS neglected tropical diseases*. 2019;13(8):e0007211.
158. Rana R, McGrath M, Sharma E, Gupta P, Kerac M. Effectiveness of Breastfeeding Support Packages in Low- and Middle-Income Countries for Infants under Six Months: A Systematic Review. *Nutrients*. 2021;13(2).
159. Bohner G, Wänke M. *Attitudes and attitude change*. Hove: Psychology Press; 2002. - p.
160. Andreason A, Bandura A. Ajzen, I., "From Intentions to Actions: A Theory of Planned Behavior," in KJ Beckman, and J. Beckman, eds, *Action Control: From Cognition to Behavior*, Berlin: Springer, 1985, pp. 11–39.
161. Bland RM, Rollins NC, Solarsh G, Van den Broeck J, Coovadia HM. Maternal recall of exclusive breast feeding duration. *Archives of Disease in Childhood*. 2003;88(9):778-83.

Appendices...

Papers 1-3



Paper I

RESEARCH

Open Access



Adaptation and validation of the Iowa infant feeding attitude scale and the breastfeeding knowledge questionnaire for use in an Ethiopian setting

Misra Abdulahi^{1,2*}, Atle Fretheim^{2,3}, Alemayehu Argaw^{1,4} and Jeanette H. Magnus^{5,6}

Abstract

Background: Validated instruments to assess breastfeeding knowledge and attitude are non-existent in Africa including Ethiopia. We aimed to adapt and validate the Breastfeeding Knowledge Questionnaire (BFKQ) and the Iowa Infant Feeding Attitude Scale (IIFAS) for use in Afan Oromo (AO), the most widely spoken language in Ethiopia.

Methods: After forward-backward translation into Afan Oromo, the instruments were reviewed for content validity by a panel of a nutritionist and pediatricians, and pretested on a sample of 30 mothers. Then, a cross-sectional study involving 468 pregnant women in their second and third trimester was conducted between May and August 2017 in the Manna district, Southwest Ethiopia, using the final versions of the adapted questionnaires. We used exploratory and confirmatory factor analysis to assess the construct validity, receiver operating characteristic (ROC) curves to determine the predictive validity and Cronbach's alpha coefficients to assess internal consistency.

Results: Using exploratory factor analysis (EFA), nine domains containing 34 items were extracted from the BFKQ-AO. A confirmatory factor analysis of the constructs from EFA confirmed construct validity of the instrument ($\chi^2/df = 2.11$, RMSEA = 0.049, CFI = 0.845, TLI = 0.823). In factor analysis of the IIFAS, the first factor explained 19.7% of the total variance and the factor loadings and scree plot test suggested unidimensionality of the tool. Cronbach's alpha was 0.79 for the BFKQ-AO and 0.72 for IIFAS-AO suggesting an acceptable internal consistency of both instruments. For the sensitivity and specificity in predicting intention of breastfeeding for ≥ 24 months, the area under the curve (AUC) was 82% for IIFAS score and 79% for BFKQ score.

Conclusions: Here we present the first study that reported the use of the BFKQ and the IIFAS in Ethiopia. Our results showed that both BFKQ-AO and IIFAS-AO can be reliable and valid tools for measuring maternal breastfeeding knowledge and attitude in the study population, showing the potential for adapting these tools for application in a wider Ethiopian context.

Keywords: Optimal breastfeeding, Knowledge, Attitude, IIFAS, Reliability, Validity, Developing country, Ethiopia

* Correspondence: misra_ab@yahoo.com

¹Department of Population and Family Health, Jimma University, Jimma, Ethiopia

²Department of Community Medicine and Global Health, University of Oslo, Oslo, Norway

Full list of author information is available at the end of the article



© The Author(s). 2020 **Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>. The Creative Commons Public Domain Dedication waiver (<http://creativecommons.org/publicdomain/zero/1.0/>) applies to the data made available in this article, unless otherwise stated in a credit line to the data.

Background

Maternal knowledge and attitude towards optimal breastfeeding practices are factors that affect practices of breastfeeding in addition to socio-demographic factors [1–5]. Both knowledge and attitude are modifiable variables that can be addressed to improve breastfeeding practices [6–12]. Understanding maternal knowledge and attitudes toward breastfeeding hence guides the development and implementation of public health policy as well as evaluation of interventions aimed at increasing rates of breastfeeding. Therefore, valid and reliable instruments are required to assess knowledge and attitudes toward breastfeeding.

Adapting an existing instrument for a study has advantages of saving cost and time and involves fewer steps compared to developing a new instrument [13]. Moreover, a well-developed instrument with strong validity and reliability of the data in the source language as well as rigorously adapted and translated into several languages allows comparison of studies across cultures and languages. Furthermore, a field that utilizes existing instruments can build a knowledge base in which generalizations can be made and discussed across cultures in efforts to impact global public health. Therefore, for an instrument to be used outside the original setting, it has to be culturally adapted and its psychometric properties assessed [14].

The Iowa Infant Feeding Attitudes Scale (IIFAS) has been adapted and validated in several countries and demonstrated to have good predictive validity and excellent internal consistency ranging from a Cronbach's alpha of 0.79 to 0.86 [15–28]. The Breastfeeding Knowledge Questionnaire (BFKQ) was developed for use in Malaysia [29] with a strong validity and reliability. On the other hand, to our knowledge, there are no breastfeeding knowledge and attitude instruments for which psychometric properties have been assessed in an African setting. Only one study in South Africa evaluated the content validity of IIFAS after cross-cultural adaptation though this was limited by the lack of a detailed psychometric assessment of the tool [30]. Therefore, we aimed at adapting and validating the Afan Oromo versions of the BFKQ and the IIFAS among pregnant women in a rural setting from southwestern Ethiopia. The current study is part of the baseline study conducted for a Breastfeeding Education and Support Intervention (BFESI) trial [31].

Methods

Participants and study design

A cross-sectional study was conducted between May and August 2017 in Manna district under Jimma Zone, Southwest Ethiopia. From a total of 78 zones under Mana district, 36 study zones were selected

based on geographic accessibility for study implementation. Pregnant women in the study zones were identified using the Antenatal Care log-book of the local Health Extension Workers [32]. Furthermore, we used leaders of the local Women Development Army groups to identify pregnant women not enrolled in the Antenatal Care [33]. All pregnant women ($n = 468$) in their second and third trimester living in the selected study zones, who met the study inclusion criteria were enrolled into the current study. Study inclusion criteria were pregnant women in their second and third trimester, without severe health complication including any psychiatric illness, who gave their consent to participate in the current study as well as in the subsequent BFESI trial with no plan to leave the study area before completion of the BFESI trial. Eligible participants were asked for their written consent of participation after they received an information session detailing the study, voluntary participation, and study withdrawal. Detailed description of the BFESI study setting is reported elsewhere [31].

Study instruments

We adapted and evaluated Afan Oromo versions of two different instruments for assessing maternal knowledge on optimal breastfeeding (BFKQ-AO) and maternal attitude towards optimal breastfeeding practices (IIFAS-AO) for use in an Ethiopian setting. Permission to adapt and use the original versions of both IIFAS and BFKQ was obtained from the copyright holders Arlene De la Mora [34] and Tengku Alina Tengku Ismail [29], respectively.

The Iowa infant feeding attitudes scale (IIFAS)

The IIFAS was [34] designed to assess maternal attitude towards infant feeding methods and to predict breastfeeding intention and exclusivity. The scale is composed of 17 items with a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The total IIFAS score can range from 17 to 85 with higher scores reflecting positive attitude towards breastfeeding. Total IIFAS scores can be further categorized into groups: 1) positive to breastfeeding (IIFAS score 70–85), 2) neutral (IIFAS score 49–69), and 3) positive to formula feeding (IIFAS score 17–48).

The breastfeeding knowledge questionnaire (BFKQ)

The BFKQ, for assessing breastfeeding knowledge, was developed in Malaysia [29]. The tool contained a total of 47 questions covering different domains of knowledge on breastfeeding including advantages to mothers, advantages to babies, colostrum, effective feeding method, duration of breastfeeding, expressed breast milk, breast

engagement, problems with breastfeeding and practical aspects of breastfeeding. Each item has categorical responses of either 'true', 'false', or 'not sure'. The BFKQ scores are converted into percentage scores using the denominator the possible maximum score for total BFKQ score and per knowledge domains.

Instruments translation, content validity and administration

A systematic process recommended by Beaton et al. [14] was employed to develop the Afan Oromo versions of the instruments (IIFAS-AO and BFKQ-AO) while maintaining semantic, idiomatic, experiential and conceptual equivalence of the original English versions. Translation of instruments was carried out in a forward-backward procedure. The forward translation was conducted by bilingual professional translators with the help of the researcher (MA) who is a health professional. The backward translation to English from the Afan Oromo versions was carried out by two other professional translators who were totally blinded to the original English versions of the instruments. The original and the back-translated English versions of the instruments were compared to check for accuracy of the translation. We used a method developed by Skperber et al. [35] to establish semantic equivalence and validate the translated instruments. Each item in the original and back-translated instruments was ranked for comparability of language and similarity of interpretation. Ranking was done independently by 30 raters from academic members of Jimma University, Public Health Faculty using Likert scales ranging from 1 (reflecting extremely comparable/extremely similar) to 7 (reflecting not at all comparable/not at all similar). Any item with a mean score of >3 for comparability of language and/or a mean score >2.5 for similarity of interpretability was considered problematic and required a formal review of the translation. In some items, problems were identified and corrected even if the mean scores were acceptable. Revision of problematic items followed the same procedure using a forward-backward translation followed by rating for comparability of language and similarity of interpretability until meeting the acceptable rating.

A team of experts composed of a nutritionist, two pediatricians, two professional translators and the first author conducted a qualitative review of the content validity of the Afan Oromo versions of the instruments for appropriateness in the study context. The instruments were then pilot tested among 30 pregnant women to assess its clarity, comprehension, length, and cultural acceptability. Based on feedbacks from the expert review and the pilot testing, a few modifications were made and the content validity of both instruments was finally confirmed.

Psychometric analyses

For psychometric evaluation of the instruments, structured interview of participants was conducted to complete the two instruments and to gather data on other relevant variables including maternal intentions to breastfeeding, previous history of breastfeeding, socio-demographic, household, and maternal information. Data collection was carried out by ten nurses. They were trained for 2 days. Data was collected through a face-to-face interview after written consent was obtained from study participants. Two supervisors checked the completeness of filled questionnaires on daily basis.

Our sample size of 468 subjects was enough to validate the BFKQ-AO and IIFAS-AO tools with a total of 46 and 17 items, respectively considering the recommendation of 10 observations per variable for factor analysis [36]. Data were entered in duplicate using EpiData version 3.1 (EpiData Association) and consistency checks and statistical analyses were conducted using Stata version 13.1. Data were evaluated for normality by visual inspection of histograms and Q-Q plots and measures of kurtosis and skewedness, and expressed using mean (SD) or median (IQR) for the continuous variables and frequencies and percentages for the categorical variables. All statistical tests were two-sided with statistical significance considered at $\alpha < 0.05$.

Construct (factorial) validity

A two-step approach of model building was carried out to develop a final version of the BFKQ-AO for the study context and evaluate its construct validity [37]. An iterative exploratory factor analysis (EFA) was carried out to extract the factors (latent variables) that fit the variance-covariance matrix of the observed variables. Principal components factor extraction method with Varimax rotation (Kaiser Normalization) was applied. A confirmatory factor analysis (CFA) was conducted in order to confirm the measurement model suggested by the EFA. Structural equation modeling (SEM) using maximum likelihood estimation was employed to assess the relationship between indicator variables and their corresponding latent variables and evaluate the overall performance of the CFA model. The need for any further model improvement like adding additional paths was examined using the modification of indices command. The overall fit of the model was evaluated by examining different goodness-of-fit statistics including the ratio of χ^2 to degree of freedom ($\chi^2/df < 3$) [38], Root Mean Squared Error of Approximation (RMSEA $< 0.06 \leq 0.08$) [39, 40], Comparative Fit Index (CFI $\geq 0.8 > 0.90$) [40], Tucker-Lewis Index (TLI > 0.95) [41], Standardized Root Mean Square Residual (SRMR < 0.08) [40], Coefficient of Determination (CD) and the values of individual variable residuals.

Since the IIFAS items have been investigated in several previous studies in different contexts [15, 17–21, 24, 25, 28, 42] and the main goal at this stage was not item reduction, we applied criteria suggested by Nanishi et al. [24] to retain items in this analysis. Accordingly, invalid items were defined as 1) items with a negative loading to the first factor in factor analysis, 2) items that increased the alpha coefficient by > 0.10 when deleted, or 3) items that had a corrected item-total correlation of < 0.07. The later criterion was chosen based on the range of correlations (0.07–0.45) that were reported during the development of the original scale [23]. Prior to factor analysis, the suitability of our respondents' data for factors extraction was examined using the Kaiser-Meyer-Olkin measure of sample adequacy (KMO > 0.5) and the Bartlett's test of sphericity (P -value < 0.05).

Internal consistency reliability

Reliability of the instruments was determined by Cronbach's alpha coefficient with alpha values ≥ 0.70 considered satisfactory [43]. Cronbach's alpha values were calculated for the total scale of both IIFAS-AO and BFKQ-AO instruments and for the subscales of BFKQ-AO.

Predictive and criterion validity

The predictive validity of the total IIFAS-AO score and the total BFKQ-AO percentage score was examined by using the receiver operating characteristic (ROC) curves. The area under the graph was assessed for the sensitivity and specificity of both instruments in predicting mothers' intention of breastfeed for at least 24 months. Regression analysis was carried out to identify the association between IIFAS-AO and BFKQ-AO. We used Pearson's χ^2 -test to evaluate the association between demographic and socioeconomic variables and IIFAS-AO and BFKQ-AO scores.

Results

Sample characteristics

A total of 468 pregnant women were enrolled at baseline of the BFESI study [31]. The mean \pm SD age of the women was 25.2 ± 4.96 years. All women were married (100%) and the majority were housewives (93.8%). Nearly three fourth (74.6%) of the women were illiterate. Eighty-six (18.4%) participants were primipara. All women intended to breastfeed (100%) and most of the women (84.4%) intended to breastfeed for ≥ 24 months (Table 1).

Psychometrics properties of instruments

Content validity

Based on the experts review and the pretest results, from the final 47 items in BFKQ in the Malaysian study, 2

Table 1 Demographic and breastfeeding characteristics of pregnant women in Ethiopia ($n = 468$)

Variables	No.	%
Age		
< 20	50	10.7
20–34	390	83.3
35–40	28	6.0
Mean \pm SD	25.2 (4.96)	
Marital status		
Married	468	100
Educational status		
Illiterate	349	74.6
Primary school	90	19.2
Secondary school	29	6.2
Occupation		
House wife/farmer	439	93.8
Other ^a	29	6.2
Wealth index		
Lowest	94	20.0
Second	94	20.0
Middle	93	20.0
Fourth	94	20.0
Highest	93	20.0
Parity		
Primiparous	86	18.4
Multiparous	382	81.6
Gestational age		
Mean \pm SD	27.3	5.96
Number of children ($n = 370$)		
Mean \pm SD	2.7	1.44
Intention to breastfeed ($n = 468$)		
Yes	468	100
Intention to breastfeed for ≥ 24 months ($n = 468$)		
Yes	395	84.4

^aGovernment employee, merchant

items about keeping breast milk in refrigerator and 1 item about warming breast milk in microwave were dropped since these household items rarely exist in the rural part of Ethiopia. Moreover, 2 items about complementary feeding were excluded since they were out of the scope of the planned BFESI study. On the other hand, 4 additional items deemed important by the panel/experts, were added making a total of 46 items: 1 item in advantages to mother domain "Breastfeeding reduces bleeding that occurs after child birth.", 1 in effective feeding domain "Correct attachment while breastfeeding helps accomplishing effective breastfeeding.", 1 in breast milk expression domain "An expressed

breast milk can stay up to 8 hours without getting spoiled.” and 1 in breast engorgement domain “It is possible to reduce breast engorgement with hot water.”. Items in the modified questionnaire covered the following scopes of knowledge on breastfeeding: advantages to mothers, advantage to babies, colostrum, effective feeding method, duration of feeding, expressed breast milk (EBM), storage of EBM, problems with breastfeeding and practical aspects of breastfeeding.

From the 17 IIFAS items, minor change were made in the three items: item number 4 “Breast milk is lacking in iron” was translated as “Breast milk doesn’t contain a mineral called iron which helps for blood production” since women had difficulty of understanding about the mineral ‘iron’; Item number 8 “Women should not breastfeed in public places such as restaurants” was translated as “Mothers should not breastfeed their child in public places e.g. wedding places, market places” as we do not have restaurants in the rural part of the region; Item number 16 “Breast milk is less expensive than formula” was translated as “Mother’s breast milk is cheaper than formula milk” to make it easy to understand.

Construct (factorial) validity

The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and the Bartlett’s test of sphericity confirmed that our respondents’ data were suitable for factor analysis. The KMO values were 0.76 and 0.71 for the BFKQ-AO and IIFAS-AO data, respectively with KMO values > 0.5 for all items except items number 4 (KMO = 0.47) and 11 (KMO = 0.49) in the IIFAS scale. The Bartlett’s test of sphericity as well showed statistical significance for both scales (χ^2 (df) = 3965 (561) & 1207 (136) for BFKQ-AO & IIFAS-AO, respectively; $P < 0.001$).

EFA using the initial BFKQ-AO with all 46 items yielded ten factors with Eigenvalues ranging from 1.04 to 4.77 and accounting for 58.1% of the total variance. We retained 34 items after dropping items with factor loading below 0.25, and also the tenth factor was not considered as an important construct because it did not contain positive loadings for most items and items with meaningful relationship. Thus, the final BFKQ-AO contained 34 items with 9 domains of breastfeeding knowledge. Table 2 shows the final items in BFKQ-AO and the factor loadings for their corresponding knowledge domains. A CFA of the nine domain BFKQ-AO suggested from the EFA showed an acceptable model fit including $\chi^2/df = 2.11$, RMSEA (95% CI) = 0.049 (0.045, 0.053), CFI = 0.845, TLI = 0.823, SRMR = 0.060 and CD = 0.999. Furthermore, all parameters for the association of items with their corresponding latent construct variable and the correlations among latent construct variables indicated in the model were statistically significant ($P < 0.05$) indicating the convergent validity of the measuring model (Fig. 1).

Principal components factor extraction in the IIFAS-AO revealed that the scale has 6 components with Eigenvalues ranging between 1.06 and 3.35 and accounting for 58.1% of the variance. The first component with eigenvalue 3.35 accounted for 19.7% of the variance followed by the remaining 5 components with Eigenvalues ranging between 1.06 and 1.51 and with explained variance ranging between 6.21 and 8.88%. The scree plot, however, showed only one dominant factor suggesting that the scale is unidimensional (Fig. 2). The factor loadings for this first factor was positive and greater than 0.3 (range: 0.35–0.58) for all items except that items number 4 (0.16) and 11 (0.18) had a slightly lower loading (Table 3).

Internal consistency reliability

The participants had higher overall IIFAS score, with mean \pm SD of 65.7 ± 7.6 , ranging between 36 and 85, with the majority (60.9%) having a neutral attitude toward breastfeeding. Only 36.9% of participants had strongly positive attitudes toward breastfeeding. The Cronbach’s alpha for the IIFAS-AO was 0.72. The mean \pm SD of each item, corrected item-total correlation, and alpha if item is removed from the scale are provided in Table 3. In total, all the 17 items were found important for the scale with alpha change if item removed not greater than 0.1 and the corrected item-total correlations were greater than 0.07 (range: 0.13–0.45) for all items.

The median percentage score for BFKQ-AO among the respondents was 76.5% (IQR 26.0). The Cronbach’s alpha scores and the median total and percentage scores for each domains of the BFKQ-AO are presented in Table 4. Cronbach’s alpha for the overall BFKQ-AO scale was 0.79, suggesting a good internal consistency reliability. With regard to reliability per domain, the Cronbach’s alpha coefficient was satisfactory (> 0.7) for breast milk expression and colostrum, moderate for advantage to mother and effective feeding and poor for advantage to baby, duration of feeding, problem with breastfeeding, breast engorgement and practical aspects of breastfeeding.

Predictive and criterion validity. In our sample, intention to breastfeed is universal. Thus, we used mothers’ intention of breastfeeding for at least 24 months to assess the predictive validity of the IIFAS-AO and BFKQ-AO. When the sensitivity and specificity of the total IIFAS score and BFKQ score were examined against intention of breastfeeding for ≥ 24 months, the area under the curve (AUC) for the ROC curve was 0.82 for IIFAS (95% CI, 0.78, 0.86) and 0.79 for BFKQ (95%CI, 0.75, 0.84) (Fig. 3). In univariate analysis, only maternal occupation was associated with BFKQ-AO (χ^2 (df) = 4.99 (1); $P = 0.026$). None of the other demographic and socioeconomic variables showed association with IIFAS-AO and BFKQ-AO. However, IIFAS-AO was

Table 2 BFKQ-AO items and their principal component factor loadings for corresponding domains

Domains	Items	Loadings
Advantages to baby (Factor 1)	Breastfeeding reduces the risk of lung infection among babies. (bf1)	0.48
	Breastfeeding increases the baby's intelligence. (bf2)	0.71
	Breastfeeding helps to reduce the incidence of child abuse and neglect. (bf3)	0.63
	Baby who received breastfeeding is less prone to get diarrhea. (bf4)	0.40
Advantages to mother (Factor 2)	Exclusive breastfeeding is beneficial in spacing birth. (bf7)	0.50
	Breastfeeding helps to stimulate uterine contraction. (bf8)	0.79
	Breastfeeding reduces bleeding that occurs after childbirth. (bf9)	0.77
	Mothers who practised breastfeeding may achieve pre-pregnancy weight faster. (bf10)	0.48
Colostrum (Factor 3)	Frequent breastfeeding may prevent breast engorgement. (bf11)	0.29
	Colostrum is difficult to digest and needs to be discarded, median (IQR)* (bf15)	0.89
Effective feeding (Factor 4)	Colostrum causes constipation among babies, median (IQR)* (bf16)	0.90
	Babies will gain weight if they receive effective feeding. (bf18)	0.31
Breastmilk expression (Factor 5)	Correct positioning helps to achieve effective breastfeeding. (bf19)	0.70
	Correct positioning helps to achieve effective breastfeeding. (bf20)	0.80
	Babies sleep well after they receive adequate breastfeeding. (bf21)	0.77
	Breast milk expression may be done every 3 h. (bf22)	0.77
	An expressed breastmilk can stay up to 8 h without getting spoiled. (bf23)	0.83
	It is necessary to express breast milk from one side of the breast only.* (bf24)	0.85
Duration of feeding (Factor 6)	Expressed breast milk may be mixed with the previous expressed milk.* (bf25)	0.84
	Expressed breast milk may be warmed on a fire.* (bf26)	0.78
	The leftover expressed breast milk that has been used may be stored again.* (bf27)	0.59
	Breastfeeding should be initiated within 30 min after delivery. (bf28)	0.48
Problem with breastfeeding (Factor 7)	Breastfeeding should be given on demand. (bf29)	0.67
	Baby should be allowed to breastfeed for at least 10–20 min for each fe. (bf30)	0.63
	Breastfeeding should be continued up to 2 years even though the baby has re. (bf31)	0.65
Breast engorgement (Factor 8)	Breastfeeding must be discontinued if mother has cracked nipple.* (bf34)	0.67
	Breastfeeding must be discontinued if mother has breast engorgement.* (bf36)	0.69
Practical aspects of breastfeeding (Factor 9)	Breast engorgement may be reduced with cold packs. (bf37)	0.66
	The use of cabbage may help to reduce breast engorgement. (bf39)	0.76
	Massage may reduce breast engorgement. (bf40)	0.34
overall	Exclusive breastfeeding must be practiced until the infant is 6 months old. (bf41)	0.38
	Giving water to baby is encouraged after every breastfeeding.* (bf42)	0.35
	Belching after feeding shows that the baby is full. (bf43)	0.77
	Babies who get enough feeding will pass urine more frequently. (bf44)	0.73

*Reverse coded items. BFKQ-AO: Breastfeeding knowledge questionnaire-Afan Oromo

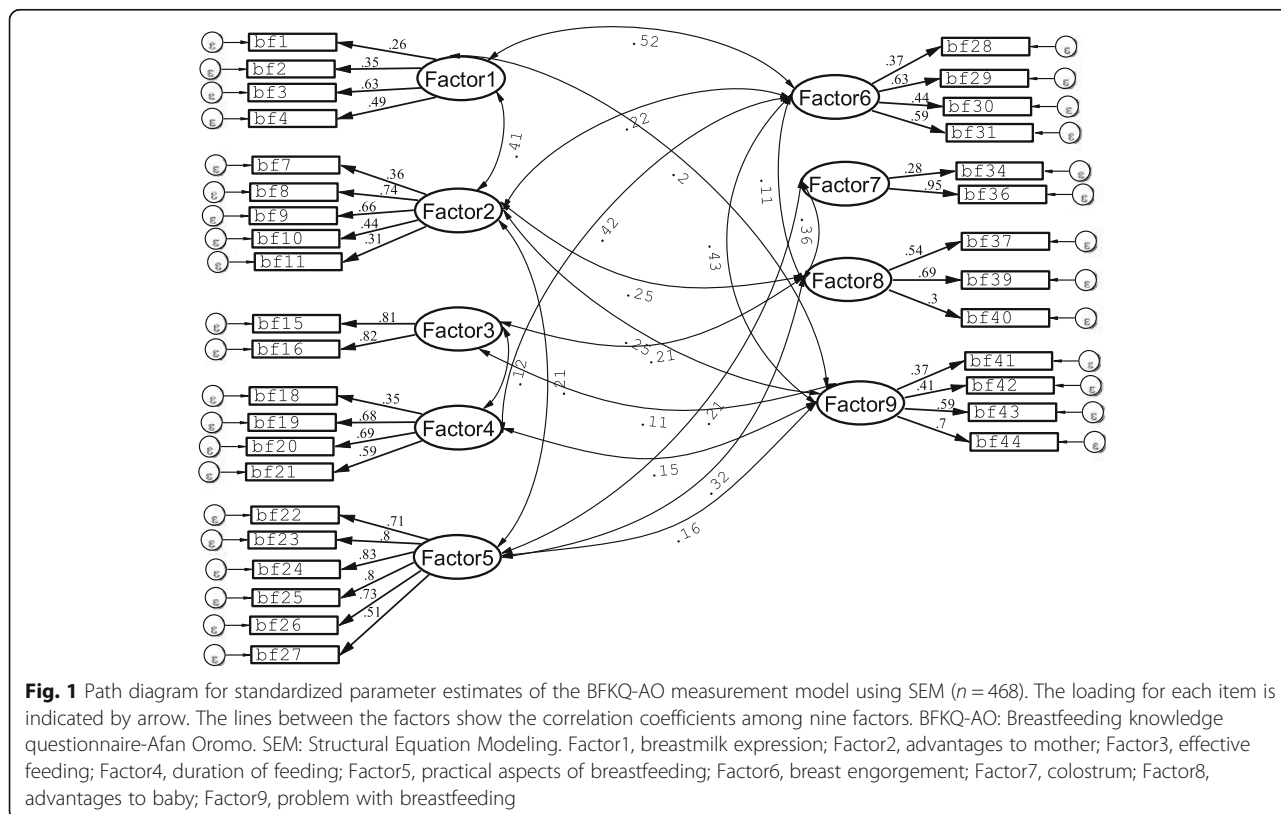
Extraction method: principal components analysis. Rotation method: Varimax with Kaiser Normalization. Twelve items were excluded since their loadings were < 0.25

found to have significant association with BFKQ-AO ($\beta = 0.33$; 95% CI, 0.19–0.60).

Discussion

To our knowledge, this is the first study reporting the adaptation and psychometric properties of the BFKQ and the IIFAS in Africa. The participants had high

overall IIFAS-AO (65.7 ± 7.6) and BFKQ-AO score (76.5%). The 17 items IIFAS-AO and 34 items BFKQ-AO were found to have an acceptable level of internal consistency and reliability as confirmed by Cronbach's alpha values > 0.70. The CFA showed that the BFKQ-AO has good construct validity. Factor analysis of the 17 items IIFAS also confirmed the unidimensionality of the



tool. Both the IIFAS-AO and the BFKQ-AO had good predictive validity for maternal intention of breastfeeding for ≥ 24 months.

In this study, the Cronbach’s alpha of IIFAS-AO was 0.72 which is acceptable for established tools [44], and is comparable to what has been reported for the original IIFAS tool with Cronbach’s alpha of 0.68. The corrected item-total correlations of 0.13–0.45 found in this study are also comparable to the original IIFAS of 0.07–0.45.

Although the corrected item-total correlations for the 17 items were all positive and significant in this study, it was less than 0.30 for two items (items 4 and 11). This might be due to the fact that women living in rural part of Ethiopia may not have knowledge about the mineral iron and that they do not consider men as having any role in breastfeeding. However, these two items were kept in the IIFAS-AO because of their good alpha estimates and positive correlations.

When it comes to the BFKQ-AO, the overall Cronbach’s alpha at 0.79 was acceptable, and similar to the original Malay version of the questionnaire [29]. Moreover, in line with the original study, the overall median percentage score of BFKQ-AO was 76.5%. However, the percentage score was lower for domains of colostrum, breastmilk expression, problem with breastfeeding and breast engorgement. Moreover, even though the mean IIFAS score show that participants had positive attitude towards breastfeeding, attitudes about breastfeeding were more towards neutral to breastfeeding signifying the importance of targeted breastfeeding education to women.

The original Malay study assessed the construct validity of the BFKQ only using EFA. However, in the current study we confirmed the results obtained from EFA using CFA, which showed satisfactorily model fit for the domain constructs and convergence of the items in each

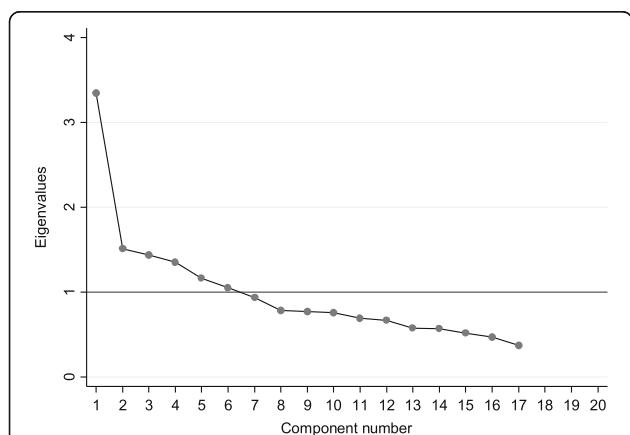


Fig. 2 Scree plot of the 17-item IIFAS-AO scale with cut-off point for retained scale factors using Exploratory Factor Analysis ($n = 468$). IIFAS-AO: lowa Infant Feeding Attitude Scale-Afan Oromo

Table 3 IIFAS-AO items with means (SD), reliability results, and principal component factor loadings

Items	Mean (SD)	ρ	α^*	Loading
1. The benefits of breastfeeding last only as long as the baby is breastfed. ^a	3.91 (1.08)	0.30	0.71	0.40
2. Formula feeding is more convenient than breastfeeding. ^a	3.83 (1.14)	0.30	0.71	0.42
3. Breastfeeding increases mother–infant bonding.	4.23 (0.78)	0.26	0.72	0.35
4. Breast milk is lacking in iron. ^a	3.00 (1.28)	0.13	0.73	0.16
5. Formula-fed babies are more likely to be overfed than breastfed babies.	3.62 (1.19)	0.41	0.70	0.53
6. Formula feeding is the better choice if the mother plans to go back to work. ^a	3.88 (1.05)	0.35	0.71	0.47
7. Mothers who formula feed miss one of the great joys of motherhood.	4.27 (0.78)	0.35	0.71	0.49
8. Women should not breastfeed in public places such as restaurants. ^a	3.73 (1.28)	0.45	0.70	0.58
9. Breastfed babies are healthier than formula-fed babies.	4.10 (0.92)	0.30	0.71	0.45
10. Breastfed babies are more likely to be overfed than formula-fed babies. ^a	3.93 (1.01)	0.34	0.71	0.45
11. Fathers feel left out if a mother breastfeeds. ^a	3.02 (1.19)	0.16	0.73	0.18
12. Breast milk is the ideal food for babies.	4.25 (0.82)	0.27	0.72	0.40
13. Breast milk is more easily digested than formula.	4.16 (0.86)	0.34	0.71	0.50
14. Formula is as healthy for an infant as breast milk. ^a	3.97 (0.97)	0.38	0.71	0.54
15. Breastfeeding is more convenient than formula.	3.95 (1.04)	0.37	0.71	0.51
16. Breast milk is cheaper than formula.	4.13 (0.89)	0.27	0.72	0.39
17. A mother who occasionally drinks alcohol should not breastfeed her baby. ^a	3.68 (1.27)	0.36	0.71	0.50
Mean (SD) and Cronbach's alpha (α) for total IIFAS-AO score	65.7 (7.64)		0.72	

^aReverse-scored items. IIFAS-AO: Iowa Infant Feeding Attitude Scale-Afan Oromo

Abbreviations: α , Cronbach's alpha for total IIFAS score based on the 17 attitude items; α^* , Cronbach's alpha if an item is removed; ρ , item-rest (corrected item-total) correlation for IIFAS items

factor/domain. Principal components factor extraction on the IIFAS-AO revealed that the scale has 6 components accounting for 58.1% of the variance. This finding is in-line with a study in Lebanon [15].

Many studies have assessed ability of IIFAS to predict intention to breastfeed [16, 18, 24, 42, 45–47]. However, in the current study, since all women had intention to breastfeed, we assessed whether IIFAS can predict intention for breastfeeding ≥ 24 months. Accordingly, the

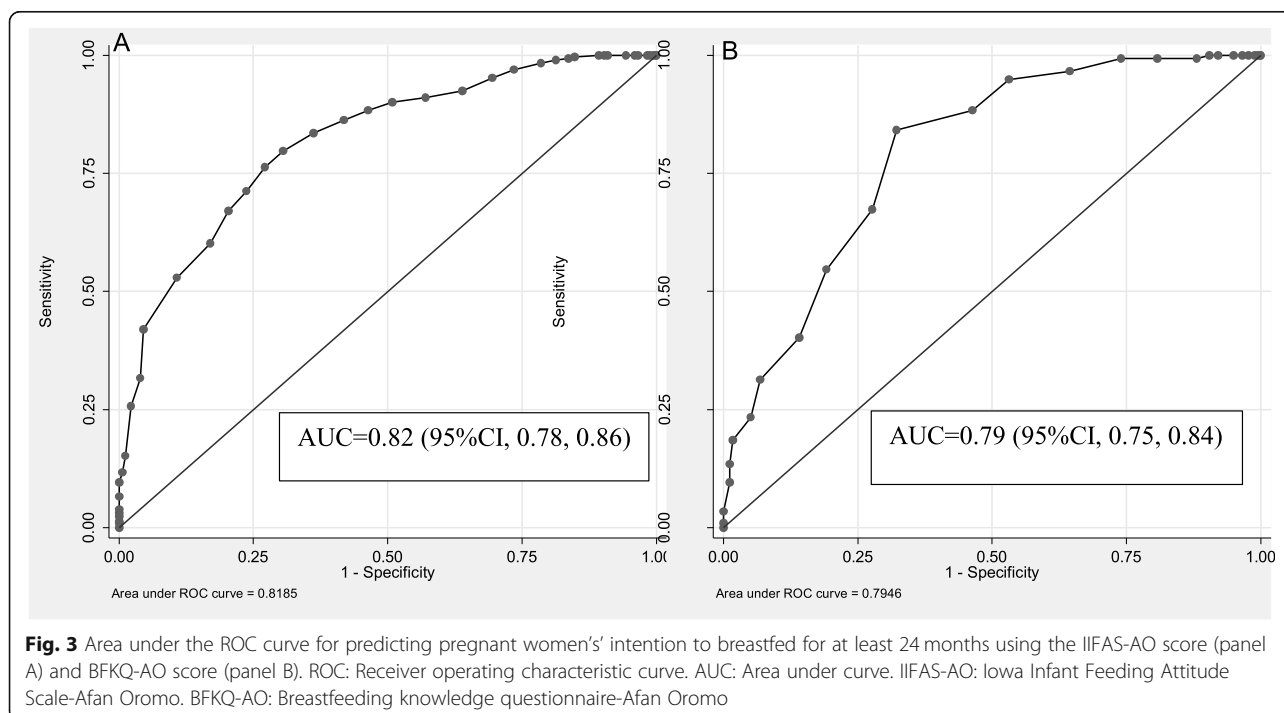
IIFAS-AO showed good predictive validity for mothers' intention of breastfeeding ≥ 24 months. Although the original study of BFKQ did not assess the predictive validity, in this study we assessed it and found that the BFKQ-AO had good predictive validity for mothers' intention of breastfeeding ≥ 24 months.

Regarding association between demographic and socioeconomic variables with the IIFAS-AO, in this study none of the demographic and socioeconomic variables

Table 4 Median (IQR) and Cronbach's alpha for the BFKQ-AO scale

Subscales	No. of items	Median score (IQR)	Median percentage score (IQR)	Cronbach's alpha
Advantages to baby	4	4.00 (3.00, 4.00)	100 (75.0, 100)	0.42
Advantages to mother	5	5.00 (4.00, 5.00)	100 (80.0, 100)	0.63
Colostrum	2	1.00 (0.00, 2.00)	50.0 (0.0, 100)	0.80
Effective feeding	4	4.00 (4.00, 4.00)	100 (100, 100)	0.62
Breast milk expression	6	4.00 (2.00, 4.00)	66.7 (33.3, 66.7)	0.87
Duration of feeding,	4	4.00 (3.00, 4.00)	100 (75.0, 100)	0.50
Problem with breastfeeding	2	0.00 (0.00, 1.00)	0.00 (0.00, 50.0)	0.41
Breast engorgement	3	2.00 (1.00, 3.00)	66.7 (33.3, 100)	0.50
Practical aspects of breastfeeding	4	3.00 (3.00, 3.00)	75.0 (75.0, 75.0)	0.51
Overall BFKQ-AO	34	26.0 (23.0, 27.0)	76.5 (67.6, 79.4)	0.79

BFKQ-AO Breastfeeding knowledge questionnaire-Afan Oromo; IQR Interquartile range



were associated with IIFAS-AO. Contrary to this, other studies that assessed IIFAS report that age [15, 48], education [15, 25, 48], income/socioeconomic status [15, 25, 48], employment [25], parity [16], number of children [15], number of breastfed children [15], and duration of any breastfeeding were associated with IIFAS score. Only maternal occupation was found to have association with BFKQ-AO in the current study. Therefore, it is important to provide targeted breastfeeding education that focuses on improving knowledge and attitude towards breastfeeding to expecting mothers.

The strength of this study was that the sample size for factor analysis was adequate, the rigor related to the translation, the expert assessment of all items, the pilot of the cultural comprehensibility of the questions, and the comprehensiveness of the factor analyses of each instrument. This study also has some limitations: study participants were all married women from rural area with low educational status. Further studies are needed to evaluate the validity and reliability of BFKQ-AO and the IIFAS-AO in urban areas. Further longitudinal research is needed to assess the ability of the tools in predicting intention for early initiation and duration of exclusive breastfeeding.

Conclusions

This is the first study to assess psychometric properties of IIFAS and confirmatory factor analysis of BFKQ in Africa. Over one third of all inhabitants in Ethiopia speak Afan Oromo. We found that both BFKQ-AO and

the IIFAS-AO can be reliable and valid instruments for assessing maternal knowledge and attitude towards breastfeeding practice in the study population. The current study showed the potential of future translation, adaptation and use of these instruments for application in a wider Ethiopian context.

Abbreviations

BFESI: Breastfeeding Education and Support Intervention; BFKQ: Breastfeeding Knowledge Questionnaire; CFA: Confirmatory Factor Analysis; CD: Coefficient of Determination; CFI: Comparative Fit Index; EBF: Exclusive breastfeeding; EFA: Exploratory Factor Analysis; IIFAS: Iowa Infant Feeding Attitudes Scale; KMO: Kaiser-Meyer-Olkin; RMSEA: Root Mean Squared Error of Approximation; ROC: Receiver Operating Characteristic; SEM: Structural Equation Modelling; SRMR: Standardized Root Mean Square Residual; TLI: Tucker-Lewis Index

Acknowledgements

The authors would like to thank Arlene De la Mora and Tengku Alina Tengku Ismail for allowing us to use the IIFAS scale and the BFKQ. The authors would like to thank all the research participants who took part in the study. We would like to acknowledge the paediatricians, nutritionist and translators who participated in the expert panel to come up with the final versions of the instruments.

Authors' contributions

MAA, JHM and AF designed the research study. MAA performed the research. MAA and AA analysed the data and drafted the paper. All authors read and approved the final manuscript.

Funding

This publication was supported by NORAD (Norwegian Agency for Development Cooperation) under the NORHED-Program, Agreement no. ETH-13/0024.

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Ethics approval and consent to participate

The study protocol was approved by the Institutional Review Boards of the University of Oslo and Jimma University, and the ethical review board of Oromia Regional Health Bureau. Written consent of participation was obtained from eligible participants after they were provided with an information sheet.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

Author details

¹Department of Population and Family Health, Jimma University, Jimma, Ethiopia. ²Department of Community Medicine and Global Health, University of Oslo, Oslo, Norway. ³Norwegian Institute of Public Health, Oslo, Norway. ⁴Department of Food Technology, Safety and Health, Faculty of Bioscience Engineering, Ghent University, Ghent, Belgium. ⁵Faculty of Medicine, University of Oslo, Oslo, Norway. ⁶Department of Global Community Health and Behavioral Sciences, Tulane School of Public Health and Tropical Medicine, New Orleans, USA.

Received: 7 October 2019 Accepted: 31 March 2020

Published online: 09 April 2020

References

- Al Ketbi MI, Al Noman S, Al Ali A, Darwish E, Al Fahim M, Rajah J. Knowledge, attitudes, and practices of breastfeeding among women visiting primary healthcare clinics on the island of Abu Dhabi, United Arab Emirates. *Int Breastfeed J*. 2018;13:26.
- Kuzma J. Knowledge, attitude and practice related to infant feeding among women in rural Papua New Guinea: a descriptive, mixed method study. *Int Breastfeed J*. 2013;8:16.
- Lenja A, Demissie T, Yohannes B, Yohannis M. Determinants of exclusive breastfeeding practice to infants aged less than six months in Offa district, Southern Ethiopia: a cross-sectional study. *Int Breastfeed J*. 2016;11:32.
- Tiwari R, Mahajan PC, Lahariya C. The determinants of exclusive breast feeding in urban slums: a community based study. *J Trop Pediatr*. 2009; 55(1):49–54.
- Senghore T, Omotosho TA, Ceasay O, Williams DCH. Predictors of exclusive breastfeeding knowledge and intention to or practice of exclusive breastfeeding among antenatal and postnatal women receiving routine care: a cross-sectional study. *Int Breastfeed J*. 2018;13:9.
- Aksu H, Kucuk M, Duzgun G. The effect of postnatal breastfeeding education/support offered at home 3 days after delivery on breastfeeding duration and knowledge: a randomized trial. *J Matern Fetal Neonatal Med*. 2011;24(2):354–61.
- Huang MZ, Kuo SC, Avery MD, Chen W, Lin KC, Gau ML. Evaluating effects of a prenatal web-based breastfeeding education programme in Taiwan. *J Clin Nurs*. 2007;16(8):1571–9.
- Khreshheh R, Suhaimat A, Jalamdeh F, Barclay L. The effect of a postnatal education and support program on breastfeeding among primiparous women: a randomized controlled trial. *Int J Nurs Stud*. 2011;48(9):1058–65.
- Kronborg H, Maimburg RD, Vaeth M. Antenatal training to improve breast feeding: a randomised trial. *Midwifery*. 2012;28(6):784–90.
- Lin CH, Kuo SC, Lin KC, Chang TY. Evaluating effects of a prenatal breastfeeding education programme on women with caesarean delivery in Taiwan. *J Clin Nurs*. 2008;17(21):2838–45.
- Lin SS, Chien LY, Tai CJ, Lee CF. Effectiveness of a prenatal education programme on breastfeeding outcomes in Taiwan. *J Clin Nurs*. 2008;17(3): 296–303.
- Şenay O, Ridvan D, Aladag Ciftedemir N, Vatanserver Ü, Betül A. Necdet S: [the effect of prenatal breast-feeding and breast-milk training given to expectant mothers on the behaviour of breast-feeding]. *Turk Pediatri Arşivi*. 2011;46:75–80.
- Epstein J, Osborne RH, Elsworth GR, Beaton DE, Guillemin F. Cross-cultural adaptation of the health education impact questionnaire: experimental study showed expert committee, not back-translation, added value. *J Clin Epidemiol*. 2015;68(4):360–9.
- Beaton DE, Bombardier C, Guillemin F, Ferraz MB. Guidelines for the process of cross-cultural adaptation of self-report measures. *Spine (Phila Pa 1976)*. 2000;25(24):3186–91.
- Charafeddine L, Tamim H, Soubra M, de la Mora A, Nabulsi M. Validation of the Arabic version of the lowa infant feeding attitude scale among Lebanese women. *J Hum Lact*. 2016;32(2):309–14.
- Cotelo M, Movilla-Fernandez MJ, Pita-Garcia P, Novio S. Infant Feeding Attitudes and Practices of Spanish Low-Risk Expectant Women Using the IIFAS (Iowa Infant Feeding Attitude Scale). *Nutrients*. 2018;10:4.
- Dai HX, Guan XD, Li XM, You LM, Lau Y. Psychometric properties of a mainland Chinese version of the lowa infant feeding attitude scale among postpartum women in China. *Contemp Nurse*. 2013;44(1):11–20.
- Dungy CI, McInnes RJ, Tappin DM, Wallis AB, Oprescu F. Infant feeding attitudes and knowledge among socioeconomically disadvantaged women in Glasgow. *Matern Child Health J*. 2008;12(3):313–22.
- Ghasemi V, Ebadi A, Kariman N, Ozgoli G, Saei Gharenaz M, Rashidi Fakari F, Haghi Navand P, Mahdizad Keyghobad F. Translation and psychometric evaluation of the Iranian version of lowa infant feeding attitude scale (IIFAS). *Int J Pediatr*. 2018;6(11):8549–59.
- Ho YJ, McGrath JM. Predicting breastfeeding duration related to maternal attitudes in a taiwanese sample. *J Perinat Educ*. 2011;20(4):188–99.
- Inoue M, Binns CW, Katsuki Y, Ouchi M. Japanese mothers' breastfeeding knowledge and attitudes assessed by the lowa infant feeding attitudes scale. *Asia Pac J Clin Nutr*. 2013;22(2):261–5.
- Lau Y, Htun TP, Lim PI, Ho-Lim SS, Klainin-Yobas P. Psychometric properties of the lowa infant feeding attitude scale among a multiethnic population during pregnancy. *J Hum Lact*. 2016;32(2):315–23.
- Adl M, Russell DW, Dungy CI, Losch M, Dusdieker L. The lowa infant feeding attitude scale: analysis of reliability and validity. *J Appl Soc Psychol*. 1999; 29(11):2362–80.
- Nanishi K, Jimba M. Reliability and validity of the Japanese version of the lowa infant feeding attitude scale: a longitudinal study. *J Hum Lact*. 2014; 30(3):346–52.
- Sittlington J, Stewart-Knox B, Wright M, Bradbury I, Scott JA. Infant-feeding attitudes of expectant mothers in Northern Ireland. *Health Educ Res*. 2007; 22(4):561–70.
- Tomas-Almarcha R, Oliver-Roig A, Richart-Martinez M. Reliability and validity of the reduced Spanish version of the lowa infant feeding attitude scale. *J Obstet Gynecol Neonatal Nurs*. 2016;45(5):e26–40.
- Topal S, Yuvaci HU, Erkorkmaz U, Cinar N, Altinkaynak S. The determination of infant feeding attitudes among Turkish mothers using the lowa infant feeding attitude scale. *J Pak Med Assoc*. 2017;67(10):1567–73.
- Wallis AB, Brinzaniuc A, Chereches R, Oprescu F, Sirlincan E, David I, Dirlu IA, Dungy CI. Reliability and validity of the Romanian version of a scale to measure infant feeding attitudes and knowledge. *Acta Paediatr*. 2008;97(9): 1194–9.
- Tengku Ismail TA, Sulaiman Z. Reliability and validity of a Malay-version questionnaire assessing knowledge of breastfeeding. *Malays J Med Sci*. 2010;17(3):32–9.
- Tuthill EL, Butler LM, McGrath JM, Cusson RM, Makiwane GN, Gable RK, Fisher JD. Cross-cultural adaptation of instruments assessing breastfeeding determinants: a multi-step approach. *Int Breastfeed J*. 2014;9:16.
- Abdulahi M, Fretheim A, Magnus JH. Effect of breastfeeding education and support intervention (BFESI) versus routine care on timely initiation and exclusive breastfeeding in Southwest Ethiopia: study protocol for a cluster randomized controlled trial. *BMC Pediatr*. 2018;18:313.
- Berhanu D: Using data to improve healthcare in Ethiopia In: *IDEAS*. 2012. <https://ideas.ishtm.ac.uk/using-data-to-improve-healthcare-in-ethiopia/> Accessed 19 Jan 2020.
- Damtew ZA, Karim AM, Chekagn CT, Fesseha Zemichael N, Yihun B, Willey BA, Betemariam W. Correlates of the Women's development Army strategy implementation strength with household reproductive, maternal, newborn and child healthcare practices: a cross-sectional study in four regions of Ethiopia. *BMC Pregnancy Childbirth*. 2018;18(Suppl 1):373.
- Mora A, Russell D, Dungy C, Losch M, Dusdieker L. The lowa infant feeding attitude scale: analysis of reliability and validity. *J Appl Soc Psychol*. 1999; 29(11):2362–80.
- Sperber AD, Devellis RF, Boehlecke B. Cross-cultural translation: methodology and validation. *J Cross-Cult Psychol*. 1994;25(4):501–24.
- Williams B, Onsmann A, Brown T. Exploratory factor analysis: A five-step guide for novices. *Australasian J Paramedicine*. 2010;8(3).

37. Kline RB. Principles and practice of structural equation modeling. 3rd ed. New York, NY: Guilford Press; 2011.
38. Tinsley HEA, Brown SD, editors: handbook of applied multivariate statistics and mathematical modeling. San Diego: Academic Press; 2000.
39. Geng G, Zhu Z, Suzuki K, Tanaka T, Ando D, Sato M, Yamagata Z. Confirmatory factor analysis of the child feeding questionnaire (CFQ) in Japanese elementary school children. *Appetite*. 2009;52(1):8–14.
40. Hu L, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. *Struct Equ Model Multidiscip J*. 1999;6(1):1–55.
41. Tucker LR, Lewis C. A reliability coefficient for maximum likelihood factor analysis. *Psychometrika*. 1973;38(1):1–10.
42. Twells LK, Midodzi WK, Ludlow V, Murphy-Goodridge J, Burrage L, Gill N, Halfyard B, Schiff R, Newhook LA. Assessing infant feeding attitudes of expectant women in a provincial population in Canada: validation of the lowa infant feeding attitude scale. *J Hum Lact*. 2014;32(3):NP9–NP18.
43. Polit DF, Beck CT. *Nursing research : principles and methods*. Philadelphia: Lippincott Williams & Wilkins; 2004.
44. DeVellis R. *Scale development: theory and applications (Vol. XXVI)*. Thousand Oaks: SAGE Publications, Inc; 2011.
45. AlKusayer NM, Midodzi WK, Newhook LA, Burrage L, Gill N, Halfyard B, Twells LK. Psychometric assessment and precision remodeling of the lowa infant feeding attitude scale to improve clinical use and efficacy among prenatal women in Canada. *J Hum Lact*. 2018;34(1):20–9.
46. Hamade H, Naja F, Keyrouz S, Hwalla N, Karam J, Al-Rustom L, Nasreddine L. Breastfeeding knowledge, attitude, perceived behavior, and intention among female undergraduate university students in the Middle East: the case of Lebanon and Syria. *Food Nutr Bull*. 2014;35(2):179–90.
47. Jefferson UT. Infant feeding attitudes and breastfeeding intentions of black college students. *West J Nurs Res*. 2014;36(10):1338–56.
48. Chen S, Binns CW, Liu Y, Maycock B, Zhao Y, Tang L. Attitudes towards breastfeeding - the lowa infant feeding attitude scale in Chinese mothers living in China and Australia. *Asia Pac J Clin Nutr*. 2013;22(2):266–9.

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Ready to submit your research? Choose BMC and benefit from:

- fast, convenient online submission
- thorough peer review by experienced researchers in your field
- rapid publication on acceptance
- support for research data, including large and complex data types
- gold Open Access which fosters wider collaboration and increased citations
- maximum visibility for your research: over 100M website views per year

At BMC, research is always in progress.

Learn more [biomedcentral.com/submissions](https://www.biomedcentral.com/submissions)



Paper
II



Article

Determinants of Knowledge and Attitude towards Breastfeeding in Rural Pregnant Women Using Validated Instruments in Ethiopia

Misra Abdulahi ^{1,2,*} , Atle Fretheim ^{3,4}, Alemayehu Argaw ^{1,5} and Jeanette H. Magnus ^{6,7}

¹ Department of Population and Family Health, Jimma University, Jimma 378, Ethiopia; yemariamwork2@gmail.com

² Department of Community Medicine and Global Health, University of Oslo, 0316 Oslo, Norway

³ Faculty of Health Sciences, Oslo Metropolitan University, 0130 Oslo, Norway; Atle.Fretheim@fhi.no

⁴ Centre for Informed Health Choices, Norwegian Institute of Public Health, 0473 Oslo, Norway

⁵ Department of Food Technology, Safety and Health, Faculty of Bioscience Engineering, Ghent University, B-9000 Ghent, Belgium

⁶ Faculty of Medicine, University of Oslo, 0316 Oslo, Norway; j.h.magnus@medisin.uio.no

⁷ Department of Global Community Health and Behavioral Sciences, Tulane School of Public Health and Tropical Medicine, New Orleans, LA 70112, USA

* Correspondence: misra_ab@yahoo.com; Tel.: +251-912-010293

Abstract: Understanding the underlying determinants of maternal knowledge and attitude towards breastfeeding guides the development of context-specific interventions to improve breastfeeding practices. This study aimed to assess the level and determinants of breastfeeding knowledge and attitude using validated instruments in pregnant women in rural Ethiopia. In total, 468 pregnant women were interviewed using the Afan Oromo versions of the Breastfeeding Knowledge Questionnaire (BFKQ-AO) and the Iowa Infant Feeding Attitude Scale (IIFAS-AO). We standardized the breastfeeding knowledge and attitude scores and fitted multiple linear regression models to identify the determinants of knowledge and attitude. 52.4% of the women had adequate knowledge, while 60.9% of the women had a neutral attitude towards breastfeeding. In a multiple linear regression model, maternal occupation was the only predictor of the BFKQ-AO score (0.56SD; 95%CI, 1.28, 4.59SD; $p = 0.009$). Age (0.57SD; 95%CI, 0.24, 0.90SD; $p = 0.001$), parity (−0.24SD; 95%CI, −0.47, −0.02SD; $p = 0.034$), antenatal care visits (0.41SD; 95%CI, 0.07, 0.74SD; $p = 0.017$) and the BFKQ-AO score (0.08SD; 95% CI, 0.06, 0.09SD; $p < 0.000$) were predictors of the IIFAS-AO score. Nearly half of the respondents had inadequate knowledge and most women had a neutral attitude towards breastfeeding. Policymakers and managers could address these factors when planning educational interventions to improve breastfeeding practices.

Keywords: attitude; breastfeeding; determinants; knowledge; rural Ethiopia



Citation: Abdulahi, M.; Fretheim, A.; Argaw, A.; Magnus, J.H. Determinants of Knowledge and Attitude towards Breastfeeding in Rural Pregnant Women Using Validated Instruments in Ethiopia. *Int. J. Environ. Res. Public Health* **2021**, *18*, 7930. <https://doi.org/10.3390/ijerph18157930>

Academic Editor: Paul B. Tchounwou

Received: 4 June 2021

Accepted: 17 July 2021

Published: 27 July 2021

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2021 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

1. Introduction

Exclusive breastfeeding (EBF) of infants during the first six months of life is recommended [1], given the several benefits that have been identified for both mother and infant [2–12]. Despite the presence of global recommendations, the practice of EBF substantially lags behind the level recommended by the World Health Organization, especially in lower- and middle-income countries where suboptimal infant feeding is prevalent [13]. In Ethiopia, early initiation of breastfeeding is at 78%, while 58% of children under 6 months old are exclusively breastfed [14]. Although the current rate of early initiation and EBF are high compared to the overall global rate, both are below the 2020 national targets of 90% and 72%, respectively [15]. Moreover, after birth, the EBF rate in Ethiopia declines rapidly from 74% between 0–1 month to 36% at 4–5 months [14]. Further, although the rate

of EBF increased from 55% in 2000 to 60% in 2016, this increase was neither substantial nor forecasting the reach of the national 2020 targets.

Understanding the levels and underlying determinants of maternal knowledge and attitude towards breastfeeding guides the development of context-specific interventions aimed at increasing the rates of optimal breastfeeding practices. Large international studies undertaken to estimate the prevalence and determinants of EBF practice have identified different sociodemographic and psychosocial factors, such as a mother's knowledge and attitude [16–18]. The knowledge and attitude of women towards breastfeeding are known to affect their decision to breastfeed [19]. Women who do not have adequate knowledge do not practice breastfeeding, as they do not understand the benefits and importance of doing so [20]. Furthermore, a positive maternal attitude toward breastfeeding is a stronger predictor of breastfeeding initiation and a longer duration than sociodemographic factors [21–27]. Because women's knowledge and attitude are modifiable factors associated with breastfeeding outcomes, they are important individual-level variables that should be targeted for behavioural change.

In Ethiopia, existing studies have attempted to recognize the critical role played by maternal knowledge and attitude as predictors of breastfeeding practices [28–37]. Maternal knowledge was identified as a predictor in a few of these studies [30,33–37]. In addition, the attitude towards breastfeeding has been assessed, but a significant association was not found [29,32,33,36]. Surprisingly, the effect of maternal knowledge and attitude remain unclear, as these studies vary greatly in their depth, in terms of the quantity and content of the questions used. The knowledge questions are superficial and lack some important domains, such as breastmilk expression, management of breast problems and practical aspects of breastfeeding. Moreover, they have used non-validated tools to report varied factors across different settings. Due to the lack of validated instruments in Ethiopia, there is a dearth of data on a range of factors known to influence maternal knowledge and attitude towards breastfeeding, rendering the generalizability of previous studies on this issue problematic.

The strength of the evidence to support interventions depends on the quality and sensitivity of instruments used to measure outcomes [38], and the quality of a measuring instrument is related to its reliability and validity [39]. Valid and reliable instruments to measure knowledge and attitude assists policymakers, researchers and practitioners develop strategies on how to promote breastfeeding [38], by identifying the levels and predictors of maternal knowledge and attitude towards breastfeeding. As such, interventions that aim to improve psychosocial factors, such as knowledge and attitude, that influence the decision-making process regarding breastfeeding, require instruments that are objective, reliable and valid to measure these outcomes [38]. A systematic review of maternal knowledge about breastfeeding and attitude toward infant feeding suggests that attitude towards infant feeding should be evaluated using the standard and validated instrument of the Iowa Infant Feeding Attitude Scale (IIFAS) [38]. Thus, we opted to use IIFAS to assess attitude. For the knowledge assessing questionnaire, we conducted a literature search to find a valid and reliable instrument to assess maternal knowledge about breastfeeding, and we found two instruments: the Breastfeeding Knowledge Questionnaire that was developed in America [40], and a questionnaire assessing knowledge of breastfeeding that was developed in Malaysia [41]. We preferred to use the latter, as it contains domains of breastfeeding that were not included in the Breastfeeding Knowledge Questionnaire, such as colostrum, breastmilk expression, management of breast problem and practical aspects of breastfeeding.

With the goal of improving breastfeeding rates in rural Ethiopia, we conducted a randomized controlled trial in which we provided pregnant women with a breastfeeding education and support intervention (BFESI), that comprised of prenatal breastfeeding education and postnatal peer support [42]. As one of the aims of the research project was to assess changes in the level of knowledge and attitude towards breastfeeding, in the current study, we sought to measure the baseline level and identify predictors of knowledge and

attitude towards breastfeeding among women who enrolled into the BFESI trial. This study will provide new insight into the factors that influence knowledge and attitude towards breastfeeding, using instruments that were validated in an Ethiopian context.

2. Materials and Methods

2.1. Design

This is a cross-sectional study that used data that were collected between May and August 2017 for the baseline survey of the BFESI. The protocol is published elsewhere [42]. The protocol was approved by the institutional review boards of Jimma University and Oromia regional health bureau.

2.2. Setting

The study was conducted in Mana district, one of the twenty-one districts found in Jimma zone, Oromia region, Southwest Ethiopia. The zone is located 368 km from Addis Ababa and 22 km from Jimma town. Agriculture is the main form of livelihood in the study community, with coffee accounting for 80% of the main crops produced in the area. According to the Manna District Health Office, the district had a total population of 197,911 in 2019. The district has a total of 26 kebeles (the smallest administrative unit in Ethiopia, 1 urban and 25 rural). It has 7 health centres, 26 health posts, 11 private clinics and 3 private pharmacies. The district has 68 health extension workers and 121 healthcare providers of different professions. The area is known for its shortage of human resources for health, as evidenced by the ratio of 121 health workers to 1000 people, i.e., 0.2, which is far below the national target of 1.6 by 2020 [15] and the international target of 4.5 [43], indicating the area has inadequate healthcare services.

2.3. Sample

We recruited 468 pregnant women using the Ethiopian community health system: the Health Extension Workers antenatal logbook and Women Development Army Leaders. All pregnant women who were identified from the antenatal care logbook were invited to a meeting at the health post, where the nature and purpose of the trial and eligibility criteria were explained, including their right to withdraw from the study at any time. They were allowed to ask questions and relevant information was provided accordingly. Then, according to their literacy status, written informed consent was secured from participants by asking them to provide their fingerprint or signature. To minimize the chance of missing pregnant women, Women Development Army Leaders were involved in the identification of pregnant women who were not registered on the antenatal care logbook and consent was obtained through a home visit following the above procedures. Participants comprised of healthy, pregnant women in their 2nd or 3rd trimester without severe health complications, including any psychiatric illness, who provided consent to participate in the trial and stated that they had no plan to move from the study area before completion of the BFESI trial.

2.4. Data Collection

Ten BSc nurses who had experience in data collection and were fluent in the local language completed a 2 day training on the main objectives of the study and how to standardize the data collection method. All the required supervision was provided by trained supervisors during the training session and on the field during data collection. Data were collected using a structured face-to-face interview after obtaining written consent from each study participant. Maternal knowledge and attitude towards breastfeeding were assessed using the local language versions of the Breastfeeding Knowledge Questionnaire-Afan Oromo (BFKQ-AO) and the Iowa Infant Feeding Attitude Scale-Afan Oromo (IIFAS-AO), which were locally adapted and validated in a similar rural population [44]. Furthermore, data on potential determinants of knowledge and attitude were gathered. Sociodemographic factors, including maternal age, level of education, number of children, household

wealth and food security status were collected in addition to maternal factors, including parity, antenatal care (ANC) visits, past obstetric and breastfeeding history.

2.5. Measurement

The BFKQ-AO consists of 34 items asking about various optimal breastfeeding practices, with responses coded as correct or incorrect. We decided to use a cut-off above or below the median to dichotomize the knowledge level. The breastfeeding knowledge questionnaire adopted from Malaysia had not operationalized an optimal knowledge level [41]. Accordingly, all women who scored \geq the median in the knowledge test were considered as having a high level of knowledge, and those scoring below the median were considered as having a low level of knowledge. The IIFAS-AO consists of 17 items with a 5-point Likert scale, rating maternal attitude towards breastfeeding, and the total scores range from 17 to 85 with a higher score reflecting a positive attitude. Attitude toward breastfeeding was categorized as follows: (1) positive to breastfeeding (IIFAS score 70–85), (2) neutral (IIFAS score 49–69) and (3) positive to formula feeding (IIFAS score 17–48) [24].

2.6. Data Analysis

Double data entry were performed using EpiData (version 3.1), and all statistical analyses were completed using Stata version 13.1 (StataCorp LLC: College Station, TX, USA). Data were summarized using frequencies and percentages. In the first stage of the analysis, we evaluated bivariate associations between potential predictors and the study outcomes, with breastfeeding knowledge and attitude scores to determine candidate predictors for the subsequent multiple linear regression models. In the second stage, based on the result of bivariate associations, we fit multiple linear regression models assessing the independent predictors of breastfeeding knowledge and attitude scores. We applied a robust variance estimation to take into account the clustering of subjects by study sub-districts. The knowledge and attitude scores were standardized based on the distribution of our data, and the results are expressed as regression coefficients with 95% Confidence Intervals (CIs). Models were evaluated for potential multi-collinearity using the variance inflation factor, with values less than ten considered acceptable. Model goodness of fit was assessed using adjusted R² values. All tests were two-tailed and a statistically significant association was considered at a p -value < 0.05 .

3. Results

The characteristics of the 468 pregnant women are presented in Table 1. Most women were in the age group of 20–34 (83.3%), illiterate (74.6%), housewives/farmers (93.8%) and lived in a food-insecure household (58.9%). Three hundred and eighty-two (81.6%) of the enrolled women were multiparous, of which 96.8% had a history of breastfeeding. The majority (88%) of the women had at least one ANC visit, but only 7.28% of them had the recommended ≥ 4 antenatal care visits (Table 1).

Table 1. Demographic Characteristics of Participants (N = 468).

Variable	No (%)
Age	
15–19	50 (10.68)
20–34	390 (83.33)
≥ 35	28 (5.98)
Educational status	
Illiterate	349 (74.6)
Primary school	90 (19.2)
Secondary school	29 (6.2)

Table 1. *Cont.*

Variable	No (%)
Wealth tertiles	
Lowest	156 (33.33)
Middle	156 (33.33)
Highest	156 (33.33)
Maternal occupation	
Housewife/Farmer	439 (93.80)
Parity	
Multiparous	382 (81.6)
Household food security status	
Food insecure	276 (58.97)
History of breastfeeding	
Yes	370 (96.8)
Number of ANC visit	
No ANC visit	56 (12.0)
<4 visits	382 (81.6)
≥4 visits	30 (6.40)

Note. The numbers in the table indicate the frequency (%). Abbreviation: ANC, Antenatal Care.

3.1. Levels of Breastfeeding Knowledge and Attitude

The mean \pm SD of the overall IIFAS score in our sample was 65.7 ± 7.6 points with a range between 36 and 85 points. The majority (60.9%) of the women had a neutral attitude towards breastfeeding, whereas 36.9% of the participants had strongly positive attitude toward breastfeeding. Two hundred and forty-five (52.4%) of the women had a high level of knowledge, while 223 (47.6%) had a low level of knowledge. Aspects of knowledge domains in which women scored high were the advantage to baby, the advantage to mother, effective feeding, duration of feeding and the practical aspect of breastfeeding. However, they scored low on colostrum, breast milk expression, problems with breastfeeding and breast engorgement domains (data not shown).

3.2. Predictors of Breastfeeding Knowledge and Attitude

From the variables included in the multiple linear regression model, i.e., age, education, employment, wealth tertile, number of children and ANC visit, only maternal occupation significantly predicted breastfeeding knowledge score (Table 2). Compared to women who were housewives, women who involved in small trades and private employment had a significantly higher breastfeeding knowledge score (β : 0.56 SD; 95% CI, 0.14, 0.97 SD; $p = 0.009$). The variables that independently predicted maternal attitude towards breastfeeding included maternal age, education, employment and parity, household wealth status and ANC visit (Table 3). Older women, as compared to their younger counterparts (<20 years) (β : 0.57 SD; 95% CI, 0.24, 0.90 SD; $p = 0.001$), and primiparous women, as compared to multiparous (β : -0.24 SD; 95% CI, -0.47 , -0.02 SD; $p = 0.034$), had a significantly higher IIFAS score. Women who attended at least four ANC visits were found to have a significantly higher attitude towards breastfeeding than those who had no ANC visit (β : 0.41 SD; 95% CI, (0.07, 0.74 SD; $p = 0.017$). We also demonstrate a statistically significant positive association between maternal BFKQ-AO and IIFAS scores (β : 0.33 SD; 95% CI, 0.25, 0.41 SD; $p < 0.000$).

Table 2. Predictors of breastfeeding knowledge using the BFKQ-AO among 468 pregnant rural Ethiopian women participating in breastfeeding education and support intervention (BFESI).

Variable	Unadjusted β (95% CI)	<i>p</i> -Value	Adjusted β (95% CI)	<i>p</i> -Value
Age				
15–19	Ref		Ref	
20–34	0.16 (−0.18, 49.3)	0.367	−0.19 (−0.76, 0.38)	0.514
≥35	0.26 (−0.23, 75.3)	0.291	−0.11 (−0.78, 0.56)	0.753
Educational status				
Illiterate	Ref		Ref	
Primary school	−0.13 (−0.39, 0.13)	0.335	−0.13 (−0.42, 0.16)	0.389
Secondary school	−0.00 (−0.44, 0.43)	0.987	−0.03 (−0.58, 0.52)	0.903
Maternal occupation				
Housewife/Farmer	Ref		Ref	
Other	0.68 (0.31, 1.06)	<0.000[†]	0.56 (0.14, 0.97)	0.009[*]
Wealth tertiles				
Lowest	Ref		Ref	
Middle	−0.19 (−0.44, 0.05)	0.114	−0.05 (−0.33, 0.22)	0.689
Highest	−0.01 (−0.22, 0.19)	0.932	−0.07 (−0.34, 0.19)	0.571
Parity				
Primiparous	Ref		Ref	
Multiparous	0.19 (−0.06, 0.45)	0.139	0.69 (−0.49, 1.88)	0.252
ANC visit				
No ANC visit	Ref		Ref	
<4 visits	−0.12 (−0.35, 0.11)	0.324	−0.03 (−0.29, 0.23)	0.813
≥4 visits	0.18 (−0.26, 0.62)	0.386	0.33 (−0.18, 0.85)	0.203

[†] $p < 0.01$, significant values. ^{*} $p < 0.05$, significant values. Note. Data are given as regression coefficients (β) and 95% confidence intervals. R2 is 0.05. Abbreviations: BFKQ-AO, breastfeeding knowledge questionnaire in Afan Oromo; ANC, antenatal Care.

Table 3. Predictors of attitude towards infant feeding using the IIFAS-AO among 468 pregnant Ethiopian rural women participating in breastfeeding education and support intervention (BFESI).

Variable	Unadjusted β (95% CI)	<i>p</i> -Value	Adjusted β (95% CI)	<i>p</i> -Value
Age				
15–19	Ref		Ref	
20–34	0.47 (0.18, 0.77)	0.002 [*]	0.58 (0.25, 0.90)	0.001[*]
≥35	0.46 (−0.06, 0.98)	0.083	0.56 (−0.02, 1.13)	0.060
Educational status				
Illiterate	Ref		Ref	
Primary school	−0.16 (−0.41, 0.09)	0.207	−0.09 (−0.32, 0.14)	0.433
Secondary school	−0.00 (−0.37, 0.37)	0.994	0.05 (−0.33, 0.42)	0.813
Maternal occupation				
Housewife/Farmer	Ref		Ref	
Other	0.08 (−0.31, 0.46)	0.702	−0.09 (−0.46, 0.26)	0.593
Wealth tertiles				
Lowest	Ref		Ref	
Middle	0.08 (−0.14, 0.30)	0.478	0.14 (−0.08, 0.35)	0.217
Highest	0.15 (−0.08, 0.38)	0.206	0.15 (−0.08, 0.37)	0.203
Parity				
Primiparous	Ref		Ref	
Multiparous	0.03 (−0.18, 0.25)	0.778	−0.25 (−0.48, −0.03)	0.027[*]
ANC visit				
No ANC visit	Ref		Ref	
<4 visits	0.12 (−0.17, 0.40)	0.430	0.16 (−0.11, 0.43)	0.238
≥4 visits	0.49 (0.12, 0.87)	0.009[*]	0.41 (0.08, 0.75)	0.017[*]
BFKQ-AO score	0.33 (0.25, 0.41)	<0.000[†]	0.33 (0.25, 0.41)	<0.000[†]

[†] $p < 0.01$, significant values. ^{*} $p < 0.05$, significant values. Note. Data are given as regression coefficients (β) and 95% confidence intervals. R2 is 0.15. Abbreviations: BFKQ-AO, breastfeeding knowledge questionnaire in Afan Oromo; IIFAS-AO, Iowa Infant Feeding Attitude Scale in Afan Oromo; ANC, Antenatal Care.

4. Discussion

Initiation, duration and exclusivity of breastfeeding is a choice made by all women, but is highly affected by various factors, including knowledge about and attitude towards the benefits of breastfeeding. Despite Ethiopian attempts at increasing the rate of early initiation and duration of exclusive breastfeeding, its success has been limited. To the best of our knowledge, this is the first study assessing predictors of knowledge and attitude towards breastfeeding using validated instruments in a local language in Ethiopia. This community-based study revealed that half of the women had adequate knowledge about breastfeeding. We also found that knowledge was associated only with maternal occupation, while the women's attitude towards breastfeeding was associated with maternal age, parity, antenatal care visits and their overall knowledge about breastfeeding.

By definition, a significant proportion of pregnant rural women had a low level of breastfeeding knowledge in this study. Interventions aimed at improving breastfeeding knowledge are important in efforts to encourage women to breastfeed. For Ethiopia, this might be imperative to reach the targets set in the national health sector plan [15]. Particularly, questions relating to aspects of knowledge that scored very low, such as colostrum, breastmilk expression, issues related to breastfeeding problems and breast engorgement, need to be emphasized during breastfeeding promotion. In Ethiopia, although extensive research has been carried out on the knowledge of women on breastfeeding [30,33–36], no single study exists which applies a validated instrument, and comparing our findings with these studies is unrealistic.

A positive attitude toward breastfeeding is a stronger predictor of breastfeeding initiation and duration when compared to sociodemographic factors [21–27]. In our study, the mean IIFAS-AO score was within a range that reflected neutral attitude towards breastfeeding [24]. The findings from the current study corroborate similar findings in the literature, as a neutral attitude towards breastfeeding has been reported across a diverse group of countries, including China and Australia [16,45], Spain [46], Canada [47], Japan [48] and Scotland [22,49]. While it is possible that the finding of a neutral attitude could be one of the major reasons for a high level of breastfeeding initiation, the low level of EBF in Ethiopia needs further study. In Ethiopia, none of the studies that assessed women's attitude towards breastfeeding [29,32,33,36] used IIFAS, and much uncertainty exists around the relationship between maternal attitude and breastfeeding practice. Our study provides a new insight into the importance of considering neutral attitude.

In the present study, women who were involved in small trades and private employment had a higher knowledge about breastfeeding. This is similar to a study in China [17], which reported a greater knowledge about breastfeeding among employed women. This could be expected, as employment is associated with education and increased general knowledge.

Earlier studies underscore that attitude influence behaviour; therefore, knowing something about a person's attitude can help predict behaviour in many contexts [50]. In this study, we found that younger women had higher attitude scores. In contrast, previous studies in China [16], Taiwan [51], Singapore [52] and Romania [53] showed that older women had more positive attitude toward breastfeeding. The direct relationship between a higher IIFAS-AO score (positive attitude) and increased age is likely linked to prior experience with breastfeeding. Breastfeeding is in many aspects a learned behaviour.

Maternal education is associated with favorable attitude toward breastfeeding, as highly educated women were more aware of the breastfeeding benefits. Although not statistically significant in the current study, women with a primary school education had a lower attitude score. Nevertheless, previous studies have shown that higher IIFAS scores were positively associated with a higher educational level in Lebanon [54], Ireland [55], China [17], Singapore [52] and Spain [46].

Studies report mixed results regarding the association between IIFAS score and occupation. A study from Ireland found that full or part-time employed women had more positive attitude toward breastfeeding compared to housewives [55], while a study among

Chinese women reported no significant difference between infant feeding attitude and working status [16]. However, in our study of rural women, we found that those that were involved in small trades and private employment had a more negative attitude toward breastfeeding than homemakers did, but this difference was not statistically significant. It is conceivable that women who work may suffer from a lack of time, fatigue and experience breastfeeding as exhausting, leading to negative attitude towards breastfeeding.

Higher maternal IIFAS score is associated with higher family annual income in Lebanon [54], Taiwan [51], Singapore [52], Ireland [55] and Spain [46]. In our study, we generated a household asset score/wealth index, as household income does not measure the value of non-monetary items, particularly in a low-income context. Nevertheless, we did not find that the IIFAS-AO score was associated with the socioeconomic status of the household in our rural setting.

Multiparous women are expected to have a positive attitude towards breastfeeding, due to their prior experience, anticipated maternal confidence and ability to solve feeding problems. However, unlike findings from the Infant Feeding Survey, where multiparous women had more favourable attitude to breastfeeding [17], multiparous women in the current study were more negative towards breastfeeding. One can speculate that Ethiopian rural women with many children are taxed by household chores, high infant mortality and morbidity, food insecurity and limited time to breastfeed, all leading to negative attitude. On the other hand, women with fewer children might have more time, and may be more concerned with their newborn.

Pregnant women with ≥ 4 antenatal care visits at the time of the baseline survey in our study had higher IIFAS-AO scores. A possible explanation might be that these women had increased exposure to prenatal breastfeeding education/counselling. Moreover, our respondents with high levels of breastfeeding knowledge also had a higher attitude score, in line with a previous study from Finland [56].

Limitations

Our study has some limitations. Firstly, this is a cross-sectional study design, and thus we cannot establish causal relationships. Our findings are associations that may or may not reflect cause and effect. Secondly, the majority of our rural Ethiopian participants had limited schooling, reducing the ability to detect a potentially statistically significant association between knowledge and attitude towards breastfeeding and educational status. The women in this study were demographically homogeneous, and the findings may not be applicable across different regions of the country. Additional research is needed to assess the relationship between IIFAS-AO and BFKQ-AO, as well as breastfeeding initiation and duration in urban Ethiopian settings.

5. Conclusions

A significant proportion of the rural pregnant women had inadequate knowledge about breastfeeding and a neutral attitude towards breastfeeding. The occupation of the women was identified as an independent predictor of breastfeeding knowledge, whereas age, parity, antenatal care visit and knowledge scores (BFKQ-AO) were predictors of breastfeeding attitude. Thus, policymakers and managers may address these factors when planning educational interventions on breastfeeding to improve knowledge and attitude, thereby advancing breastfeeding practices in rural communities.

Author Contributions: Conceptualization, M.A., J.H.M. and A.F.; investigation, M.A.; formal analysis, M.A. and A.A.; writing—original draft preparation, M.A. and A.A.; writing—review and editing, M.A., A.A., A.F. and J.H.M. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by Norad (Norwegian Agency for Development Cooperation) under the NORHED-Program, Agreement no. ETH-13/0024.

Institutional Review Board Statement: Ethical review and approval of the University of Oslo were waived for this study (Code: 2016/1726 REC South East, Section D, 26 November 2016), as the study falls outside of the scope of the Health Research Act. The Regional Committee for Medical and Health Research Ethics has the authority to either approve or disapprove medical and health research studies conducted within Norway or by Norwegian institutions. We have notified the Norwegian Centre for Research Data officers about the study, project number 954846. The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the institutional review board of Jimma University (Code: RPGC/381/2016, 26 September 2016) and the institutional review board of Oromia regional health bureau (Code: BEF/AHBFHI/1-8/2349, 30 September 2016).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on request from the corresponding author, due to privacy restrictions.

Acknowledgments: We would like to thank the women in the study for their participation and time. We thank the staff and officials of Jimma Zone Health Office and Mana district health office, health extension workers, and all data collectors for their contribution to this study.

Conflicts of Interest: The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

Abbreviations

ANC	Antenatal Care
BFESI	Breastfeeding education and support intervention
BFKQ	Breastfeeding Knowledge Questionnaire
EBF	Exclusive breastfeeding
IIFAS	Iowa Infant Feeding Attitude Access Scale

References

- World Health Organization. *Global Strategy for Infant and Young Child Feeding*; WHO: Geneva, Switzerland, 2003.
- Arenz, S.; Ruckerl, R.; Koletzko, B.; von Kries, R. Breast-feeding and childhood obesity—A systematic review. *Int. J. Obes. Relat. Metab. Disord.* **2004**, *28*, 1247–1256. [[CrossRef](#)]
- Brown, K.H.; Black, R.E.; Lopez de Romana, G.; Creed de Kanashiro, H. Infant-feeding practices and their relationship with diarrheal and other diseases in Huascar (Lima), Peru. *Pediatrics* **1989**, *83*, 31–40.
- Godfrey, J.R.; Lawrence, R.A. Toward optimal health: The maternal benefits of breastfeeding. *J. Womens Health Larchmt.* **2010**, *19*, 1597–1602. [[CrossRef](#)]
- Grummer-Strawn, L.M.; Mei, Z. Does breastfeeding protect against pediatric overweight? Analysis of longitudinal data from the centers for disease control and prevention pediatric nutrition surveillance System. *Pediatrics* **2004**, *113*, 81–86. [[CrossRef](#)] [[PubMed](#)]
- Harder, T.; Bergmann, R.; Kallischnigg, G.; Plogemann, A. Duration of breastfeeding and risk of overweight: A meta-analysis. *Am. J. Epidemiol.* **2005**, *162*, 397–403. [[CrossRef](#)] [[PubMed](#)]
- Heinig, M.J.; Dewey, K.G. Health advantages of breast feeding for infants: A critical review. *Nutr. Res. Rev.* **1996**, *9*, 89–110. [[CrossRef](#)]
- Horta, B.L.; Bahl, R.; Martinés, J.C.; Victora, C.G.; World Health Organization. *Evidence on the Long-Term Effects of Breastfeeding: Systematic Review and Meta-Analyses*; World Health Organization: Geneva, Switzerland, 2007.
- Li, R.; Fein, S.B.; Grummer-Strawn, L.M. Association of breastfeeding intensity and bottle-emptying behaviors at early infancy with infants' risk for excess weight at late infancy. *Pediatrics* **2008**, *122*, 77–84. [[CrossRef](#)]
- Owen, C.G.; Martin, R.M.; Whincup, P.H.; Smith, G.D.; Cook, D.G. Effect of infant feeding on the risk of obesity across the life course: A quantitative review of published evidence. *Pediatrics* **2005**, *115*, 1367–1377. [[CrossRef](#)]
- Popkin, B.M.; Adair, L.; Akin, J.S.; Black, R.; Briscoe, J.; Fliieger, W. Breast-feeding and diarrheal morbidity. *Pediatrics* **1990**, *86*, 874–882.
- Victora, C.G.; Fuchs, S.C.; Flores, J.A.C.; Fonseca, W.; Kirkwood, B. Risk factors for pneumonia among children in a Brazilian metropolitan area. *Pediatrics* **1994**, *93*, 977–985. [[PubMed](#)]
- Victora, C.G.; Bahl, R.; Barros, A.J.; França, G.V.; Horton, S.; Krasevec, J.; Murch, S.; Sankar, M.J.; Walker, N.; Rollins, N.C. Breastfeeding in the 21st century: Epidemiology, mechanisms, and lifelong effect. *Lancet* **2016**, *387*, 475–490. [[CrossRef](#)]
- Central Statistical Agency. *Ethiopia Demographic and Health Survey*; Central Statistical Agency: Addis Ababa, Ethiopia, 2017.

15. Federal Democratic Republic of Ethiopia Ministry of Health. *Health Sector Transformation Plan 2015/16–2019/20*; Federal Democratic Republic of Ethiopia Ministry of Health: Addis Ababa, Ethiopia, 2015.
16. Chen, S.; Binns, C.W.; Liu, Y.; Maycock, B.; Zhao, Y.; Tang, L. Attitudes towards breastfeeding—The Iowa infant feeding attitude scale in Chinese mothers living in China and Australia. *Asia Pac. J. Clin. Nutr.* **2013**, *22*, 266–269. [[CrossRef](#)] [[PubMed](#)]
17. Hamze, L.; Mao, J.; Reifsnider, E. Knowledge and attitudes towards breastfeeding practices: A cross-sectional survey of postnatal mothers in China. *Midwifery* **2019**, *74*, 68–75. [[CrossRef](#)] [[PubMed](#)]
18. Zhang, Z.; Zhu, Y.; Zhang, L.; Wan, H. What factors influence exclusive breastfeeding based on the theory of planned behaviour. *Midwifery* **2018**, *62*, 177–182. [[CrossRef](#)] [[PubMed](#)]
19. Leshi, O.; Samuel, F.O.; Ajakaye, M.O. Breastfeeding knowledge, attitude and intention among female young adults in Ibadan, Nigeria. *Open J. Nurs.* **2016**, *6*, 11–23. [[CrossRef](#)]
20. Mahmud, N.A. Knowledge of Breastfeeding: A descriptive study among mothers in Kirkuk Governorate. *Iraqi Natl. J. Nurs. Spec.* **2011**, *24*, 84–93.
21. Chen, C.-H.; Chi, C.-S. Maternal intention and actual behavior in infant feeding at one month postpartum. *Acta Paediatr. Taiwanica* **2003**, *44*, 140–144.
22. Dungy, C.I.; McInnes, R.J.; Tappin, D.M.; Wallis, A.B.; Oprescu, F. Infant feeding attitudes and knowledge among socioeconomically disadvantaged women in Glasgow. *Matern. Child Health J.* **2008**, *12*, 313–322. [[CrossRef](#)]
23. Jessri, M.; Farmer, A.P.; Maximova, K.; Willows, N.D.; Bell, R.C.; Team, A.S. Predictors of exclusive breastfeeding: Observations from the Alberta pregnancy outcomes and nutrition (APrON) study. *BMC Pediatr.* **2013**, *13*, 77. [[CrossRef](#)]
24. Mora, A.d.I.; Russell, D.W.; Dungy, C.I.; Losch, M.; Dusdieker, L. The Iowa infant feeding attitude scale: Analysis of reliability and validity1. *J. Appl. Soc. Psychol.* **1999**, *29*, 2362–2380. [[CrossRef](#)]
25. Scott, J.A.; Binns, C.W.; Oddy, W.H.; Graham, K.I. Predictors of breastfeeding duration: Evidence from a cohort study. *Pediatrics* **2006**, *117*, 646–655. [[CrossRef](#)]
26. Sonko, A.; Worku, A. Prevalence and predictors of exclusive breastfeeding for the first six months of life among women in Halaba special woreda, Southern Nations, Nationalities and Peoples’ Region/SNNPR/, Ethiopia: A community based cross-sectional study. *Arch. Public Health* **2015**, *73*, 53. [[CrossRef](#)]
27. Thulier, D.; Mercer, J. Variables associated with breastfeeding duration. *J. Obstet. Gynecol. Neonatal Nurs.* **2009**, *38*, 259–268. [[CrossRef](#)]
28. Adugna, B.; Tadele, H.; Reta, F.; Berhan, Y. Determinants of exclusive breastfeeding in infants less than six months of age in Hawassa, an urban setting, Ethiopia. *Int. Breastfeed. J.* **2017**, *12*, 45. [[CrossRef](#)]
29. Asfaw, M.M.; Argaw, M.D.; Kefene, Z.K. Factors associated with exclusive breastfeeding practices in Debre Berhan District, Central Ethiopia: A cross sectional community based study. *Int. Breastfeed. J.* **2015**, *10*, 23. [[CrossRef](#)] [[PubMed](#)]
30. Awoke, N.; Tekalign, T.; Lemma, T. Predictors of optimal breastfeeding practices in Worabe town, Silte zone, South Ethiopia. *PLoS ONE* **2020**, *15*, e0232316. [[CrossRef](#)]
31. Belachew, A.; Tewabe, T.; Asmare, A.; Hirpo, D.; Zeleke, B.; Muche, D. Prevalence of exclusive breastfeeding practice and associated factors among mothers having infants less than 6 months old, in Bahir Dar, Northwest, Ethiopia: A community based cross sectional study, 2017. *BMC Res. Notes* **2018**, *11*, 1–6. [[CrossRef](#)] [[PubMed](#)]
32. Bimerew, A.; Teshome, M.; Kassa, G.M. Prevalence of timely breastfeeding initiation and associated factors in Dembecha district, North West Ethiopia: A cross-sectional study. *Int. Breastfeed. J.* **2016**, *11*, 28. [[CrossRef](#)]
33. Chekol, D.A.; Biks, G.A.; Gelaw, Y.A.; Melsew, Y.A. Exclusive breastfeeding and mothers’ employment status in Gondar town, Northwest Ethiopia: A comparative cross-sectional study. *Int. Breastfeed. J.* **2017**, *12*, 27. [[CrossRef](#)] [[PubMed](#)]
34. Hoche, S.; Meshesha, B.; Wakgari, N. Sub-optimal breastfeeding and its associated factors in rural communities of hula district, Southern Ethiopia: A cross-sectional study. *Ethiop. J. Health Sci.* **2018**, *28*, 49–62. [[CrossRef](#)] [[PubMed](#)]
35. Kelkay, B.; Kindalem, E.; Tagele, A.; Moges, Y. Cessation of exclusive breastfeeding and determining factors at the university of Gondar comprehensive specialized hospital, Northwest Ethiopia. *Int. J. Pediatr.* **2020**, *2020*, 8431953. [[CrossRef](#)]
36. Tsegaye, M.; Ajema, D.; Shiferaw, S.; Yirgu, R. Level of exclusive breastfeeding practice in remote and pastoralist community, Aysaita woreda, Afar, Ethiopia. *Int. Breastfeed. J.* **2019**, *14*, 6. [[CrossRef](#)]
37. Egata, G.; Berhane, Y.; Worku, A. Predictors of non-exclusive breastfeeding at 6 months among rural mothers in east Ethiopia: A community-based analytical cross-sectional study. *Int. Breastfeed. J.* **2013**, *8*, 8. [[CrossRef](#)]
38. Chambers, J.; McInnes, R.; Hoddinott, P.; Alder, E. A systematic review of measures assessing mothers’ knowledge, attitudes, confidence and satisfaction towards breastfeeding. *Breastfeed. Rev.* **2007**, *15*, 17–25.
39. Kimberlin, C.L.; Winterstein, A.G. Validity and reliability of measurement instruments used in research. *Am. J. health Syst. Pharm.* **2008**, *65*, 2276–2284. [[CrossRef](#)]
40. Grossman, L.K.; Harter, C.; Hasbrouck, C. Testing mothers’ knowledge of breastfeeding: Instrument development and implementation and correlation with infant feeding decision. *J. Pediatr. Prenatal Nutr.* **1991**, *2*, 43–63. [[CrossRef](#)]
41. Tengku Ismail, T.A.; Sulaiman, Z. Reliability and validity of a Malay-version questionnaire assessing knowledge of breastfeeding. *Malays. J. Med. Sci.* **2010**, *17*, 32–39.
42. Abdulahi, M.; Fretheim, A.; Magnus, J.H. Effect of breastfeeding education and support intervention (BFESI) versus routine care on timely initiation and exclusive breastfeeding in Southwest Ethiopia: Study protocol for a cluster randomized controlled trial. *BMC Pediatr.* **2018**, *18*, 313. [[CrossRef](#)]

43. World Health Organization. Global Strategy on Human Resources for Health: Workforce 2030. 2016. Available online: <https://apps.who.int/iris/bitstream/handle/10665/250368/?sequence=1> (accessed on 21 July 2021).
44. Abdulahi, M.; Fretheim, A.; Argaw, A.; Magnus, J.H. Adaptation and validation of the Iowa infant feeding attitude scale and the breastfeeding knowledge questionnaire for use in an Ethiopian setting. *Int. Breastfeed. J.* **2020**, *15*, 24. [[CrossRef](#)]
45. Cox, K.N.; Giglia, R.C.; Binns, C.W. The influence of infant feeding attitudes on breastfeeding duration: Evidence from a cohort study in rural Western Australia. *Int. Breastfeed. J.* **2015**, *10*, 25. [[CrossRef](#)]
46. Tomas-Almarcha, R.; Oliver-Roig, A.; Richart-Martinez, M. Reliability and validity of the reduced Spanish version of the Iowa infant feeding attitude scale. *J. Obstet. Gynecol. Neonatal Nurs.* **2016**, *45*, 26–40. [[CrossRef](#)]
47. Twells, L.K.; Midodzi, W.K.; Ludlow, V.; Murphy-Goodridge, J.; Burrage, L.; Gill, N.; Halfyard, B.; Schiff, R.; Newhook, L.A. Assessing infant feeding attitudes of expectant women in a provincial population in Canada: Validation of the Iowa infant feeding attitude scale. *J. Hum. Lact.* **2014**, *32*, 9–18. [[CrossRef](#)]
48. Nanishi, K.; Jimba, M. Reliability and validity of the Japanese version of the Iowa infant feeding attitude scale: A longitudinal study. *J. Hum. Lact.* **2014**, *30*, 346–352. [[CrossRef](#)] [[PubMed](#)]
49. Scott, J.A.; Shaker, I.; Reid, M. Parental attitudes toward breastfeeding: Their association with feeding outcome at hospital discharge. *Birth* **2004**, *31*, 125–131. [[CrossRef](#)] [[PubMed](#)]
50. Ajzen, I.; Fishbein, M. The influence of attitudes on behavior. In *The Handbook of Attitudes*; Lawrence Erlbaum Associates Publishers: Mahwah, NJ, USA, 2005; Volume 173, pp. 173–221.
51. Ho, Y.J.; McGrath, J.M. Predicting breastfeeding duration related to maternal attitudes in a Taiwanese sample. *J. Perinatal Educ.* **2011**, *20*, 188–199. [[CrossRef](#)]
52. Lau, Y.; Htun, T.P.; Lim, P.I.; Ho-Lim, S.S.; Klainin-Yobas, P. Psychometric properties of the Iowa infant feeding attitude scale among a multiethnic population during pregnancy. *J. Hum. Lact.* **2016**, *32*, 315–323. [[CrossRef](#)]
53. Wallis, A.B.; Brinzaniuc, A.; Chereches, R.; Oprescu, F.; Sirlincan, E.; David, I.; Dirlu, I.A.; Dungy, C.I. Reliability and validity of the Romanian version of a scale to measure infant feeding attitudes and knowledge. *Acta Paediatr.* **2008**, *97*, 1194–1199. [[CrossRef](#)] [[PubMed](#)]
54. Charafeddine, L.; Tamim, H.; Soubra, M.; de la Mora, A.; Nabulsi, M. Validation of the Arabic version of the Iowa infant feeding attitude scale among Lebanese women. *J. Hum. Lact.* **2016**, *32*, 309–314. [[CrossRef](#)] [[PubMed](#)]
55. Sittlington, J.; Stewart-Knox, B.; Wright, M.; Bradbury, I.; Scott, J.A. Infant-feeding attitudes of expectant mothers in Northern Ireland. *Health Educ. Res.* **2007**, *22*, 561–570. [[CrossRef](#)]
56. Laanterä, S.; Pölkki, T.; Ekström, A.; Pietilä, A.-M. Breastfeeding attitudes of Finnish parents during pregnancy. *BMC Pregnancy Childbirth* **2010**, *10*, 79. [[CrossRef](#)]



Paper
III

Article

Breastfeeding Education and Support to Improve Early Initiation and Exclusive Breastfeeding Practices and Infant Growth: A Cluster Randomized Controlled Trial from a Rural Ethiopian Setting

Misra Abdulahi ^{1,2,*} , Atle Fretheim ^{3,4}, Alemayehu Argaw ^{1,5} and Jeanette H. Magnus ^{6,7}

¹ Department of Population and Family Health, Jimma University, Jimma 378, Ethiopia; yemarimwork2@gmail.com

² Department of Community Medicine and Global Health, University of Oslo, 0316 Oslo, Norway

³ Faculty of Health Sciences, Oslo Metropolitan University, 0130 Oslo, Norway; atle.fretheim@medisin.uio.no

⁴ Centre for Informed Health Choices, Norwegian Institute of Public Health, 0473 Oslo, Norway

⁵ Department of Food Technology, Safety and Health, Faculty of Bioscience Engineering, Ghent University, B-9000 Ghent, Belgium

⁶ Faculty of Medicine, University of Oslo, 0316 Oslo, Norway; j.h.magnus@medisin.uio.no

⁷ Department of Global Community Health and Behavioral Sciences, Tulane School of Public Health and Tropical Medicine, New Orleans, LA 70112, USA

* Correspondence: misra_ab@yahoo.com or m.a.ahmed@studmed.uio.no; Tel.: +251-912-010293



Citation: Abdulahi, M.; Fretheim, A.; Argaw, A.; Magnus, J.H. Breastfeeding Education and Support to Improve Early Initiation and Exclusive Breastfeeding Practices and Infant Growth: A Cluster Randomized Controlled Trial from a Rural Ethiopian Setting. *Nutrients* **2021**, *13*, 1204. <https://doi.org/10.3390/nu13041204>

Academic Editor:
Jennifer T. Smilowitz

Received: 8 February 2021
Accepted: 28 March 2021
Published: 6 April 2021

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2021 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

Abstract: Although peer-led education and support may improve breastfeeding practices, there is a paucity of evidence on the effectiveness of such interventions in the Ethiopian context. We designed a cluster-randomized trial to evaluate the efficacy of a breastfeeding education and support intervention (BFESI) on infant growth, early initiation (EI), and exclusive breastfeeding (EBF) practices. We randomly assigned 36 clusters into either an intervention group ($n = 249$) receiving BFESI by trained Women's Development Army (WDA) leaders or a control group ($n = 219$) receiving routine care. The intervention was provided from the third trimester of pregnancy until five months postpartum. Primary study outcomes were EI, EBF, and infant growth; secondary outcomes included maternal breastfeeding knowledge and attitude, and child morbidity. The intervention effect was analysed using linear regression models for the continuous outcomes, and linear probability or logistic regression models for the categorical outcomes. Compared to the control, BFESI significantly increased EI by 25.9% (95% CI: 14.5, 37.3%; $p = 0.001$) and EBF by 14.6% (95% CI: 3.77, 25.5%; $p = 0.010$). Similarly, the intervention gave higher breastfeeding attitude scores (Effect size (ES): 0.85SD; 95% CI: 0.70, 0.99SD; $p < 0.001$), but not higher knowledge scores (ES: 0.15SD; 95% CI: -0.10 , 0.41SD; $p = 0.173$). From the several growth and morbidity outcomes evaluated, the only outcomes with significant intervention effect were a higher mid-upper arm circumference (ES: 0.25cm; 95% CI: 0.01, 0.49cm; $p = 0.041$) and a lower prevalence of respiratory infection (ES: -6.90% ; 95% CI: -13.3 , -0.61% ; $p = 0.033$). Training WDA leaders to provide BFESI substantially improves EI and EBF practices and attitude towards breastfeeding.

Keywords: community-based; peer support; breastfeeding initiation; exclusive breastfeeding; infant growth; breastfeeding knowledge; attitude

1. Introduction

Globally, 2.5 million neonatal deaths occurred in 2017, accounting for 46% of all under-five mortality [1]. The majority of the global burden of neonatal mortality occurred in low- and middle-income countries (LMICs), and mainly from preventable causes. If scaled up at a universal level, breastfeeding can improve the survival of children by preventing an estimated 823,000 annual deaths in under-five children, of which 87% occurs in infants

under 6 months of age [2]. Despite the well-established benefits of breastfeeding, only 42% of newborns globally initiate breastfeeding within 1 h [3], and only 37% of infants younger than 6 months in LMICs are exclusively breastfed [2].

A recent review concluded that the scale-up of breastfeeding protection, promotion, and support interventions is among the key strategies to achieve nutrition targets under the Sustainable Development Goals [2]. In this regard, community-based intervention approaches, including household service delivery, have been identified as particularly effective for scaling-up breastfeeding promotion and support interventions and reaching the populations at most risk [4]. Moreover, a systematic review of breastfeeding promotion interventions in LMICs found that peer-led support strategies were effective in improving the rates of exclusive breastfeeding (EBF), while the provision of education alone was not effective [5]. It has also been shown that community-based peer-support is an effective approach in increasing the rates of early initiation of breastfeeding (EI) and the duration of EBF in populations in LMICs [6]. In Sub-Saharan Africa, a few studies that evaluated the effectiveness of community-based peer-support interventions reported increased optimal breastfeeding practices [7–9].

The World Health Organization recommends EI of breastfeeding within 1 h of birth, EBF during the first 6 months of life, and continued breastfeeding at least until the age of 2 years [10]. In Ethiopia, only 58% of infants were exclusively breastfed for six months in 2016, giving a national average duration of EBF of 3.1 months [11]. Furthermore, there has been limited progress in improving optimal breastfeeding practices in the country. For instance, the National Nutrition Program set a target to increase the rate of EBF by 22% between 2016 and 2020—only a 1% increase was achieved by 2019 [12,13]. Therefore, there is a critical need to identify effective strategies for large-scale implementation of breastfeeding promotion intervention in the country.

The Ethiopian perinatal care packages provided at health facilities include four focused antenatal visits, delivery care, and five contacts of postnatal care [14]. As part of newborn care immediately after birth, health workers encourage women to initiate breastfeeding within one hour and counsel them on correct positioning. After discharge from a health facility, health workers advise women to exclusively breastfeed their baby for six months during each postnatal contact. The challenge for implementing health facility-based breastfeeding promotion intervention is that most rural Ethiopian women deliver at home with very few women making postnatal visits. For instance, the 2016 EDHS reported that institutional delivery was only 20% among women living in rural areas [11]. On the other hand, the current community-based nutrition program in Ethiopia includes an outreach strategy to reach populations living in rural areas through health extension workers (HEWs) and local women peer-educators—also known as the Women Development Army (WDA) leaders [13]. The main components of the HEW program provided as routine care include a monthly growth monitoring and promotion for children under 24 months, biannual vitamin A supplementation and deworming, and a quarterly screening for acute malnutrition. Furthermore, HEWs are expected to provide infant and young child feeding counselling to mothers during the monthly growth monitoring sessions and during antenatal and postnatal care at health posts or through home visits though they do not have a fixed schedule for this. However, the HEWs are overburdened with their assigned tasks [15], which hinder them from providing the support lactating mothers need, particularly during the immediate postpartum period when women may give up breastfeeding due to difficulties they may face.

In Ethiopia, large-scale intervention studies such as the Alive and Thrive project [16] used an evaluation design with no control groups, making it unable to draw causal inference; and the “CBMNH-N multi-country project logic models focus on pregnant women and their newborns” employed a quasi-experimental design lacking true randomization [17]. The Muskoka Initiative Consortium—Knowledge Management Initiative focused on identifying contextual factors associated with the successful implementation of EBF programs [18] while in a trial in Hawassa, the intervention involved a single prenatal edu-

cational session [19]. None of these prior interventions combined prenatal and postnatal support with high intensity (>5 visits) which is found to have the highest impact on EBF in developing countries. Moreover, none of these interventions involved extra visits for women who experienced breastfeeding problems when they most needed the support to continue EBF. We, therefore, designed a cluster-randomized controlled trial evaluating the effectiveness of a community-based peer-led breastfeeding education and support intervention delivered during the prenatal and postnatal period through the established WDA system.

The primary outcomes of the trial were early initiation, exclusive breastfeeding, and infant growth, while childhood morbidity, breastfeeding knowledge, and attitude were secondary outcomes. The reason why we selected breastfeeding practices (early initiation and exclusive breastfeeding) as a primary outcome is because these two practices are associated with enormous health benefits, such as the reduced risk of morbidity and mortality. Improved breastfeeding practice is also associated with improved growth of infants; however, there are conflicting findings among the available evidence and thus growth was also selected as a primary outcome. As a secondary outcome, we wanted to see if the improved breastfeeding practice is associated with a reduced prevalence of childhood illnesses. Moreover, breastfeeding knowledge and attitude are an intermediate effect of the intervention, which could contribute to the improved practice and thus we identified them as secondary outcomes.

2. Materials and Methods

2.1. Study Design and Setting

The design and methods used in this trial, the Breastfeeding Education and Support Intervention (BFESI), are described in detail elsewhere [20]. Briefly, the study involved a cluster randomized, parallel-group, single-blinded trial evaluating the efficacy of BFESI on EI and EBF practices, and infant growth in a rural Ethiopian setting. The study was conducted in the Manna district located in Jimma Zone in southwest Ethiopia, where there was no similar ongoing intervention or project. From the total of 78 sub-districts under Mana, 36 sub-districts were selected for the study. The 36 sub-districts selected for the study were randomly assigned to either an intervention group ($n = 18$) receiving the BFESI or a control group ($n = 18$) receiving the routine Ethiopian healthcare service. We used simple randomization with a 1:1 allocation to allocate sub-districts to either control or intervention. First, the 36 sub-districts were listed alphabetically and then they were sequentially numbered starting from 01 to 36. Then we generated 18 random numbers from those 01 to 36 using MS Excel 2010 and the districts with the selected random numbers were assigned to the intervention group, while the rest were assigned to the control group. The generation of the allocation sequence and the randomization of clusters were done by a statistician blinded to study groups and not participating in the research. Allocation concealment was not done for study participants, as they would know if they were in the intervention group or not. However, data collectors were masked to the sub-district allocation by not being informed of the allocation, not being part of trial implementers, and not being residents in any of the sub-districts.

2.2. Participants

All pregnant women in the selected sub-districts were identified by reviewing the HEWs' antenatal care logbook. Women in their second or third trimester of pregnancy, who were willing to participate with no intention of leaving the study area during the intervention period, were enrolled for the study between May and September 2017. Study exclusion criteria were the presence of severe mental illness that could interfere with consent and study participation, serious illness or clinical complications warranting hospitalization, the occurrence of maternal death, abortion, stillbirth, infant death, twin gestation, preterm birth (at <37 weeks gestation), or any child congenital malformation that could interfere with breastfeeding.

2.3. Procedures

2.3.1. Training of Peer Supporters

The Ethiopian government introduced the health extension program in 2003 aimed at improving access to primary health care to rural communities through the expansion of health posts and training of HEWs [21]. After training and deployment to health posts, HEWs train model families on 16 health extension program elements over several weeks for 96 h. A woman who knows all the 16 packages and practices them is selected from the model family to lead other five women in her neighbourhood, supporting their adaptation of good practices, such as vaccinating their children, sleeping under mosquito bed-nets, building separate latrines, and using family planning [22]. Peer support is defined as the provision of emotional, appraisal, and informational assistance by a created social network member who possesses experiential knowledge of a specific behaviour or stressor, similar characteristics as the target population, and the ability to address a health-related issue [23]. With this in mind, for this trial, we selected WDA leaders who could read and write the local language, aged 24–39 years, with experience of motherhood as well as breastfeeding, being from the same community as the women they should support.

The WDA leaders from the intervention communities were trained for five days as breastfeeding peer-supporters by a nutritionist and a nurse with prior training on breastfeeding. WHO/UNICEF/USAID manuals were used to develop Ethiopian training guidebooks in the Afan Oromo language [24–26]. Moreover, to equip WDA leaders with the ability to educate and support study participants, a handbook with counselling cards were translated and prepared from these manuals. The training involved classroom lectures, demonstrations, and role play. Use of the manual and the counselling cards was practised through role-playing in teams with feedback from peers. Follow-up and supervision were carried out monthly during scheduled visits, in addition to unannounced spot-checks. Every pregnant mother was given a form to tally the number and timing of the visits she received from the WDA leaders. During the supervision, the supervisors checked the tallied paper and collected it at the end of the intervention.

2.3.2. Breastfeeding Education and Peer Support

Peer-supporters made home visits to women in the intervention clusters according to a pre-specified schedule [20]. During pregnancy, they made two home visits in the last trimester of pregnancy: during the 8th and 9th month. Visits after delivery were scheduled on the 1st or 2nd, 6th or 7th and 15th day, and thereafter monthly until the infant was five months. During the two antenatal visits, peer-supporters encouraged delivery at the nearby health centre, emphasized the importance of initiating breastfeeding within 1 h of delivery, feeding colostrum first, discouraging the use of traditional pre-lacteal foods (items given to newborns before breastfeeding is established such as raw butter, plain water and milk-other than breast milk), and post-lacteal foods in addition to advising them to eat one extra meal during pregnancy to support lactation. The discussions were combined with the use of educational materials and practical demonstrations on proper breastfeeding positioning and latching. During the first two weeks after delivery, peer-supporters emphasised frequent and on-demand breastfeeding, encouraged stopping any traditional pre-lacteal foods or post-lacteal food items if already given to the child. Besides, peer-supporters observed the positioning, latching, and feeding of the newborn, solving any breastfeeding problems and providing appropriate feedback, while encouraging the mothers to continue EBF for six months. During these visits, women were advised to eat two extra meals during lactation from a variety of foods available in their area to provide energy and nutrition for themselves and their babies as well as to secure sufficient breast-milk production. Starting from month one, in addition to the above components, peer-supporters emphasized techniques for preparing for work and management of breast-milk (breast-milk expression, storing breast-milk), discussed the lactation amenorrhea method, and other family planning options. Hands-on guidance was provided only when necessary. Personal cleanliness and domestic hygiene, hand washing before feeding, after going to the toilet, and after changing babies' diapers, were promoted during each visit. The mothers were

encouraged to ask questions related to any topic discussed. Peer-supporters also provided additional visits if women experienced breastfeeding problems such as engorgement, cracked nipple or insufficient breastmilk that prohibited them from continuing breastfeeding. In addition to the informational support described above, women also received an emotional, appraisal, and instrumental support (Table S1). The duration of each visit was typically 20–40 min.

Women in the control group received the routine care offered by the HEWs and WDA leaders working in their cluster, similar to that received by women in the intervention group [22]. The current Ethiopian standard/routine prenatal and postnatal care by HEWs includes providing four focused prenatal visits, developing an individualized birth preparedness and complication readiness plan, accompanying a woman to a health facility during delivery, and conducting four postnatal visits [27]. Moreover, as part of the community-based nutrition program, HEWs are expected to deliver the following key breastfeeding and nutrition messages to mothers during the monthly growth monitoring sessions or during antenatal or postnatal care visits: the importance of antenatal care, maternal nutrition during pregnancy and breastfeeding, early initiation of breastfeeding, proper positioning and attachment, EBF for six months, breastfeeding on demand, and complementary feeding [24]. WDA leaders also support the HEWs by educating and mobilizing communities to use key available health services, including dissemination of essential health messages such as infant and young child feeding practices.

2.4. Outcome Measures

The primary study outcomes were rates of EI and EBF for six months and infant growth. Secondary outcomes included maternal knowledge and attitude towards breastfeeding at the endline. We further included morbidity for common childhood illnesses over the past two weeks as an additional secondary outcome, although this was not considered a priori in the study protocol.

2.5. Data Collection

Data were collected at three time-points including at study enrolment (May–September 2017), at around 1 month (± 2 weeks), and 6 months (± 2 weeks) postpartum. At baseline, data on demographic and socio-economic characteristics, information on various maternal factors, and maternal knowledge and attitude towards breastfeeding were assessed. At one month postpartum, information about pregnancy outcome and other study exclusion criteria, and maternal practice on early initiation of breastfeeding including information about colostrum and pre-lacteals feeding were gathered. Data collected at around six months postpartum included maternal knowledge and attitude towards breastfeeding, EBF practice, infant anthropometry measurements, and morbidity. Data were collected by trained nurses and all instruments used were Afan Oromo language translations of English versions.

Gestational age was determined based on the last menstrual period (LMP). LMP was self-reported at baseline during enrolment. If women did not remember the exact date of the month, the 15th day of the month was used. First, we determined the estimated delivery date from the LMP and then subtracted the difference between the estimated delivery date and the actual delivery date from 280 days. Finally, we divided the total number of days by 7 to determine the gestational age in weeks. Maternal knowledge and attitude towards breastfeeding were assessed using Afan Oromo (AO) versions of the Breastfeeding Knowledge Questionnaire (BFKQ) and the Iowa Infant Feeding Attitude Access Scale (IIFAS), which were culturally adapted and validated in the same population. Details of the adaptation process and psychometric properties of both tools are reported previously [28]. Both the BFKQ-AO and the IIFAS-AO had an acceptable level of internal consistency with Cronbach alpha values of 0.79 and 0.72, respectively. Since our breastfeeding knowledge questionnaire adopted from Malaysia does not have a cut-off point suggesting an optimal knowledge level, we used a cut-off of \geq the median for a good level of knowledge. For attitude, we used the recommended cut-off of ≥ 70 scores for a positive attitude towards

breastfeeding [29]. EI of breastfeeding and EBF practices were defined according to the WHO Infant and Young Child Feeding indicators [30]. Accordingly, mothers were asked how soon after delivery they put their newborn to the breast with responses ≤ 1 h considered as optimal EI practice. EBF practice was defined as feeding infant no other food or drink, not even water, except breast milk for the first six months of life, but allowing the infant to receive oral rehydration solution, drops, and syrups (vitamins, minerals, and medicines). The following questions were asked to evaluate EBF practice: (i) For how many months did you exclusively breastfeed (name); (ii) Are you currently giving your infant any food/drink other than breast milk? (iii) If yes to ii, we asked the age at which the food/drink was started. Thus, we used questions i, ii, and iii to determine if the child had been exclusively breastfed for six months since birth.

Anthropometry measurements of infant length, weight, and mid-upper arm circumference (MUAC) were done in duplicate by two independent teams of data collectors and recorded on separate forms so that the first measurement could not influence the second. Then, a supervisor compared the duplicate measurements, and both teams repeated the measurement whenever there was a difference of ≥ 0.5 kg for weight, ≥ 1.0 cm for length, or ≥ 0.5 cm for MUAC. Recumbent length was measured using a length board (SECA 417) with a precision of 0.1 cm. Weight was measured together with the mother using an electronic scale (SECA 876) to the nearest 1.0 g. MUAC measurement was taken on the left arm to the nearest 0.1 cm using flexible non-stretchable measuring tapes (SECA 212). Instruments were calibrated before each measurement session. The average value of the duplicate anthropometry measurements was used for analysis, and length-for-age (LAZ), weight-for-length (WLZ), and weight-for-age (WAZ) z scores were calculated based on the WHO 2006 Child Growth Standards using the Stata `zscore06` command [31]. Child stunting, wasting, and underweight were determined from the respective z-score values using a cut-off < -2 SD from the median.

Mothers were asked to recall infant morbidity during the two weeks before the endline follow-up. Diarrhoea was defined as three or more liquid or semisolid stools within a day. Fever was determined by the mother's report. Acute respiratory infection was defined as a combination of fever and cough. Serious illness was the occurrence of an illness that required medical attention, i.e., hospital or health centre visits. Household wealth status was assessed using a 16-item household asset questionnaire adapted from the Ethiopian Demographic and Health Survey [11], and principal components analysis was used to generate a household asset score. Household food security status was assessed using the Household Food Insecurity Access Scale from the Food and Agriculture Organization [32].

2.6. Statistical Analysis

The sample size was calculated by taking into account an assumed intracluster correlation coefficient, the expected effect, and the power of the study [20]. In Ethiopia, the current overall rate estimate of EBF was 58%, according to the EDHS 2016 report [11]. We hypothesized that the BFESI would increase the prevalence of EBF to 78% in the intervention group. To detect a 20% difference in the rates of EBF, with 80% power, and 5% type I error, assuming an intra-cluster correlation of $\rho = 0.1$ [9], 10 pregnant women were needed per study cluster. We inflated the sample size from 346 to 432 to accommodate for a potential 20% attrition rate.

Data were entered using Epi-data version 3.1 (EpiData Association) and consistency checks and statistical analysis were conducted using Stata version 13.0 (StataCorp LLC, College Station, TX, USA). Descriptive statistics were summarized as frequency and percentage for the categorical variables, and mean and standard deviation for the continuous variables. Maternal knowledge and attitude scores were standardized to z scores based on the distribution of the data. The effects of the intervention were estimated using linear regression models for the continuous outcomes, and linear probability models for the binary outcomes. The use of linear probability models for binary outcomes is well established and allows for a straightforward interpretation of the average intervention effect

expressed as a risk difference using percentage points [33]. However, for the rare outcomes of child stunting, wasting, and underweight, we fitted logistic regression models. In all models, we applied a robust standard error estimation taking into account the clustering of subjects by sub-districts. Both unadjusted and adjusted group differences were estimated with covariates used for adjustment, including maternal age, educational status, wealth index, parity, household food insecurity status and IIFAS score at baseline. Analyses were done following the intention-to-treat principle. For this purpose, we conducted multiple imputations of missing data using chained equations under the assumption of missing at random. To estimate the regression coefficients, we ran a hundred imputations of missing data for cases lost-to-follow-up. Statistical significance was declared at p -value < 0.05 .

3. Results

A total of 468 pregnant women (n intervention = 249; control = 219) were enrolled at baseline. At the one-month postpartum follow-up, 47 subjects (n intervention = 28; control = 19) were excluded because of newborn death ($n = 11$), twin deliveries ($n = 4$), still-birth ($n = 6$), maternal death ($n = 1$), abortion ($n = 3$), or change in residence ($n = 22$) (Figure 1). At the six-month postpartum follow up, 12 subjects (n intervention = 9; control = 3) were excluded because of child death ($n = 2$) or change in residence ($n = 10$). Ultimately, we have outcome data from 421 (90.0%) mother-child pairs (n intervention = 221; control = 200) at the one-month postpartum follow-up and from 409 (87.4%) mother-child pairs (n intervention = 212; control = 197) at the six-month postpartum follow-up. Reasons for drop out are reported according to the CONSORT reporting guideline in Figure 1. Baseline characteristics of study participants are presented in Table 1.

Table 1. Baseline characteristics of the study participants ¹.

Variables	Intervention ($n = 249$)	Control ($n = 219$)
Maternal age, years		
15–19	8.84	12.8
20–34	85.1	81.3
35–40	6.02	5.94
Maternal educational status		
Illiterate	60.2	62.1
Can read and write	12.5	14.6
Primary education	7.63	4.57
Secondary education	19.7	18.7
Married	53.2	46.8
Housewife/farmer	93.6	94.1
Wealth quantiles		
Lowest	19.6	20.6
Second	18.1	22.4
Middle	18.9	21.0
Fourth	20.9	19.1
Highest	22.5	16.9
Birth interval ≥ 24 months	94.5	94.8
Primipara	18.5	18.3
Household food security status		
Food secure	57.0	61.2
Mildly food insecure	23.3	13.2
Moderately food insecure	12.5	17.4
Severely food insecure	7.23	8.22
Have a history of breastfeeding	94.3	93.5
IIFAS score	66.5 \pm 6.93	64.8 \pm 8.31
BFKQ score	24.7 \pm 3.80	24.4 \pm 4.81
Received ANC visit for the index baby	98.6	98.5
Received at least four ANC visits	50.6	53.3

¹ Values are means \pm SDs or proportions, ANC, Antenatal Care; BFKQ, Breast Feeding Knowledge Questionnaire; IIFAS, Iowa Infant Feeding Attitude Scale.

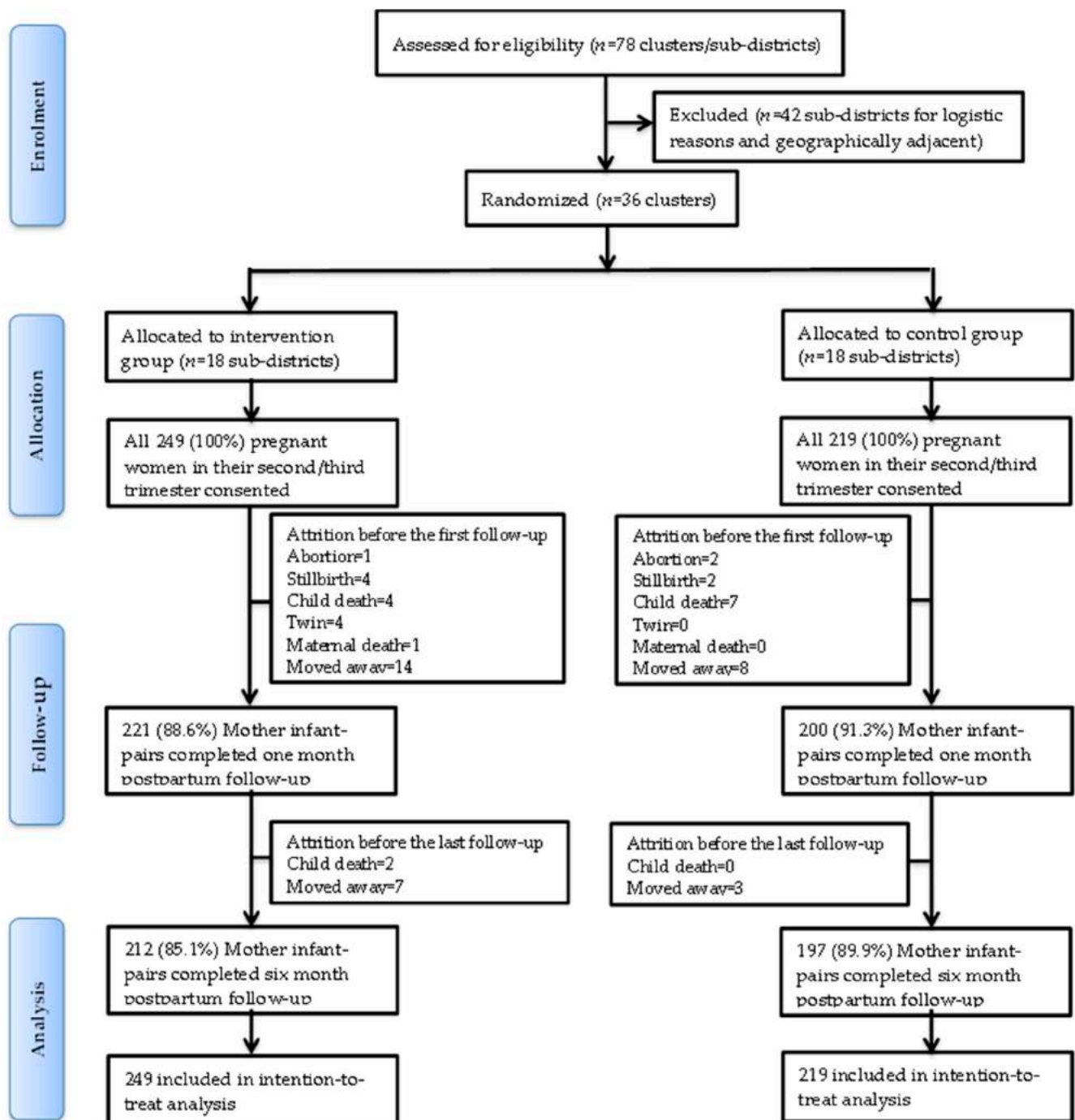


Figure 1. CONSORT (Consolidated Standards of Reporting Trials) flow diagram of the study.

Peer supporters' visit coverage was reported by women and peer counsellors during the two follow-up visits. Among 221 women who were available for the first follow-up at month one after delivery, 189 (75.9%) received the two prenatal visits and 152 (80%) of the visits were timely; 32 (12.9%) women received only one prenatal visit as per the schedule. Out of 212 women who were available for the last follow-up visit, 150 (70.8%) received all the planned 8 visits and 119 (79.3%) of these visits were timely. However, 35 women received seven visits and 29 (82.9%) visits were timely, while 27 women received 6 visits with 20 (74.1%) of the visits being timely.

3.1. Effects on Breastfeeding Practices

A significantly higher proportion of newborns in the intervention group, 181 (72.7%), initiated breastfeeding within the first hour after delivery compared to the control group, 89 (40.6%) ($p = 0.001$) (Table 2). Similarly, EBF was significantly higher in the intervention group, 170 (68.3%), than in the control group, 120 (54.8%) ($p = 0.009$). In the adjusted analysis, BFESI significantly increased the rate of EI of breastfeeding by 25.4% (95% CI: 14.5, 37.3%; $p = 0.001$) and EBF by 14.6% (95% CI: 3.77, 25.5%; $p = 0.010$), as compared to the control group.

Table 2. Breastfeeding knowledge, attitude, and practices by study arms ¹.

Outcomes	Intervention (n = 249)	Control (n = 219)	Unadj diff (95% CI) ²	p^2	Adj Diff (95% CI) ²	p^2
Early initiation of breastfeeding ³	72.7	40.6	25.9 (13.8, 37.9)	<0.001	25.4 (14.5, 37.3)	<0.001
Exclusive breastfeeding ⁴	68.3	54.8	14.4 (3.91, 24.8)	0.009	14.6 (3.77, 25.5)	0.010
BFKQ score ⁴	26.3 ± 1.77	26.0 ± 2.07	0.15 (−0.09, 0.39)	0.211	0.15 (−0.10, 0.41)	0.173
IIFAS score ⁴	77.6 ± 9.04	67.7 ± 9.72	0.85 (0.70, 0.99)	<0.001	0.85 (0.70, 0.99)	<0.001
Good knowledge about breastfeeding ⁴	69.1	65.1	5.20 (−3.80, 14.2)	0.257	5.38 (−3.59, 14.4)	0.239
Positive attitude towards breastfeeding ⁴	75.5	43.8	30.4 (23.4, 37.4)	<0.001	30.4 (23.4, 37.4)	<0.001

¹ Values are means ± SDs or proportions, ² Unadjusted and adjusted group differences (CIs) and Ps estimated using linear regression models (as mean difference) for the continuous outcomes and linear probability models (as risk difference in percentage points) for proportions, with a robust variance estimation, used to account clustering of subjects by sub-districts. Covariates used for adjusted estimates were maternal age, educational status, wealth index, parity, and IIFAS at baseline. ³ Assessed at one month postpartum, ⁴ Assessed at six months postpartum, BFKQ, Breast Feeding Knowledge Questionnaire; IIFAS, Iowa Infant Feeding Attitude Scale.

3.2. Effects on Infant Growth and Nutritional Status at the Age of Six Months

We found no statistically significant difference between the intervention and control groups on LAZ and WAZ or the prevalence of stunting, wasting, or underweight (Table 3). However, infants in the intervention group had a significantly higher MUAC than infants in the control group (effect size: 0.25 cm; 95% CI: 0.01, 0.49 cm; $p = 0.041$).

Table 3. Infant anthropometry and morbidity outcomes by study arms at 6 months postpartum follow-up ¹.

Outcomes	Intervention (n = 249)	Control (n = 219)	Unadj Diff (95% CI) ²	p^2	Adj Diff (95% CI) ²	p^2
LAZ	−0.14 ± 1.15	−0.18 ± 1.22	0.05 (−0.30, 0.39)	0.795	0.05 (−0.30, 0.39)	0.790
WAZ	0.01 ± 0.95	−0.12 ± 1.06	0.15 (−0.12, 0.41)	0.267	0.15 (−0.11, 0.41)	0.255
WLZ	0.23 ± 1.12	0.09 ± 1.07	0.15 (−0.16, 0.46)	0.326	0.15 (−0.15, 0.46)	0.311
MUAC	13.7 ± 0.96	13.5 ± 0.93	0.25 (0.00, 0.50)	0.048	0.25 (0.01, 0.49)	0.041
Stunted	4.82	6.39	−0.24 (−1.13, 0.64)	0.591	−0.25 (−1.11, 0.61)	0.565
Underweight	3.21	4.57	−0.31 (−1.29, 0.68)	0.537	−0.28 (−1.38, 0.82)	0.618
Wasted	4.02	1.37	1.16 (0.03, 2.29)	0.044	1.16 (0.00, 2.33)	0.051
Cough	16.9	24.2	−6.93 (−15.1, 1.29)	0.096	−7.09 (−15.1, 0.92)	0.081
Fever	16.1	21.5	−4.95 (−12.6, 2.69)	0.196	−4.71 (−12.2, 2.75)	0.207
Diarrhea	10.0	8.22	2.50 (−4.08, 9.09)	0.445	2.54 (−4.09, 9.18)	0.442
Fever with cough	10.0	15.5	−6.70 (−13.4, −0.03)	0.049	−6.90 (−13.3, −0.61)	0.033
Any illness	28.1	34.7	−6.07 (−16.4, 4.21)	0.238	−6.12 (−16.1, 3.85)	0.221
Serious illness	18.9	27.4	−8.17 (−17.4, 1.04)	0.080	−7.79 (−16.9, 1.29)	0.090

¹ Values are means ± SDs or proportions, ² Unadjusted and adjusted group differences (CIs) and Ps estimated using linear regression models (as means difference) for continuous outcomes, logistic regression models (as odds ratio) for nutritional status outcomes, and linear probability models (as risk difference in percentage points) for morbidity outcomes, with a robust variance estimation, used to account clustering of subjects by sub-districts. Covariates used for adjusted estimates were maternal age, educational status, wealth index, parity, IIFAS, and household food insecurity status at baseline, LAZ, length-for-age z scores; MUAC, mid-upper-arm-circumference in cm; WAZ, weight-for-age z scores; WHZ, weight-for-length z scores.

3.3. Effects on Maternal Knowledge and Attitude towards Breastfeeding

BFESI resulted in a significantly higher maternal breastfeeding attitude score (effect size: 0.85 SD; 95% CI: 0.70, 0.99 SD; $p < 0.001$) and a higher proportion of mothers with positive attitude towards breastfeeding (30.4% (23.4, 37.4%); $p < 0.001$), as compared to the control group (Table 2). There was an increase in maternal knowledge level in both

groups from baseline. The intervention resulted in a non-significant trend towards a higher maternal knowledge score (Effect size: 0.15 SD; 95% CI: $-0.10, 0.41$ SD; $p = 0.173$).

3.4. Effects on Infant Morbidity at Six Months of Age

During the two weeks before the six-month postpartum follow-up, we found no statistically significant group differences in the occurrence of common childhood illnesses, including serious illnesses, except that infants in the intervention group had a lower prevalence of cough with fever (Effect size (95% CI): -6.90% ($-13.3, -0.61\%$); $p = 0.033$) (Table 3). In the complete-case analysis with only available information, similar results were obtained for the intervention effect in all outcomes (Tables S2 and S3).

4. Discussion

This study demonstrated that engaging WDA leaders, who already function in the healthcare system as peer-educators, successfully improved maternal practices related to EI of breastfeeding and EBF in rural Southwest Ethiopia. Peer-led education and support intervention significantly increased EI of breastfeeding by 26%, and EBF by 15%, compared to routine healthcare service. BFESI also resulted in a substantial improvement in maternal attitude towards breastfeeding. However, we did not find important impacts of the intervention on maternal knowledge about optimal breastfeeding practices, child growth or nutritional status, or child morbidity outcomes.

This study confirms that BFESI can ensure EI of breastfeeding within 1 h of birth and EBF. This is consistent with what has been reported by other studies [6–9,34]. The few RCTs from Sub-Saharan African countries, Kenya [8], rural Malawi [7], and the PROMISE EBF trial [9] concur with the presented study from Ethiopia.

The success of the peer-led interventions in improving EI, EBF, and attitude could be explained by several factors. Firstly, evidence from systematic review demonstrated that education alone is not effective and individual level combined prenatal and postnatal support with high intensity (>5 contacts) had the highest impact on EBF in developing countries [5,35]. In this trial, women received peer-support both during the antenatal and postnatal period with a minimum of 10 visits, with the majority of the women receiving all prenatal and postnatal visits as per the schedule. Moreover, the first two postnatal visits took place in the first week since this a critical time when women may give up breastfeeding due to difficulties they may face. Furthermore, the peers delivered instrumental/practical support during the scheduled/extra visits if the women experienced any breastfeeding problem. Thus, the timing and intensity of support received may have helped to build the mothers' confidence, improve feeding technique, and prevent or resolve breastfeeding problems. Secondly, the WDA program is based on a theory of behaviour change where others in the community admire and copy the behaviour of these "model" women [36]. Furthermore, according to the theory of planned behaviour, people tend to perform certain behaviours when they believe that the "important others" think they should perform them [37]. Thus, owing to the fact that WDA leaders are from model households that are admired in the community, their function as a peer might have made them effective communicators and led to the success of the intervention.

Our findings on infant growth were similar to a previous study from India reporting the lack of effects of a breastfeeding promotion intervention on infant linear or ponderal growth [38]. A systematic review of breastfeeding promotion intervention on child growth suggests that it can lead to a modest reduction in body mass index or WAZ [39]. In our study, except for a modest increase in MUAC, the differences for LAZ, WAZ, and WLZ were not statistically significant. These findings could be due to the effect of exclusive or predominant breastfeeding that promotes higher accretion of fat mass during the first six months of life [40]. Moreover, not only breastfeeding behaviour but also intrauterine growth retardation contributes considerably to infant growth faltering, and growth faltering is also more prominent after six months of age when infants start complementary feeding [41].

On the other hand, it should be noted that our study was not adequately powered to detect potentially important differences in growth outcomes.

There is strong and convincing evidence that breastfeeding reduces the incidence and severity of acute infections, especially diarrhoea and lower respiratory tract infections such as pneumonia [2]. In a review by Chapman et al. [42], peer counselling was found to reduce the prevalence of diarrhoea. A trial from India revealed a similar effect [38]. In the current study, although the intervention group had a reduced prevalence of respiratory infection, we did not observe a lower prevalence of diarrhoea in our intervention group. This is in line with the PROMISE EBF trial and another study in Guinea-Bissau where diarrhoea was not significantly different between the intervention and control groups [9,43]. Although exclusive breastfeeding is one prevention strategy for diarrhoeal morbidity, it is not the only strategy [44]. Basic water, sanitation, and hygiene are among other strategies for diarrhoea prevention that are influenced by maternal age, educational status, occupation, and household living conditions [45]. However, these variables are similarly distributed between the intervention and control clusters, which might explain the absence of statistical difference in diarrhoeal prevalence between the two groups. Moreover, the diarrheal disease has an association with seasons, where some pathogens are more prevalent during rainy seasons contaminating water sources [46]. In this regard, although most endline data were collected during rainy seasons, diarrheal illness was statistically different between the groups when adjusted for the season.

Our intervention aimed to improve maternal knowledge and attitudes towards optimal breastfeeding practices. The level of breastfeeding knowledge increased in both the intervention and control group, although there was no statistical difference between the two groups. However, the intervention significantly improved the attitudes towards breastfeeding. For a behaviour change, not only knowledge and personal intention to act, but also the availability of social support are important [47]. Moreover, as reflected in the theory of planned behaviour, the peer-led education and support provided by the WDA leaders might have influenced the women to develop a positive attitude and a greater sense of confidence and commitment, leading to the adoption of the behaviour even without much gain in knowledge [37,48].

Our study has several strengths. The study had a high response rate with few dropouts. We used internationally developed breastfeeding knowledge and attitude tools that were validated in the Ethiopian setting. Besides, for the majority of the women, all prenatal and postnatal visits were implemented as per the schedule. Further, unlike peer-support interventions conducted in sub-Saharan Africa that selected peer counsellors who were not part of the healthcare system, training WDA leaders who are already introduced into the healthcare system by the government to support HEWs, as peer-supporters, may provide the opportunity to integrate this intervention into the existing healthcare system.

Our study had some limitations related to the outcome measurements. First, the allocation status of the clusters was concealed only from the outcome assessors since it was not possible to blind the participants due to the nature of the study. This might have introduced social desirability bias in outcomes such as breastfeeding practice and morbidity outcomes that were assessed through maternal self-report. Measuring social desirability to assess for potential biases in our estimates would have confirmed the accuracy of self-reported outcome measures. Second, reporting breastfeeding indicators based on both point-in-time and life-long data has been recommended as a stronger approach than either of these in isolation [49]. In the present trial, although we measured breastfeeding practices using a 24-h recall, a week recall, and a since birth, we used the since birth data to calculate EBF. We believe that due to within-subject variance, assessing practice over the past 24 hours is not superior to using a since birth measure. Third, additional assessment of EBF at month one follow-up would have enabled us to have a better picture of how EBF declined over time in our study population, and how this was affected by the intervention. Fourth, our sample size was limited in detecting small effects on child growth outcomes. Fifth, although there may be a possible risk of recall bias, any threats to validity related to the precise

estimation of the outcomes affected both groups equally since we used a randomized design. Lastly, although assessing uptake of the intervention through qualitative study both from the perspectives of the mothers as well as peer-educators could have informed a future scale-up, this was not done. Future studies accompanying the scale-up should evaluate the quality, uptake, and cost-effectiveness of the peer-support interventions to map the sustainability of the intervention. Additionally, we have noted a high prevalence of food insecurity in the households of both the intervention and control groups. Therefore, we recommend that nutrition-sensitive interventions that can improve food security be implemented with future community-based breastfeeding promotion interventions.

5. Conclusions

In conclusion, the present study confirmed that in Ethiopia, WDA leaders in the primary healthcare structure can be trained as peer-supporters to provide successful breastfeeding education and support during home visits to the women in their neighborhoods. Our findings call for future studies assessing the feasibility of integrating the current intervention into the existing Ethiopian primary healthcare system with potential desirable impacts.

Supplementary Materials: The following are available online at <https://www.mdpi.com/article/10.3390/nu13041204/s1>, Table S1: Types of peer support intervention provided to women in the intervention arm, Table S2: Maternal knowledge, attitude, and practices related to breastfeeding by study arms at 1 month or 6 months postpartum follow-ups; Table S3: Infant anthropometry and morbidity outcomes by study arms at 6 months postpartum follow-up.

Author Contributions: Conceptualization, M.A., J.H.M., and A.F.; investigation, M.A.; formal analysis, M.A. and A.A.; writing—original draft Preparation, M.A. and A.A.; writing—review and editing, M.A., A.A., A.F., and J.H.M. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by Norad (Norwegian Agency for Development Cooperation) under the NORHED-Program, Agreement no. ETH-13/0024.

Institutional Review Board Statement: Ethical review and approval of the University of Oslo were waived for this study (Code: 2016/1726 REC South East, Section D, 26/11/2016) for the study falls outside of the scope of the Health Research Act as the Regional Committee for Medical and Health Research Ethics has the authority to either approve or disapprove medical and health research studies conducted within Norway or by Norwegian institutions. We have notified the Norwegian Centre for Research Data officers about the study—project number 954846. The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Institutional Review Board of Jimma University (Code: RPGC/381/2016, 26/09/2016) and the Institutional Review Board of Oromia regional health Bureau (Code: BEF/AHBFHI/1-8/2349, 30/09/2016).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on request from the corresponding author, due to privacy restriction.

Acknowledgments: We would like to thank the study mothers and infants for their participation and time; the local women development army leaders who provided the intervention for their time and effort; staff and officials of the Jimma Zone Health office and the Mana District Health office, Health Extension Workers, and all data collectors for their contributions to this study. We would like to thank Nancy Lea Eik-Nes (NTNU) for reading and commenting on the last version of the manuscript.

Conflicts of Interest: The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

Abbreviations

ANC	Antenatal care
BFESI	Breastfeeding education and support intervention
BFKQ	Breastfeeding knowledge questionnaire
EI	Early initiation
EBF	Exclusive breastfeeding
HEWs	Health extension workers
IIFAS	Iowa Infant Feeding Attitude Access Scale
LAZ	Length-for-age
LMICs	Low- and middle-income countries
LMP	Last menstrual period
MUAC	Mid-upper arm circumference
WLZ	Weight-for-length
WAZ	Weight-for-age
WDA	Women Development Army
WHO	World Health Organization

References

- UNICEF; WHO; World Bank; UN-DESA Population Division. *Levels & Trends in Child Mortality: Report 2018, Estimates Developed by the United Nations Children's Fund*; WHO: Geneva, Switzerland, 2018.
- Victora, C.G.; Bahl, R.; Barros, A.J.; França, G.V.; Horton, S.; Krasevec, J.; Murch, S.; Sankar, M.J.; Walker, N.; Rollins, N.C. Breast-feeding in the 21st century: Epidemiology, mechanisms, and lifelong effect. *Lancet* **2016**, *387*, 475–490. [[CrossRef](#)]
- UNICEF/WHO. *Capture the Moment—Early Initiation of Breastfeeding: The Best Start for Every Newborn*; UNICEF: New York, NY, USA, 2018.
- Bhutta, Z.A.; Das, J.K.; Rizvi, A.; Gaffey, M.F.; Walker, N.; Horton, S.; Webb, P.; Lartey, A.; Black, R.E. Evidence-based interventions for improvement of maternal and child nutrition: What can be done and at what cost? *Lancet* **2013**, *382*, 452–477. [[CrossRef](#)]
- Imdad, A.; Yakoob, M.Y.; Bhutta, Z.A. Effect of breastfeeding promotion interventions on breastfeeding rates, with special focus on developing countries. *BMC Public Health* **2011**, *11* (Suppl. 3). [[CrossRef](#)]
- Shakya, P.; Kunieda, M.K.; Koyama, M.; Rai, S.S.; Miyaguchi, M.; Dhakal, S.; Sandy, S.; Sunguya, B.F.; Jimba, M. Effectiveness of community-based peer support for mothers to improve their breastfeeding practices: A systematic review and meta-analysis. *PLoS ONE* **2017**, *12*, e0177434. [[CrossRef](#)] [[PubMed](#)]
- Lewycka, S.; Mwansambo, C.; Rosato, M.; Kazembe, P.; Phiri, T.; Mganga, A.; Chapota, H.; Malamba, F.; Kainja, E.; Newell, M.L.; et al. Effect of women's groups and volunteer peer counselling on rates of mortality, morbidity, and health behaviours in mothers and children in rural Malawi (MaiMwana): A factorial, cluster-randomised controlled trial. *Lancet* **2013**, *381*, 1721–1735. [[CrossRef](#)]
- Ochola, S.A.; Labadarios, D.; Nduati, R.W. Impact of counselling on exclusive breast-feeding practices in a poor urban setting in Kenya: A randomized controlled trial. *Public Health Nutr.* **2013**, *16*, 1732–1740. [[CrossRef](#)] [[PubMed](#)]
- Tylleskar, T.; Jackson, D.; Meda, N.; Engebretsen, I.M.; Chopra, M.; Diallo, A.H.; Doherty, T.; Ekstrom, E.C.; Fadnes, L.T.; Goga, A.; et al. Exclusive breastfeeding promotion by peer counsellors in sub-Saharan Africa (PROMISE-EBF): A cluster-randomised trial. *Lancet* **2011**, *378*, 420–427. [[CrossRef](#)]
- World Health Organization. *Guideline: Protecting, Promoting and Supporting Breastfeeding in Facilities Providing Maternity and Newborn Services*; World Health Organization: Geneva, Switzerland, 2017.
- CSA; ICF. Ethiopia demographic and health survey: Key indicators report. In *Ethiopia, and Rockville, Maryland, USA*; CSA and ICF: Addis Ababa, Ethiopia, 2016.
- EPHI [Ethiopia]; ICF. *Ethiopia Mini Demographic and Health Survey 2019: Key Indicators*; ICF: Rockville, MD, USA, 2019.
- Federal Democratic Republic of Ethiopia. *National Nutrition Programme II: 2016–2020*; Federal Democratic Republic of Ethiopia: Addis Ababa, Ethiopia, 2020.
- Federal Ministry of Health of Ethiopia. *Essential Health Services Package for Ethiopia*; Federal Ministry of Health, Ethiopia: Addis Ababa, Ethiopia, 2005.
- Wang, H.; Tesfaye, R.; Ramana, G.N.V.; Chekagn, C.T. *Ethiopia Health Extension Program: An Institutionalized Community Approach for Universal Health Coverage World Bank Studies*; World Bank: Washington, DC, USA, 2016.
- Kim, S.S.; Rawat, R.; Mwangi, E.M.; Tesfaye, R.; Abebe, Y.; Baker, J.; Frongillo, E.A.; Ruel, M.T.; Menon, P. Exposure to large-scale social and behavior change communication interventions is associated with improvements in infant and young child feeding practices in Ethiopia. *PLoS ONE* **2016**, *11*, e0164800.
- Kung'u, J.K.; Pendame, R.; Ndiaye, M.B.; Gerbaba, M.; Ochola, S.; Faye, A.; Basnet, S.; Frongillo, E.A.; Wuehler, S.; De-Regil, L.M. Integrating nutrition into health systems at community level: Impact evaluation of the community-based maternal and neonatal health and nutrition projects in Ethiopia, Kenya, and Senegal. *Matern. Child Nutr.* **2018**, *14*, e12577. [[CrossRef](#)] [[PubMed](#)]

18. Barwick, M.; Barac, R.; Zlotkin, S. *An Examination of Exclusive Breastfeeding Implementation in Ethiopia and Mali: Factors Influencing Change*; CARE Canada; Save the Children Canada; Plan International Canada: Toronto, ON, Canada, 2015.
19. Belay, S.; Haidar, J. *Effect of Prenatal Education on Breastfeeding Initiation and Exclusive Breast Feeding Rate in Selected Health Institutions of Hawassa City, the Capital of SNNPR*; East African Journal of Public Health: Hawassa, Ethiopia, 2013.
20. Abdulahi, M.; Fretheim, A.; Magnus, J.H. Effect of breastfeeding education and support intervention (BFESI) versus routine care on timely initiation and exclusive breastfeeding in Southwest Ethiopia: Study protocol for a cluster randomized controlled trial. *BMC Pediatr.* **2018**, *18*, 313. [[CrossRef](#)]
21. Banteyerga, H. Ethiopia's health extension program: Improving health through community involvement. *Med. Rev.* **2011**, *13*, 46–49. [[CrossRef](#)]
22. Maes, K.; Closser, S.; Vorel, E.; Tesfaye, Y. Using community health workers: Discipline and Hierarchy in Ethiopia's Women's Development Army. *Ann. Anthropol. Pract.* **2015**, *39*, 42–57. [[CrossRef](#)]
23. Dennis, C.-L. Peer support within a health care context: A concept analysis. *Int. J. Nurs. Stud.* **2003**, *40*, 321–332. [[CrossRef](#)]
24. USAID. *Training of Trainers Manual for Counseling on Maternal, Infant, and Young Child Nutrition*; United States Agency for International Development: Washington, DC, USA, 2011.
25. World Health Organization. *Breastfeeding Counselling a Training Course*; World Health Organization: Geneva, Switzerland, 1993.
26. World Health Organization/Unicef. *Infant and Young Child Feeding Counselling: An Integrated Course*; World Health Organization: Geneva, Switzerland, 2006.
27. Caglia, J.; Kearns, A.; Langer, A. *Health Extension Workers in Ethiopia: Delivering Community-Based Antenatal and Postnatal Care*; Maternal Health Task Force: Boston, MA, USA, 2014.
28. Abdulahi, M.; Fretheim, A.; Argaw, A.; Magnus, J.H. Adaptation and validation of the Iowa infant feeding attitude scale and the breastfeeding knowledge questionnaire for use in an Ethiopian setting. *Int. Breastfeed. J.* **2020**, *15*, 24. [[CrossRef](#)] [[PubMed](#)]
29. Mora, A.D.L.; Russell, D.W.; Dungy, C.I.; Losch, M.; Dusdieker, L. The Iowa Infant Feeding Attitude Scale: Analysis of Reliability and Validity 1. *J. Appl. Soc. Psychol.* **1999**, *29*, 2362–2380. [[CrossRef](#)]
30. World Health Organization. *Indicators for Assessing Breast-Feeding Practices: Report of an Informal Meeting, 11–12 June 1991, Geneva, Switzerland*; World Health Organization: Geneva, Switzerland, 1991.
31. Leroy, J.L. *zscore06: Stata Command for the Calculation of Anthropometric z-Scores Using the 2006 WHO Child Growth Standards*; Statistical Software Components S457279; Boston College Department of Economics: Boston College, MA, USA, 2011.
32. Coates, J.; Swindale, A.; Bilinsky, P. *Household Food Insecurity Access Scale (HFIAS) for Measurement of Food Access: Indicator Guide: Version 3*; Food and Nutrition Technical Assistance Project, Academy for Educational Development: Washington, DC, USA, 2007.
33. Wooldridge, J.M. *Econometric Analysis of Cross Section and Panel Data*; The MIT Press: Cambridge, MA, USA, 2002; p. 108.
34. Olufunlayo, T.F.; Roberts, A.A.; MacArthur, C.; Thomas, N.; Odeyemi, K.A.; Price, M.; Jolly, K. Improving exclusive breastfeeding in low and middle—Income countries: A systematic review. *Matern. Child Nutr.* **2019**, *15*, e12788. [[CrossRef](#)]
35. Jolly, K.; Ingram, L.; Khan, K.S.; Deeks, J.J.; Freemantle, N.; MacArthur, C. Systematic review of peer support for breastfeeding continuation: Metaregression analysis of the effect of setting, intensity, and timing. *BMJ* **2012**, *344*, d8287. [[CrossRef](#)]
36. Provost, C. Ethiopia's Model Families Hailed as Agents of Social Transformation. *The Guardian*. 2014. Available online: <http://www.theguardian.com/globaldevelopment/2014/jan/09/ethiopiamodel-families-social-transformationhealthcare> (accessed on 15 October 2020).
37. Andreason, A.; Bandura, A.; Ajzen, I. From Intentions to Actions: A Theory of Planned Behavior. In *Action Control: From Cognition to Behavior*; Beckman, K.J., Beckman, J., Eds.; Springer: Berlin, Germany, 1985; pp. 11–39.
38. Bhandari, N.; Bahl, R.; Mazumdar, S.; Martinez, J.; Black, R.E.; Bhan, M.K. Effect of community-based promotion of exclusive breastfeeding on diarrhoeal illness and growth: A cluster randomised controlled trial. *Lancet* **2003**, *361*, 1418–1423. [[CrossRef](#)]
39. Giugliani, E.R.; Horta, B.L.; Loret de Mola, C.; Lisboa, B.O.; Victora, C.G. Effect of breastfeeding promotion interventions on child growth: A systematic review and meta-analysis. *Acta Paediatr.* **2015**, *104*, 20–29. [[CrossRef](#)]
40. Rodríguez-Cano, A.M.; Mier-Cabrera, J.; Allegre-Dávalos, A.L.; Muñoz-Manrique, C.; Perichart-Perera, O. Higher fat mass and fat mass accretion during the first six months of life in exclusively breastfed infants. *Pediatr. Res.* **2020**, *87*, 588–594. [[CrossRef](#)]
41. Shrimpton, R.; Victora, C.G.; de Onis, M.; Lima, R.C.; Blossner, M.; Clugston, G. Worldwide timing of growth faltering: Implications for nutritional interventions. *Pediatrics* **2001**, *107*, E75. [[CrossRef](#)] [[PubMed](#)]
42. Chapman, D.J.; Morel, K.; Anderson, A.K.; Damio, G.; Perez-Escamilla, R. Breastfeeding peer counseling: From efficacy through scale-up. *J. Hum. Lact. Off. J. Int. Lact. Consult. Assoc.* **2010**, *26*, 314–326. [[CrossRef](#)] [[PubMed](#)]
43. Jakobsen, M.S.; Sodemann, M.; Biai, S.; Nielsen, J.; Aaby, P. Promotion of exclusive breastfeeding is not likely to be cost effective in West Africa. A randomized intervention study from Guinea-Bissau. *Acta Paediatr.* **2008**, *97*, 68–75. [[CrossRef](#)]
44. Fischer Walker, C.L.; Friberg, I.K.; Binkin, N.; Young, M.; Walker, N.; Fontaine, O.; Weissman, E.; Gupta, A.; Black, R.E. Scaling up diarrhea prevention and treatment interventions: A Lives Saved Tool analysis. *PLoS Med.* **2011**, *8*, e1000428. [[CrossRef](#)]
45. Genser, B.; Strina, A.; Teles, C.A.; Prado, M.S.; Barreto, M.L. Risk Factors for Childhood Diarrhea Incidence: Dynamic Analysis of a Longitudinal Study. *Epidemiology* **2006**, *17*, 658–667. [[CrossRef](#)]
46. Chao, D.L.; Roose, A.; Roh, M.; Kotloff, K.L.; Proctor, J.L. The seasonality of diarrheal pathogens: A retrospective study of seven sites over three years. *PLoS Negl. Trop. Dis.* **2019**, *13*, e0007211. [[CrossRef](#)]
47. Bohner, G.; Wänke, M. *Attitudes and Attitude Change*; Psychology Press: Hove, UK, 2002.

-
48. Avery, A.; Zimmermann, K.; Underwood, P.W.; Magnus, J.H. Confident commitment is a key factor for sustained breastfeeding. *Birth* **2009**, *36*, 141–148. [[CrossRef](#)] [[PubMed](#)]
 49. Greiner, T. Exclusive breastfeeding: Measurement and indicators. *Int. Breastfeed. J.* **2014**, *9*, 18. [[CrossRef](#)]

Breastfeeding education and support intervention Information sheets

For the pregnant women

Are you interested in taking part in the research project

“Breastfeeding Education and Support Intervention versus routine care on Timely Initiation and Exclusive Breastfeeding in Southwest Ethiopia: a cluster randomized controlled trial”?

This is an inquiry about participation in a research project where the main purpose is to examine the Effect of Breastfeeding education and support intervention: The purpose of this study is to examine the effectiveness of Breastfeeding education and support in improving timely initiation and exclusive breastfeeding for six months. You are invited to participate in the study since you live in a zone that was randomly selected as an intervention zone. In this letter, we will give you information about the purpose of the project and what your participation will involve.

Purpose of the project

A cluster-randomized controlled trial at the community level will be conducted to compare the effect of breastfeeding education and support versus routine care. The intervention will be provided by Women Development Armies (WDAs) who are already in the country's health system using standard training manuals in the local language. Culturally appropriate operational packages of information will be developed for them. Using preset criteria at least 432 pregnant women in their third trimester will be recruited from 36 zones. In the intervention zones, WDAs will make two prenatal home visits and 8 postnatal home visits.

The research project has the following primary and secondary objectives:

Primary objective - To determine if Breastfeeding education and support intervention is superior to usual care in improving timely initiation of breastfeeding, exclusive breastfeeding and growth

Secondary objectives – the main secondary objectives are

- To validate the Afan Oromo version breastfeeding knowledge and attitude questionnaire.
- To assess baseline knowledge, attitude and practice of mothers on breastfeeding
- To examine the effect of breastfeeding education and support intervention on mothers' knowledge and attitude towards Breastfeeding
- To assess the experiences of breastfeeding mothers and WDAs participating in the breastfeeding education and support intervention.

This research project is a doctoral thesis.

Who is responsible for the research project?

Jimma University is the institution responsible for the project.

Breastfeeding education and support intervention

Information sheets

Why are you being asked to participate?

All pregnant women found in the selected 36 zones will be enrolled into the study. In 18 zones breastfeeding education and support will be provided while in the rest of the zones the routine service provided by Health Extension Workers (HEWs) and Women Development Armies (WDAs) during pregnancy and after delivery will continue. The intervention will be provided for a period of eight months. However, since the outcome is measured at six months after delivery, data will be collected from pregnant women who fulfil the inclusion criteria. You are selected from the Health Extension Worker's logbook since you fulfil the inclusion criteria.

What does participation involve for you?

- If you chose to take part in the project, this will involve that you will be interviewed by data collectors. It will take approx. 40 minutes. The survey includes questions about socio-demographic and economic characteristics, knowledge and attitude about breastfeeding, water sanitation and hygiene, food security and previous breastfeeding history. Your answers will be recorded on paper. At the end of the project, you may be selected to ask about your experience with the intervention using an audio recorder. Your voice will be deleted once the data is transcribed.

If the woman is less than 18 years old, her husband will see the survey questions in advance.

Participation is voluntary

Participation in the project is voluntary. If you chose to participate, you can withdraw your consent at any time without giving a reason. All information about you will then be made anonymous. There will be no negative consequences for you if you chose not to participate or later decide to withdraw.

Your personal privacy – how we will store and use your personal data

We will only use your personal data for the purpose(s) specified in this information letter. We will process your personal data confidentially and in accordance with data protection legislation (the General Data Protection Regulation and Personal Data Act).

- Information about each zone and personal data from participants will be stored in a database on a password-protected computer at Jimma University and only accessible by the study team. Your name and contact details will be replaced with a code. The list of names, contact details and respective codes will be stored separately from the rest of the collected data.

The data that will be registered about you will only be used in accordance with the purpose of the study as described above. All the data will be processed without name, personal identification number or other directly recognisable types of information.

What will happen to your personal data at the end of the research project?

The project is scheduled to end 30/09/2019. The collected data will be anonymised at the end of the project. A code number links you to your data through a list of names. The list that can

Breastfeeding education and support intervention Information sheets

link your name to the code number will be stored at Jimma University only, and only the authorised study staff will have access to this list. It will not be possible to identify you in the results of the study when these are published.

Your rights

So long as you can be identified in the collected data, you have the right to:

- access the personal data that is being processed about you
- request that your personal data is deleted
- request that incorrect personal data about you is corrected/rectified
- receive a copy of your personal data (data portability), and
- send a complaint to the Data Protection Officer or The Norwegian Data Protection Authority regarding the processing of your personal data

What gives us the right to process your personal data?

We will process your personal data based on your consent.

Based on an agreement with *Jimma University*, NSD – The Norwegian Centre for Research Data AS has assessed that the processing of personal data in this project is in accordance with data protection legislation.

Where can I find out more?

If you have questions about the project or want to exercise your rights, contact:

- *Jimma University* via *Misra Abdulahi Ahmed* - phone number +251912010293, email: misra_ab@yahoo.com or misraaa@studmed.uio.no or misra.abdulahi@ju.edu.et. Supervisors of the research project are Professor Jeanette H. Magnus (Section for Leadership, Faculty of Medicine, University of Oslo, Norway) and Professor Atle Fretheim (Department of Community Medicine, Institute of health and society, University of Oslo, Norway).
- Our Data Protection Officer: None
- NSD – The Norwegian Centre for Research Data AS, by email: (personvertjenester@nsd.no) or by telephone: +47 55 58 21 17.

Yours sincerely,

Project Leader
(Researcher/supervisor)

Student (if applicable)

Breastfeeding education and support intervention
Information sheets

Consent form

I have received and understood information about the project **Breastfeeding Education and Support Intervention versus routine care on Timely Initiation and Exclusive Breastfeeding in Southwest Ethiopia: a cluster randomized controlled trial** and have been given the opportunity to ask questions. I give consent:

- ✓ *to participate in an interview*
- ✓ *for my personal data to be processed outside the EU – if applicable*

I give consent for my personal data to be processed until the end date of the project, approx. 30/09/2019.

(Signed by participant, date)

Breastfeeding education and support intervention Information sheets

For the husband of the pregnant women

Are you interested in taking part in the research project

“Breastfeeding Education and Support Intervention versus routine care on Timely Initiation and Exclusive Breastfeeding in Southwest Ethiopia: a cluster randomized controlled trial”?

This is an inquiry about participation in a research project where the main purpose is to examine the Effect of Breastfeeding education and support intervention: The purpose of this study is to examine the effectiveness of Breastfeeding education and support in improving timely initiation and exclusive breastfeeding for six months. You are invited to participate in the study since you are the husband of a woman who was selected to participate in this research project. In this letter, we will give you information about the purpose of the project and what your participation will involve.

Purpose of the project

A cluster-randomized controlled trial at the community level will be conducted to compare the effect of breastfeeding education and support versus routine care. The intervention will be provided by Women Development Armies (WDAs) who are already in the country’s health system using standard training manuals in the local language. Culturally appropriate operational packages of information will be developed for them. Using preset criteria at least 432 pregnant women in their third trimester will be recruited from 36 zones. In the intervention zones, WDAs will make two prenatal home visits and 8 postnatal home visits.

The research project has the following primary and secondary objectives:

Primary objective - To determine if Breastfeeding education and support intervention is superior to usual care in improving timely initiation of breastfeeding, exclusive breastfeeding and growth

Secondary objectives – the main secondary objectives are

- To validate the Afan Oromo version breastfeeding knowledge and attitude questionnaire.
- To assess baseline knowledge, attitude and practice of mothers on breastfeeding
- To examine the effect of breastfeeding education and support intervention on mothers’ knowledge and attitude towards Breastfeeding
- To assess the experiences of breastfeeding mothers and WDAs participating in the breastfeeding education and support intervention.

This research project is a doctoral thesis.

Who is responsible for the research project?

Jimma University is the institution responsible for the project.

Breastfeeding education and support intervention

Information sheets

Why are you being asked to participate?

You are asked to participate in this study because you are a husband of a woman who is selected to participate in this research. Your wife will be asked to give information about your name and occupation.

What does participation involve for you?

- If you chose to take part in the project, this will involve that your wife will be interviewed by data collectors. It will take approx. 40 minutes. The survey includes questions about socio-demographic and economic characteristics, knowledge and attitude about breastfeeding, water sanitation and hygiene, food security and previous breastfeeding history. Your answers will be recorded on paper.

If the woman is less than 18 years old, her husband will see the survey questions in advance.

Participation is voluntary

Participation in the project is voluntary. If you chose not to participate, you can withdraw your consent at any time without giving a reason. All information about you will then be made anonymous. There will be no negative consequences for you if you chose not to participate or later decide to withdraw.

Your personal privacy – how we will store and use your personal data

We will only use your personal data for the purpose(s) specified in this information letter. We will process your personal data confidentially and in accordance with data protection legislation (the General Data Protection Regulation and Personal Data Act).

- Information about each zone and personal data from participants will be stored in a database on a password-protected computer at Jimma University and only accessible by the study team. Your name and contact details will be replaced with a code. The list of names, contact details and respective codes will be stored separately from the rest of the collected data.

The data that will be registered about you will only be used in accordance with the purpose of the study as described above. All the data will be processed without a name, personal identification number or other directly recognisable types of information.

What will happen to your personal data at the end of the research project?

The project is scheduled to end 30/09/2019. The collected data will be anonymised at the end of the project. A code number links you to your data through a list of names. The list that can link your name to the code number will be stored at Jimma University only, and only the authorised study staff will have access to this list. It will not be possible to identify you in the results of the study when these are published.

Your rights

So long as you can be identified in the collected data, you have the right to:

- access the personal data that is being processed about you

Breastfeeding education and support intervention

Information sheets

- request that your personal data is deleted
- request that incorrect personal data about you is corrected/rectified
- receive a copy of your personal data (data portability), and
- send a complaint to the Data Protection Officer or The Norwegian Data Protection Authority regarding the processing of your personal data

What gives us the right to process your personal data?

We will process your personal data based on your consent.

Based on an agreement with *Jimma University*, NSD – The Norwegian Centre for Research Data AS has assessed that the processing of personal data in this project is in accordance with data protection legislation.

Where can I find out more?

If you have questions about the project, or want to exercise your rights, contact:

- *Jimma University* via *Misra Abdulahi Ahmed* - phone number +251912010293, email: misra_ab@yahoo.com or misraaa@studmed.uio.no or misra.abdulahi@ju.edu.et. Supervisors of the research project are Professor Jeanette H. Magnus (Section for Leadership, Faculty of Medicine, University of Oslo, Norway) and Professor Atle Fretheim (Department of Community Medicine, Institute of health and society, University of Oslo, Norway).
- Our Data Protection Officer: None
- NSD – The Norwegian Centre for Research Data AS, by email: (personverntjenester@nsd.no) or by telephone: +47 55 58 21 17.

Yours sincerely,

Project Leader
(Researcher/supervisor)

Student (if applicable)

Breastfeeding education and support intervention
Information sheets

Consent form

I have received and understood information about the project **Breastfeeding Education and Support Intervention versus routine care on Timely Initiation and Exclusive Breastfeeding in Southwest Ethiopia: a cluster randomized controlled trial** and have been given the opportunity to ask questions. I give consent:

✓ *for my personal data to be processed outside the EU – if applicable*

I give consent for my personal data to be processed until the end date of the project, approx. 30/09/2019.

(Signed by participant, date)

Breastfeeding education and support intervention
Baseline questionnaire

Module 1: Interview Information & Socio-economic and demographic Information

Section 1: Interview Information

Q#	Question	Response category
1.1.1	Date of interview (dd/mm/yyyy)	/ / /
1.1.2	Data Time Point (1- 3)	
1.1.3	Woreda	_____
1.1.4	Kebele	_____
1.1.5	Zone	_____
1.1.6	Interviewer's ID	
1.1.7	Supervisor's ID	
1.1.8	Delivered Consent Information	1 = Yes 0 = No
1.1.9	Consent Given	1 = Yes 0 = No
1.1.10	Outcome of Interview	1. Completed 2. Incomplete 3. Absent 4. Refused

Section-2: Socio-economic and demographic Information for all at baseline

Q#	Question	Response category
1.2.1	How old are you now?	_____ years
1.2.2	Educational status	1. Illiterate 2. Can read and write 3. Grade completed _____ 4. If attended >12 grade, specify _____
1.2.3	What is your marital status now?	5. Single 6. Married/in Union 7. Divorced 8. Widowed 1. Separated
1.2.4	What is your ethnicity?	1. Oromo 2. Amhara 3. Yem 4. Dawuro 5. Kaficho 6. Others (specify) _____
1.2.5	What is your religion?	1. Islam 2. Orthodox Christian 3. Protestant 4. Catholic 5. Jova 6. Others (Specify) _____
1.2.6	What is your current occupation?	1. Housewife/farmer

Breastfeeding education and support intervention
Baseline questionnaire

		2. Government employee 3. Private employee 4. NGO employee 5. Merchant 6. Student 7. Others (specify) _____	
1.2.7	What is the current occupation of your husband?	1. Housewife/farmer 2. Government employee 3. Private employee 4. NGO employee 5. Merchant 6. Student 1. Others (Specify) _____	
1.2.8	What is the approximate monthly income of your household per month?	_____ (ET. Birr)	
1.2.9	Does your household own the following?	Yes	No
1.2.9.1	Electricity?	1	0
1.2.9.2	Television?	1	0
1.2.9.3	Watch?	1	0
1.2.9.4	Refrigerator?	1	0
1.2.9.5	Radio?	1	0
1.2.9.6	Mobile phone?	1	0
1.2.9.7	A landline telephone functioning?	1	0
1.2.9.8	Table?	1	0
1.2.9.9	Chair	1	0
1.2.9.10	Bed with sponge mattress?	1	0
1.2.9.11	Electric mitad?	1	0
1.2.9.12	Lantrine	1	0
1.2.9.13	Separate kitchen	1	0
1.2.9.14	Bicycle?	1	0
1.2.9.15	Motor cycle?	1	0
1.2.9.16	Animal drawn cart?	1	0
1.2.9.17	Piped water	1	0
1.2.9.18	Public tap	1	0

**Breastfeeding education and support intervention
Baseline questionnaire**

1.2.9.19	Tube well	1	0	
1.2.9.20	borehole	1	0	
1.2.9.22	Protected well	1	0	
1.2.9.23	Unprotected well	1	0	
1.2.9.24	protected well or spring	1	0	
1.2.9.25	unprotected well or spring	1	0	
1.2.9.26	Rainwater	1	0	
1.2.9.27	River	1	0	
1.2.9.28	Pond	1	0	
1.2.9.29	Bottled water	1	0	
1.2.9.30	Toilet	1	0	
1.2.9.31	Do you share a latrine with another family?	1	0	
1.2.9.32	Does any member of this household own any agricultural land?	1	0	
1.2.9.33	Does any member of this household own a bank account?	1	0	
		Yes	No	How many?
1.2.9.34	Cattle?	1	0	
1.2.9.35	Milk cows or bulls?	1	0	
1.2.9.36	Horses, donkeys or mules?	1	0	
1.2.9.37	Goats/Sheep	1	0	
1.2.9.38	Chickens?	1	0	
1.2.9.39	Donkey?	1	0	
1.2.9.40	Do you own your residential home?	1	0	
What is the main material of the floor of the home?				
1.2.9.41	Mud or dirt	1	0	
1.2.9.42	Brick/stones/cement	1	0	
1.2.9.43	Tiles	1	0	
What is the main material of the roof of the home?				
1.2.9.44	Grass or leaf thatched	1	0	

Breastfeeding education and support intervention
Baseline questionnaire

1.2.9.45	Corrugated iron sheets	1	0
1.2.9.46	Tiles	1	0
What is the main material of the wall of the home?			
1.2.9.47	Wood and mud	1	0
1.2.9.48	Mud bricks or burnt bricks	1	0
1.2.9.49	Concrete blocks	1	0
1.2.9.50	Wood	1	0
1.2.9.51	Grass/bamboo	1	0
Kind of toilet facility do your household members use?			
1.2.9.52	Flush toilet	1	0
1.2.9.53	Traditional Pit toilet/latrine	1	0
1.2.9.54	Ventilated Improved Pit (VIP) latrine	1	0
1.2.9.55	Community-owned latrine	1	0
1.2.9.56	No facility-use open field	1	0
The main source of fuel or energy for cooking in your household?			
1.2.9.57	Electricity	1	0
1.2.9.58	Natural gas	1	0
1.2.9.59	Biogas	1	0
1.2.9.60	Kerosene	1	0
1.2.9.61	Charcoal	1	0
1.2.9.62	Firewood	1	0
1.2.9.63	Dung	1	0
The main source of fuel or energy for lighting in your household?			
1.2.9.64	Electricity	1	0
1.2.9.65	Solar	1	0
1.2.9.66	Gas	1	0
1.2.9.67	Lantern or fanos	1	0
1.2.9.68	Kuraz	1	0
1.2.10.69	Open firewood place	1	0

Breastfeeding education and support intervention Baseline questionnaire

Module 2: Breastfeeding knowledge and attitude questions

Section 1: Knowledge questions

Q#	Question	Response category		
		T	F	DK
	Advantages to baby			
2.1.1	Breastfeeding reduces the risk of lung infection among babies			
2.1.2	Breastfeeding increases the baby's intelligence			
2.1.3	Breastfeeding helps to reduce the incidence of child abuse and neglect			
2.1.4	A baby who received breastfeeding is less prone to get diarrhoea			
2.1.5	Breast milk provides baby with more protection from allergy compared to formula milk			
2.1.6	Breastfeeding causes good development of baby's teeth and gum			
	Advantages to mother			
2.1.7	Exclusive breastfeeding is beneficial in spacing birth			
2.1.8	Breastfeeding helps to stimulate uterine contraction.			
2.1.9	Beginning breastfeeding immediately after delivery reduces maternal bleeding			
2.1.10	Mothers who practised breastfeeding may achieve pre-pregnancy weight faster			
2.1.11	Frequent breastfeeding may prevent breast engorgement			
2.1.12	Mother who practised breastfeeding has a low risk of getting breast cancer			
2.1.13	Breastfeeding may protect against osteoporosis			
	Colostrum			
2.1.14	Colostrum is the mother's early milk, which is thick, sticky, and yellowish in colour			
2.1.15	Colostrum is difficult to digest and needs to be discarded			
2.1.16	Colostrum causes constipation among babies			
2.1.17	Colostrum is not able to protect babies from jaundice			
	Effective Feeding			
2.1.18	Babies will gain weight if they receive effective feeding			
2.1.19	Correct positioning helps to achieve effective breastfeeding			
2.1.20	Correct positioning helps to achieve effective breastfeeding			
2.1.21	Babies sleep well after they receive adequate breastfeeding			
	Breast milk Expression			
2.1.22	Breast milk expression may be done every 3 hours			
2.1.23	An expressed breastmilk can stay up to 8 hours without getting spoiled.			
2.1.24	It is necessary to express breast milk from one side of the breast only			
2.1.25	Expressed breast milk may be mixed with the previously expressed milk			
2.1.26	Expressed breast milk may be warmed on a fire			
2.1.27	The leftover expressed breast milk that has been used may be stored again			
	Duration of Feeding			
2.1.28	Breastfeeding should be initiated within 30 minutes after delivery			
2.1.29	Breastfeeding should be given on demand			
2.1.30	Baby should be allowed to breastfeed for at least 10–20 minutes for each feeding			
2.1.31	Breastfeeding should be continued up to 2 years even though the baby has received complimentary food			

Breastfeeding education and support intervention Baseline questionnaire

	Problem with Breastfeeding			
2.1.32	Breast milk production is influenced by breast size			
2.1.33	Mothers with inverted nipples cannot breastfeed their babies			
2.1.34	Breastfeeding must be discontinued if mother has cracked nipple			
2.1.35	Breastfeeding must be discontinued if baby has jaundice			
2.1.36	Breastfeeding must be discontinued if mother has breast engorgement			
	Breast engorgement			
2.1.37	Breast engorgement may be reduced with cold packs			
2.1.38	Breast engorgement may be reduced with hot packs			
2.1.39	The use of cabbage may help to reduce breast engorgement			
2.1.40	Massage may reduce breast engorgement			
	The practical aspect of breastfeeding			
2.1.41	Exclusive breastfeeding must be practiced until the infant is 6 months old			
2.1.42	Giving water to baby is encouraged after every breastfeeding			
2.1.43	Belching after feeding shows that the baby is full			
2.1.44	Babies who get enough feeding will pass urine more frequently			
2.1.45	Babies may also be given formula milk in the first 6 months of life			
2.1.46	Oral thrush frequently happens to babies who breastfeed			

Section 2: Attitude questions

Iowa Infant Feeding Attitude Scale Items

1=Strongly disagree 2=Disagree 3=Neutral 4=Agree 5=Strongly agree

Q#	Question	Response category				
		1	2	3	4	5
2.2.1	The nutritional benefits of breast milk last only until the baby is weaned from breast milk.					
2.2.2	Formula-feeding is more convenient than breastfeeding.					
2.2.3	Breastfeeding increases mother-infant bonding.					
2.2.4	Breast milk doesn't contain a mineral called iron which helps for blood production.					
2.2.5	Formula-fed babies are more likely to be overfed than are breast-fed babies.					
2.2.6	Formula-feeding is the better choice if a mother plans to work outside the home.					
2.2.7	Breastfeeding is one of the joys of motherhood.					
2.2.8	Women should not breastfeed their children in public places e.g. wedding places, market places.					
2.2.9	Babies fed breast milk are healthier than babies who are fed formula.					
2.2.10	Breast-fed babies are more likely to be overfed than formula-fed babies.					
2.2.11	Fathers feel left out if a mother breastfeeds.					
2.2.12	Breast milk is the ideal food for babies.					
2.2.13	Breast milk is more easily digested than formula.					
2.2.14	Formula is as healthy for an infant as breast milk.					
2.2.15	Breastfeeding is more convenient than formula feeding.					
2.2.16	Mother's breast milk is cheaper than formula milk.					
2.2.17	A mother who occasionally drinks alcohol should not breastfeed her baby.					

Breastfeeding education and support intervention Baseline questionnaire

Module 3: Water, Hygiene and Sanitation

Section 1: Water Source & Use

Q#	Question	Response category
3.1.1	What is your household's most commonly used source of drinking water?	1=Piped water, 2=Public tap, 3=Tube well or borehole, 4=Protected well or spring, 5=Unprotected well or spring, 6=Rainwater, 7=River or pond, 8=Bottled, 9=Other (specify _____) 98 = Don't know
3.1.2	What is your household's most commonly used source of water for other household activity (non agri)?	1=Piped water, 2=Public tap, 3=Tube well or borehole, 4=Protected well or spring, 5=Unprotected well or spring, 6=Rainwater, 7=River or pond, 8=Bottled, 9=Other (specify _____) 98 = Don't know
3.1.3	What is the distance from your household to this source of water (one-way)? If two sources, refer to the furthest distance	_____ kilometers; if the source of water is in the compound, then put 0, 98 = Don't know
3.1.4	How much time does it take to bring water (one round trip, including waiting time, by usual means) from the furthest source?	_____ minutes 98 = Don't know
3.1.5	Does the household do any rainwater harvesting (for domestic use)?	0=No 1=Yes 98 = Don't know
3.1.6	Do you do anything to your household water before drinking it?	1=Do nothing, 2= Boiling, 3=Use traditional herbs, 4=Use chemicals (water guard, liquid, Wuha Agar/Bishan gari), 5=Filter/sieve, 6=Decant, 7=Other (specify _____) 98 = Don't know
3.1.7	Do you store drinking water separately from your other household water?	1= Yes 0= No 98 = Don't know
3.1.8	Where do you store your household drinking water?	1=Traditional pot with cover, 2=Traditional pot without cover, 3=Plastic jerry can with cover, 4=Plastic jerry can without cover, 5=Other (specify _____) 98 = Don't know
3.1.9	How much water (in 20L jerry cans) does your household usually use in one day?	_____ 20L jerry cans or equivalent 98 = Don't know

Section 2: Sanitation & Hygiene

Q#	Question	Response category
How do you dispose of household rubbish? (Do not read the responses. Allow respondent to answer, then fill each item below.)		
3.2.1	Garbage pit	1=Yes 0=No
3.2.2	Discard in garden	1=Yes 0=No
3.2.3	Discard in bush	1=Yes 0=No
3.2.4	Open burning	1=Yes 0=No

Breastfeeding education and support intervention
Baseline questionnaire

3.2.5	Other (specify_____)	1=Yes	0=No
3.2.6	How do you most commonly store prepared food? <i>(Do not read the responses. Allow respondent to answer, then fill in response appropriately.)</i>	1. Uncovered container or plate 2. Covered container or plate 3. On fire or hot ash 4. Other (specify_____) 98 = don't know	
3.2.7	Where do you most commonly store clean dishes?	1. Shelf 2. Floor 3. Covered Container 4. N/A 5. Other (specify)_____ 98 = don't know	
Under what circumstances do you wash your hands? (Do not read the responses below. Allow respondent to answer, and then fill each item below.)			
3.2.8	Not at all	1=Yes	0=No
3.2.9	When dirt is visible	1=Yes	0=No
3.2.10	After toilet use/defecation/urination	1=Yes	0=No
3.2.11	After cleaning child following defecation	1=Yes	0=No
3.2.12	Before preparing the food	1=Yes	0=No
3.2.13	Before serving a meal	1=Yes	0=No
3.2.14	Before eating	1=Yes	0=No
3.2.15	Before feeding a child	1=Yes	0=No
3.2.16	When I am reminded to do so	1=Yes	0=No

Module 4: Food Security

Now I am going to ask you questions about your household's food supply over the past four weeks. Food supply includes staples, sauces, and any other foods in your diet and the diets of all members of your household.

Q#	Question	Response category
4.1.1	In the past four weeks, did you <u>worry</u> that your household would not have enough food?	1=Yes 0=No
4.1.2	If yes, how often did this happen?	1. Rarely (once or twice in the past four weeks) 2. Sometimes (3-10 times in the past four weeks) 3. Often (more than 10 times in the past four weeks)
4.1.3	In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?	1=Yes 0=No
4.1.4	If yes, how often did this happen?	1. Rarely (once or twice in the past four weeks) 2. Sometimes (3-10 times in the past four weeks) 3. Often (more than 10 times in the past four weeks)

Breastfeeding education and support intervention
Baseline questionnaire

4.1.5	In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?	1=Yes 0=No
4.1.6	If yes, how often did this happen?	1. Rarely (once or twice in the past four weeks) 2. Sometimes (3-10 times in the past four weeks) 3. Often (more than 10 times in the past four weeks)
4.1.7	In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?	1=Yes 0=No
4.1.8	If yes, how often did this happen?	1. Rarely (once or twice in the past four weeks) 2. Sometimes (3-10 times in the past four weeks) 3. Often (more than 10 times in the past four weeks)
4.1.9	In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?	1=Yes 0=No
4.1.10	If yes, how often did this happen?	1. Rarely (once or twice in the past four weeks) 2. Sometimes (3-10 times in the past four weeks) 3. Often (more than 10 times in the past four weeks)
4.1.11	In the past four weeks, did you or any household member have to eat fewer meals in a day because there was not enough food?	1=Yes 0=No
4.1.12	If yes, how often did this happen?	1. Rarely (once or twice in the past four weeks) 2. Sometimes (3-10 times in the past four weeks) 3. Often (more than 10 times in the past four weeks)
4.1.13	In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?	1=Yes 0=No
4.1.14	If yes, how often did this happen?	1. Rarely (once or twice in the past four weeks) 2. Sometimes (3-10 times in the past four weeks) 3. Often (more than 10 times in the past four weeks)
4.1.15	In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?	1=Yes 0=No

Breastfeeding education and support intervention

Baseline questionnaire

4.1.16	If yes, how often did this happen?	1. Rarely (once or twice in the past four weeks) 2. Sometimes (3-10 times in the past four weeks) 3. Often (more than 10 times in the past four weeks)
4.1.17	In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?	1=Yes 0=No
4.1.18	If yes, how often did this happen?	1. Rarely (once or twice in the past four weeks) 2. Sometimes (3-10 times in the past four weeks) 3. Often (more than 10 times in the past four weeks)

Module 5: Mother's Health Status & Obstetric history

Section 1: Health Status Assessment

I am going to ask you about your health. Please respond to the following questions about you.

Q#	Question	Response category	Skip
5.1.1	In the past two weeks, have you had any illness?	1=Yes 0=No 98= Don't know	If no, go to next section
5.1.2	If yes, how many days in the past two weeks were you unable to do your daily work because of illness?	____days (allow partial days)	
Please answer the following three questions regarding the last illness you ever had:			
5.1.3	Did you seek help outside the home?	1=Yes 0=No 98= don't know	If no, go to next section
5.1.4	If yes, where did you seek help?	1. Traditional healer 2. Holy Water 3. Witchcraft 4. Health extension worker 5. Community resource persons (VHT, drug distributors) 6. Drug shop or private pharmacy 7. Private clinic 8. NGO health facility 9. Public health facility (HC, Hospital) 10. Others, specify _____	
5.1.5	How far was the furthest facility where you sought help? (km)	_____ kms 98 = Don't know	

Section-2: Past obstetric history

Q#	Question	Response category	Skip
5.2.1	How many pregnancies have you ever had,	_____times	If 1 st

Breastfeeding education and support intervention
Baseline questionnaire

	including current pregnancy, abortion and stillbirth?		pregnancy, skip to next section
5.2.2	How many live-born children have you ever had?	_____ children	
5.2.3	Have you ever lost a child due to death (including stillbirths)?	<input type="checkbox"/> 1=Yes <input type="checkbox"/> 0=No	
5.2.4	If yes, how many?	_____ children	
5.2.5	Have you ever lost a child due to miscarriage (spontaneous abortion)?	<input type="checkbox"/> 1=Yes <input type="checkbox"/> 0=No	
5.2.6	If yes, how many?	_____ children	
5.2.7	How long ago was your last pregnancy?	_____ months 98 = Don't know	
5.2.8	Had you attended ANC for your last delivery (for the pregnancy before this pregnancy)?	1. Yes 0. No	If no, skip to Q 5.2.12
5.2.9	If Yes to Q209, at what gestation did you have your first visit?	1. 1 st trimester 2. 2 nd trimester 3. 3 rd trimester	
5.2.10	If Yes to Q209, how many visits did you have?	_____ visits, If no, write 0 98. Don't know	
5.2.11	If Yes to Q209, where did you attend?	1. Hospital 2. Health centre 3. Health post 4. Home 5. Other (specify) _____	
5.2.12	Where did you give your last delivery?	1. Hospital 2. Health centre 3. Health post 4. Home 5. Other (specify) _____	
5.2.13	Who attended your last delivery?	1. Doctor 2. Nurse 3. Midwife 4. Health Officer 5. HEWs 6. TBA/TTBA 7. Family member 8. Other (specify) _____	
5.2.14	During your last pregnancy, did you deliver by Caesarean section?	<input type="checkbox"/> 1=Yes <input type="checkbox"/> 0=No	
5.2.15	During your last pregnancy, did you deliver by instruments?	<input type="checkbox"/> 1=Yes <input type="checkbox"/> 0=No	
5.2.16	What was the outcome of your last pregnancy? <i>(Do not read the options, allow the respondent to answer spontaneously)</i>	1. Live birth 2. Stillbirth 3. Spontaneous abortion/ miscarriage 4. Induced abortion 98 = Don't know	

Breastfeeding education and support intervention Baseline questionnaire

Section 3: Current pregnancy

Q#	Question	Response category	Skip
5.3.1	For how many months have you been pregnant? (prompt with the date of last menstrual period)	____ weeks ____ months 98=Don't Know	
5.3.1	Have you sought antenatal care during this pregnancy so far?	1=Yes 0=No 98=Don't Know	If no, go to next section
5.3.1	How many antenatal care visits have occurred during this pregnancy <i>so far</i> ?	_____visits 98=Don't Know	

Module 6: Breastfeeding at baseline

Q#	Question	Response category	Skip
6.1.1	Did you ever breastfeed (NAME)?	0. No 1. Yes	If no, end the interview
6.1.2	What was the main reason(s) you chose to breastfeed? (list as many reasons that apply)	_____ _____ _____	
6.1.3	For how long did you breastfeed your previous child?	_____ months	
6.1.4	How long after birth did you first put (NAME) to the breast? If less than 1 hour, record '00' hours. If less than 24 hours, record hours. Otherwise, record days.	Immediately __ Hours __ __ Days __ __	
6.1.5	During the first three days after delivery, did you give (NAME) the liquid that came from your breasts?	0. No 1. Yes 98. Don't know	
6.1.6	If no to Q 116, what was your reason?	_____ _____	
6.1.7	In the first three days after delivery, was (NAME) given anything to drink other than breast milk?	0. No 1. Yes 98. Don't know	
6.1.8	If yes to Q 317, What was (NAME) given to drink? Anything else? (DO NOT READ THE LIST) RECORD ALL MENTIONED BY CIRCLING FOR EACH ITEM MENTIONED	1. Milk (other than Breast milk) 2. Plain water 3. Sugar or glucose water 4. Gripe water 5. Sugar-salt-water solution 6. Fruit juice 7. Infant formula 8. Tea/infusions 9. Honey 10. Fresh butter 11. Fenugreek 12. Other (specify) _____	
6.1.9	Do you intend to breastfeed your child?	1 = Yes 0 = No	
6.1.10	If yes to Q6.1.9, for how long do you intend to breastfed your child?	_____ months	

Breastfeeding education and support intervention
Month one questionnaire

Section 1: Interview Information

Q#	Question	Response category
1.1.1	Date of interview (dd/mm/yyyy)	/ / /
1.1.2	Data Time Point (1- 3)	
1.1.3	Woreda	_____
1.1.4	Kebele	_____
1.1.5	Zone	_____
1.1.6	Interviewer's ID	
1.1.7	Supervisor's ID	
1.1.8	Delivered Consent Information	1 = Yes 0 = No
1.1.9	Consent Given	1 = Yes 0 = No
1.1.10	Outcome of Interview	1. Completed 2. Incomplete 3. Absent 4. Refused

Section 2: information on current pregnancy and birth events

S No.	Question	Response	Skip
2.1	Had you attended ANC for your last delivery?	1. Yes 0. No	If no, go to Q2.5
2.2	If Yes to Q2.1, at what gestation did you have your first visit?	1. 1 st trimester 2. 2 nd trimester 3. 3 rd trimester	
2.3	If Yes to Q2.1, how many visits did you have?	_____visits, If no, write 0 98. Don't know	
2.4	If Yes to Q2.1, where did you attend?	1. Hospital 2. Health centre 3. Health post 4. Home 5. Other (specify) _____	
2.5	Where did you give your last delivery?	1. Public Health Facility /Gov't. 2. Nonprofit health facility/NGO 3. Private health facility 4. At home 5. Other (specify) _____	
2.6	Who attended your last delivery?	1. Health Worker 2. Health Extension Worker 3. TBA 4. Family 5. Other (specify) _____	

Breastfeeding education and support intervention
Month one questionnaire

2.7	If your answer to Q2.4 is "at home", why didn't you give birth at a health facility?	1. It is expensive 2. The health facility not open 3. Too far/no transportation 4. Lack of trust/lack of quality service 5. Lack of female health worker 6. Husband/family not allowed 7. Not necessary 8. Not practiced 9. Other (specify)	
2.8	When was the date of birth of your baby?	/ / /	
2.9	What was the mode of delivery?	1. Spontaneous vaginal delivery 2. Cesarean section 3. Instrumental/forceps	
2.10	Were there any complications to birth? (select all that apply)	1. Prolonged labour (> 24 hours) 2. Heavy bleeding 3. Retained placenta 4. Rupture of membrane >6hrs 5. Infection/fever 6. Convulsion 7. Other (specify) _____	
2.11	After delivery, was the weight of your baby measured?	0. No 1. Yes	
2.13	If yes, how much was the weight?	_____ Kg	
2.14	What is the sex of your baby?	1. Male 2. Female	

Section 3: Index child Breastfeeding

S No.	Question	Response	Skip
3.1	Did you ever breastfeed (Name)?	0. No 1. Yes	If no, end the interview
3.2	If yes to Q 3.1, are you still breastfeeding (Name)?	0. No 1. Yes	
3.3	What is the main reason you chose to breastfeed?	_____ _____ _____	
3.4	For how long do you intend to breastfeed (Name)?	_____ Month	
3.5	How long after birth did you first put (Name) to the breast? If less than 1 hour, record '00' hours. If less than 24 hours, record hours. Otherwise, record days.	Immediate __ __ Hour __ __ Day __ __	

Breastfeeding education and support intervention
Month one questionnaire

3.6	During the first three days after delivery, did you give (Name) the liquid	0. No 1. Yes 98. I don't know	
3.7	If no to Q 3.6, what was your reason?	<hr/> <hr/> <hr/> <hr/>	
3.8	In the first three days after birth was (Name) given anything to drink other than breastmilk?	0. No 1. Yes 98. I don't know	
3.9	If yes to Q 3.8, What was (NAME) given to drink? Anything else? (DO NOT READ THE LIST) RECORD ALL MENTIONED BY CIRCLING FOR EACH ITEM MENTIONED	1.Milk (other than Breast milk) 2.Plain water 3.Sugar or glucose water 4.Gripe water 5.Sugar-salt-water solution 6.Fruit juice 7.Infant formula 8.Tea/infusions 9.Honey 10. Fresh butter 11. Fenugreek 12. Other (specify)_____	

Breastfeeding education and support intervention Month six questionnaire

Section 1: Interview Information

Q#	Question	Response category
1.1.1	Date of interview (dd/mm/yyyy)	/ / /
1.1.2	Data Time Point (1- 3)	
1.1.3	Woreda	_____
1.1.4	Kebele	_____
1.1.5	Zone	_____
1.1.6	Interviewer's ID	
1.1.7	Supervisor's ID	
1.1.8	Delivered Consent Information	1 = Yes 0 = No
1.1.9	Consent Given	1 = Yes 0 = No
1.1.10	Outcome of Interview	1. completed 2. incomplete 3. absent 4. refused

Section 2: Knowledge questions

Q#	Question	Response category		
		T	F	DK
	Advantages to baby			
2.1	Breastfeeding reduces the risk of lung infection among babies.			
2.2	Breastfeeding increases the baby's intelligence.			
2.3	Breastfeeding helps to reduce the incidence of child abuse and neglect.			
2.4	A baby who received breastfeeding is less prone to get diarrhoea.			
	Advantages to mother			
2.5	Exclusive breastfeeding is beneficial in spacing birth.			
2.6	Breastfeeding helps to stimulate uterine contraction.			
2.7	Breastfeeding reduces bleeding that occurs after childbirth.			
2.8	Mothers who practised breastfeeding may achieve pre-pregnancy weight faster.			
2.9	Frequent breastfeeding may prevent breast engorgement.			
	Colostrum			
2.10	Colostrum is difficult to digest and needs to be discarded.			
2.11	Colostrum causes constipation among babies.			
	Effective Feeding			
2.12	Babies will gain weight if they receive effective feeding.			
2.13	Correct positioning helps to achieve effective breastfeeding.			
2.14	Correct attachment helps to achieve effective breastfeeding.			
2.15	Babies sleep well after they receive adequate breastfeeding.			
	Breast milk Expression			
2.16	Breast milk expression may be done every 3 hours.			

Breastfeeding education and support intervention Month six questionnaire

2.17	An expressed breastmilk can stay up to 8 hours without getting spoiled.			
2.18	It is necessary to express breast milk from one side of the breast only.			
2.19	Expressed breast milk may be mixed with the previously expressed milk.			
2.20	Expressed breast milk may be warmed on a fire.			
2.21	The leftover expressed breast milk that has been used may be stored again.			
	Duration of Feeding			
2.22	Breastfeeding should be initiated within 30 minutes after delivery.			
2.23	Breastfeeding should be given on demand.			
2.24	The baby should be allowed to breastfeed for at least 10–20 minutes for each feeding.			
2.25	Breastfeeding should be continued up to 2 years even though the baby has received complementary food.			
	Problem with Breastfeeding			
2.26	Breastfeeding must be discontinued if the mother has a cracked nipple.			
2.27	Breastfeeding must be discontinued if the mother has breast engorgement.			
	Breast engorgement			
2.28	Breast engorgement may be reduced with cold packs.			
2.29	The use of cabbage may help to reduce breast engorgement.			
2.30	Massage may reduce breast engorgement.			
	The practical aspect of breastfeeding			
2.31	Exclusive breastfeeding must be practiced until the infant is 6 months old.			
2.32	Giving water to the baby is encouraged after every breastfeeding.			
2.33	Belching after feeding shows that the baby is full.			
2.34	Babies who get enough feeding will pass urine more frequently.			

Section 3: Attitude questions

Iowa Infant Feeding Attitude Scale Items

1=Strongly disagree 2=Disagree 3=Neutral 4=Agree 5=Strongly agree

Q#	Question	Response category				
		1	2	3	4	5
3.1	The nutritional benefits of breast milk last only until the baby is weaned from breast milk.					
3.2	Formula-feeding is more convenient than breastfeeding.					
3.3	Breastfeeding increases mother-infant bonding.					
3.4	Breast milk doesn't contain a mineral called iron which helps for blood production.					
3.5	Formula-fed babies are more likely to be overfed than are breast-fed babies.					
3.6	Formula-feeding is the better choice if a mother plans to work outside the home.					
3.7	Breastfeeding is one of the joys of motherhood.					
3.8	Women should not breastfeed their children in public places e.g. wedding places, market places.					
3.9	Babies fed breast milk are healthier than babies who are fed formula.					
3.10	Breast-fed babies are more likely to be overfed than formula-fed babies.					
3.11	Fathers feel left out if a mother breastfeeds.					

Breastfeeding education and support intervention Month six questionnaire

3.12	Breast milk is the ideal food for babies.						
3.13	Breast milk is more easily digested than formula.						
3.14	Formula is as healthy for an infant as breast milk.						
3.15	Breastfeeding is more convenient than formula feeding.						
3.16	Mother's breast milk is cheaper than formula milk.						
3.17	A mother who occasionally drinks alcohol should not breastfeed her baby.						

Section 4. Breastfeeding history

Q#	Question	Response category	Skip
4.1	Did you ever breastfeed (CHILD'S NAME)?	0. No 1.Yes	If no, go to next section
4.2	If yes to Q4.1, are you still breastfeeding (NAME)?	0. No 1.Yes	
4.3	If no to Q4.2, for how months did you breastfeed (NAME)?	(Months)_____ (if less than one month, record "00" months)	
4.4	If no to Q4.2, why did you stop breastfeeding?	1. Mother pregnant 2. Mother sick 3. Mother tired of breastfeeding 4. Introduced solids 5. Breastmilk making the child sick 6. Not enough milk 7. Other specify)_____	
4.5	If yes to Q4.1, for how many months did exclusively breastfed (Name) continuously from birth?	_____months	
4.6	Was [NAME] breastfed yesterday during the day or at night? That is since this time yesterday until now? (to emphasize 24 hours)	1. Yes 0. No	
4.7	How many times did you breastfeed [NAME], between sunrise yesterday and sunrise today? If the response is not numeric, probe for a numeric response	_____times 98. Don't Know	
4.8	Are you giving your infant any foods other than breast milk?	0. Yes 1. No	
4.9	If yes to Q4.8, how old was the child when you first gave them any food or liquid other than breast milk?	_____ months If less than one month, enter "0"	
4.10	What made you decide to start giving food to your infant?	1. Not enough breast milk 2. Baby always crying 3. Baby active 4. Told to 5. Not enough time to breastfeed 6. Baby reaching for food	

Breastfeeding education and support intervention
Month six questionnaire

		7. Tradition 8. (Other)_____		
		98. Don't know		
4.11	Was (name) given any vitamin drops or other medicines as drops yesterday during the day or at night?	0. No 1. Yes 98. Don't know		
4.12	Was (name) given lelem yesterday during the day or at night?	0. No 1. Yes 98. Don't know		
4.13	Did (NAME) drink anything from a bottle with a nipple yesterday or last night?	0. No 1. Yes 98. Don't know		
4.14	Did you breastfeed (Name) continuously during the past week?	0. No 1. Yes 98. Don't know		
4.15	Now I would like to ask you about (other) liquids or foods that (NAME) had yesterday during the day or at night. I am interested in whether your child had the item even if it was combined with other foods.			
Did (name) (drink/eat):			<u>Yes</u>	<u>No</u>
			<u>DK</u>	
A.	Plain water		1	0 98
B.	Juice or juice drinks		1	0 98
C.	Soup		1	0 98
D.	Milk such as tinned, powdered, or fresh animal milk? If yes: how many times did (name) drink milk? Number of times_____		1	0 98
	If 7 or more times, record '7'. Drank milk_____			
E.	Infant formula such as plan, 2-26? If yes: how many times did (name) drink infant formula? Number of times_____		1	0 98
	If 7 or more times, record '7'. Drank formula_____			
F.	Any others liquids?		1	0 98
G.	Youghurt? If yes: how many times did (name) eat yogurt? Number of times_____		1	0 98
	If 7 or more times, record '7'. Ate yogurt_____			
H.	Any commercially fortified baby food, like fafa, hilina, cerilak, cerifam, mother choice?		1	0 98
I.	Enjera, bread, rice noodles, or other foods made from grains such as teff, oats, maize, barley, wheat, sorghum, millet or other grains?		1	0 98
J.	Pumpkin, carrots, cabbage, squash or sweet potatoes that are yellow or orange inside?		1	0 98
K.	White potatoes, white yams, bulla, kocho, manioc, cassava, or any other food made from roots?		1	0 98
L.	Any dark green leafy vegetables such as kale, spinach, or amaranth leaves?		1	0 98
M.	Ripe mangoes or papayas?		1	0 98
N.	Any other fruits or vegetables?		1	0 98
O.	Liver, kidney, heart or other organ meats?		1	0 98

Breastfeeding education and support intervention
Month six questionnaire

P. Any meat, such as beef, pork, lamb, goat, chicken, or duck?	1	0	98
Q. Eggs?	1	0	98
R. Fresh or dried fish or shellfish?	1	0	98
S. Any foods made from beans, peas, lentils, or nuts?	1	0	98
T. Cheese or other food made from milk?	1	0	98
U. Any other solid, semi-solid, or soft food?	1	0	98
4.16 Did (name) eat any solid, semi-solid, or soft foods yesterday during the day or at night? If 'yes' probe: what kind of solid, semi-solid or soft foods did (name), eat? (go back to 4.15 to record food eaten yesterday)	0. No 1. Yes		

Section 5: Child Illnesses and Symptoms

Q#	Question	Response category	Skip
5.1	Did the index child sleep under a bed net last night?	1=Yes 0=No 98=Don't Know	
5.2	Has the child had any illness in the past two weeks?	1=Yes 0=No 98=Don't Know	<i>If no, skip to the next section.</i>
5.3	Which illnesses or symptoms has the child had in the past two weeks? <i>Do not read the list below; allow the caregiver to answer, and then complete all questions.</i>	For how many days in the past two weeks (14 days), has the child experienced the symptom? <i>(0 if the child has not experienced the symptom) 98 = don't know</i>	
5.4	Cough 1=Yes 0=No	_____ Days	
5.5	Difficult or fast breathing 1=Yes 0=No	_____ Days	
5.6	Fever 1=Yes 0=No	_____ Days	
5.7	Diarrhea without blood 1=Yes 0=No	_____ Days	
5.8	Diarrhea with blood 1=Yes 0=No	_____ Days	
5.9	Skin rash 1=Yes 0=No	_____ Days	
5.10	Ear discharge 1=Yes 0=No	_____ Days	
5.11	Eye infection 1=Yes 0=No	_____ Days	
5.12	Measles 1=Yes 0=No	_____ Days	
5.13	Other (specify _____) 1=Yes 0=No	_____ Days	
5.14	If the child had diarrhoea, did you give them any liquids?	1=yes 0=no 98=Don't Know	

Breastfeeding education and support intervention
Month six questionnaire

5.15	If yes, what liquids did you give to the child?	1. Water 2. Sugar water 3. ORS (Iemlem) 4. Other (specify) _____	
5.16	If your child had any illness or symptoms, did you seek any help outside the home?	1=Yes 0=No	
5.17	If yes, where did you seek help? Select multiple	1. Traditional healer 2. Holy Water 3. Witchcraft 4. Health extension worker 5. Community resource persons (VHT, drug distributors) 6. Drug shop or private pharmacy 7. Private clinic 8. Not-for-profit health facility 9. Public health facility (HC, Hospital) 10. Other (specify) _____	

Section 7: Children Anthropometry

Q#	Question	Response category
7.1	Child initials	
7.2	Sex	M F
7.3	Date of birth (dd/mm/yyyy)	/ / /
7.4	Age in months	_____ months
7.5	Weight 1	.kg _____
7.6	Weight 2	.kg _____
7.7	Weight 3	.kg _____
7.8	Length 1	.cm _____
7.9	Length 2	.cm _____
7.10	Length 3	.cm _____
7.12	MUAC 1	.cm _____
7.13	MUAC 2	.cm _____
7.14	MUAC 3	.cm _____
7.15	Edema	1=Yes 0=No
7.16	Referral?	1=Yes 0=No

Breastfeeding education and support intervention
Afan Oromo version of the baseline questionnaire

Bargaaffii sarjalaa

Module 1: Odeeffannoo gaafii deebii fi hawaasummaa

Kutaa 1: Odeeffannoo gaafii deebii

Lakk	Gaafii	Deebii
1.1.1	Guyyaa gaafiif deebiin itti gaggeeffame (guyyaa/ji'a/bara)	/ / /
1.1.2	Marsaa doo'annoo (1-3)	
1.1.3	Aanaa	_____
1.1.4	Ganada	_____
1.1.5	Zoonii	_____
1.1.6	Eenyummaa[ID] gaafataa	
1.1.7	Eenyummaa[ID] too'ataa	
1.1.8	Odeeffannoon hayyamaa laatame	1 = Eyyee 0 = Lakki
1.1.9	Hayyamaa laatte	1 = Eyyee 0 = Lakki
1.1.10	Bu'aa gaafiif deebii	1. Xumurte 2. Hin xummurre 3. Hin argamne 4. Ni didde

Kutaa 2: Gaafii hawaasummaa

Lakk	Gaafii	Deebii
1.2.1	Umriin kee meeqa?	Woggaa_____
1.2.2	Sadarkaa barumsaa?	1. Homa hin baranne 2. Barreessuuf dubbisu nan danda'a 3. ____ [Yoo barnoota idilee baratte hanga kutaa meeqaatti baratte] 4. Kutaa 12 ol yoo ta'e ibsi_____
1.2.3	Haala gaa'ilaa?	1. Hinheerumne 2. Heerume 3. Seeraan walhiikne 4. Najalaa du'e 5. Gargar baane
1.2.4	Sabni kee maali?	1. Oromoo 2. Amaara 3. Yam 4. Daawuroo 5. Kafichoo 6. Kan biroo ibsi_____

Breastfeeding education and support intervention
Afan Oromo version of the baseline questionnaire

1.2.5	Amantaan kee maali?	1. Islaama 2. Ortodoksii 3. Prootestaantii 4. Kaatolikii 5. Joovaa 6. Kan biroo ibsi _____	
1.2.6	Dalagaan/hojiin kee kan yeroo amma maali?	1. Haadha manaa/ qotee bulaa 2. Hojjataa mootummaa 3. Hojii dhuunfaa qaba 4. Hojjattuu dhaaba miti-mootummaa 5. Daldaltuu 6. Barattuu 7. Kan biroo ibsi _____	
1.2.7	Dalagaan/hojiin abbaa worraa keetii kan yeroo amma maali?	1. Qotee bulaa 2. Hojjataa mootummaa 3. Hojii dhuunfaa kan qabu 4. Hojjata dhaaba miti-mootummaa 5. Daldalaa 6. Barataa 7. Kan biroo ibsi _____	
1.2.8	Galiin maatii keetii kan ji'a tokkoo meeqa?	Qarshii _____	
1.2.9	Maatiin kee wantoota armaan gaditti tarraaye qabaa?	Eeyyee	Lakki
1.2.9.1	Koreentii?	1	0
1.2.9.2	Teeleeviziyoona?	1	0
1.2.9.3	Sa'aatii	1	0
1.2.9.4	Firiijii	1	0
1.2.9.5	Raadiyoo	1	0
1.2.9.6	Mobaayilii	1	0
1.2.9.7	Bilbila manaa[kan mobaayilii hintaane]	1	0
1.2.9.8	Miinjala[xarapeezaa]	1	0
1.2.9.9	Tessoo[chair]	1	0
1.2.9.10	Siree firaashii xixii ykn ispoonjii woliin	1	0
1.2.9.11	Eelee koreenttin hojjatu	1	0
1.2.9.12	Faanosa	1	0
1.2.9.13	Mana nyaanni itti qophaa'u addatti	1	0
1.2.9.14	Saaykilii	1	0

Breastfeeding education and support intervention
Afan Oromo version of the baseline questionnaire

1.2.9.15	Doddoqqee	1	0	
1.2.9.16	Gaarii horiin harkifamu	1	0	
1.2.9.17	Bishaan boonbaa	1	0	
1.2.9.18	Paampii bishaanii/ Boonoo	1	0	
1.2.9.19	Bishaan biirii ol dhihaataa	1	0	
1.2.9.20	Bishaan biirii gad fageenya qabu	1	0	
1.2.9.22	Bishaan boollaa kan itti ijaarame	1	0	
1.2.9.23	Bishaan boollaa kan itti hin ijaaramin	1	0	
1.2.9.24	Bishaan burqaa sirnaan eegame	1	0	
1.2.9.25	Bishaan burqaa sirnaan hineeggamne	1	0	
1.2.9.26	Bishaan bokkaa	1	0	
1.2.9.27	Bishaan yaa'u	1	0	
1.2.9.28	Laga ykn haroo	1	0	
1.2.9.29	Bishaan haaylaandii/samsame	1	0	
1.2.9.30	Mana fincaanii/boolii?	1	0	
1.2.9.31	Mana fincaanii maatii biroo woliin fayyadamtuu?	1	0	
1.2.9.32	Maatii keessan keessa namni lafa qonnaa qabu jiraa?	1	0	
1.2.9.33	Maatii keessan keessa namni buukii/akkawantii qusannaa qabu jiraa?	1	0	
		Eeyyee	Lakki	Meeqa?
1.2.9.34	Qotiyyoo	1	0	
1.2.9.35	Sa'oota	1	0	
1.2.9.36	Farda/gaangee	1	0	
1.2.9.37	Re'ee/ hoolaa	1	0	
1.2.9.38	Lukkuu	1	0	
1.2.9.39	Harree	1	0	
1.2.9.40	Manni keessa jiraattan keessanii?	1	0	
Akaakuu lafa manaa ijoo				

Breastfeeding education and support intervention
Afan Oromo version of the baseline questionnaire

1.2.9.41	Dhoqqee ykn kosii	1	0
1.2.9.42	Xuubii/dhakaa/Simintoo	1	0
1.2.9.43	Taayilii waan laastikii ykn supheerraa tolfamu	1	0
Akaakuu baaxii /sora manaa ijoo			
1.2.9.44	Kanmargaan ykn citaan kabame	1	0
1.2.9.45	Qorqoorroo	1	0
1.2.9.46	Taayilii waan laastikii ykn supheerraa tolfamuuf baaxii manaatti maxxanfamu	1	0
Akaakuu dhaaba manaa ijoo			
1.2.9.47	Mukaaf dhoqqee	1	0
1.2.9.48	Xuubii dhoqqee ykn xuubii waddame /gubame	1	0
1.2.9.49	Simintoodhaan /concrete block	1	0
1.2.9.50	Muka	1	0
1.2.9.51	Marga/citaa/leemman	1	0
Akaakuu mana fincaanii kanmaatiin yerooheddu itti fayyadamu:			
1.2.9.52	Mana fincaanii bishaaniin hojjatu	1	0
1.2.9.53	Mana fincaanii aadaa [kan hinfooyyofne]	1	0
1.2.9.54	Mana fincaanii fooyya'aa	1	0
1.2.9.55	Mana fincaanii hawaasaa	1	0
1.2.9.56	Hinjiru/daggala/oddoo	1	0
Yeroo baay'ee nyaata bilcheeffachuuf maal fayyadamtu ?			
1.2.9.57	Korreentii/Electricity	1	0
1.2.9.58	Gaasii uumamaa	1	0
1.2.9.59	Boba'aa ykn baayoogaazii	1	0
1.2.9.60	Boba'aa adii/Kerosene	1	0
1.2.9.61	Kasala	1	0
1.2.9.62	Muka	1	0
1.2.9.63	Koboota	1	0
Maddi ijoo boba'aa ykn anniisaa ibsaa maatii keetii maali?			

Breastfeeding education and support intervention
Afan Oromo version of the baseline questionnaire

1.2.9.64	Korreentii/Electricity	1	0
1.2.9.65	Soolaarii	1	0
1.2.9.66	Boba'aa /gaazii	1	0
1.2.9.67	Maashoo /Faanosa	1	0
1.2.9.68	Kurraazii	1	0
1.2.9.69	Midijjaa /qoraan /kobotaan	1	0

Mojulii 2: Gaaffillee beekumsaa fi ilaalcha harma hosisuu

Kutaa 1: Gaaffillee beekumsaa

Dh – Dhugaa S – Soba Hb - Hinbeeku

Lakk	Gaafii	Deebii		
		Dh	S	Hb
	Bu'aa daa'imaaf			
2.1.1	Harma hosisuun carraa faalama sombaa (fkn. qulqullina dhabuu/michii somba) daa'immanii ni hir'isa.			
2.1.2	Harma hoosisuun dandeettii sammuu (xin-sammuu) daa'ima ni dabala.			
2.1.3	Harma hoosisuun babaldhinaa, miidhaa fi irranfatamuu daa'ima hir'isuuf ni gargaara.			
2.1.4	Da'imni harma haadhaa hodhu carraan garaa kaasaan qabamuuf qabu xinnoodha.			
2.1.5	Aannan harmaa, aannan xaasaatin (daakuu) yoo walbira qabame irra calatti da'imman alergii (adanyoo) irraa ittisa.			
2.1.6	Harma hoosisuun dagaagina ilkaani fi irga da'ima ni taasisa.			
	Faayidaa haadhaaf			
2.1.7	Haga ji'a 6 harma qofa hoosisuun walirraa fageesanii da'uuf bu'aa qaba.			
2.1.8	Akka da'imni dhalateen harma hoodhuu jalqabsiisuun da'umsaa booda dhigni akka dafee dhaabbatu nigargaara.			
2.1.9	Harma hoosisuun gadaamessi deessuu akka bakkatti deebi'u godha.			
2.1.10	Harma hoosisuun haati gar malee akka hinfurdane gargaara.			
2.1.11	Amma amma harma hosisuun harmi aannaniin guutame akka hin iitofne ittisuuf nigargaara.			
2.1.12	Harma hoosisuun carraa xannacha ykn naqarsaa harmatiin qabamuu ni hir'isa.			
2.1.13	Harma hoosisuun lafeen akka jabaatu godha.			
	Silga (colostrum)			
2.1.14	Silgi aannan haadhaa kan jalqabaa, furdaa, ititaa fi bifa keelloo kan qabuudha.			
2.1.15	Silgi marrumaan daa'imaatti waan ulfaatuf gatamuu qaba.			
2.1.16	Silgi daa'immannitti gogiinsa garaa fida.			
2.1.17	Silgi dhukuba daa'imarraa ittisa.			
	Sirritti hoosisuu			
2.1.18	Daa'ima sirritti harma hoosisuun ulfaatina qaama akka dabalu ni gargaara.			

Breastfeeding education and support intervention
Afan Oromo version of the baseline questionnaire

2.1.19	Daa'imman yeroo hoosisan sirritti qabachuun sirritti hodhuuf ni gargaara.			
2.1.20	Daa'ima harma sirritti qabsiisuun aannan akka sirritti argatan gargaara.			
2.1.21	Daa'imman erga bareechanii hodhani booddee hirriiba gaarii rafu.			
	Aannan harmaa elmuu			
2.1.22	Aannan harmaa garaagarummaa sa'aatii sadii sadiin elmanii achi/ol kaa'uun ni danda'ama.			
2.1.23	Aannan harmaa elmamee utuu hinbadin hanga sa'aatii saddeetii taa'uu ni danda'a.			
2.1.24	Aannan harma tokkoo qofa irraa elmamanii ol kaa'uun barbaachisaadha.			
2.1.25	Aannan harmaa elmamee sa'aati 8 ol ture irratti, harmaa elmanii walitti makuun irratti dabalani ol kaa'uun ni danda'ama.			
2.1.26	Aannan harmaa elmamee abida irratti ho'ifamuu ni danda'a.			
2.1.27	Aannan harmaa elmamee, kan da'iimni irraa dhugee/obaafame irraa hafe, olkaa'amuu ni danda'a.			
	Turtii hosisuu			
2.1.28	Harma hosisuun da'umsa booddee daqiqaa 30 keessatti jalqabamuu qaba.			
2.1.29	Yeroo daa'imni barbaade hunda harmi hoosifamuu/keennamuufii qaba.			
2.1.30	Daa'imni yeroo hoosifamu hunda, yoo xinnaate hanga harmi duwwaa ta'utti hosiifamuu qaba.			
2.1.31	Daa'imani nyaata dabalataa yoo fudhataa jiraateyyuu harma hosisuun waggaa lamaaf itti fufuu qaba.			
	Rakko harma hosisuun walqabatu			
2.1.32	Baayyinni aannan harmaa guddina fi xiqinna/bicina harmaa irratti hundaa'a.			
2.1.33	Haadhooliin fiixheen harma isaanii dhokate/keessatti garagalee daa'ima isaanii harma hosisuu hin danda'an.			
2.1.34	Yoo fiixheen harma haadhaa qunca'ee madaa'ee, haati harma hosisuu addaan kutuun qabdi.			
2.1.35	Yoo daa'imni allaattii (dhukuba ija fi qaama/jismii bifa keelloo godhuun) qabamte haati harma hosisuu addaan kutuu qabdi.			
2.1.36	Harmi haaadhaa aannan guutee yoo iita'e, haati harmicha hosisuu addaan kutuu qabdi.			
	Harma dhiita'uu			
2.1.37	Harma aannan guutee iita'e waan qorraa ta'e kan akka uffata bisaanin jiisuun irra buusun /ittiin qaqqabuun hir'isuun ni danda'ama.			
2.1.38	Harma aannan guutee iita'e bishaan ho'aan qaqqabuun hir'isuun ni danda'ama.			
2.1.39	Raafuu maramaan ykn "xiqil goomanniin"/qurrumbaana fayyadamuun harmaa aannaniin guutee iita'e hir'isuuf gargaara.			
2.1.40	Harma aannaniin guutamee iita'e sukkuumun iita hir'isuun ni danda'ama.			
	Haala shaakkallii harma hoosisuu			
2.1.41	Haga ji'a ja'hatti, daa'imman harma qofa hoosifamuu amaleefattamuu qaba.			
2.1.42	Yeroo hunda, eega daa'imni hodhe booddee, bishaan laatufin/keenuufiin nigorfama.			

Breastfeeding education and support intervention
Afan Oromo version of the baseline questionnaire

2.1.43	Daa'imni eega hodhe booddee deeffachuun quufuu muldhisa.			
2.1.44	Daa'imman hodhiinsa aannan harmaa gahaa argatan ammaa ammaa boolii xiqqaa (bisaanii) boola'u.			
2.1.45	Ji'ota ja'an jalqabaa keessatti aannan xaasaa (daakuu) daa'imaaf keenuufiin ni danda'ama.			
2.1.46	Madaa'un afaani ykn affaffaan yeroo hedduu daa'imman harma hodhu irratti argama.			

Kutaa 2: Wantoota safara ilaalcha hosisaa daa'ima lowa

1 = cimseen morma 2= Nanmorma 3. Hin mormu hin deegaru 4. Nan deegara /waliigala 5 = cimseen deegara/waliigala

Lakk	Gaafii	Deebii				
		1	2	3	4	5
2.2.1	Bu'aan aannan harmaa hanga da'imni nyaata dabalataa jalqabutti.					
2.2.2	Aannan xaasaa (daakuu) obaasun harma hoosisuu caalaa mijjataadha.					
2.2.3	Harma hosisuun walitti dhiheenya haadha fi da'ima ni dabala.					
2.2.4	Aannan harma haadhaa albuuda aayranii ykn dhiiga dabaluuuf gargaaru ofkeessaa hin qabu.					
2.2.5	Da'imman aannan xaasaa (daakuu) dhugdu da'ima harma hootu caalaa hamma barbaadamuu ol obaafamu.					
2.2.6	Yoo haati hojii bakkee kan hojjatuu ta'e, aannan xaasaa (daakuu) obaasuun aannan harmaa elmamerra filatamaadha.					
2.2.7	Harma hosisuun gammachuu haadhummaa keessaa isa tokkoodha.					
2.2.8	Haadhooliin bakka namoonni baayyinaan itti walga'anitti (fkn iddo cidhaa, booyichaa) hosisuu hin qaban.					
2.2.9	Da'imman harma haadhaa hodhan, da'imman aannan xaasaa (daakuu) dhugan caalaa fayyaa qabeeyyiidha.					
2.2.10	Daa'imman harma haadhaa hodhan, daa'imman aannan xaasaa (daakuu) dhugan caalaa hamma barbaachisuu ol obaafamuu danda'u.					
2.2.11	Yoo haadhooliin harma hoosisan, abbootin waan irraanfataman itti fakkaata.					
2.2.12	Aannan harmaa daa'imaaf nyaata filatamaadha.					
2.2.13	Aannan harmaa kan xaasaa caalaa salphaatti bullaa'a.					
2.2.14	Aannan xaasaa (daakuu) akkuma aannan harmaa nyaata gaariidha.					
2.2.15	Harma haadhaa hosisuun aannan xaasaa (daakuu) obasuu caalaa mijjataadha.					
2.2.16	Harmi haadhaa aannan xaasaa (daakuu) caalaa salphaatti baasii malee argama.					
2.2.17	Haati darbitee darbitee dhugaatii alkoolii (fkn xajjii, farsoo, araqee, biraa) dhugdu, da'ima ishee harma hosisuu hin qabdu.					

Breastfeeding education and support intervention
Afan Oromo version of the baseline questionnaire

Mojulii 3: Bishaan Fi Qulqullina

Kutaa 1: Itti Fayyadamaa Fi Madda Bishaanii

Lakk	Gaafii	Deebii
3.1.1	Maaddi bishaanii dhugaatiif maatiin keessan baay'naan fayyadamu maali?	1. Bishaan uujummoo, 2. Boonoo, 3. Bishaan biirii/boollaa, 4. Burqaa/bishaan boollaa sirnaan eeggama, 5. Burqaa/bishaan boollaa sirnaan hineeggamne, 6. Bishaan roobaa, 7. Laga ykn haroo, 8. Bishaan samsame, 9. Kanbiraa (ibsi _____) 98. Hin beeku
3.1.2	Maddi bishaanii maatiin keessan qonnaan ala baay'naan fayyadamu maali?	1. Bishaan uujummoo, 2. Boonoo, 3. Bishaan biirii/boollaa, 4. Burqaa/bishaan boollaa sirnaan eeggama, 5. Burqaa/bishaan boollaa sirnaan hineeggamne, 6. Bishaan roobaa, 7. Laga ykn haroo, 8. Bishaan samsame, 9. Kanbiraa (ibsi _____) 98. Hin beeku
3.1.3	Maddi bishaanii mana kee irraa hangam fagaata (gartokko qofa-dhaqa/gala qofa)? Yoo maddi lama ta'e isa fagoo filadhu.	_____ kiilomeetiraan (maddi bishaanii mooraa keessa yoo ta'e, 0 barreessi) 98. Hin beeku
3.1.4	Al tokko Bishaan waraabdee deebi'uuf (waraabachuuf yeroo eegdu dabalatee, haala baramaan) sa'aa meeqa sirraa fudhata? Isa fagoo filadhu.	Daqiiqaa _____ 98. Hin beeku
3.1.5	Maatiin kee bishaan roobaa tajaajila mana keessaaf ni kuufataa?	0.Lakki 1.Eeyyee 98. Hin beeku
3.1.6	Bishaan osoo hindhugin qulqullina isaa eeguuf wanti gootan jiraa?	1. Homaa hingoonu, 2. Danfisuu, 3. Qoricha aadaa fayyadamuu, 4. Keemikaala fayyadamuu (eegduu bishaanii, dhangala'oo, wuhaa aggaar, bishaan gaarii), 5. Dhinbiibuu, 6. Bishaan waraabanii tursiisun qulqulluuf boora'a addaan baasuu/decant, 7. Kanbiroo (ibsi _____) 98. Hin beeku
3.1.7	Bishaan dhugaatiif oolu bishaan biraa irraa addatti kuufattuu?	1.Eeyyee 0.Lakki 98. Hin beeku
3.1.8	Maatiin kee bishaan dhugamu maal keessatti kuufatu?	1.Hubboo/washoo aadaa qadaada qabu, 2. Hubboo aadaa qadaada malee, 3. Jeerikaana qadaada malee, 4. Jeerikaana qadaada qabu, 5. Kanbiroo (ibsi _____) 98. Hin beeku

Breastfeeding education and support intervention
Afan Oromo version of the baseline questionnaire

3.1.9	Maatiinkee guyyaa tokkotti bishaan hangamii fayyadamu?	_____ litra 98. Hin beeku
-------	--	------------------------------

Kutaa 2: Qulqullina [Sanitation & Hygiene]

Lakk	Gaafii	Deebii	
Balfa/kosii manaa bahuu akkamitti maqsita? (Filannoo hindubbisiin. Deebii akka deebistu godhi, sana booda deebii gaafii hundaa armaan gaditti guuti.)			
3.2.1	Boolla balfaa/kosii	1.Eeyyee	0.Lakki
3.2.2	Oddootti gatuu	1.Eeyyee	0.Lakki
3.2.3	Daggalatti gatuu	1.Eeyyee	0.Lakki
3.2.4	Bakeetti gubuu	1.Eeyyee	0.Lakki
3.2.5	Kanbiroo (ibsi _____)	1.Eeyyee	0.Lakki
3.2.6	Nyaata qophaa'e irra caalaa akkamitti kuufattu/kaawwattu? (Filannoo hindubbisiin. Deebii akka deebistu godhi, sana booda deebii gaafii hundaa armaan gaditti guuti.)	1. Meeshaa hinqadaadamne 2. Meeshaa qadaadame 3. Abiddarratti ykn daaraa oo'aa 4. Kanbiroo (ibsi _____) 98.hinbekuu	
3.2.7	Yeroo baay'ee meeshaalee nyaata qulqullaa'an/dhiqaman eessatti kuufattu?	1. Zalangaa/girgijii/shelf 2. Lafa/floor 3. Meeshaa qadaadame 4. Hin ilaallatu 5. Kan biroo ibsi 98.Hin beeku	
Harka kandhiqattu yeroo kami? (Filannoo hindubbisiin. Deebii akka deebistu godhi, sana booda deebii gaafii hundaa armaan gaditti guuti.)			
3.2.8	Gonkumaa	1. Eeyyee	0. Lakki
3.2.9	Xuriin mul'atu yoo jiraate	1. Eeyyee	0. Lakki
3.2.10	Erga manfincaanii fayyadamee booda/booliin/fincaaniin	1. Eeyyee	0. Lakki
3.2.11	Boolii daa'ima qulqulleessuun booda	1. Eeyyee	0. Lakki
3.2.12	Nyaata qopheessuun dura	1. Eeyyee	0. Lakki
3.2.13	Nyaata dhiheessuun dura	1. Eeyyee	0. Lakki
3.2.14	Nyaachuun dura	1. Eeyyee	0. Lakki
3.2.15	Daa'ima nyaachisuun dura	1. Eeyyee	0. Lakki
3.2.16	Yeroo namni nayaadachiisu	1. Eeyyee	0. Lakki

Breastfeeding education and support intervention
Afan Oromo version of the baseline questionnaire

Mojulii 4: Madaallii/Safartuu dhiheennatti argama fi dhabiinsa wabii nyaataa maatii

Kutaa 1: Madaallii/Safartuu dhiheennatti argama fi dhabiinsa wabii nyaataa maatii

Torban arfan darban keessatti waa'ee dhiheenna nyaataa maatiikee irratti gaafii sigaafachuuf deema. Soorata kan akk nyaata idilee, mi'eessitoota fi nyaata kamiyyuu soorata maatii kee keessa jiru.

	Gaafii	Deebii
4.1.1	Torban arfan darban keessatti ati ykn maatiin kee nyaata gahaa hinargannu jechuudhaan sodaattanii beektuu?	1. Eeyyee 0. Lakki 98. Hin bekuu
4.1.2	Eeyyee yoo ta'e, yeroo hangamiif sodaan kun isin muudate?	1. Akka tasaa (torban arfan darbanitti yeroo 1/2) 2. Darbee darbee (torban arfan darbanitti yeroo 3 hanga 10tti) 3. Yeroo baay'ee (torban arfan darbanitti yeroo 10 ol)
4.1.3	Torban arfan darban keessatti, ati ykn maatiin kee hanqina qabeenyaatiin nyaata nyaachuu barbaaddan osoo hin nyaatiin haftanii beektuu?	1. Eeyyee 0. Lakki 98. Hin bekuu
4.1.4	Eeyyee yoo ta'e, yeroo hangamiif wanti kun isin muudate/qunname?	1. Akka tasaa (torban arfan darbanitti yeroo 1/2) 2. Darbee darbee (torban arfan darbanitti yeroo 3 hanga 10tti) 3. Yeroo baay'ee (torban arfan darbanitti yeroo 10 ol)
4.1.5	Torban arfan darban keessatti, ati ykn maatiin kee hanqina qabeenyaatiin kan ka'e gosa nyaataa muraasa qofa beektuu?	1. Eeyyee 0. Lakki 98. Hin bekuu
4.1.6	Eeyyee yoo ta'e, yeroo hangamiif wanti kun isin muudate/qunname?	1. Akka tasaa (torban arfan darbanitti yeroo 1/2) 2. Darbee darbee (torban arfan darbanitti yeroo 3 hanga 10tti) 3. Yeroo baay'ee (torban arfan darbanitti yeroo 10 ol)
4.1.7	Torban arfan darban keessatti, ati ykn maatiin kee hanqina qabeenyaatiin kan ka'e akaakuu nyaata biroo argachuu dhabuun nyaata nyaachuu hinfeene nyaattanii beektuu?	1. Eeyyee 0. Lakki 98. Hin bekuu

Breastfeeding education and support intervention
Afan Oromo version of the baseline questionnaire

4.1.8	Eeyyee yoo ta'e, yeroo hangamiif wanti kun isin muudate/qunname?	1. Akka tasaa (torban arfan darbanitti yeroo 1/2) 2. Darbee darbee (torban arfan darbanitti yeroo 3 hanga 10tti) 3. Yeroo baay'ee (torban arfan darbanitti yeroo 10 ol)
4.1.9	Torban arfan darban keessatti, ati ykn maatiin kee nyaatni gahaan waan hinjirreef nyaata nyaachuu feetan gaditti nyaattanii beektuu?	1. Eeyyee 0. Lakki 98. Hin bekuu
4.1.10	Eeyyee yoo ta'e, yeroo hangamiif wanti kun isin muudate/qunname?	1. Akka tasaa (torban arfan darbanitti yeroo 1/2) 2. Darbee darbee (torban arfan darbanitti yeroo 3 hanga 10tti) 3. Yeroo baay'ee (torban arfan darbanitti yeroo 10 ol)
4.1.11	Torban arfan darban keessatti, ati ykn maatiin kee nyaatni gahaan waan hinjirreef guyyaatti nyaata bicuu nyaattanii beektuu?	1. Eeyyee 0. Lakki 98. Hin bekuu
4.1.12	Eeyyee yoo ta'e, yeroo hangamiif wanti kun isin muudate/qunname?	1. Akka tasaa (torban arfan darbanitti yeroo 1/2) 2. Darbee darbee (torban arfan darbanitti yeroo 3 hanga 10tti) 3. Yeroo baay'ee (torban arfan darbanitti yeroo 10 ol)
4.1.13	Torban arfan darban keessatti, ati ykn maatiin kee hanqina qabeenyaa nyaata ittin argatturraa kan ka'e yeroo waan nyaatamu kamiyyuu itti dhabdan jiraa?	1. Eeyyee 0. Lakki 98. Hin bekuu
4.1.14	Eeyyee yoo ta'e, yeroo hangamiif wanti kun isin muudate/qunname?	1. Akka tasaa (torban arfan darbanitti yeroo 1/2) 2. Darbee darbee (torban arfan darbanitti yeroo 3 hanga 10tti) 3. Yeroo baay'ee (torban arfan darbanitti yeroo 10 ol)
4.1.15	Torban arfan darban keessatti, ati ykn maatiin kee nyaatni gahaan waan hinjirreef halkan beela'aa raftanii beektuu?	1. Eeyyee 0. Lakki 98. Hin bekuu
3.3.16	Eeyyee yoo ta'e, yeroo hangamiif wanti kun isin muudate/qunname?	1. Akka tasaa (torban arfan darbanitti yeroo 1/2) 2. Darbee darbee (torban arfan darbanitti yeroo 3 hanga 10tti) 3. Yeroo baay'ee (torban arfan darbanitti yeroo 10 ol)

Breastfeeding education and support intervention
Afan Oromo version of the baseline questionnaire

4.1.17	Torban arfan darban keessatti, ati ykn maatiin kee nyaatni gahaan waan hinjirreef halkaniif guyyaa tokko guutuu osoo nyaata kamiyyuu hin nyaatiin dabarsitanii beektuu?	1. Eeyyee 0. Lakki 98. Hin bekuu
4.1.18	Eeyyee yoo ta'e, yeroo hangamiif wanti kun isin muudate/qunname?	1. Akka tasaa (torban arfan darbanitti yeroo 1/2) 2. Darbee darbee (torban arfan darbanitti yeroo 3 hanga 10tti) 3. Yeroo baay'ee (torban arfan darbanitti yeroo 10 ol)

Mojulii 5: Ulfaa Fi Haala FayyaaDubartii Qorannoof barbaadamtuu

Kutaa 1: Gamaaggama/Qorannaa Haala Fayyaa

Kanatti aansee gaafilee Waa'ee fayyaa keetii sigaafachuuf deema. Maaloo gaafilee itti aanuuf deebii deebisi.

Lakk	Gaafii	Deebii	Darbi
5.1.1	Torban lamaan darban keessatti, dhukkubni kamiyyuu sidhukkubee turee?	1. Eeyyee 0. Lakki 98. Hinbeeku	<i>Lakki yoo ta'e, gara kutaa itti aanutti derbi</i>
5.1.2	Eeyyee yoo jette, tarban lamaan darban keessatti sababa dhukkubaatiin guyyoota meeqaaf hojii idileekee hojjachuu dadhabde?	___guyyaa (walakkaa guyyaas ta'us)	
Maaloo gaafii sadeen kanaa gadii waa'ee dhukkuba yeroo boodaa si qabe naa deebisi:			
5.1.3	Gargaarsa manaan alatti barbaaddee turtee?	1. Eeyyee 0. Lakki 98. Hinbeeku	<i>Lakki yoo ta'e, gara kutaa itti aanutti derbi</i>
5.1.4	Yoo eeyyee jette, gargaarsa eessaa barbaadde?	1. Ogeessa aadaa 2. Xabala 3. Falfala/tolchaa 4. Hojjattuu ekisteenshinii fayyaa 5. Hawaasaa keessatti nama tajaajilu (raabsaa qorichaa) 6. Mana qorichaa/faarmaasii dhuunfaa 7. Kilinika dhuunfaa 8. Dhaabilee fayyaa tolaan tajaajilan [bu'aaf hinhojjanne] 9. Dhaabbilee fayyaa hawaasaa (B/fayyaa, Hospitaala) 10. Kan biroo ibsi_____	
5.1.5	Dhaabbanni fayyaa ati gargaarsa barbaachaaf	kiiloo meetira _____	

Breastfeeding education and support intervention
Afan Oromo version of the baseline questionnaire

	deemte hagam fagaata? (kiiloo meetiraan)	98. Hinbeeku	
--	--	--------------	--

Kutaa 2: Ulfa kanaan Duraa

Lakk	Gaafii	Deebii	Darbi
5.2.1	Hanga ammaatti yeroo meeqa ulfoofte? (<i>ulfa ammaa kana, ulfa sirraa bahe fi kan due dabalatee</i>)	Yeroo____ ulfaaye	<i>Ulfa duraa yo ta'e gara kutaa 3itti darbi</i>
5.2.2	Hanga ammaatti daa'mman lubbuudhaan dhalatan meeqa qabda?	Daa'imman_____	
5.2.3	Daa'imni sijalaa du'ee beekaa (du'anii kandhalatan dabalatee)?	1. Eeyyee 0.Lakki	
5.2.4	Eeyyee yoo jette, hangam?	Daa'imman_____	
5.2.5	Ulfi sirraa bahuudhaan daa'ima dhabdee beektaa (akka tasaatti ulfa namarraa bahuu)?	1. Eeyyee 0.Lakki	
5.2.6	Eeyyee yoo jette, hangam?	Daa'imman_____	
5.2.7	Ulfi kee kan dhumaa yoom ture?	Ji'a_____ Waggaa_____ 98. Hinbeeku	
5.2.8	Ulfa kee isa kanaan duraaf kunuunsa da'uumsaan duraa faayyadamtee beektaa?	1. Eeyyee 0.Lakki	<i>Lakki yoo ta'e, gara gaafii 5.2.12 darbi</i>
5.2.9	Gaaffii 5.2.8 if deebiin eyyee yoo ta'e, isa jalqabaa yoom fayyadamte?	1. ji'a sadan duraa keessa 2. ji'a sadan jiduu keessa 3. ji'a sadan boodaa keessa	
5.2.10	Ulfa kee isa kanaan duraaf si'a meeqa kunuunsa da'uumsaan duraa argatte?	Si'a _____, yoo hin jiruu ta'e 0 baressi 98. Hin beeku	
5.2.11	Gaaffii 5.2.8 if deebiin eyyee yoo ta'e, essatti fayyadamte?	1. Hospitaala 2. Buufata fayyaa 3. Keellaa fayyaa 4. Manatti 5. Other (specify) _____	
5.2.12	Daa'ima kanaan duraa, eessatti deesse?	1. Dhaabbilee fayyaa hawaasaa /mootummaa. 2. Dhaabbilee fayyaa bu'aaf hin hojjanne/ 3. Dhaabbilee fayyaa dhuunfaa 4. Deessistuu aadaa [TBA] 5. Manatti (manakootti/ mana nama biro) 6. Kanbiraa (ibsi_____)	

Breastfeeding education and support intervention
Afan Oromo version of the baseline questionnaire

5.2.13	Da'umsa kanaan duraa eenyutu sideesise?	1. Doctoora 2. Narsii 3. Midwayfii 4. Health Officer 5. Hojjattuu exteenshnii fayyaa 6. Deessistuu adaa 7. Maatii	
5.2.14	Ulfa kee isa kanaan duraa garaa baqaqsanii hodhuudhaan deessee?	1. Eeyyee 0. Lakki 98. Hinbeeku	
5.2.15	Ulfa kee isa kanaan duraa meeshaan [forceps] gargaaramtee deessee?	1. Eeyyee 0. Lakki 98. Hinbeeku	
5.2.16	Bu'aan/carraan ulfa kee isa kanaan duraa maal ture? <i>(filannoo hindubbisiinif, deebii ofumaa akka deebistu godhi)</i>	1. Lubbuudhaan dhalate 2. Du'ee dhalate 3. Ulfi akka tasaa narraa bahe 4. Beekaatumaa ofirraa baasise 98. Hinbeeku	

Kutaa 3: Ulfa Ammaa

Lakk	Gaafii	Deebii	Darbi
5.3.1	Torbaan/ji'a meeqaaf ulfa turte?	Torbaan____ Ji'a____ 98. hinbeeku	
5.3.2	Hanga ammaatti kunuunsa da'uumsa duraa argattee?	1. Eeyyee 0. Lakki 98. Hinbeeku	<i>Lakki yo ta'e gara kutaa itti aanutti darbi</i>
5.3.3	Ulfa kanaaf hanga ammaatti kunuunsa da'uumsa duraa yeroo meeqa fudhattee?	Yeroo _____ 98. Hin beeku	

Mojuulii 6: Harma hoosisuu

Kutaa 1: Harma hoosisuu

Lakk	Gaafii	Deebii	Darbi
6.1.1	Daa'ima kee (maqaa) harma hoosistee beektaa?	1. Eeyyee 0. Lakkii	<i>Lakki yo ta'e, xumuri</i>
6.1.2	Sababni inni guddaan harma hoosisuuf fillateef maali?	_____ _____ _____	
6.1.3	Turtii hammamiif daa'ima kee isa kana duraa harma hoosifte?	Ji'a _____	

Breastfeeding education and support intervention
Afan Oromo version of the baseline questionnaire

6.1.4	Erga deessee turtii hammammiin booddee harma hoosisuu jalqabde? Sa'aatii 1 gad yo ta'e, sa'aatii "00" barreessi. Sa'aatii 24 gad yo ta', sa'aatii barreessi. Kanarraa kan hafe, guyyaa barreessi.	Batallumatti __ Sa'aatii __ __ Guyyaa __ __	
6.1.5	Da'umsaan booddee guyyaa sadan jalqabaa keessatti (maqaa daa'ima) dhangala'aa harma keetirra yeroo jalqabaaf ba'u keniteefii?	1. Eeyyee 0. Lakkii 98. Hin beeku	
6.1.6	Gaaffii 6.1.5 deebiin lakkii yoo ta'e, sababni kee maali?	_____ _____ _____	
6.1.7	Da'umsaan booda guyyaa sadan jalqabaa keessaatti (maqaa) aannan harma alatti wanta dhugamu keniteefii bektaa?	1. Eeyyee 0. Lakkii 98. Hin beeku	
6.1.8	Gaaffii 6.8 deebiin eeyyee yo ta'e, maal keeniteef? Kan birahoo? Dhangala'oo himtu hunda galmeessi.	1. Aannan (aannan harmaan alatti) 2. Bishaan 3. Sukara/bishaan glucose 4. Kamooomeellaa 5. Sukarra fi ashabo bishaaniin makame 6. Juusii kuduraa 7. Aannan xaasaa/dakuu 8. Shayii 9. Damma 10. Dhadhaa haaraa 11. Abishii 12. Kan biro (ibsi)_____	
6.1.9	Daa'ima kee isa amma deessu harma hoosisuuf yaadda?	1. Eeyyee 0. Lakkii	
6.1.10	Gaaffii 6.1.9 deebiin eeyyee yo ta'e, turtii hammamiif harma hoosisuuf yaadda?	Ji'a _____	

Breastfeeding education and support intervention
Afan Oromo version of month one questionnaire

Bargaaffii hordoffii ji'a tokkooffa

Kutaa 1: Odeeffannoo gaafii deebii

Lakk	Gaafii	Deebii
1.1	Guyyaa gaafiif deebiin itti gaggeeffame (guyyaa/ji'a/bara)	/ / /
1.2	Marsaa doo'annoo (1-3)	
1.3	Aanaa	
1.4	Ganda	
1.5	Zoonii	
1.6	Eenyummaa[ID] gaafataa	
1.7	Eenyummaa[ID] too'ataa	
1.8	Odeeffannoon hayyamaa laatame	1 = Eyyee 0 = Miti
1.9	Odeeffannoo hayyamaa laatte	1 = Eyyee 0 = Miti
1.10	Bu'aa gaafiif deebii	1. Xumurte 2. Hin xumure 3. Hin argamne 4. Ni didde

Kutaa 2: Odeeffannoo Da'umsa kanaa

Lakk	Gaafii	Deebii	Darbi
2.1	Daa'ima kana yeroo ulfa turte hordoffi da'uumsaan duraa faayyadamtee beektaa?	1. Eyyee 0. Lakkii	Lakkii yo ta'e, gara gaafii 2.5 darbi
2.2	Gaaffii 2.1if deebiin eyyee yoo ta'e, isa jalqabaa yoom fayyadamte?	1. Ji'a sadan duraa keessa 2. Ji'a sadan jiduu keessa 3. Ji'a sadan boodaa keessa	
2.3	Gaaffii 2.1 if deebiin eyyee yoo ta'e, si'a meeqa kunuunsa da'uumsaan duraa argatte?	Si'a _____, yoo hjin jiruu ta'e 0 baressi 98. hin beeku	
2.4	Gaaffii 2.1 if deebiin eyyee yoo ta'e, essatti fayyadamte?	1. Hospitaala 2. Buufata fayyaa 3. Keellaa fayyaa 4. Manatti 5. Kanbiroo (ibsi)	

Breastfeeding education and support intervention
Afan Oromo version of month one questionnaire

2.5	Daa'ima kee kana, eessatti deesse?	<ol style="list-style-type: none"> 1. Dhaabbilee fayyaa hawaasaa /mootummaa. 2. Dhaabbilee fayyaa bu'aaf hin hojjanne 3. Dhaabbilee fayyaa dhuunfaa 4. Manatti (manakootitti/mana nama biroo) 5. Kan biroo (ibsi) 	
2.6	Da'umsa kee kana eenyutu siddeesise?	<ol style="list-style-type: none"> 1. Hojjattaa/hojjattuu fayyaa 2. Hojjattuu exteenshnii fayyaa 3. Deessistuu adaa 4. Maatii 5. Kan biroo (ibsi) _____ 	
2.7	Gaaffii 2.4.if deebiin mana yoo ta'e, mana yaalaatti maaf hin da'in?	<ol style="list-style-type: none"> 1. Gatiin baayye olka'aa ta'u 2. Manni yaalaa banaa ta'u dhabu 3. Baayye fagoo/ konkolaataan hinjiru 4. Amantii dhabuu/tajaajilli gahaa tahuu dhabu 5. Ogeessa fayyaa dubartiin jiraachuu dhabu 6. Abbaan manaa/maatiin hinhayyamne 7. Barbaachisaa miti 8. Hinbaratamne 9. Kan biroo (ibsi)_____ 	
2.8	Guyyaan dhaloota daa'ima keetii yoom ture?	/ / /	
2.9	Ulfa kee kana akkamiin deessee?	<ol style="list-style-type: none"> 1. Nagumaanan da'e 2. Garaa baqaqsanii hodhuudhaan 3. Meeshaan [forceps] gargaaramudhaan 	
2.10	Where there any complications to birth? (kan ilaalatu hunda fili)	<ol style="list-style-type: none"> 1. Ciniinfuu dheeraa (sa'aatii 24 ol) 2. Dhiigni baayyeen dhangala'uu 3. Ofkoltiin hafuu 4. Bishaan mataa dhangala'ee sa'aatii 6 ol turuu 5. Infekshnii/gubaa 6. Of walaalanii kufuu 7. Kan biroo (ibsi)_____ 	

Breastfeeding education and support intervention
Afan Oromo version of month one questionnaire

2.11	Ulfaatinni/kiloon daa'ima keetii yeroo dhalate madaalamee ture?	0. Lakkii 1.Eeyyee	
2.13	Eeyyee yoo ta'e, kiloon isaa/ishee meeqa ture?	Kilograama _____	
2.14	Saalli daa'ima keetii maali?	1. Dhiira 2. Dhalaa	

Kutaa 3: Harma hoosisuu daa'ima amma dhalatee

Lakk	Gaaffii	Deebii	Darbi
3.1	Daa'ima kee (maqaa) harma hoosistee beektaa?	0. Lakkii 1.Eeyyee	
3.2	Gaaffii 3.1if deebiin eeyyee yoo ta'e, ammallee hoosisaa jirtaa daa'ima kee (maqaa)?	0. Lakkii 1.Eeyyee	
3.3	Turtii hammamiif daa'ima kee kana harma hoosisuuf yaadda?	Ji'a _____	
3.4	Erga deessee turtii hammammiin booddee harma hoosisuu jalqabde? Sa'aatii 1 gad yo ta'e, sa'aatii "00" barreessi. Sa'aatii 24 gad yo ta', sa'aatii barreessi. Kanarraa kan hafe, guyyaa barreessi.	Battalummatti __ Sa'aatii __ __ Guyyaa __ __	
3.5	Da'umsaan booddee guyyaa sadan jalqabaa keessatti (maqaa daa'ima) dhangala'aa harma keetirra yeroo jalqabaaf ba'u keniteetaa?	0. Lakkii 1. Eeyyee 98. Hin beeku	
3.6	Gaaffii 3.6 deebiin lakkii yoo ta'e, sababni kee maali?	_____ _____ _____	
3.7	Da'umsaan booda guyyaa sadan jalqabaa keessaatti (maqaa daa'imaa) harmaan alatti wanta dhugamu kenitteefii bekta?	0. Lakkii 1. Eeyyee 98. Hin beeku	
3.8	Gaaffii 3.8 deebiin eeyyee yo ta'e, maal keeniteef? Kan birahoo? DHANGALA'AA IBSAME HUNDA GALMEESSI	1. Aannan (aannan harmaan alatti) 2. Bishaan 3. Sukaara/bishaan glukosii 4. Kamoomeellaa 5. Sukarra fi ashabo bishaaniin makame	

Breastfeeding education and support intervention
Afan Oromo version of month one questionnaire

		6. Juusii kuduraa 7. Aannan gaalaa/aannan aashagame 8. Shayii 9. Damma 10. Dhadhaa haaraa 11. Abishii 12. Kan biro ibsi)_____	
--	--	--	--

Breastfeeding education and support intervention
Afan Oromo version of month six questionnaire

Bargaaffii hordoffii ji'a ja'affaa

Kutaa 1: Odeeffannoo gaaffii deebii

Lakk	Gaaffii	Deebii
1.1	Guyyaa gaafiif deebiin itti gaggeeffame (guyyaa/ji'a/baraa)	/ / /
1.2	Marsaa doo'annoo (1-3)	
1.3	Aanaa	
1.4	Ganada	
1.5	Zoonii	
1.6	Eenyummaa[ID] gaafataa	
1.7	Eenyummaa[ID] Too'ataa	
1.8	Odeeffannoon hayyamaa laatame	1 = Eyyee 0 = Mit
1.9	Odeeffannoo hayyamaa laatte	1 = Eyyee 0 = Mit
1.10	Bu'aa gaafiif deebii	1. Xumurte 2. Hin xumure 3. Hin argamne 4. Ni didde

Kutaa 2: Gaaffilee beekumsa harma hoosisuu

Dh – dhugaa S – Soba Hb - Hinbeeku

Lakk	Gaaffii	Deebii		
		Dh	S	Hb
	Bu'aa daa'imaaf			
2.1	Harma hoosisuun carraa faalama sombaa (fkn. qulqullina dhabuu/michii somba) daa'immanii ni hir'isa.			
2.2	Harma hoosisuun dandeettii sammuu (xin-sammuu) daa'ima ni dabala.			
2.3	Harma hoosisuun babaldhinaa, miidhaa fi irranfatamuu daa'ima hir'isuuf ni gargaara.			
2.4	Da'imni harma haadhaa hodhu carraan garaa kaasaan qabamuuf qabu xinnoodha.			
	Faayidaa haadhaaf			
2.5	Haga ji'a 6 harma qofa hoosisuun walirraa fageesanii da'uuf bu'aa qaba.			
2.6	Harma hoosisuun gadaamessi deessuu akka bakkatti deebi'u godha.			
2.7	Akka daa'imni dhalateen harma hoosisuu jalqabsiisuun da'umsaaan booda dhigni akka dafee dhaabbatu nigargaara.			
2.8	Harma hoosisuun haati gar malee akka hinfurdane gargaara.			
2.9	Amma amma harma hoosisuun harmi aannaniin guutame akka hin iitofne ittisuuf nigargaara.			
	Silga (colostrum)			
2.10	Silgi marrumaan daa'imatti waan ulfaatuf gatamuu qaba.			
2.11	Silgi daa'immannitti gogiinsa garaa fida.			
	Sirritti hoosisuu			
2.12	Daa'ima sirritti harma hoosisuun ulfaatina qaama akka dabaluu ni gargaara.			
2.13	Daa'imman yeroo hoosisan sirritti qabachuun sirritti hodhuuf ni gargaara.			

Breastfeeding education and support intervention
Afan Oromo version of month six questionnaire

2.14	Daa'ima harma siritti qabsiisuun aannan akka siritti argatan gargaara.			
2.15	Daa'imman erga bareechanii hodhani booddee hirriiba gaarii rafu.			
	Aannan harmaa elmuu			
2.16	Aannan harmaa garaagarummaa sa'aatii sadii sadiin elmanii achi/ol kaa'uun ni danda'ama.			
2.17	Aannan harmaa elmamee utuu hinbadin hanga sa'aatii saddeetitti taa'uu ni danda'a.			
2.18	Aannan harma tokkoo qofa irraa elmamanii ol kaa'uun barbaachisaadha.			
2.19	Aannan harmaa elmame sa'aati 8 ol ture irratti, harma elmanii walitti makuun irratti dabalani ol kaa'uun ni danda'ama.			
2.20	Aannan harma elmamee abida irratti ho'ifamuu ni danda'a.			
2.21	Aannan harmaa elmamee, kan da'iimni irraa dhugee/obaafame irraa hafe, olkaa'amu ni danda'ama.			
	Turtii hosisuu			
2.22	Harma hosisuun da'umsa booddee daqiqaa 30 keessatti jalqabamuu qaba.			
2.23	Yeroo daa'imni barbaade hunda harmi hoosifamuu/keennamuufii qaba.			
2.24	Daa'imni yeroo hoosifamu hunda, yoo xinnaate hanga harmi duwwaa ta'utti hosiifamuu qaba.			
2.25	Daa'imani nyaata dabalataa yoo fudhataa jiraateyyuu harma hosisuun waggaa lamaaf itti fufuu qaba.			
	Rakko harma hosisuun walqabatu			
2.26	Yoo fiixxeeni harmaa haadha qunca'ee madaa'ee haati harma hosisuu addaan kutuun qabdi.			
2.27	Harmi haadhaa, aannan guutee yoo iita'e haati harmicha hosisuu addaan kutuu qabdi.			
	Harma dhiita'uu			
2.28	Harma aannan guutee iita'e waan qorraa ta'e kan akka uffata bisaanin jiisuun irra buusun /ittiin qaqqabuun hir'isuun ni danda'ama.			
2.29	Raafuu maramaan ykn "xiqil goomanniin"/qurrumbaan fayyadamuun harmaa aannaniin guutee iita'e hir'isuuf gargaara.			
2.30	Harma aannaniin guutamee iita'e sukkuumun iita hir'isuun ni danda'ama.			
	Haala shaakkallii harma hoosisuu			
2.31	Haga ji'a ja'hatti, daa'imman harma qofa hoosifamuu amaleefattamuu qaba.			
2.32	Yeroo hunda, eega daa'imni hodhe booddee, bishaan laatufin/keenuufiin nigorfama.			
2.33	Daa'imni eega hodhe booddee deeffachuun quufuu muldhisa.			
2.34	Daa'imman hodhiinsa aannan harmaa gahaa argatan ammaa ammaa boolii xiqqaa (bisaanii) boola'u.			

Kutaa 3: Wantoota safara ilaalcha hosisaa daa'imaa lowa

1 = cimseen morma 2= Nanmorma 3. Hin mormu hin deegaru 4. Nan deegara /waliigala 5 = cimseen deegara/waliigala

Lakk	Gaafii	Deebii				
3.1	Bu'aan aannan harmaa hanga da'imni nyaata dabalataa jalqabutti.	1	2	3	4	5

Breastfeeding education and support intervention
Afan Oromo version of month six questionnaire

3.2	Annan xaasaa (daakuu) obaasun harma hoosisuu caalaa mijataadha.					
3.3	Harma hosisuun walitti dhiheenya haadha fi da'ima ni dabala.					
3.4	Aannan harma haadhaa albuuda aayranii ykn dhiiga dabaluuuf gargaaru ofkeessaa hin qabu.					
3.5	Da'imman aannan xaasaa (daakuu) dhugdu da'ima harma hootu caalaa hamma barbaadamuu ol obaafamu.					
3.6	Yoo haati hojii bakkee kan hojjatuu ta'e, aannan xaasaa (daakuu) obaasuun aannan harmaa elmamerra filatamaadha.					
3.7	Harma hosisuun gammachuu haadhummaa keessaa isa tokkoodha.					
3.8	Haadhooliin bakka namoonni baayyinaan itti walga'anitti (fkn iddo cidhaa, booyichaa) hosisuu hin qaban.					
3.9	Da'imman harma haadhaa hodhan, da'imman aannan xaasaa (daakuu) dhugan caalaa fayyaa qabeeyyiidha.					
3.10	Daa'imman harma haadhaa hodhan, daa'imman aannan xaasaa (daakuu) dhugan caalaa hamma barbaachisuu ol obaafamuu danda'u.					
3.11	Yoo haadhooliin harma hoosisan, abbootin waan irraanfatan itti fakkaata.					
3.12	Aannan harmaa daa'imaaf nyaata filatamaadha.					
3.13	Aannan harmaa kan xaasaa caalaa salphaatti bullaa'a.					
3.14	Annan xaasaa (daakuu) akkuma aannan harmaa nyaata gaariidha.					
3.15	Harma haadha hosisuun annan xaasaa (daakuu) obasuu caalaa mijataadha.					
3.16	Harmi haadhaa aannan xaasaa (daakuu) caalaa salphaatti baasii malee argama.					
3.17	Haati darbitee darbitee dhugaatii alkoolii (fkn xajjii, farsoo, araqee, biiraa) dhugdu, da'ima ishee harma hosisuu hin qabdu.					

Kutaa 4. Harma hoosisuu

Lakk	Gaaffii	Deebii	Darbi
4.1	Daa'ima kee (Maqaa) harma hoosistee beektaa?	0. Lakkii 1.Eeyyee	<i>Lakkii yo ta'e gara 4.4 ce'i</i>
4.2	Gaaffii 4.1 if deebiin eeyyee yoo ta'e, ammallee hoosisaa jirtaa daa'ima kee (Maqaa)?	0. Lakkii 1.Eeyyee	
4.3	Gaaffii 4.2 if deebiin lakkii yoo ta'e, ji'a meeqaaf harma hoosiste (maqaa)?	(Ji'a) _____ (ji'a tokkoo gad yoo ta'e, ji'a "00" galmeessi)	

Breastfeeding education and support intervention
Afan Oromo version of month six questionnaire

4.4	Gaaffii 4.2 if deebiin lakkii yoo ta'e, harma hoosisuu maaliif dhaabde?	1. Nan ulfaa'e 2. Nan dhukubsadhe 3. Harma hoosisuu nan dadhabe 4. Nyaatan jalqabsiise 5. Aannan harmaa daa'ima dhukubse 6. Harmi koo aannan gahaa hinqabu 7. Kan biraa (ibsi)_____	
4.5	Gaaffii 4.2 if deebiin eeyyee yoo ta'e, (Maqaa) erga deesse ji'a meeqaaf harma qofa ittifuftee hoosiste?	Ji'a_____	
4.6	Kaleessa ganama irra kaasee hanga ganama harraatti (sa'aati 24 kessatti) (Maqaa) harma hoosisteetta?	0. Lakkii 1. Eeyyee	
4.7	Kaleessa ganama irra kaasee hanga ganama harraatti (sa'aati 24 kessatti) (maqaa) yeroo meeqa harma hoosiste?	yeroo_____	
4.8	Daa'ima keetiif harmaan allatti nyaata dabalataa keennameefii jirtaa?	0. Eeyyee 1. Lakkii	
4.9	Gaaffii 4.2f deebiin eeyyee yoo ta'e, yeroo duraaf nyaata yeroo jalqabsiistu daa'imni kee ji'a meeqa ture?	Ji'a____ ji'a tokkoo gad yoo ta'e, ji'a "00" galmeessi)	
4.10	Daa'ima keetiif nyaata kennuufi akka murteesittu maaltu si godhe?	1. Aannan harmaa gahaa qabaachu dhabuu 2. Daa'imni yeroo hunda booyu 3. daa'imni si'aawaadha 4. Natihimame 5. Harma hoosisuuf yeroo gahaa dhabu 6. Nyaata barbaadee jannaan/nyaata dukaa ilaalee jannaan 7. Aadaa 8. Kan biraa(ibsi)_____	
4.11	Kaleessa guyyaa ykn galgala (Maqaan) xabitaa vitaaminaa ykn kan qoricha biraa keennameefii?	1.Eeyyee 0. Lakkii 98. Hinbeeku	
4.12	Kaleessa guyyaa ykn galgala (Maqaan) ORS/lamlam keennameefii?	1.Eeyyee 0. Lakkii 98. Hinbeeku	
4.13	Kaleessa ykn halkan kaleessaa (maqaa) dhangala'oo kamiinuu xuuxxoodhaan keniteettafii?	1.Eeyyee 0. Lakkii 98. Hinbeeku	

Breastfeeding education and support intervention
Afan Oromo version of month six questionnaire

4.14	(Maqaa) torbaan darbee harma qofa ittifuftee hoosisteettaa?	1. Eeyyee 0. 98. Hinbeeku			
4.15	Amma dhangala'aa ykn nyaata kaleessa guyyaa ykn galgala (Maqaa) fudhateen sigaafadha. Gosti nyaata sun yoo nyaata biraatti dabalame/makame keennameef yo jiraates baruun barbaad				
	(Maqaan) (dhugee/nyaatee:		E	L	Hb
	A) Bishaan?		1	0	98
	B) Cunfaa ykn dhugaatii cunfaa?		1	0	98
	C) Shorbaa?		1	0	98
	D) Aannan daakuu/gaalaa, ykn annan haaraa horii? Eyyee yo ta'e: yeroo meeqa (Maqaa) aannan dhuge? yeroo _____ Yeroo 7 ykn 7 ol yo ta'e, '7' bareessi. Aannan dhuge		1	0	98
	E) Aannan xaasaa kan akka plan, s-26? Eyyee yo ta'e: yeroo meeqa (Maqaa) aannan xaasaa dhuge? yeroo _____ Yeroo 7 ykn 7 ol yo ta'e, '7' bareessi. aannan xaasaa dhuge		1	0	98
	F) Dhangaloo gara biraa?		1	0	98
	G) Itittuu? Eyyee yo ta'e: yeroo meeqa (Maqaa) itittuu dhuge? yeroo _____ Yeroo 7 ykn 7 ol yo ta'e, '7' bareessi. Itittuu nyaate		1	0	98
	H) Nyaata daaimaniihaala ammayyaan qophaae kamuu, kan akka fafa, hilina, cerilak, cerifam, mother choice?		1	0	98
	I) Bideena, daabboo, ruzii, noodles, ykn nyaata midhaan callaa irraa qophaa'e kan akka, xaafii, aajjaa, boqqolloo, garbuu, qamadii, bisinga, daagujjaa ykn midhaan biraa?		1	0	98
	J) Buqqee, kaarootii, squash or mixaaxisa keessoon saanii keelloo ykn burtukaana?		1	0	98
	K) Dinicha, mixaaxis, bulla, kocho, kaasaavaa, ykn nyaata hidda irraa qophaa'e?		1	0	98
	L) Muduraalee baalli isaanii magariisa gurrachaa kan akka raafuu, qosxaa?		1	0	98
	M) Maangoo bilchaataa ykn paapaayyaa?		1	0	98
	N) kuduraa ykn muduraa gara biraa?		1	0	98
	O) Tiru, kalee, onnee ykn qaama foon of keessaa qabu?		1	0	98
	P) Foon sa'aa, booyyee, hoolaa, re'ee, lukkuu, ykn daakiyyee?		1	0	98
	Q) Hanqaaquu?		1	0	98
	R) Qurxummii fi kkf?		1	0	98
	S) Nyaata atara, baaqeelaa, misira ykn ocholoonii irraa qophaa'e?		1	0	98
	T) Aannan, baaduu, itittuu, ykn aannan irraa kan qophaa'e kan akka areeraa?		1	0	98
	U) Nyaata lallaafaa, gidu-galeesa ykn nyaata jajjabaa gara biraa?		1	0	98
4.16	Kaleessa guyyaa ykn galgala (Maqaa) nyaata lallaafaa, gidu-galeesa ykn nyaata jajjabaa nyaateeraa? Eyyee yo ta'e, gosa nyaata lallaafaa, gidu-galeesa ykn nyaata jajjabaa (Maqaa) nyaatee iyyaafadhu. gara gaaffii 4.15 deebi'ii nyaata kaleessa nyaatame galmeessi		1. Eeyyee 0. Lakkii		

Kutaa 5: dhukuba fi mallattoo dhukuba daa'imaa

Lakk	Gaaffii	Deebii	Darbi
5.1	Daa'imni kee kun halkan edaa agoobara jala rafee?	1=Eeyyee 0=Lakkii 98=Hinbeeku	

Breastfeeding education and support intervention
Afan Oromo version of month six questionnaire

5.2	Daa'imni kee kun torbaan lamaan darbe kessatti dhukubsatee beekaa?	1=Eeyyee 0=Lakkii 98=Hinbeeku	<i>Lakkii yo ta'e, gara kutaa itt aanuu darbi.</i>
5.3	Torban lamman darbe kessatti dhukubsate ykn mallattoon dhukubba irraa mul'atee beekaa? <i>Deebii hindubbisiniif, haatii akka deebistu yeroo keennifii gaaffi hunda guuti.</i>	Torban lamaan darbe keessatti guyyaa meeqaaf mallattoo kana qabaate? (<i>0 yoo daa'imni mallattoo kana hinqabaatin</i>) 98=Hinbeeku	
5.4	Qufaa 1=Eeyyee 0=Lakkii	Guyyoota _____	
5.5	Affuura baafachuu dadhabuu/aritiidhaan afuura baasuu 1=Eeyyee 0=Lakkii	Guyyoota _____	
5.6	Qaama gubaa 1=Eeyyee 0=Lakkii	Guyyoota _____	
5.7	Garaa kaasaa dhiiga makaa hinqabne 1=Eeyyee 0=Lakkii	Guyyoota _____	
5.8	Garaa kaasaa dhiiga makaa qabu 1=Eeyyee 0=Lakkii	Guyyoota _____	
5.9	Qaammarratti shif jedhuu 1=Eeyyee 0=Lakkii	Guyyoota _____	
5.10	Infeekshnii/dhukuba gurraa 1=Eeyyee 0=Lakkii	Guyyoota _____	
5.11	Infeekshnii/dhukuba ijaa 1=Eeyyee 0=Lakkii	Guyyoota _____	
5.12	Gifira 1=Eeyyee 0=Lakkii	Guyyoota _____	
5.13	Kan biraa (ibsi _____) 1=Eeyyee 0=Lakkii	Guyyoota _____	
5.14	Daa'ima kee garaa kaasaan yoo qabame, dhangala'aa tokkollee laatteettaafii?	1=Eeyyee 0=Lakkii 98=Hinbeeku	
5.15	Gaaffii 5.14 if deebiin eeyyee yoo ta'e, dhangala'aa maal laatteef?	1. Bishaan 2. Bishaan sukaraan makaa 3. ORS (Iemlem) 4. Kan biraa (ibsi) _____	
5.16	Yeroo daa'imni kee dhukuba ykn mallattoo dhukubaa qabaatu, gargaarsa manaan allatti barbaadeettaa?	1=Eeyyee 0=Lakkii	
5.17	Gaaffii 1.1 if deebiin eeyyee yoo ta'e, gargaarsa eessaa barbaadde? Baayye filadhu	1. Ogeessa aadaa 2. Xabala 3. Falfala/tolchaa 4. Hojjattuu ekisteenshinii fayyaa 5. Hawaasaa keessatti nama soorressa (raabsaa qorichaa) 6. Mana qorichaa ykn faarmaasii dhuunfaa 7. Kilinika dhuunfaa 8. Dhaabilee fayyaa tolaan tajaajilan	

Breastfeeding education and support intervention
Afan Oromo version of month six questionnaire

		[bu'aaf hinhojjanne] 9. Dhaabbilee fayyaa hawaasaa (B/fayyaa, Hospitaala) 10. Kan biraa ibsi _____
--	--	---




Kutaa 7: Safara antirooppomeetrii daa'ima

Lakk	Gaafii	Deebii
7.1	Maqaa daa'ima	
7.2	Saala	M F
7.3	Guyyaa dhalootaa (guyyaa/ji'a/baraa)	/ / /
7.4	Umrii ji'aan	Ji'a _____
7.5	Ulfaatina 1	.kg _____
7.6	Ulfaatina 2	.kg _____
7.7	Ulfaatina 3	.kg _____
7.8	Dheerina 1	.cm _____
7.9	Dheerina 2	.cm _____
7.10	Dheerina 3	.cm _____
7.12	MUAC 1	.cm _____
7.13	MUAC 2	.cm _____
7.14	MUAC 3	.cm _____
7.15	lita/Edema	1=Yes 0=No
7.16	Gara wallaansa ol'aanaa ergitanii?	1=Yes 0=No



Breastfeeding education and support intervention Manual for the peer supporters

Participant materials 1



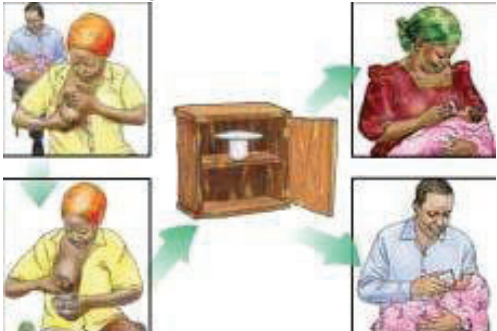
Recommended breastfeeding practices and possible counseling discussion points

Recommended breastfeeding practice	Possible counseling discussion points
	<p>Note: choose two or three most relevant to mother's situation and/or add other discussion points from knowledge of area</p> <ul style="list-style-type: none"> ➤ During pregnancy, mother's body needs extra meals daily. Eat one extra meal daily. ➤ Drink whenever you are thirsty, but avoid taking tea and coffee with meals. ➤ No foods are forbidden. ➤ Do not eat nonfood things like charcoal and earth. <p>CC 1: Nutrition during pregnancy</p>
<p>Place infant skin-to-skin with mother immediately after birth.</p> 	<ul style="list-style-type: none"> ➤ Skin-to-skin contact with mother keeps newborn warm and helps stimulate bonding or closeness, and brain development. ➤ Skin-to-skin helps the —let down of the colostrum/milk. ➤ There may be no visible milk in the first hours. For some women it even takes a day or two to experience the —let down. ➤ It is important to continue putting the baby to the breast to stimulate milk production and let down. ➤ Colostrum is the first thick, yellowish milk that protects baby from illness. <p>CC 2: Delivery</p>
<p>Initiate breastfeeding within the first hour of birth.</p> 	<ul style="list-style-type: none"> ➤ Make sure baby is well attached. ➤ This first milk [use local word] is called colostrum. It is yellow and full of antibodies that help protect your baby. ➤ Colostrum provides the first immunization against many diseases. ➤ Breastfeeding frequently from birth helps the baby learn to attach and helps to prevent engorgement and other complications. ➤ In the first few days, the baby may feed only 2 to 3 times/day. If the baby is still sleepy on day 2, the mother may express some colostrum and give it from a cup. ➤ Give nothing else—no water, no infant formula, no other foods or liquids—to the newborn. <p>CC 2: Delivery/Initiation of breastfeeding</p>



Breastfeeding education and support intervention Manual for the peer supporters

Recommended breastfeeding practice	Possible counseling discussion points Note: choose two or three most relevant to mother's situation and/or add other discussion points from knowledge of area
<p>Exclusively breastfeed (no other food or drink) from birth to 6 months.</p> 	<ul style="list-style-type: none"> ➤ Breastmilk is all the infant needs for the first 6 months. ➤ Do not give anything else to the infant before 6 months, not even water. ➤ Breastmilk contains all the water a baby needs, even in a hot climate. ➤ Giving water will fill the infant and cause less suckling; less breastmilk will be produced. ➤ Water and other liquids and foods for an infant less than 6 months can cause diarrhea. <p>CC 3: Exclusive breastfeeding</p>
<p>Breastfeed frequently, day and night.</p> 	<ul style="list-style-type: none"> ➤ After the first few days, most newborns want to breastfeed frequently, 8 to 12 times/day. ➤ Frequent breastfeeding helps produce lots of breastmilk. ➤ Once breastfeeding is well-established, breastfeed 8 or more times day and night to continue to produce plenty of (or lots of) breastmilk. ➤ If the baby is well attached, contented, and gaining weight, the number of feeds is not important. ➤ More suckling (with good attachment) makes more breastmilk. <p>CC 4: How to put your baby on the breast</p>
<p>Breastfeed on demand every time the baby asks to breastfeed.</p>	<ul style="list-style-type: none"> ➤ Crying is a <u>late</u> sign of hunger. ➤ Early signs that baby wants to breastfeed: <ul style="list-style-type: none"> – Restlessness. – Opening mouth and turning head from side to side. – Putting tongue in and out. – Sucking on fingers or fists. <p>CC 4: How to make enough milk</p>
<p>Let infant finish one breast and come off by him/herself before switching to the other breast.</p>	<ul style="list-style-type: none"> ➤ Switching back and forth from one breast to the other prevents the infant from getting the nutritious 'hind milk.' ➤ The 'fore milk' has more water content and quenches infant 's Thirst. ➤ The 'hind milk' has more fat content and satisfies the infant 's hunger <p>CC 4: How to make enough milk</p>

Breastfeeding education and support intervention Manual for the peer supporters



Recommended breastfeeding practice	Possible counseling discussion points Note: choose two or three most relevant to mother's situation and/or add other discussion points from knowledge of area
<p>Practice good positioning and attachment.</p> 	<p>Four signs of good positioning:</p> <ul style="list-style-type: none"> ➤ baby's body should be straight, ➤ baby's body faces the breast, ➤ baby should be close to mother, and ➤ mother should support the baby's whole body, not just the neck and shoulders, with her hand and forearm. <p>Four signs of good attachment:</p> <ul style="list-style-type: none"> ➤ mouth wide open, ➤ chin touching breast, ➤ more areola showing above than below the nipple, ➤ lower lip turned out. <p>CC 5 & 6: How to put your baby on the breast</p>
<p>Continue breastfeeding until 2 years of age or longer.</p>	<ul style="list-style-type: none"> ➤ Breastmilk contributes a significant proportion of energy and nutrients during the complementary feeding period and helps protect babies from illness. <p>CC 7: Complementary feeding</p>
<p>Continue breastfeeding when infant or mother is ill.</p>	<ul style="list-style-type: none"> ➤ Breastfeed more frequently during child illness. ➤ The nutrients and immunological protection of breastmilk are important to the infant when mother or infant is ill. ➤ Breastfeeding provides comfort to a sick infant. <p>CC 8: How to feed a sick baby from birth to 6 months</p>
<p>Mother needs to eat and drink to satisfy hunger and thirst.</p> 	<ul style="list-style-type: none"> ➤ No one special food or diet is required to provide adequate quantity or quality of breastmilk. ➤ Breastmilk production is not affected by maternal diet. ➤ No foods are forbidden. ➤ Mothers should be encouraged to eat more food to maintain their own health. <p>CC 9: Nutrition for lactating mothers</p>
<p>Avoid feeding bottles.</p> 	<ul style="list-style-type: none"> ➤ Foods or liquids should be given by cup to reduce nipple confusion and the possible introduction of contaminants. ➤ Learn to express your breast milk soon after your baby is born. ➤ Breastfeed exclusively and frequently for the whole period that you are with our baby. ➤ Express and store breast milk before you leave your home so that your baby's caregiver can feed your baby while you are away. ➤ Express breast milk while you are away from your baby. This will keep the milk flowing & prevent breast swelling. ➤ Teach your baby's caregiver how to use a clean open cup to feed your baby while you are away. <p>CC 14: What to do when separated from your baby</p>

Breastfeeding education and support intervention Manual for the peer supporters


Recommended breastfeeding practice	Possible counseling discussion points
<p>New pregnancy</p> 	<p>Note: choose two or three most relevant to mother's situation and/or add other discussion points from knowledge of area</p> <ul style="list-style-type: none"> ➤ A pregnant woman can safely breastfeed her older child, but should eat very well herself to protect her own health (she will be eating for 3: herself, the new baby, and the older child). ➤ Because she is pregnant, her breast milk will now contain small amounts of colostrum, which may cause the older child to experience diarrhoea for a few days (colostrum has a laxative effect). After a few days, the older child will no longer be affected by diarrhoea. <p>It is perfectly safe to breastfeed two babies and will not harm either baby – there will be enough milk for both.</p>
<p>Baby refuse breastfeeding</p> 	<ul style="list-style-type: none"> ➤ Usually refusal to breastfeed is the result of bad experiences, such as pressure on the head. Refusal may also result when mastitis changes the taste of the breast milk (more salty). ➤ Check baby for signs of illness that may interfere with feeding, including looking for signs of thrush in the mouth. ➤ Refer baby for treatment if ill. ➤ Let the baby have plenty of skin-to-skin contact; let baby have a good experience just cuddling mother before trying to make baby suckle; baby may not want to go near breast at first – cuddle in any position and gradually over a period of days bring nearer to the breast ➤ Let mother baby try lots of different positions ➤ Wait for the baby to be wide awake and hungry (but not crying) before offering the breast. ➤ Gently touch the baby's bottom lip with the nipple until s/he opens his/her mouth wide ➤ Do not force baby to breastfeed and do not try to force mouth open or pull the baby's chin down – this makes the baby refuse more. ➤ Do not hold baby's head ➤ Express & feed baby by cup until baby is willing to suckle ➤ Express directly into baby's mouth <p>Avoid giving the baby bottles with teats or dummies</p>
<p>Crying baby</p>	<ul style="list-style-type: none"> ➤ Help mother to try to figure out the cause of baby's crying and listen to her feelings: <ul style="list-style-type: none"> ○ Discomfort: hot, cold, dirty ○ Tiredness: too many visitors ○ Illness or pain: changed pattern of crying ○ Hunger: not getting enough breast milk; growth spurt ○ Mother's foods: can be a certain food; sometimes cow's milk ○ Mother's drugs, ○ Colic

Breastfeeding education and support intervention Manual for the peer supporters

Participant Materials 2: Common Breastfeeding Problems

Breastfeeding Difficulty	Prevention	What to do
<p>Breast Engorgement</p>  <p>Symptoms:</p> <ul style="list-style-type: none"> ▪ Occurs on both breasts ▪ Swelling ▪ Tenderness ▪ Warmth ▪ Slight redness ▪ Pain ▪ Skin shiny, tight and nipple flattened and difficult to attach ▪ Pain often occur on 3rd to 5th day after birth (when milk production increases dramatically and suckling not established) 	<ul style="list-style-type: none"> ▪ Keep mother and baby together after birth ▪ Put baby skin-to-skin with mother ▪ Start breastfeeding within an hour of birth ▪ Good attachment ▪ Breastfeed frequently on demand (as often and as long as baby wants) day and night: 8 to 12 times per 24 hours <p>Note: on the first day or two baby may only feed 2 to 3 times</p>	<ul style="list-style-type: none"> ▪ Improve attachment ▪ Breastfeed more frequently ▪ Gently stroke breasts to help stimulate milk flow ▪ Press around areola to reduce swelling, to help baby to attach ▪ Offer both breasts ▪ Express milk to relieve pressure until baby can suckle ▪ Apply cold compresses to breasts to reduce swelling ▪ Apply warm compresses to help the milk flow before breastfeeding or expressing
<p>Sore or Cracked Nipples</p>  <p>Symptoms:</p> <ul style="list-style-type: none"> ▪ Breast/nipple pain ▪ Cracks across top of nipple or around base ▪ Occasional bleeding ▪ May become infected 	<ul style="list-style-type: none"> ▪ Good attachment ▪ Do not use feeding bottles (sucking method is different than breastfeeding so can cause 'nipple confusion') ▪ Do not use soap or creams on nipples 	<ul style="list-style-type: none"> ▪ Do not stop breastfeeding ▪ Improve attachment making certain baby comes onto the breast from underneath and is held close ▪ Begin to breastfeed on the side that hurts less ▪ Change breastfeeding positions ▪ Let baby come off breast by him/herself ▪ Apply drops of breast milk to nipples ▪ Do not use soap or cream on nipples ▪ Do not wait until the breast is full to breastfeed ▪ Do not use bottles
<p>Plugged Ducts and Mastitis</p>	<ul style="list-style-type: none"> ▪ Get support from the family to perform 	<ul style="list-style-type: none"> ▪ Do not stop breastfeeding (if milk is not removed risk of abscess increases; let baby feed as often as he or she

Breastfeeding education and support intervention Manual for the peer supporters

	<p>non-infant care chores</p> <ul style="list-style-type: none"> ▪Ensure good attachment ▪Breastfeed on demand, and let infant finish/come off breast by him/herself ▪Avoid holding the breast in scissors hold ▪Avoid tight clothing 	<p>will)</p> <ul style="list-style-type: none"> ▪Apply warmth (water, hot towel) ▪Hold baby in different positions, so that the baby's tongue/chin is close to the site of the plugged duct/mastitis (the reddish area). The tongue/chin will massage the breast and release the milk from that part of the breast. ▪Ensure good attachment ▪For plugged ducts: apply gentle pressure to breast with flat of hand, rolling fingers towards nipple; then express milk or let baby feed every 2-3 hours' day and night ▪Rest (mother) ▪Drink more liquids (mother) ▪If no improvement in 24 hours, refer ▪If mastitis: express if too painful to suckle; expressed breast milk may be given to baby ▪If mastitis, seek treatment ▪If there is pus, discard by expressing and continue breastfeeding
<p>Symptoms of Plugged Ducts:</p> <ul style="list-style-type: none"> ▪Lump, tender, localized redness, feels well, no fever <p>Symptoms of Mastitis:</p> <ul style="list-style-type: none"> ▪Hard swelling ▪Severe pain ▪Redness in one area ▪Generally not feeling well ▪Fever ▪Sometimes a baby refuses to feed as milk tastes more salty 		

Breastfeeding education and support intervention Manual for the peer supporters

Participant Materials 3: “Not enough” Breast Milk

“Not enough” breast milk	Prevention	What to do
<p>Perceived by mother</p> <ul style="list-style-type: none"> ▪Mother “thinks” she does not have enough milk ▪(Baby restless or unsatisfied) <p>First decide if the baby is getting enough breast milk or not (weight, urine and stool output)</p>	<ul style="list-style-type: none"> ▪Put baby skin-to-skin with mother ▪Start breast feeding within an hour of birth ▪Stay with baby ▪Ensure good attachment ▪Encourage frequent demand feeding ▪Let baby release first breast first ▪Breastfeed exclusively day and night ▪Avoid bottles ▪Encourage use of suitable family planning methods 	<ul style="list-style-type: none"> ▪Listen to mother’s concerns and why she thinks she does not have enough milk ▪Decide if there is a clear cause of the difficulty (poor breastfeeding pattern, mother’s mental condition, baby or mother ill) ▪Check baby’s weight and urine and stool output (if poor weight gain, refer) ▪Build mother’s confidence – reassure her that she can produce enough milk ▪Explain what the difficulty may be – growth spurts (around 3 weeks, 6 weeks, 3 months) or cluster feeds ▪Explain the importance of removing plenty of breast milk from the breast ▪Check and improve attachment ▪Suggest stopping any supplements for baby – no water, formulas, tea, or liquids ▪Avoid separation from baby and care of baby by others (express breast milk when away from baby) ▪Suggest improvements to feeding pattern. Feed baby frequently on demand, day and night. ▪Let the baby come off the breast by him/herself ▪Ensure mother gets enough to eat and drink ▪The breasts make as much milk as the baby takes – if he or she takes more, the breasts make more (the breast is like a ‘factory’ – the more demand for milk, the more supply) ▪Take local drink or food that helps mother to ‘make milk’ ▪Ensure that the mother and baby are skin-to-skin as much as possible.
<p>Real “not enough” breast milk</p> <ul style="list-style-type: none"> ▪Baby is not gaining weight: trend line on growth chart for infant less than 6 months is flat or slopes downward ▪For infants after day 4 up to 6 weeks: at least 6 wets and 3 to 4 stools/day 	<ul style="list-style-type: none"> ▪Same as above 	<ul style="list-style-type: none"> ▪Same as above ▪If no improvement in weight gain after 1 week, refer mother and baby to nearest health post

Breastfeeding education and support intervention

Manual for the peer supporters

Participant materials 4: Counseling skills

Listening and learning skills

1. Using non-verbal communication
 - Keep your head level
 - Pay attention
 - Remove barriers
 - Take time
 - Touch appropriately
2. Ask open questions.
 3. Use responses and gestures that show interest.
 4. Reflect back what the mother says.
 5. Empathize: show that you understand how she feels.
 6. Avoid words that sound judging.

Building confidence and giving support skills

1. Accept what a mother/father/caregiver thinks and feels (to establish confidence, let the mother/father/caregiver talk through her/his concerns before correcting information).
2. Recognize and praise what a mother/father/caregiver and baby are doing correctly.
3. Give practical help.
4. Give a little, relevant information.
5. Use simple language.
6. Use appropriate counseling card or cards.
7. Make one or two suggestions, not commands.

Breastfeeding education and support intervention Manual for the peer supporters

Participant materials 5: Breastfeed observation job aid

THE BREASTFEED OBSERVATION JOB AID

Mother's name _____ Date _____

Baby's name _____ Baby's age _____

Signs that breastfeeding is going well:

Signs of possible difficulty:

GENERAL

Mother:

- Mother looks healthy
- Mother relaxed and comfortable
- Signs of bonding between mother and baby

Mother:

- Mother looks ill or depressed
- Mother looks tense and uncomfortable
- No mother/baby eye contact

Baby:

- Baby calm and relaxed
- Baby reaches or roots for breast if hungry

Baby:

- Baby is restless or crying
- Baby does not reach or root

BREASTS

- Breasts look healthy
- No pain or discomfort
- Breast well supported with fingers

- Breasts look red, swollen, or sore
- Breast or nipple painful
- Breast held with fingers on areola away from nipple

BABY'S POSITION

- Baby's head and body in line
- Baby held close to mother's body
- Baby's whole body supported
- Baby approaches breast, nose to nipple

- Baby's neck and head twisted to feed
- Baby not held close
- Baby supported by head and neck only
- Baby approaches breast, lower lip/chin to nipple.

BABY'S ATTACHMENT

- More areola seen above baby's top lip
- Baby's mouth open wide
- Lower lip turned outwards
- Baby's chin touches breast

- More areola seen below bottom lip
- Baby's mouth not open wide
- Lips pointing forward or turned in
- Baby's chin not touching breast

SUCKLING

- Slow, deep sucks with pauses
- Cheeks round when suckling
- Baby releases breast when finished
- Mother notices signs of oxytocin reflex

- Rapid shallow sucks
- Cheeks pulled in when suckling
- Mother takes baby off the breast
- No signs of oxytocin reflex noticed

Ask the other participants to start observing the 'mothers and babies'. (Do not let this role-play last more than 2 minutes). As they are observing ask what they have observed from the first two sections of the BREASTFEED OBSERVATION JOB AID.

Breastfeeding education and support intervention

Manual for the peer supporters

Participant material 6: Schedule for breastfeeding education and support

When/time	Point of discussion
During pregnancy Month 8 and 9	<ul style="list-style-type: none"> ➤ Look at the breast (whether the nipple is inverted) ➤ Discuss the importance of skin-to-skin contact ➤ Starting breastfeeding within one hour of delivery (giving colostrum) ➤ Breastfeeding during the first few days ➤ Exclusive breastfeeding for 6 months (do not give even water) ➤ Breastfeeding the baby on demand 8-12 times day and night ➤ The mother should eat extra food and take extra fluids ➤ Hygiene
After delivery Day 1	<ul style="list-style-type: none"> ➤ Establish skin-to-skin contact between the baby and mother ➤ About positioning and attachment ➤ Starting breastfeeding within one hour of delivery (giving colostrum, do not give water and other fluids) ➤ Breastfeeding during the first few days
After delivery Day 2/3 and 6/7	<ul style="list-style-type: none"> ➤ About positioning and attachment ➤ Breastfeeding during the first few days ➤ Exclusive breastfeeding for 6 months (do not give even water) ➤ Breastfeeding the baby on demand 8-12 times day and night ➤ Make sure that the mother can express breast milk ➤ Prevention of breastfeeding problems (engorgement and crack) ➤ Hygiene
Month 1	<ul style="list-style-type: none"> ➤ About positioning and attachment ➤ Exclusive breastfeeding for 6 months (do not give even water) ➤ Breastfeeding the baby on demand 8-12 times day and night ➤ Prevention of breastfeeding problems (engorgement and crack) ➤ Increasing production of breast milk ➤ Hygiene ➤ Family planning
Month 2	<ul style="list-style-type: none"> ➤ About positioning and attachment ➤ Exclusive breastfeeding for 6 months (do not give even water)

Breastfeeding education and support intervention Manual for the peer supporters

	<ul style="list-style-type: none"> ➤ Breastfeeding the baby on demand 8-12 times day and night ➤ Prevention of breastfeeding problems (engorgement and cracked nipple) ➤ Increasing production of breast milk ➤ Continue breastfeeding when baby/mother is sick ➤ Hygiene ➤ Family planning
Month 3	<ul style="list-style-type: none"> ➤ Exclusive breastfeeding for 6 months (do not give even water) ➤ Breastfeeding the baby on demand 8-12 times day and night ➤ Continue breastfeeding when baby/mother is sick ➤ If the mother has job, show her how to express breast milk ➤ Hygiene ➤ Family planning
Month 4	<ul style="list-style-type: none"> ➤ Exclusive breastfeeding for 6 months (do not give even water) ➤ Breastfeeding the baby on demand 8-12 times day and night ➤ Continue breastfeeding when baby/mother is sick ➤ If the mother has job, show her how to express breast milk ➤ Hygiene ➤ Family planning
Month 5	<ul style="list-style-type: none"> ➤ Exclusive breastfeeding for 6 months (do not give even water) ➤ Breastfeeding the baby on demand 8-12 times day and night ➤ Continue breastfeeding when baby/mother is sick ➤ If the mother has job, show her how to express breast milk ➤ Hygiene ➤ Family planning

Breastfeeding education and support intervention Training schedule

Day 1	Day 2	Day 3	Day 4	Day 5
Welcome and introductions Session 1: (60 min) Introduction, expectations, and Objectives Session 2: (60 min) Why breastfeeding matters	DAILY REVIEW			
	Session 7: (120 min) How to counsel: Listening and Learning	Session 10: (120 min) Role play or practice with mothers, listening and learning, assessing a breastfeed, giving support and positioning the baby	Session 15: (120 min) Clinical practice: Taking a breastfeeding assessment	Session 18: (180 min) Continued Clinical practice
T E A B R E A K				
Session 3: (90 min) Recommended breastfeeding practices and breastfeeding beliefs Session 4: (60 min) Assessing a breastfeed	Session 7: Continued: Listening and Learning	Session 11: (60 min) Role play continued	Session 15: (120 min) -Common breastfeeding difficulties	Session 19: (120 min) Continued Clinical practice
LUNCH				
Session 5: (60 min) Counseling a mother on how to breastfeed her infant	Session 8: (120 min) Building confidence and giving support	Session 12: (60 min) Role play continued Session 13: (60 min) Role play continued	Session 16: (60 min) Care for the woman during Pregnancy and lactation	Session 20: Continued Clinical practice
T E A B R E A K				
Session 6: VIDEOS	Session 9: Continued: Building confidence and giving support	Session 14: (60 min) Role play continued	Session 17: (60 min) Feeding and care of the sick infant	Session 21: (90 min) Continued Clinical practice



Published
protocol

STUDY PROTOCOL

Open Access



Effect of breastfeeding education and support intervention (BFESI) versus routine care on timely initiation and exclusive breastfeeding in Southwest Ethiopia: study protocol for a cluster randomized controlled trial

Misra Abdulahi^{1,2*} , Atle Fretheim^{2,3} and Jeanette H. Magnus^{4,5}

Abstract

Background: Infant mortality rates are still high in Ethiopia. Breastfeeding is regarded as the simplest and least expensive strategy for reduction of infant mortality rates. Community-based educational and support interventions provided prenatally and postnatally are effective in increasing breastfeeding rates. However, such interventions are not widely implemented in Ethiopia. This study aims to assess the effect of breastfeeding education and support on timely initiation and duration of exclusive breastfeeding.

Methods: A cluster-randomized controlled trial at the community level will be conducted to compare the effect of breastfeeding education and support versus routine care. The intervention will be provided by Women Development Army leaders who are already in the country's health system using a 40-h WHO breastfeeding counseling course, "Infant and Young Child Feeding Counseling: an integrated course" and the "Training of Trainers Manual for Counseling on Maternal, Infant and Young Child Nutrition" in the local language. Culturally appropriate operational packages of information will be developed for them. Using preset criteria at least 432 pregnant women in their third trimester will be recruited from 36 zones. Visits in the intervention arm include two prenatal visits and 8 postnatal visits. Supervisory visits will be conducted monthly to each intervention zone. Data will be entered into Epi-data version 3.1 and analyzed using STATA version 13.0. All analysis will be done by intention to treat analysis. We will fit mixed-effects linear regression models for the continuous outcomes and mixed-effects linear probability models for the binary outcomes with study zone as random intercept to estimate study arm difference (intervention vs. routine education) adjusted for baseline value of the outcome and additional relevant covariates. The protocol was developed in collaboration with the Jimma Zone and Mana district Health office. Ethical clearance was obtained from the Institutional Review Board of University of Oslo and Jimma University. This study is partly funded by NORAD's NORHED programme.

(Continued on next page)

* Correspondence: misra_ab@yahoo.com

¹Department of Population and Family Health, Jimma University, Jimma, Ethiopia

²Department of Community Medicine and Global Health, University of Oslo, Oslo, Norway

Full list of author information is available at the end of the article



(Continued from previous page)

Discussion: We expect that the trial will generate findings that can inform breastfeeding policies and practices in Ethiopia.

Trial registration: [ClinicalTrials.gov NCT 03030651](https://clinicaltrials.gov/ct2/show/study/NCT03030651) January 25, 2017 version 3 dated 16 July 2018.

Keywords: Exclusive breastfeeding, Peer education, Community-based intervention, Peer support, Early initiation of breastfeeding

Background

Breastfeeding is a unique way of providing ideal food for the healthy growth and development of infants [1]. Breastfeeding is known to have a beneficial effects in enhancing infants' immunity, protecting against gastrointestinal and respiratory infections, reducing maternal hemorrhage, as well as the risk of breast and ovarian cancer [2–6]. Breastfeeding is associated with reduced risk of chronic diseases such as diabetes mellitus type 2 [7] and obesity [8–12].

Despite the above benefits to breastfeeding, its prevalence and duration in many countries is below the international recommendation of exclusive breastfeeding (EBF) for the first six months of life. For instance, the proportion of infants less than six months who are exclusively breastfed are 36% globally, 39% in developing countries and 31% in Sub Saharan Africa [13]. A recent systematic review has revealed that risk of all-cause and infection-related mortality was higher in predominantly, partially and non-breastfed infants compared to exclusively breastfed infants aged 0–5 months [14]. Another aspect is timely initiation of breastfeeding within one hour after delivery [15]; early initiation of breastfeeding averages about 43% globally [16]. According to the 2016 Ethiopian Demographic and Health Survey (EDHS) report, only 73% of mothers initiated timely breastfeeding and 58% of children less than 6 months old were exclusively breastfed [17]. Moreover, in addition to breast milk, 17% of infants 0–5 months consumed plain water, 5% each consumed non-milk liquids or other milk whereas 11% consumed complementary foods – practices contrary to WHO's recommendation of EBF. Additionally, 5% of infants under age 6 months are not breastfed at all. The percentage of EBF decrease sharply with age from 74% of infants age 0–1 month to 64% of age 2–3 months and, further, to 36% of infants age 4–5 months [17].

Interventions for breastfeeding promotion have been implemented using different strategies in various settings. At the policy level the extent of conferences, conventions and declarations demonstrate the global efforts in promoting breastfeeding. At the health facility level one of the strategies is the Baby Friendly Hospital Initiative (BFHI). This is a global strategy that promotes breastfeeding in maternity wards around the time of delivery based on the

ten steps to successful breastfeeding model [18]; Studies have established the effectiveness of the BFHI-approach in promoting optimal breastfeeding practices particularly in developed countries where the majority of women deliver in health facilities [19–22]. Nevertheless, the effectiveness of the BFHI as well as training of health workers might be limited in developing countries where the majority of deliveries occur at home.

Community-based interventions have been employed in different parts of the world during pregnancy and/or the postnatal period on an individual or group basis, through health facilities or home visiting programmes, using professional education/counselling and peer counselling/support. Most studies on the effectiveness of using peer support/counsellors have reported increased levels of early initiation of breastfeeding and EBF [20, 23–27].

A systematic review of 52 studies from 21 countries revealed that all forms of extra support including lay and professional, analyzed together showed an increase in duration of 'any breastfeeding' as well as the duration of EBF. However, the most effective support is provided in person and on a recurring basis at regular scheduled visits [28]. Among breastfeeding promotion interventions involving peer counsellors for support of EBF few studies are from sub-Saharan Africa [29–31].

In Ethiopia, a few behavior change interventions aimed at improving the Infant and Young Child Feeding practice have been conducted by the Non-governmental organizations (NGOs) projects [32–34]. The reports of these projects focus either on implementation fidelity [33], or are implementation research [32] and large scale in scope, focusing not only on breastfeeding but also on other Infant and Young Child Feeding practices [34]. Moreover, none of the interventions were provided during pregnancy as well as the postnatal period and none of the projects used control groups except a trial conducted in Hawassa city [35]. In that trial, the intervention consisted of only one prenatal educational session [35].

The aim of the planned trial is to examine the effect of breastfeeding education and support intervention on timely initiation and duration of EBF in a cluster randomized community based behavioral promotion trial.

Study objectives/hypotheses

Research Hypothesis – Breastfeeding education and support intervention is superior to usual care in improving timely initiation of breastfeeding, exclusive breastfeeding and growth.

Primary objective - To determine if breastfeeding education and support intervention is superior to usual care in improving timely initiation of breastfeeding, exclusive breastfeeding and growth.

Secondary objectives – the main secondary objectives are

- To validate the Afan Oromo version breastfeeding knowledge and attitude questionnaire.
- To assess baseline knowledge, attitude and practice of mothers on breastfeeding.
- To examine the effect of breastfeeding education and support intervention on mothers' knowledge and attitude towards breastfeeding.
- To assess the experiences of breastfeeding mothers and WDA leaders participating in the breastfeeding education and support intervention.

Methods/design

Design

A cluster randomized controlled single-blind parallel-group, two-arm, superiority trial with 1:1 allocation ratio was designed to investigate whether a breastfeeding education and support intervention provided prenatally and postnatal period increase timely initiation, exclusive breastfeeding duration and infant growth among women in Mana district, Jimma zone, Southwest Ethiopia. This study design was chosen in order to avoid contamination among treatment groups. Clusters are zones found in Mana district, Jimma (Fig. 1).

Setting

The study will be conducted in the Jimma Zone which is one of 17 administrative zones of the Oromia region, Southwest Ethiopia. Its capital Jimma is situated 352 km to the Southwest of Addis Ababa. Jimma Zone has 17 districts and one special zone. According to population projection of Ethiopia for all Regions at district level from 2014 to 2017, which is based on the 2007 national census, the zone has a total population of 3.1 million in 2016. The rural part accounts for 80.2% of the total population; Oromo is the dominant ethnic group in the area. Health services are provided through 3 hospitals, 112 health centers and 498 health posts. In the Oromia Region a total of 147,428 Health Development Army (HDA) groups and 732,259 one-to-five networks were established in 2011 [36]. The one-to-five networks are women volunteers who are empowered as a HDA to transform their society. They are trained to focus more

intensively on sparking local behavior change making regular rounds to check on neighbors and encourage practices like latrine building and setting-up separate cooking spaces. They are from “model families” and serve as living examples that the health extension workers' messages are being heard [37]. The proportion of women of child bearing age is 24% [38]. The trial will be conducted in the Mana district which is one of the 17 districts found in the Jimma zone. The district has 26 kebeles - the lowest administrative unit and each kebele is divided into three small zones (Fig. 2).

The context

Health extension program

As part of an accelerated primary health care expansion to the community the government of Ethiopia launched its health extension program (HEP), an innovative community-based strategy to deliver preventive and promotive services, and selected high impact curative interventions at community level in 2003. In addition to the construction of health posts and provision of supplies, the implementation strategy of HEP focused on building human resource by deploying two salaried female Health Extension Workers (HEWs) at health posts in each kebele (village) of the country [39]. All HEW trainees are women aged 18 and above with a minimum of 10th grade schooling. In order to increase acceptance, these HEWs are drawn from the communities in which they serve. They complete a one year training of courses and field work that is provided by Technical and Vocational Education Training Schools (TVETs), operated by the Ministry of Education. Upon completion, two HEWs are assigned to each health post which serves as the basis for the HEP [40].

HEWs promote the 16 health packages in the HEP consisting of disease prevention and control, family health, hygiene and environmental sanitation as well as health education and communication [40]. HEWs implement the health promotion program through house to house visits. The interventions include: promotion and provision of contraceptives, antenatal care including nutritional advice and micronutrient supplementation, clean delivery, basic new-born care, child nutrition (such as exclusive breastfeeding, complementary feeding, cooking nutritious meals, and vitamin A supplementation), immunization, use of mosquito bed nets, HIV prevention, sanitation, and hygiene (including support and supervision in the construction of latrines, disposal pits and healthful homes) [41]. HEWs spend 75% of their time visiting families in their homes implementing promotional and preventive interventions to create appropriate healthy behaviors and to improve knowledge and attitude toward health-seeking behaviors.

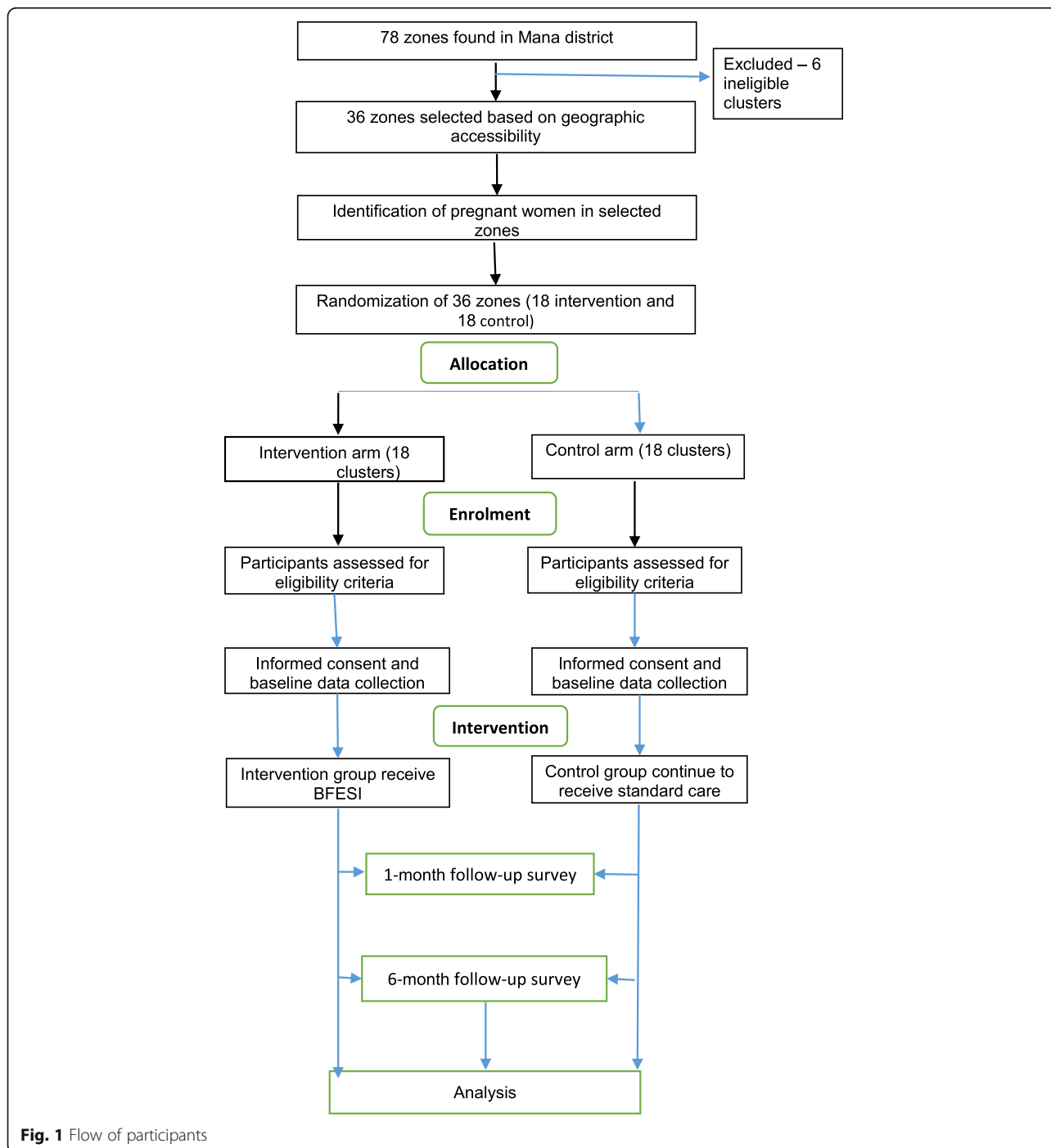
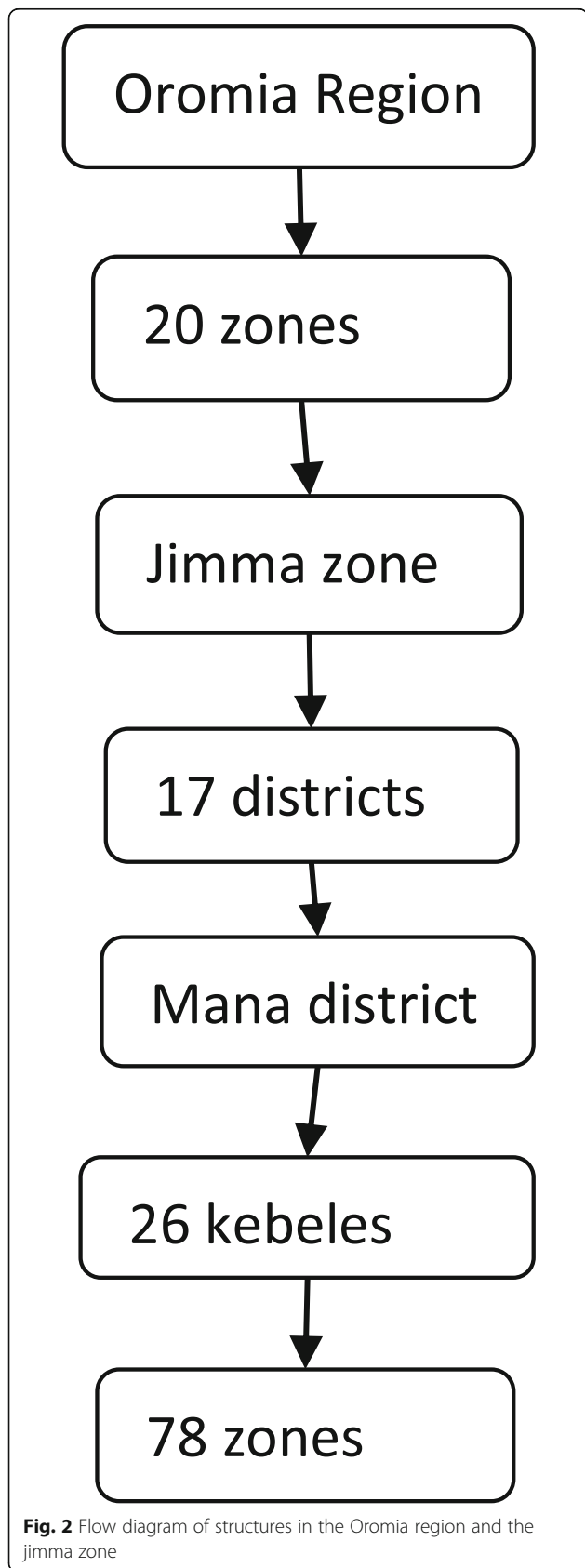


Fig. 1 Flow of participants

The remaining 25% of their time is spent providing the following services at the health post: immunization, health education, antenatal care, family planning; delivery and postnatal care, growth monitoring of children, community treatment of severe acute malnutrition, diagnosis and treatment of malaria, diagnosis and treatment of pneumonia, treatment of diarrhoea with oral rehydration fluids, treatment of eye infections with eye ointment, treatment of selected skin problems with ointments,

Vitamin A supplementation, first aid, referral of difficult cases, documentation, and reporting. The HEWs' community outreach activities include promoting model families, community groups or households [41, 42]. At least two diploma level midwives and one health officer with emergency obstetric care training support HEWs from the local health center [43].

The HEW selects "model families" in collaboration with the village administration. Model families are



households who receive 96 h of training and adopt all 16 HEP packages [41] – from vaccinating their children and sleeping under mosquito bed-nets to building separate latrines and using family planning [42]. The training involves face-to-face teaching and household visits in four modules corresponding to the four HEP subprograms: prevention of communicable diseases, family health, environmental and household sanitation, and health education. Model families are expected to disseminate their knowledge and behavior to other households in order to support the HEWs’ efforts [44].

Antenatal and postnatal care

Within their catchment area, HEWs are responsible for identifying pregnant women, providing antenatal care (ANC) and connecting them with the formal health system in the event of elevated risk or complications. They provide four focused ANC visits throughout a woman’s pregnancy using an integrated maternal and child care card. Women see the same HEW for all four home visits: first visit after 16 weeks of pregnancy, second visit between weeks 24–28, third visit between weeks 30–32 and fourth visit between weeks 36–40. The HEW conducts a general physical examination and evaluation at each visit, checking the mother and the growth of the foetus. HEWs also assess all pregnancies for the potential risks by communicating with women and their families about the danger signs of complications so that there is a shared responsibility for identification and action when needed. Furthermore, HEWs develop an individualized birth preparedness and complication readiness plan with each woman, involving the women’s partner or support whenever possible [43].

During delivery, the same HEW is able to assist by accompanying a woman to a health facility for delivery. HEWs are trained in pre-referral clinical procedures such as starting intravenous fluids and catheterization [45]. After delivery, HEWs do follow up visits during the postnatal period when care is critical for both mother and new-born. The initial postnatal care visit occurs ideally within four hours of delivery [46]. They conduct the next follow-up postnatal visits at two days, six days, and six weeks [43].

Women development Army (WDA) groups

In 2011 the government started the Health Development Army (HDA) with the aim to consolidate the gains made as a result of roll out of the HEP and promote community ownership of the programs. The program was first tested in Tigray and then introduced to the four big regions of the country. Although some regions have both male and female HDAs, HDAs are now basically women known as the women development army (WDA) [38].

WDAs are identified from the model families. As soon as the WDA groups are formed through a participatory community engagement, the WDA leaders go through an intensive 7 to 10 days training program [38], whose primary task is to educate and mobilize communities to use available high impact maternal, neonatal and child health (MNCH) services provided by the health post and health centres [42]. In a kebele of 1000 households, averages of 150 leaders go through the training program that is supported by the local PHC unit and the woreda (district) health office. In an average kebele, there are approximately 30 WDA team leaders and 200 WDA network leaders [38].

Each WDA group consists of 25–30 households (women) which are further organized into the “1 to 5” network of women where a model woman leads five other women within her neighbourhood [47]. Designed to empower women in particular and the family in general in health decision making leading to democratization of health and to community partnership, the one-to-five network functions as a forum for exchange of concerns, priorities, problems and decisions related to the health status of women. While being supported by the HEWs the networks are responsible for the preparation of plans and ensuring their completion, for the collection of health information, and also for conducting weekly meeting to review progress and submitting monthly reports [41]. The WDA groups thus support the implementation of the HEP (Fig. 3).

The one-to-five networks meet every week, while the larger health development team meets once every two weeks. Furthermore, they review their performance against their plan and evaluate each other on monthly

basis and give grades A, B, and C for top, middle and poor performers, respectively. A performance report including the grades is organized at the health development team level and sent to the HEWs [38].

Eligibility criteria for clusters and WDA leaders

Out of 78 zones found in Mana district, 36 clusters that are not adjacent to each other and have geographical accessibility will be selected randomly for the study - 18 intervention and 18 controls.

Women development army leaders, one from each selected zone, who are influential members of their community will be selected by maternal health focal person at Mana district health office.

Eligibility criteria for participants

Participants for this trial will be healthy pregnant women in their third trimester. We will recruit them using a 2-stage screening process. An initial screening will take place while women are pregnant; the second screening will take place after delivery to ascertain whether both mother and infant are qualified for inclusion. Inclusion criteria during pregnancy will be pregnant women in the third trimester, living in the selected cluster with no plans to move away during the intervention period, without psychiatric illness, capable of giving informed consent and willing to be visited by supervisors and data collectors. Inclusion criteria after delivery will be a singleton live birth with no severe malformation that could interfere with breastfeeding. Exclusion criteria will be maternal death, women with severe psychological illness which could interfere with consent and study participation, severely ill or clinical complications warranting hospitalization,

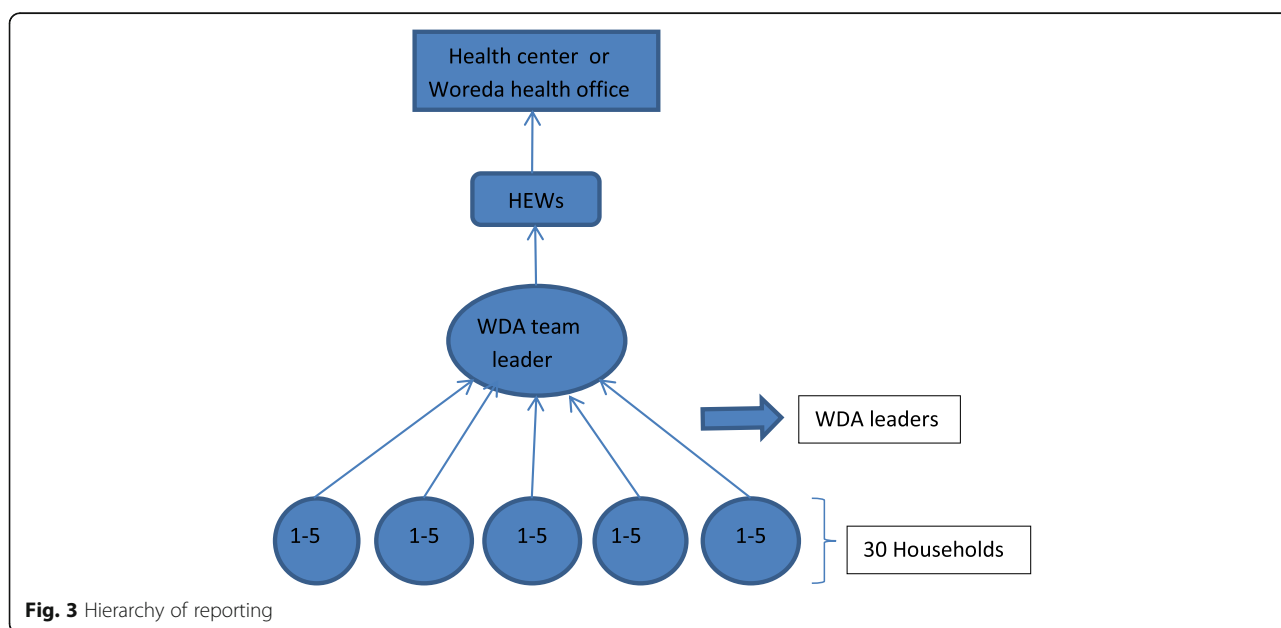


Fig. 3 Hierarchy of reporting

stillbirth, infant death, twin gestation, or preterm birth (at < 37 weeks gestation).

Sample size determination

Sample size was calculated using Sample Size Calculator (SSC) a Windows based software package [48] with the following assumptions: to detect an increase in exclusive breastfeeding for 6 months from 58 to 78% [17], with 95% CIs and 80% power, assuming an intra-cluster correlation coefficient of 0.1 equal to the Ugandan study [49] for a cluster size of 10, it was calculated that we will need 36 clusters. Adding 20% of the sample size for loss to follow-up, the final sample size is 432 pregnant women (216 in intervention, and 216 in control groups).

Sampling and randomization procedures

Zones in kebeles will form the unit of randomization for the trial, while mothers within the zones will form units of observation. From the 17 districts in Jimma zone, one district will be selected purposively after excluding districts with similar ongoing intervention or project. After identifying and listing the 78 zones found in the selected woreda, 36 non adjacent zones will be selected. Then eligible pregnant women will be identified from the selected zones using Health Extension Worker's logbook before the zones are randomized into either treatment group. A simple randomization with a 1:1 allocation will be used to randomize zones to either control or intervention group. First, the 36 zones will be listed alphabetically and then a list of random numbers will be generated in MS Excel 2010 and the generated values will be fixed by copying them as "values" next to the alphabetic list of the zones. These will then be arranged in ascending order according to the generated random number. Finally, the first 18 zones will be selected as intervention clusters and the last 18 as control clusters.

A statistician that is blinded to study groups and not participating in the research will do the generation of the allocation sequence and the randomization of clusters. Allocation Concealment will not be done for study participants, as they will certainly know if they were in the intervention group or not. Data collectors will be masked to the zone allocation by not informing them of the allocation, not making them part of trial implementers and not being residents in any of the zones.

Recruitment

Before cluster randomization, all pregnant women in the randomized zones will be identified by reviewing Health Extension Worker's logbook. However, recruitment will be started after clusters have been randomized. During recruitment, WDA leaders will additionally be used to identify pregnant women in their 1–5 network to minimize the chance of missing any pregnant women in

each cluster zone. Identified pregnant women will be invited to a meeting at the health post where the nature and purpose of the trial and eligibility criteria will be explained.

Informed consent will be obtained from each woman prior to their inclusion in the trial. Verbal consent will be obtained to ensure approval by the woman that she could be visited by WDA leaders for the intervention. Then the written consent will be obtained from all women who will be enrolled into the study. The data collectors will explain all trial procedures from inclusion criteria to the last follow-up using an information sheet. The women will be allowed to ask questions and relevant information will be provided accordingly. The data collectors will be trained using simulation situations. Women who are willing to consent will either sign or put their finger-prints according to their literacy status. If a woman declines, a form will be filled and she will be thanked. All women in the intervention clusters will receive the breastfeeding education and support if they wish to do so, whether they participate in data collection or not. To retain study participants with complete follow up there will be repeated visits. Unless a clear reason for non-participation at a scheduled visit is given, three attempts to visit the mother-infant pair will be made before a visit is considered as missed. A recruited mother will be revisited until the last scheduled visit, irrespective of the number of missed visits, unless there is a clear reason for termination. Regardless of decision to discontinue their assigned intervention, study participants will be retained in the trial whenever possible to enable follow up data collection and prevent missing data. All pregnant women in the randomized clusters will be identified and approached in order to minimize selection bias. Participants are enrolled from May to August 2017.

The assigned study intervention may need to be discontinued for a given trial participant if there is withdrawal of participant consent. As part of the need for intervention modification, additional visits will be arranged for both educational and practical support intervention for study participants whenever there is missed visit. Strategies to improve and monitor adherence include repeated breastfeeding education and support intervention as well as repeated outcome measurement whenever there is missed visit. There can be a possibility of exclusive breastfeeding information through mass media that participants may not be prohibited to follow.

Training of supervisors and women development Army leaders

Although WDA leaders are acknowledged from a model family, they need to extend their knowledge and skills through appropriate training and support to become effective peer counsellors/support. Therefore, the 18 WDA

leaders from the selected intervention clusters will be trained as peer supporters together with the supervisors for five days at Mana District Health Office using the WHO/UNICEF “Breastfeeding Counselling Course”, “Infant and Young Child Feeding Counseling: an integrated course” and the “Training of Trainers Manual for Counseling on Maternal, Infant and Young Child Nutrition” [50–52]. A trainer’s and participants’ manuals will be developed based on the above three training materials. Both the trainer’s and participants’ manuals will be translated to local language (Afan Oromo) by language expert and a health professional who is nutritionist will review the translation. Accordingly adjustment will be made to the manual considering the local culture. As some WDA leaders may have writing and reading skills in Amharic (national language), this will be identified ahead of time and a participant’s manual will be prepared in Amharic. During the training, methods proposed in the above manuals will be used. The training has three parts: classroom sessions for providing theoretical aspects of breastfeeding, counselling and communication; practical sessions on counselling skills (listening and learning skills, confidence and support skills) and supervised fieldwork with pregnant and lactating mothers. The following teaching methods will be used during the training: lectures, demonstrations, clinical practice, and work in smaller groups with discussion and role-plays.

Classroom sessions

Classroom sessions will include lectures and interactive discussions on the benefits of breastfeeding, benefits of timely initiation of breastfeeding, disadvantages of prelacteal feeds and bottle-feeding, benefits of exclusive and frequent breastfeeding, how breastfeeding works (anatomy and physiology of breast), positioning and latching on, assessing a breastfeed, counselling (listening, learning, building confidence and giving support), identification and management of breast problems, refusal of breastfeed, taking a breastfeeding history, breast examination, expressing breast milk, identification and management of breastfeeding problems, importance of the mother’s diet during pregnancy and lactation and use of lactational amenorrhea method (LAM) and other family planning options. During the classroom sessions, the cultural norms of the community will be explored not to violate their cultural practice. Once the cultural norms are identified, the training will be given keeping the essence of the intervention by respecting their norm. Moreover, for those trainees who choose a working local language other than Afan Oromo, their concern will be taken into account. Trainers will also make sure that WDA leaders understand the

lectures using both Amharic and Afan Oromo language if need arise.

Practical sessions

WDA leaders will be taught about different skills through demonstrations and role plays. The skills will include: listening to mothers and learning about their problems, assessing position and latching of babies during a breastfeed, building mothers’ confidence and giving support, identification and management of breast problems, taking a breastfeeding history, breast examination, expressing breast milk, identification and management of breastfeeding problems and providing relevant information and practical help when required. During the demonstrations and role plays, the trainers will make sure that WDA leaders respect the cultural norms of the community and use a language the women understand.

Field work

Ten pregnant mothers and another ten women with recent deliveries will be “enrolled” for the practice and counselling. During this visit, 4 to 5 WDA leaders will form one group to avoid overcrowding a room with a new-born. Counselling will be provided by one of the WDA leaders whereas others will observe and complement as needed. The supervisor will interfere only if the counselling is incomplete. During the field work, trainers will ensure that WDA leaders respect the cultural norms of the community and use a language the women understand.

The intervention description

Control group For this trial a standard/usual care is chosen as a comparator for the breastfeeding education and support intervention as per the World Medical Association (WMA) of Helsinki declaration. Women in the control group will receive the routine health and nutrition education during prenatal and postnatal period that is currently offered to mothers by HEWs and WDA leaders working in their cluster.

The standard/routine prenatal and postnatal care by HEWs and WDA leaders in Ethiopia include: WDA leaders educate and mobilize communities to use available high impact maternal, neonatal and child health (MNCH) services provided by the health post and health centres, whereas HEWs provide four focused ANC visits, develop an individualized birth preparedness and complication readiness plan with each woman, accompany a woman to a health facility during delivery and conduct 4 postnatal visits.

Intervention group Women in the intervention group will receive an enhanced breastfeeding education and

support intervention from third trimester during pregnancy till 5 months post-delivery. The intervention is composed of the following elements: a) prenatal breastfeeding education to raise knowledge and awareness where benefits of breastfeeding will be emphasized, b) postnatal breastfeeding counselling and support.

After being trained, WDA leaders will provide breastfeeding education and support through a house to house visit before and after delivery. Besides the routine information and education HEWs and WDA leaders provide to the women, each visit will be designated to cover specific topics related to the outcomes of the study.

Education and support by peer-supporters during pregnancy WDA leaders will function as peers for mothers in their clusters. During each visit WDA leaders will, in addition to a specific topic from the health package, cover in detail the importance of timely initiation of breastfeeding and EBF, feeding colostrum first, and discouraging prelacteal and postlacteal foods and encourage the mother to deliver at the nearby health center. The discussion will be combined with use of educational materials and practical demonstrations on proper breastfeeding positioning and attachment. Mothers will be encouraged to ask any question related to topics discussed.

WDA leaders will use language and culturally appropriate visual educational materials in the form of flip charts to illustrate the new information (e.g., correct and incorrect breastfeeding positions, correct and incorrect breastfeeding latching on, examples of how the father/significant others can support the mother with breastfeeding), and the benefits of applying this new information to practice (e.g., pictures of babies who were breastfed versus those who were not).

Visits after delivery During the first two weeks after delivery, WDA leaders will visit the mothers in their group on days 1 or 2, 6 or 7 and 15th day and encourage them to breastfeed frequently and on demand and to stop prelacteals and postlacteals if these have been given. During each visit, mothers will be observed positioning, latching on, and feeding the new-born, with appropriate feedback provided, solving any BF problems, emphasize nutrition for sufficient breast milk to breastfeed successfully and hands-on guidance only when necessary. They will support and encourage the mothers to continue exclusive breastfeeding for 6 months. WDA leaders will also promote personal cleanliness and domestic hygiene, and hand washing before feeding, after going to the toilet, and after changing babies' diapers.

Monthly visits Starting from the 1st month of delivery, the mothers will be visited monthly for the first five months postpartum. During these visits mothers will be

observed positioning, latching on, and feeding the new-born, with appropriate feedback provided, emphasizing techniques for preparing for work and management of breast milk (breast milk expression, storing breast milk), encouraging the mothers to continue exclusive breastfeeding for 6 months, discuss lactational amenorrhea method (LAM) and other family planning options, providing hands-on guidance only when necessary. WDA leaders will also stress personal cleanliness and domestic hygiene, and hand washing before feeding, after going to the toilet, and after changing babies' diapers.

Additional visits and referral If a baby or mother becomes sick, family members will inform the WDA leader and the WDA leader will inform the situation to the HEWs. Then the HEW will make a visit to that household to identify the problem and provide the necessary care. If there is an urgency or if the situation do not improve within 2 days, she will make referral to the next level.

Supervisors Two persons who are currently involved in the supervision of the HEWs and participated in the WHO training with the WDA leaders will serve as supervisors. The breastfeeding supervisors' main responsibility will be to provide supportive supervision and monitor the WDA leaders. Supervisory visits will be conducted by the researcher along with supervisors monthly. WDA leaders will receive feedback on their work from the supervisors during monthly supervision meetings.

Outcome assessment Primary outcomes of the trial include timely initiation of breastfeeding, exclusive breastfeeding at 6 month and infant growth.

Timely breastfeeding initiation is measured as the proportion of women who initiated breastfeeding her baby within the first hour after delivery.

Exclusive breastfeeding at 6 month is measured as the proportion of women who provided their infants with only breast milk but no solids, nonhuman milk, water, or other liquids (other than vitamins or medications) at six months.

Infant growth - WHO Child Growth Standards (2006) will be used to estimate anthropometric status at 6 month [53]: weight-for length z-scores (WLZ), length-for-age z-scores (LAZ) and weight-for-age z-scores (WAZ). Children who have WLZ below -2 (WLZ < -2) will be considered wasted, those with LAZ below -2 (LAZ < -2) stunted, and those with WAZ below -2 (WAZ < -2) underweight.

Secondary outcomes are validation of the Afan Oromo version breastfeeding knowledge and attitude questionnaire, baseline knowledge, attitude and practice

of mothers on breastfeeding, change in mothers' knowledge and attitude towards breastfeeding at baseline and study completion, mothers' and WDA leaders' experiences of the intervention at study completion.

Outcomes will be assessed as illustrated in the Standard Protocol Items: Recommendations for interventional trials (SPIRIT) (Table 1).

Data collection tools and techniques Ten data collectors will be recruited and trained for 2 days. A structured questionnaire prepared in Afan Oromo will be used to collect data. Components in the questionnaire will be prepared by adapting tools validated for use in similar contexts. Data will be collected at baseline, 1st month and 6th month. Data collection interviews will be made 1–3 days before counselling visits. Data on socio-economic and demographic variables, maternal and pregnancy factors, and previous infant feeding experience will be collected at baseline. Information on delivery, about early initiation, whether colostrum was

discarded, use of prelacteals, and reasons for delaying or not initiating breastfeeding will be obtained one month after birth. Data on knowledge and attitude will be collected at baseline and at study completion. Anthropometric measurements (length, weight and mid upper arm circumference (MUAC)) will be done at 6 month. Length will be measured using length board at a precision of 0.1 cm. Infant's weight will be measured to the nearest 1.0 g using UNICEF SECA weighing scales with light clothing. MUAC will be measured to the nearest 0.1 cm on the left arm using non-stretchable MUAC tape. Length and MUAC measurements will be done in duplicate. The measurement procedures will follow standard WHO guidelines [54]. All data collectors will be trained on content, questionnaire techniques and measurements and will be kept uninformed about cluster allocation. Reproducibility and validity exercises will be conducted for the weight and length measurements. Mothers' and WDA leaders' experience about the intervention will be assessed qualitatively at study completion. To obtain feedback on

Table 1 Standard Protocol Items: Recommendations for Interventional Trials (SPIRIT)

Outcomes	Allocation	Study period			
		Enrollment		Close-out	
		-t ₁	Baseline (t ₀)	Intervention (8 months)	Midline at month 1 after delivery (t ₁)
Enrollment					
Allocation	x				
Eligibility screen		x			
Informed consent		x			
Interventions					
BFES Intervention			x		
Control group			x		
Assessments					
Background/demographics		x			
Water, Hygiene and Sanitation		x			
Household Food Insecurity Access Scale		x			
Food Taboos during Pregnancy & Lactation		x			
Mother's Health Status & Obstetric history		x			
Current pregnancy and breastfeeding		x			
Timely breastfeeding initiation				x	
Exclusive breastfeeding at 6 month					x
Infant growth					x
Validation of the Afan Oromo version breastfeeding knowledge and attitude questionnaire			x		
Baseline knowledge, attitude and practice of mothers on breastfeeding			x		
Change in mothers' knowledge and attitude towards breastfeeding at baseline and study completion			x		x
Mothers' and WDA leaders' experiences of the intervention at study completion					x

the intervention, individual semi-structured interviews will be held with intervention mothers at the end of 6 months after end-line data is collected. Additionally, focus group discussions will be carried out with WDA leaders to assess their opinions about the intervention strategy. All group discussions will be moderated by the principal investigator. Another person will take notes while the discussions are simultaneously audio-taped. Additionally, a field memo will be completed for each FGD and interview, and socio-demographic data will be collected for all participants based on a brief questionnaire (e.g., age, education, etc.). The memos will include observations about the group dynamics, information about non-verbal responses, questions that elicited hesitations or any interruptions or difficulties in running the focus groups. Breastfeeding Knowledge and Attitude (B-KA) questionnaire will be developed and adapted using the following validated instruments: the Iowa Infant Feeding Attitude Scale (IIFAS) [55] and the Breastfeeding Knowledge Questionnaire (BKQ) [56].

The Iowa infant feeding attitudes scale (IIFAS) The Iowa Infant Feeding Attitudes Scale (IIFAS) was developed in 1999 by de la Mora [55]. The scale was designed to assess maternal attitude toward infant feeding methods and to predict breastfeeding intention and exclusivity. It is composed of 17 items with a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Eight items are worded in manner favoring breastfeeding, whereas the other 9 favors bottle feeding. Items favoring bottle-feeding are reverse scored. The total IIFAS score ranges from 17 (reflecting positive attitudes toward bottle-feeding) to 85 (reflecting more positive attitudes toward breastfeeding). It has been validated in different countries such as the United States [55], Northern Ireland [57], Scotland [58], Japan [59], Romania [60] and China [61].

Breastfeeding knowledge questionnaire The questionnaire assessing breastfeeding knowledge was adapted and modified from a breastfeeding questionnaire developed by a team of pediatric nurses at the Hospital Universiti Sains Malaysia (HUSM) [58]. Items in the modified questionnaire covered the following scopes of knowledge on breastfeeding: general knowledge, colostrum, advantages to mothers and babies, effective feeding method, duration of feeding, expressed breast milk (EBM), storage of EBM, complementary feeding, and problems with breastfeeding.

Instrument translation Permission to use both instruments will be obtained from authors. A systematic process recommended by Beaton et al. [62] will be used for maintaining semantic, idiomatic, experiential and conceptual equivalence. The instruments will be forward translated to Afan Oromo by bilingual translators. Two bilingual translators who are totally blind to the original English version

will translate the instruments back to English. The back-translation is essential to establish semantic equivalence. An expert committee meeting will be held to consolidate all versions of translation to develop the pre-final version of the questionnaire for field testing.

The original and the back-translated English version of instruments will be compared to check for the accuracy of translation. A method developed by Skperber et al. [63] will be used for validating the translated instrument where each item in the original and back-translated versions will be ranked in terms of comparability of language and similarity of interpretability. Ranking will be done by raters who are fluent in English using Likert scales ranging from 1 (extremely comparable/extremely similar) to 7 (not at all comparable/not at all similar). Any mean score > 3 requires a formal review of the translation. The translated instruments will then be piloted among 30 pregnant women to assess its clarity, comprehension, length, and cultural acceptability. The questionnaires will finally be used to assess knowledge and attitude of study participants who will be enrolled into the trial at baseline and completion of the study.

Data management All filled questionnaire will be checked for completeness by supervisors and questionnaires with missing items will be returned to data collectors for correction. Participants who are lost to follow up will be recorded along with their reasons. The following standard processes will be implemented to improve the accuracy of data entry and coding: double data entry; verification that the data are in the proper format (eg, integer) or within an expected range of values; and independent source document verification of a random subset of data to identify missing or apparently erroneous values. Only the study team will have access to the trial datasets. In order to ensure confidentiality, information about each zone and personal data of participants will not be shared with any third party both during and after the trial. Additionally, all personal identifiers will be removed from database and filled questionnaires will be stored in a locked cabinet. Data will be stored in a database on a password protected computer and only accessible by the study team.

Data processing and analysis Double data entry will be performed using EpiData version 3.1 (EpiData Association) and consistency checks and statistical analysis will be done using Stata version 13.1 (StataCorp). The effect of the intervention in comparison with the routine education will be assessed by fitting mixed-effects linear regression models for the continuous outcomes and mixed-effects linear probability models for the binary outcomes using study zone as random intercept to account for clustering of subjects by zones. The use of linear probability model for binary

outcomes is well-established and allows for a straightforward interpretation of the average intervention effect expressed as risk difference using percentage points [64]. Fixed-effects in the models will include study arm (intervention vs. routine education), baseline value of the outcome when appropriate, and additional covariates that could potentially confound estimation of group difference. Potential covariates will be selected based on consideration of study arm balance at baseline and potential confounders for an outcome previously reported in the literature. Potential confounders of timely breastfeeding initiation include: place of delivery, mode of delivery [65] whereas potential confounders of EBF are mode of delivery, age, parity, educational status, previous BF experience, household income and breastfeeding intention [30, 65–68]. We will further explore effect modification of the intervention by the different covariates by adding interaction terms between study group and a covariate as fixed-effect parameter. Subgroup analysis of the intervention effect by a covariate will be considered when there is significant interaction ($P < 0.1$) between the intervention and a covariate. Moreover, mean values of anthropometric data of infants in the intervention and control groups will be compared using Student's t test and linear regression will be used. In all analyses, adjustment will be made for clustering at the zone level since randomization was done at cluster level rather than individual level.

All analyses will be performed by the intention-to-treat principle including all subjects initially enrolled into the study. For this purpose, we will conduct a multiple imputations procedure for the missing data using chained equations under the missing at random assumption. Fifty imputations of missing data will be generated to estimate the regression coefficients. All tests will be two-sided and the level of significance will be set at $\alpha < 0.05$. No interim analyses are planned and all outcomes will be analyzed after data collection is completed.

All FGDs and interview audio files and notes will be translated to English, then transcribed verbatim and analyzed thematically using Systematic Text Condensation, a descriptive and explorative analysis strategy in Atlas Ti7 software. Malterud's text condensation follows four steps: 1) total impression - from chaos to themes; 2) identifying and sorting meaning units - from themes to codes; 3) condensation - from code to meaning; 4) synthesizing - from condensation to descriptions and concepts. It is a qualitative research method particularly suited to analyze qualitative data, such as interview studies, observational studies and the analysis of written texts [69].

Data monitoring Since the risks of harm are small, the study does not have a data monitoring committee. Moreover, earlier stopping points cannot be anticipated as effectiveness will not be able to be determined until the end of the study.

Dissemination To make the trial transparent, the full protocol will be published on open access journal. However, participant-level dataset, and statistical code will not be accessed publicly for the sake of ensuring confidentiality. Any modifications that will be made to the protocol will be communicated to relevant parties such as trial registry and the ethics committee. Articles from this research project will be published in peer reviewed journals. Result of the study will be presented to Jimma zone health office. Moreover, findings will be presented at national and international conferences and workshops. Authorship eligibility guidelines and any intended use of professional Writers. ICMJE guideline for authorship will be followed.

The protocol adheres to the recommendations provided by the SPIRIT 2013 (Additional file 1). Moreover, all items from the WHO Trial Registration Data Set are available (Additional file 2).

Discussion

At the beginning, the aim was to include all pregnant women in selected clusters who are in their third trimester. However, when recruitment was started, we failed to get intended number of women in each cluster. As one of the purposes of using cluster randomized controlled trial is to prevent information contamination among study participants, we could not increase number of clusters beyond 36 and also there was a logistic constraint to expand the trial into another district. Therefore, we included women who are in their second trimester to fill our sample size; however, the intervention for these women will start when they are in their third trimester. This will inevitably prolong the intervention duration for a few months. If this intervention proves to be effective in improving the timely initiation and exclusive breastfeeding rates, it will be scaled up in other parts of Oromia region and other regions of the country.

Trial status

From the 17 districts found in Jimma zone, Mana district is selected purposely. The 36 zones selected from 78 zones found in Mana district are randomized. Trainers' and participants' manual was prepared in local language (Afan Oromo and Amharic). Training of intervention implementers (Women Development Army leaders) in the intervention arm is completed and visual teaching material, flip chart, is prepared in both Afan Oromo and Amharic language. All trial participants have been recruited from the selected clusters and baseline data are collected. Data at month one (for timely initiation of breastfeeding) has already been collected while data collection for exclusive breastfeeding and other outcomes at month 6 has started.

Additional files

Additional file 1: SPIRIT 2013 Checklist for the BFESI cRCT. (DOC 124 kb)

Additional file 2: Items from the WHO Trial Registration Data Set. (DOCX 14 kb)

Abbreviations

BF: Breastfeeding; BFHI: Baby Friendly Hospital Initiative; CI: Confidence Interval; EBF: Exclusive Breastfeeding; EDHS: Ethiopian Demographic and Health Survey; FGD: Focus Group Discussion; HDA: Health Development Army; HEWs: Health Extension Workers; UNICEF: United Nation Children's Fund; WDAs: Women Development Army; WHO: World Health Organization

Acknowledgements

The trial team wishes to acknowledge the support provided by NORAD (Norwegian Agency for Development Cooperation) under the NORHED-Programme.

Funding

The trial team wishes to acknowledge the support provided by NORAD (Norwegian Agency for Development Cooperation) under the NORHED-Programme, the Jimma Zone Health Department and the local MOH office. The study sponsor and funder do not have role in the design, its execution, collection, management, analysis and interpretation of data, writing of the report including the decision to submit results for publication. They will also not have ultimate authority over any of these activities.

Availability of data and materials

Data sharing is not applicable to this article as no datasets were generated or analyzed during the current study.

Authors' contributions

MA and JHM conceived the research idea and initiated the appropriate study design, MA, JHM and AF developed the whole study protocol. The authors critically reviewed for intellectual content and approved the protocol for trial registry on publicly accessible database. All authors contributed to refinement of the study protocol and approved the final protocol.

Ethics approval and consent to participate

Ethical clearance was obtained from the Institutional Review Board of University of Oslo (ref 2016/1726 REC South East, Section D) as well as from Jimma University (RPGC/381/2016) and the Oromia region (ORH/AH31711/1-8/2341). The purpose of the trial was explained in a formal letter and verbally to district administrative and health officials. Approval to include the selected zones in the trial will be sought from kebele authorities. After identification of all pregnant women in each cluster, they were invited to a meeting where nature and purpose of the trial was explained. Then data collectors explained the detailed procedures on the information sheet from inclusion criteria to the last follow-up. The women will be given chance to ask questions. Pregnant women, who fulfill eligibility criteria, agree to participate in the trial and agree to be visited by data collectors will be requested to sign a written informed consent. Women who are unable to read and/or write give a thumbprint. If the woman is less than 18 years old then consent will be sought from her husband or guardian. Irrespective of their participation in data collection, all women in intervention clusters will benefit from counselling sessions on EBF if they wished. During the course of the trial, women while pregnant or after giving birth and infants reporting to be ill in both study groups will be referred to health facilities.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Author details

¹Department of Population and Family Health, Jimma University, Jimma, Ethiopia. ²Department of Community Medicine and Global Health, University of Oslo, Oslo, Norway. ³Norwegian Institute of Public Health, Oslo, Norway. ⁴Faculty of Medicine, University of Oslo, Oslo, Norway. ⁵Department of Global Community Health and Behavioral Sciences, Tulane School of Public Health and Tropical Medicine, New Orleans, USA.

Received: 1 January 2018 Accepted: 5 September 2018

Published online: 26 September 2018

References

1. WHO. Global strategy for infant and young child feeding. . 2003.
2. Bhandari N, Bahl R, Mazumdar S, Martines J, Black RE, Bhan MK. Effect of community-based promotion of exclusive breastfeeding on diarrhoeal illness and growth: a cluster randomised controlled trial. *Lancet* (London, England). 2003;361(9367):1418–23.
3. Brown KHBR, Lopez de Romana G, Creed de Kanashiro H. Infant-feeding practices and their relationship with diarrheal and other diseases in Huascar (Lima), Peru. *Pediatrics*. 1989;83(1):31–40.
4. Heinig MJ, Dewey KG. Health advantages of breast feeding for infants: a critical review. *Nutr Res Rev*. 1996;9(1):89–110.
5. Popkin BM, Adair L, Akin JS, Black R, Briscoe J, Fliieger W. Breast-feeding and diarrheal morbidity. *Pediatrics*. 1990;86(6):874–82.
6. Victora CG, Fuchs SC, Flores JA, Fonseca W, Kirkwood B. Risk factors for pneumonia among children in a Brazilian metropolitan area. *Pediatrics*. 1994;93(6 Pt 1):977–85.
7. Horta BL, Bahl R, Martines J, C., & Victora, C. G. Evidence on the long-term effects of breastfeeding – Systematic reviews and meta-analyses. . 2007.
8. Arenz S, Ruckerl R, Koletzko B, von Kries R. Breast-feeding and childhood obesity – a systematic review. *Int J Obes*. 2004;28:1247–56.
9. Grummer-Strawn LM, Mei Z. Does breastfeeding protect against pediatric overweight? Analysis of longitudinal data from the Centers for Disease Control and Prevention pediatric nutrition surveillance system. *Pediatrics*. 2004;113:e81–e6.
10. Harder T, Bergmann R, Kallischnigg G, Plagemann A. Duration of breastfeeding and risk of overweight: a meta-analysis. *Am J Epidemiol*. 2005; 162:397–403.
11. Li R, Fein SB, Grummer-Strawn LM. Association of breastfeeding intensity, and bottle-emptying behaviors at early infancy with infants' risk for excess weight. at late infancy. *Pediatrics*. 2008;122((Suppl. 2)):S77–84.
12. Owen CG, Martin RM, Whincup PH, Smith GD, Cook DG. Effect of infant feeding on the risk of obesity across the life course. A quantitative review of published evidence *Pediatrics*. 2005;115:1367–77.
13. Black RE, Allen LH, Bhutta ZA, Caulfield LE, de Onis M, Ezzati M, et al. Maternal and child undernutrition: global and regional exposures and health consequences. *Lancet* (London, England). 2008;371(9608):243–60.
14. Sankar MJSB, Chowdhury R, Bhandari N, Taneja S, Martines J, Bahl R. Optimal breastfeeding practices and infant and child mortality: a systematic review and meta-analysis. *Acta Paediatr*. 2015;104:3–13.
15. WHO. Infant and Young Child feeding. Model chapter for textbooks for medical students and allied health professionals. Geneva: World Health Organization; 2009.
16. UNICEF. State of the world's children 2013: children with disabilities. New York: UNICEF; 2013.
17. ICF Ca. Ethiopia demographic and health survey: key indicators report. Ethiopia, and Rockville, Maryland, USA. CSA and ICF: Addis Ababa; 2016.
18. World Health Organization U. Implementation guidance: protection, promotion and support of breastfeeding in facilities providing maternity and newborn services - the revised Baby-friendly Hospital Initiative. In. Geneva: World Health Organization. 2018.
19. Braun ML, Giugliani ER, Soares ME, Giugliani C, de Oliveira AP, Danelon CM. Evaluation of the impact of the baby-friendly hospital initiative on rates of breastfeeding. *Am J Public Health*. 2003;93(8):1277–9.
20. Martens PJ. What do Kramer's baby-friendly hospital initiative PROBIT studies tell us? A review of a decade of research. *Journal of human lactation : official journal of International Lactation Consultant Association*. 2012;28(3):335–42.
21. Merten S, Dratva J, Ackermann-Liebrich U. Do baby-friendly hospitals influence breastfeeding duration on a national level? *Pediatrics*. 2005; 116(5):e702–8.

22. Perez-Escamilla R. Evidence based breast-feeding promotion: the baby-friendly hospital initiative. *J Nutr.* 2007;137(2):484–7.
23. Haider R, Ashworth A, Kabir I, Huttly SR. Effect of community-based peer counsellors on exclusive breastfeeding practices in Dhaka, Bangladesh: a randomised controlled trial. [see comments] *Lancet* (London, England). 2000;356(9242):1643–7.
24. Hodnett E. Efficacy of home-based peer counseling to promote exclusive breast-feeding: a randomized controlled trial. *J Pediatr.* 1999;135(5):649–50.
25. Kistin N, Abramson R, Dublin P. Effect of peer counselors on breastfeeding initiation, exclusivity, and duration among low-income urban women. *Journal of human lactation : official journal of International Lactation Consultant Association.* 1994;10(1):11–5.
26. McInnes RJ, Stone DH. The process of implementing a community-based peer breast-feeding support programme: the Glasgow experience. *Midwifery.* 2001;17(1):65–73.
27. Morrow AL, Guerrero ML, Shults J, Calva JJ, Lutter C, Bravo J, et al. Efficacy of home-based peer counselling to promote exclusive breastfeeding: a randomised controlled trial. *Lancet* (London, England). 1999;353(9160):1226–31.
28. Renfrew MJ, McCormick FM, Wade A, Quinn B, Dowswell T. Support for healthy breastfeeding mothers with healthy term babies. *The Cochrane database of systematic reviews.* 2012(5):Cd001141.
29. Tylleskar T, Jackson D, Meda N, Engebretsen IM, Chopra M, Diallo AH, et al. Exclusive breastfeeding promotion by peer counsellors in sub-Saharan Africa (PROMISE-EBF): a cluster-randomised trial. *Lancet* (London, England). 2011;378(9789):420–7.
30. Asma Misbah Qureshi OMO, Sadiq UA, Kabiru S. Using community volunteers to promote exclusive breastfeeding in Sokoto state, Nigeria. *Pan African Medical Journal.* 2011;10(8).
31. Bridget A, Aidam RPr-E, and Anna Lartey. Lactation counseling increases exclusive breast-feeding rates in Ghana. *J Nutr.* 2005;135:1691–5.
32. Barwick M, BR Z. An Examination of Exclusive Breastfeeding Implementation in Ethiopia and Mali: Factors Influencing Change. . 2015.
33. Kim SSAD, Kennedy A, Tesfaye R, Tadesse AW, Abrha TH, et al. Assessing implementation fidelity of a community-based infant and young child feeding intervention in Ethiopia identifies delivery challenges that limit reach to communities: a mixed-method process evaluation study. *BMC Public Health.* 2015;15:316.
34. vision W. Health and Nutrition. Ethiopia's community health workers. December. 2015:28.
35. Belay SHJ. Effect of prenatal education on breastfeeding initiation and exclusive breast feeding rate in selected health institutions of Hawassa city, the capital of SNNPR. Ethiopia: *East African Journal of Public Health*; January 2013.
36. Health FDRoEMo. POLICY AND PRACTICE INFORMATION FOR ACTION. *Quarterly Health Bulletin* April 2014;6(1).
37. USAID. The Female "Army" Leading Ethiopia's Health Revolution. 2012.
38. MOH F. Policy and practice information for action. . *Quarterly Health Bulletin.* April 2014;6(1).
39. FMOH. Health Extension Program in Ethiopia Profile. Federal Ministry of Health of the Federal Democratic Republic of Ethiopia. . 2007.
40. FDRE. National report on the implementation of the Beijing declaration and platform for action (1995) and the outcome of the 23rd special session of the united nations general assembly (2000).
41. Teklehaimanot HD T. Human resource development for a community-based health extension program: a case study from Ethiopia.
42. UNICEF. Survival and Health. The Health Extension Program. Media & External Relations Section.
43. KA CJ, Langer A. Health Extension Workers in Ethiopi: Delivering community-based antenatal and postnatal care. 2014.
44. USAID. Health system 20/20. Health Extension Program: An Innovative Solution to Public Health Challenges of Ethiopia A Case Study. . 2012.
45. EFMOH. Health Sector Development Programme-IV. . 2011.
46. EFMOH. Blended Learning Module for the Health Extension Programme. Postnatal Care.
47. Bilal NJHCH, Zhao F, Soucat A, Lemiere C. Health Extension Workers in Ethiopia: Improved Access and Coverage for the Rural Poor Chapter. 4:433–43.
48. Sample Size Calculator. .
49. PROMISE-EBF a multicentre community-based cluster-randomised behavioural-intervention trial in sub-Saharan Africa, webappendix.
50. USAID I. Training of trainers manual for counseling on maternal, infant, and young child nutrition. 2011.
51. WHO. Infant and young child feeding counseling an integrated course.2006.
52. WHO/UNICEF. Breastfeeding Counselling: A Training Course.
53. WHO. The WHO Child Growth Standards. 2006.
54. Physical status WHO. The use and interpretation of anthropometry. In WHO technical report series 854. Geneva. 1995:452.
55. RD DLMA. The lowa infant feeding attitude scale: analysis of reliability and validity. *J Appl Soc Psychol.* 1999;29:2362–80.
56. Ismail TAT, Sulaiman Z. Reliability and validity of a Malay-version questionnaire assessing knowledge of breastfeeding. *Malaysian J Med Sci* Jul-Sep. 2010;17(3):32–9.
57. Sittlington J, Stewart-Knox B, Wright M, Bradbury I, Scott JA. Infant-feeding attitudes of expectant mothers in Northern Ireland. *Health Educ Res.* 2007; 22(4):561–70.
58. Dungy CI, McInnes RJ, Tappin DM, Wallis AB, Oprescu F. Infant feeding attitudes and knowledge among socioeconomically disadvantaged women in Glasgow. *Matern Child Health J.* 2008;12(3):313–22.
59. NKaj M. Reliability and validity of the Japanese version of the lowa infant feeding attitude scale: a longitudinal study. *J Hum Lact.* 2014;30(3):346–52.
60. Wallis ABBA, Chereches R, Oprescu F, Irlincan ES. David I., D'irle I. A. DCI. Reliability and validity of the Romanian version of a scale to measure infant feeding attitudes and knowledge. *Acta Paediatr.* 2008;97:1194–9.
61. Ho YJMJM. A Chinese version of lowa infant feeding attitude scale: reliability and validity assessment. *Int J Nurs Stud.* 2011;48:475–8.
62. Beaton D, Bombardier C, Guillemin F, Ferraz M. B. In: Recommendations for the cross-cultural adaptation of health status measures; 2002.
63. Skperber AD, DeVellis RF, Boehlecke B. Cross-cultural translation: methodology and validation. *J Cross-Cult Psychol.* 1994;25(4):501–24.
64. JM. W. *Econometric Analysis of Cross Section and Panel Data.* Cambridge, Massachusetts, USA. . 2002.
65. HJ. BS. Effect of prenatal education on breastfeeding initiation and exclusive breast feeding rate in selected health institutions of Hawassa city, the capital of SNNPR. Ethiopia. In: *East African journal of public health*; January 2013.
66. Kronborg H, MV JO, Iversen L, Harder I. Effect of early postnatal breastfeeding support: a cluster-randomized community based trial. *Acta Paediatr.* 2007;96:1064–70.
67. Sandy JM. EA, and Erline Ramirez, . Effects of a prenatal intervention on breastfeeding initiation rates in a Latina immigrant sample. *J Hum Lact.* 2009;25(4):404–11.
68. Shahla Meedyia KF, Ashley Kable. Factors that positively influence breastfeeding duration to 6 months: a literature review. *Women and Birth* 2010;23:135–45.
69. Malterud K. Systematic text condensation: a strategy for qualitative analysis. *Scandinavian Journal of Public Health.* 2012;40(8):795–805.

Ready to submit your research? Choose BMC and benefit from:

- fast, convenient online submission
- thorough peer review by experienced researchers in your field
- rapid publication on acceptance
- support for research data, including large and complex data types
- gold Open Access which fosters wider collaboration and increased citations
- maximum visibility for your research: over 100M website views per year

At BMC, research is always in progress.

Learn more biomedcentral.com/submissions

