

Making Midwifery Matter

Introduction of a Midwife-led Continuity Model of Care in occupied Palestine

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In memory of three wonderful and wise Palestinian midwife colleagues:

Galina Abu Nahle, Asia Hamed and Maha Fatho

To all Palestinian Midwives

May the art and science of midwifery today give birth to a better future.

Prologue

I have been working with solidarity projects in occupied Palestine since 1987, when I was 23. I was living in Nablus when the Palestinian uprising against the occupation, *The First Intifada*, erupted in December of that year. Twenty years later, in the aftermath of *The Second Intifada*, I again visited Palestine. I responded to an Amnesty International report on how several Palestinian women in labour suffered the burden of the occupation by being denied access to hospital. Many had to give birth in the dusty ditches by the military checkpoints, causing fatalities and severe morbidity for mothers and babies.

I met with Palestinian midwives and midwife scholars from Palestinian universities to discuss their challenges in supporting marginalized women in the rural areas in the occupied West Bank. They described the Palestinian governmental facilities as overcrowded and understaffed, where midwives had limited autonomy and restricted scope of practice. They requested aid projects that would build on and strengthen local professionals.

At home, I worked as a midwife in Northern Norway, on a coastline where women living in rural areas feared that stormy weather, not weapons, might prevent them from reaching the hospital to give birth safely. I served a rural community once a week by providing antenatal care in the primary clinic and postnatal home visits to women who gave birth in the hospital where I worked the other weekdays. Following women through pregnancy, birth, and after birth gave me an improved ability to help, as well as important experience and knowledge. The continuity facilitated building trustful relationships, enabling a professional sensitive approach to individual intimate challenges.

Building on practical experience and existing research evidence, my Palestinian colleagues and I developed a midwife-led continuity model of care tailored to the Palestinian context. We received funding from the Norwegian Ministry of Foreign Affairs to test the model. The Norwegian government had just launched a global campaign to meet the UN millennium goals on improving maternal and child health.

Palestine Red Crescent Society Hospital in Ramallah tested the model in the hospital and seven surrounding villages between 2007 and 2012. The midwife supervisor drove each midwife to her respective clinic in the same village every week, where the midwife provided antenatal care in the morning and afterwards did home visits to women who had given birth. Each midwife worked at the hospital the remaining four weekdays.

During my master's in Practical Knowledge, I conducted a qualitative study to investigate Palestinian midwives' experiences with the model. The Palestinian midwives described how the relational continuity gave them valuable insights in individual women's challenges. They found that the model enabled them to act as childbearing women's advocates in the hostile setting of the occupation and within a fragmented health system.

The Palestinian Ministry of Health adopted the midwifery-led model in 2012, and in cooperation with the Norwegian Aid Committee (NORWAC) they facilitated implementation of the model in all Palestinian regions. The Norwegian aid policy shifted, and in 2016 the funding unfortunately stopped. By then the model was successfully implemented in six out of twelve governmental hospitals, the midwives served 37 rural villages, and the model has sustained to date. Luckily, I had received research funding from The Norwegian Research council's GLOBVAC fund and in April 2015 started my PhD project, the *Validation of a Continuity of Midwifery Care Model in Palestine*. The two first years I mainly spent in Palestine working with the implementation and organizing the data collection process for the three quantitative studies in my PhD. In September 2017 I was denied entry by the Israeli border authorities at Ben Gurion airport. This has sadly prevented me from visiting Palestine to this date. Fortunately, with good help, all data were safely transferred to Norway, enabling me to conduct the three studies, which all by now are published in well-respected, scientific journals.

My involvement gave me an advantage in understanding the context and the detailed implementation process, though, my involvement challenged my objectivity as a researcher. The choice of methods, data collection, and statistical analysis must be considered critically in this regard. Initially, I had doubt that the model's impact would be possible to measure by quantitative research, due to the model's limitations compared to midwife-led models in high income countries. I was skeptical about how quantitative methods often are used as the only way to define quality. I learned considerably during this PhD journey, and the findings gladly surprised me. My previously critical approach to quantitative research is modified and more qualified. A good mixture of quantitative and qualitative research brings important new knowledge to improve practice. My PhD thesis *Making Midwifery Matter - Introduction of a Midwife-led Continuity Model of care in occupied Palestine* was submitted to the Medical Faculty on August. 29, 2019, it was approved on December 19, and the Disputation is on March.12, 2020.

Berit Mortensen, Oslo, February 5th, 2020.

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I feel privileged and grateful to have met and learned from so many on my way to achieving this PhD. The Palestinian midwife-led model of care would never have happened if it was not for my courageous and resilient midwife colleagues in Palestine. They taught me about life and filled me with gratitude.

This PhD would never have happened if it was not for Professor Erik Fosse, my main supervisor, who strictly told me that doing this research was my obligation – such a complex intervention required thoroughly investigation and documentation. Your constant and ardent belief in my ability to manage this made me believe in miracles too. You gave me the freedom I needed and guidance when I got lost. Our continuous cooperation in solidarity projects through the years made me trust and respect you. I highly appreciate your supervision and warm support through this process, and also when life brought me unexpected challenges. You told me conducting a PhD would change me, and it did, hopefully for the better.

From the very beginning, when I wrote the proposal, my main supervisor and two co-supervisors have supported and advised me. Professor Miriam Lukasse, my only supervisor with a midwife background, has been an inspiring and caring supporter. Your quick response and thorough supervision have improved the studies and been truly encouraging. I appreciate that you joined me to Palestine to learn about the implementation and that you shared your research with Palestinian midwives. Professor Marit Lieng has provided a professional, distanced and critical approach to methods and writing that has assured an improved quality. Your experience from working with projects in Palestine was helpful, and receiving your acknowledgements along the way meant a great deal to me.

Through all three studies, I was lucky to have relational continuity with the statistician, Lien My Diep. Her eagerness in teaching me to implement statistical methods and analysis has stretched my reasoning ability to a point that I did not know existed. We spent much time together during the processes of sample size calculations, organizing data, and analysis. Her detailed and strict adherence to good statistical methodology contributed to publications in journals of good quality. That she was able to be involved in all three studies surely improved the research, and the continuity improved my ability to learn.

The call for proposal of an individual PhD project came at a perfect time from The Research Council of Norway and the Global Health and Vaccination Program (GLOBVAC). I am grateful they accepted my PhD project.

Thanks to the Palestine Committee of Norway for facilitating the pilot-implementation, and to Norwegian Aid Committee (NORWAC) and the Palestinian Ministry of Health for facilitating the scaled-up implementation and the research. And thanks to the Intervention Centre for hosting me, their only midwife, and especially to Marianne Berg who made me feel included.

Thanks to the Norwegian Ministry of Foreign Affairs for funding of the implementation between 2006 and 2014.

In Palestine I am indebted to so many, from the initiation of the implementation in 2006 until today, including very important stakeholders, colleagues and supportive friends that should be named, and this PhD rests upon their devoted engagement. The late Dr. Maha Fatho from Bethlehem University was the first midwife I met in 2006. She joined in the initial planning together with the midwives, Mrs. Vartouhi Koukeian from Al Quds University, and Mrs. Laura Wick and Dr. Sahar Hassan from Bir Zeit university. Midwives depend on support from good obstetricians, and Dr. Odeh Abu Nahle from the PRCS Hospital in Ramallah was crucial; he paved the way for us, embracing midwives as his “eyes and hands”. The head midwife in the PRCS Hospital, Mrs Itidal Alrefai, enthusiastically welcomed the idea of piloting the model in her labour ward. The senior supervisor nurses in the Ministry of Health’s primary health, Mrs. Ilham Shamasnah and Mrs. Taghreed Abed, took charge and assured a practical implementation in the primary clinics through the whole implementation process. Their knowledge and positive respect among the fieldworkers were essential. There have been three Ministers of Health through these years, Dr. Fathi Abumohli, Dr. Hani Abdeen and Dr. Jawad Awwad, and all have signed the cooperation agreements and held their protective hand over the fulfilment of the details, while Dr. Assad Ramlawi, as director of primary care and later deputy minister, critically supported the implementation through the years.

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funding ended is admirable. Dr. Amal Abu Awad, the dean of Ibn Sine College and Director of Continuous Education in the Ministry of Health, has contributed with important professional advices and a protective hand. Office manager, Mrs. Hanan Sabah kept the documents and economy and appointments in order, a crucial part of any implementation.

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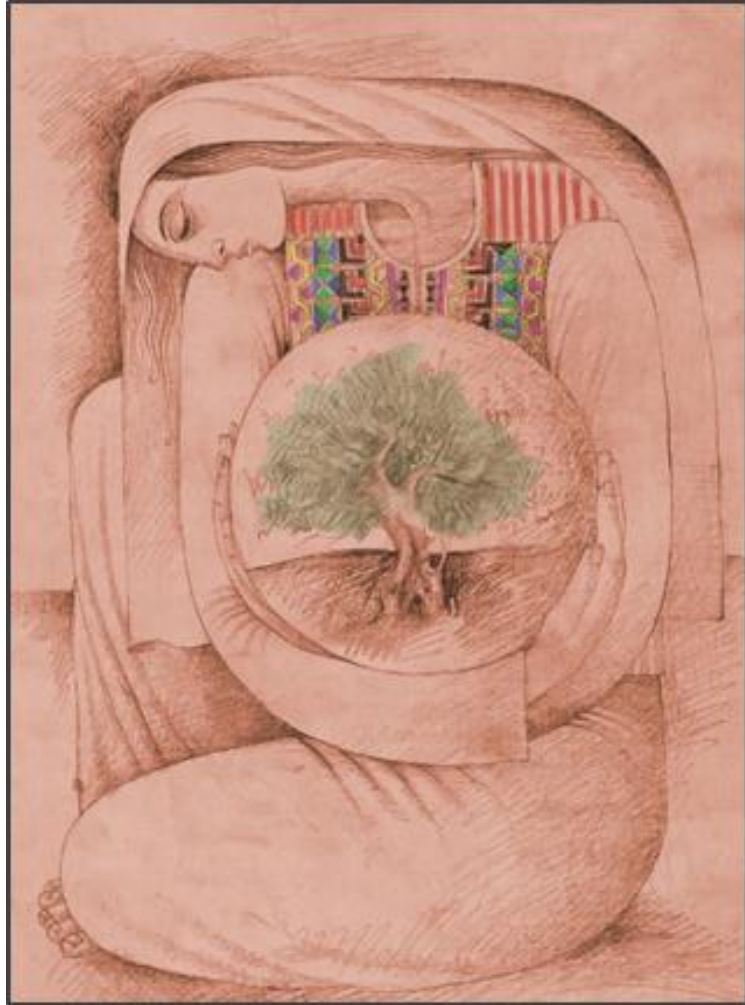
Thanks to my dear Palestinian sister since 1987, Randa Bani Odeh, who has followed me though the implementation and PhD research. She came up with the good suggestion of testing the model at the PRCS Hospital in Ramallah, when the government services were on strike in 2006.

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Thanks to Suleiman Mansour, for allowing us to use this beautiful drawing to promote midwifery in Palestine.

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Summary

To address the challenge faced by Palestinian women living under Israeli occupation in rural areas in the West Bank, the Palestinian Ministry of Health implemented a modified midwife-led continuity model of care, in cooperation with a Norwegian humanitarian organization, the Norwegian Aid Committee (NORWAC). The model was implemented between 2013 to 2016 in six governmental hospitals from where midwives provided outreaching antenatal care and postnatal home visits in 37 rural villages. When the midwife-led model was tested in the region of Ramallah between 2007 and 2012, the midwives described in a qualitative study how the model enabled them to provide personalized care related to the individual woman's needs. The broad scope of practice gave them new and important experience and knowledge.

The main aim of the research presented in this thesis was to investigate if and how a modified caseload midwife-led continuity model of care, in the governmental system in Palestine, influenced different aspects of quality in maternal health services to women in some rural areas in the occupied West Bank. Three quantitative observational studies were conducted, using different designs and participants to investigate utilisation and quality of services, health outcomes and satisfaction with care.

Implementing the midwife-led continuity model of care was associated with improved utilisation and adherence to antenatal care, improved detection of complications during pregnancy and improved postnatal care for mothers and children. In addition, the model was associated with reduced unnecessary medical interventions and improved maternal and neonatal outcomes. Receiving midwife-led continuity of care was also associated with improved satisfaction with care and longer duration of exclusive breastfeeding.

The thesis presents a detailed description of the implementation and discusses the findings from the three quantitative studies within an implementation research approach by including two external evaluations and a previous study related to the implementation. The model's feasibility in the Palestinian context and the findings compliance to existing evidence on midwife-led continuity models of care are discussed. The thesis aims at providing an understanding of the implementation process and its influence on maternal services, health outcomes and satisfaction with care. The comprehensive findings are concluded in relation to the Framework for Quality Maternal and Newborn care(1).

List of papers

- I. Berit Mortensen, Mirjam Lukasse, Lien My Diep, Marit Lieng, Amal Abu Awad, Munjid Suleiman, Erik Fosse. **Can a midwife-led continuity model improve maternal services in a low resource setting? – a non-randomized cluster intervention study in Palestine.** *BMJ Open* 2018;**8**:e019568. <http://dx.doi.org/10.1136/bmjopen-2017-019568>

- II. Berit Mortensen, Marit Lieng, Lien My Diep, Mirjam Lukasse, Kefaya Atieh, Erik Fosse. **Improving maternal and neonatal health by a midwife-led continuity model of care – an observational study in one governmental hospital in Palestine.** *EClinicalMedicine*, <https://doi.org/10.1016/j.eclinm.2019.04.003>

- III. Berit Mortensen, Lien My Diep, Mirjam Lukasse, Marit Lieng, Ibtesam Dwekat, Dalia Elias, Erik Fosse. **Women’s satisfaction with midwife-led continuity of care – an observational study in Palestine.** *Submitted BMJ Open, March 8, revised version resubmitted July 8, 2019.*

Abbreviations

WHO – World Health Organization

MoH – Ministry of Health

ANC – Antenatal care

PRCS – Palestine Red Crescent Society

95%CI – 95% Confidence interval

The following definitions of midwifery and the midwife were used in the Lancet series on Midwifery in 2014 (1).

Definition of Midwifery (1)

Midwifery is defined in this thesis as “skilled, knowledgeable and compassionate care for childbearing women, newborn infants and families across the continuum throughout pre-pregnancy, pregnancy, birth, post-partum and the early weeks of life. Core characteristics include optimising normal biological, psychological, social and cultural processes of reproduction and early life, timely prevention and management of complications, consultation with and referral to other services, respecting women’s individual circumstances and views, and working in partnership with women to strengthen women’s own capabilities to care for themselves and their families.”

Definition of a Midwife (1)

“The International Labour Organisation (ILO) describes midwives as the primary professional group to provide midwifery (2). The International Confederation of Midwives defines the work of midwives and core competencies and standards for their education and practice” (3, 4).

“A midwife is a person who has successfully completed a midwifery education programme that is duly recognised in the country where it is located and that is based on the International Confederation of Midwives (ICM) Essential Competencies for Basic Midwifery Practice and the framework of the Global Standards for Midwifery Education; who has acquired the requisite qualifications to be registered and/or legally licensed to practice midwifery and use the title *midwife*; and who demonstrates competency in the practice of midwifery.”

1.0. Introduction

Midwives are key to building sustainable quality maternal health care systems and solidarity is an important factor to reduce inequity in health (5, 6). The available research evidence and the World Health Organization (WHO) call for action and recommend implementing midwife-led continuity of care to improve maternal health globally (7, 8).

A woman's health and wellbeing through the continuum of pregnancy, labour, and after birth is pivotal to her family and especially to her children's foundation and wellbeing. Thus, good quality maternal health care through the continuum is a human right with universal significance, as we were all born by a woman and dependent on her health (9).

In 2000 the United Nation introduced the eight millennium goals (MDGs) for the year 2015. Two of the goals, numbers 4 and 5, were to reduce child and maternal mortality by ensuring universal access to maternal care (10). Reaching the goals has been a long and difficult road and still more than 300,000 women die each year of preventable causes related to pregnancy and childbirth. More efforts must be made to achieve equity in health care, especially since 99% of maternal deaths occur in low- and middle-income countries (11). It is estimated that for each maternal death there are 100 women who suffer severe maternal morbidity or experience a "near miss" (12, 13). A newborn child's prospects of survival, good health, and wellbeing depend a great deal on their mother's survival, health and wellbeing (12). Not only is a mother's health important to her family, but maternal health between and among diverse populations has a crucial impact on society at large (9). Around the world, the wealthy buy services from private providers, while the poor depend on charity or public service providers, and the gap is wide (14). The inverse care law applies when market mechanisms rule in the absence of robust public health systems: the rich get too much too soon, while the poor get too little too late (11, 15). Data from 2010 envisaged that black women in New York had a higher risk of dying in birth than women in North Korea and Vietnam (11).

Appropriate and timely medical interventions during pregnancy, birth and the postnatal period save lives and improve health outcomes, while unnecessary interventions can disturb an otherwise healthy natural process and cause serious side effects (11). Strategies to improve maternal health services must include enhanced provision of respectful care and facilitate improved education and regulation of skilled providers to assure accessible, available, appropriate, and good quality care (16). These elements are crucial to save lives, improve health

and to address equity in health (16). The millennium goals shifted in 2015 to propose 17 sustainable development goals (SDGs) by 2030. Goal number three, to “ensure healthy lives and promote well-being for all at all ages” acknowledge a broad perspective on health. Goal number five intends to “ensure gender equality and women’s empowerment” (9). Women’s empowerment through respectful, dignified care-provision seems to be important to improve health services in low-resource settings. A woman perceiving the quality of care as being satisfactory will most likely increase her adherence to service and her chances of a positive outcome, for herself and her child (16, 17). Systematic reviews have investigated disrespectful and abusive treatment of women in maternity care globally (18, 19). In low income settings mistreatment can explain why many women choose not to attend available maternal services (19-21). To understand better what determines women’s satisfaction with care in developing countries, Srivastava et al. undertook a systematic review, presented in 2015 (22). They found that women globally seek dignity and anticipate being treated respectfully, in terms of courtesy and non-abuse. This applies irrespective of socio-cultural or economic context. Interpersonal behaviour was more important than structural factors, such as cleanliness and physical environment. Around the world women value empathy and respect in the meeting with health providers in maternal care. Although high-income countries seem to have had more focus on mental health in maternal care than low- and middle-income countries, the need for mental health care and psychological support is universal. A systematic review by Fisher et al. in 2012 revealed a higher prevalence of women with non-psychotic common perinatal mental health disorders in low-middle income countries than the global prevalence of 10% during pregnancy and 13% postnatally (23). In low-middle income countries, the prevalence of mental health disorders was estimated at 15.6% during pregnancy and 19.8% postnatally, and particularly poor women experiencing gender based violence are at risk (23). Women from disadvantaged groups within populations, and who were in higher need of mental support, were found to have less chance of receiving such support (24).

Based on the research evidence, the World Health Organization (WHO) has recommended interventions, or packages of care, that scale up midwifery and facilitate continuity of care to enhance respectful relations in maternal care (25). Previous studies related to midwife-led continuity of care have mainly been from high-income countries (7). The needs and challenges in low- and middle-income countries vary, and cultural and contextual sensitivity is essential when introducing improvement strategies to new settings (22). To achieve sustainable,

accessible, appropriate, and woman-centred care globally, midwife-led continuity models of care, where a known midwife supports a woman throughout pregnancy, birth and the postnatal period, is recommended in settings with functioning midwife education (25). Sandall et al. (2016) concluded in a Cochrane review that midwife-led models of care improved several health outcomes for mothers and babies when implemented in high-income countries (7). For healthy mothers with normal pregnancies, such models of care decreased the risk of unnecessary interventions during birth, such as instrumental birth and regional anaesthesia, and reduced the rate of premature births <37 weeks gestation (7). In settings with high caesarean rates, previous studies have shown that midwife-led continuity models of care were associated with decreased caesarean section rates (26-28). Midwife-led continuity of care has increased satisfaction with care, and has been especially valued by disadvantaged women (29). Furthermore, such models of care seem to be a cost-efficient way to improve maternal health services (30, 31). The World Health Organisation (WHO) recommends implementation and research on midwifery-led continuity models in low- and middle-income countries to improve maternal services and enhance respectful care (25). Implementation research is recommended to investigate how midwife-led models can be appropriately adapted to a low- and middle-income setting and to enhance replicability to other settings (25, 32). The researcher's involvement in the implementation is important to understand the process and context. Thus, caution regarding choice of research methods is crucial in reducing bias and obtaining reliable results (33).

2.0. Background

2.1. History of midwifery

In the Middle East, the first significant description of midwifery was found in Egypt, in the Ebers Papyrus, with copied texts from as far back as 3400 years B.C (34). Also, in the Old Testament's second book of Moses 1:16 we can read about the brave midwives, Sifa and Pua, who opposed the Pharaoh to save newborn boys' lives.

Soranus of Ephesus (98-138 A.D.) received his medical training in Alexandria and in his work, *Gynaecology*, he included detailed descriptions of the midwife and her work. According to Soranus, a suitable midwife should be discreet and trusted. She should be educated and skilled in female health and diseases, including provision of contraceptives. Soranus's work had great importance until the Middle Ages (35). Soranus described the ideal midwife meticulously: She

should not be unnecessarily handicapped, but sound of limb and robust. She should be sympathetic and respectable, not greedy, and she needed not to have borne a child herself. She should keep her hands soft and nails short, apparently so she will not create any discomfort for the mother or the child. Soranus claimed that the best midwives should be literate so that they could gain knowledge of obstetrics and paediatric theory by reading his work, probably in a shorter, compressed version, as a kind of handbook (36).

Until two hundred years ago, theoretical education was not available to most women practicing midwifery, even in developed countries. Their education was mainly through apprenticeship; the transferral of practical knowledge from one experienced midwife to a younger one (34). Midwives' discreet and trustful relationship with women was challenged by authorities' interest in controlling the population and its growth (37). The midwives knowledge, especially related to birth control and abortion, was a sensitive issue that led authorities to implement the regulation of midwives (37). In sixteenth century France, midwives had to be authorized by the church and had to testify in matters related to women's reproductive status, such as abortion (37). Midwives were given the death penalty for providing an abortion and they had to swear to report the name of anyone practicing midwifery without a licence. The authorities legislation of midwives was initially less medically motivated, but rather an attempt to discipline midwives and turn them into government agents in controlling women's sexual health and population growth. Later, when modern medicine developed, national theoretical and practical education and licensing of midwives became a strategy to improve maternal and newborn health. In Norway for example, national education for midwives was established in 1818, and all regions in the country were obliged to have educated and licenced midwives (38). These educated local midwives' endeavor in the rough rural communities resulted in a 50% reduction in maternal mortality in Norway between 1887 and 1921 (39).

2.1.1. History of midwifery in Palestine

Before the British took over the rule of Palestine in 1918, the respected traditional midwives, *dayas*, were the usual assistants to women in birth (40). They were apprentices, mainly with their mothers, and they were respected persons in their villages (41). The local religious cleric ensured that the midwife was equipped with soap and nail-brushes. Hygiene was important and brought God's blessings, as would refusing payment from poor people (42). A change took place in the work of the midwives when the British brought in Western medicine, with education, training and licensing of midwives (40, 41). Parallel to this, the traditional midwives

carried on their work in the villages, alongside a developing hospital system (40). All who practiced midwifery were obliged to register births as well as deaths related to labour (40). Before Palestine was divided by the UN in 1947, there were ten public hospitals. When Israel declared itself an independent state in 1948, nearly 800,000 Palestinians became refugees in neighbouring countries. The Palestinians in East Jerusalem and on the West Bank of the Jordan River came under Jordanian rule and the Gaza Strip under the Egyptians. When Israel occupied East Jerusalem, the Gaza Strip, Sinai, the West Bank, and the Golan Heights during the Six Day War in 1967, the Israelis accordingly had to take the responsibility for the health service in these areas. The Israelis escalated the process of hospitalizing births while the lack of capacity in the form of equipment, beds, and personnel to meet the growing number of births became an increasing problem (43). This development implemented the Western world's modern organization of care, where women give birth in hospitals and doctors lead the maternity care within a medicalized system. The institutionalisation and fragmentation of maternity care in Palestine reduced the midwives' scope of practice and autonomy (44). Since the 1990s a growing number of universities and colleges in Palestine offer a bachelor's degree in Midwifery. Palestinian midwives are educated according to ICM standards and licensed after graduation by the Palestinian Authorities. UNFPA still estimate a shortage of 3000 midwives in Palestine (45).

2.2. The modern Palestinian context in the West Bank

2.2.1. Political and social context

In 1967, the Palestinian territory in West Bank, Gaza, and East Jerusalem, was occupied by Israel. The three areas became subsequently divided, and thus developed different contexts. The midwife-led continuity model of care described in this thesis was implemented in the West Bank region. Therefore, the further description of context is related to the West Bank.

Palestinian women living under Israeli occupation in rural areas in the West Bank represent a vulnerable part of a generally disadvantaged population living under the longest military occupation in modern history. As a result of the Oslo Agreements in 1993-95, the Palestinian Authority was established, and a governmental health system developed (46). Although framed as a step toward freedom, the agreements disguised and cemented Israeli occupation and colonization, compelling the international community to pay aid and develop assistance (47). The Palestinian Health Authorities became responsible for providing health service and education to all Palestinians in the occupied territories. The dependence on other countries'

regulations for aid assistance and control paved the way for more fraud and fragmentation (48). The Israeli economist, Shir Hever, revealed in 2010 that of the foreign aid provided to Palestinians, 72% ended up in the Israeli economy (49).

In parts of the occupied area, the Palestinian Authority has some possibilities to develop the economy, and to manage construction and security, while people living in 60% of the area, also called area C, mainly rural, are under full Israeli military rule and severe restrictions (50). Poverty, deprived infrastructure, military checkpoints, and armed Israeli settlers restrict the freedom of movement and reduce access to central health-facilities and legal assistance for people in rural areas (50). Soldiers have often denied pregnant Palestinian women access to hospitals at military checkpoints. The checkpoints are set up to protect Israeli settlements in the occupied areas and divide Palestinian communities from each other in the West Bank and Jerusalem. During an escalation of the conflict, between 2000 to 2006, it was reported that 69 women gave birth at military checkpoints, causing casualties for both mothers and babies, as they were hindered from reaching the hospital (51). In 2009, the UN Human Rights Council estimated that yearly, around 2,500 Palestinian women in labour face difficulties in reaching health facilities, causing the deaths of mothers and infants, as well as unnecessary pain and suffering (52). Although the political situation in the West Bank was less violent during the following decade, it is persistently volatile. Women living in the rural West Bank are particularly vulnerable and deprived from important infrastructure and legal security (53). Many people living in rural areas are poor, and private health providers are scarce; thus, pregnant women depend more on available governmental facilities than women in urban areas.

2.2.2. Reproductive health in West Bank, Palestine

In 2016, the Palestinian ministry of Health (MoH) reported 72,327 births in the West Bank, of which 53.6% were in governmental hospitals, 46.3% in private hospitals, and 0.1% outside institutions (54). The Palestinian Multiple Indicator Cluster Survey from 2014 reported a fertility rate of 3.7 per woman in the West Bank (55). Although a variety of factors have contributed to a steady decline in recent decades, the fertility rate in Palestine is still among the highest in the world (56). The ministry reported an overall caesarean section rate of 24.9% in governmental hospitals in 2016, and that 5.6% of newborn babies had a birth weight below 2500 grams. Anaemia below 11 g/dl was reported for 28.2% of the pregnant women and 25.6% of women postpartum. Prematurity and low birth weight were reported by the MoH in 2016 as

the two main reasons for infant deaths accounting for 24.6% of deaths within the first year of life (55).

According to World Bank data from 2015, the maternal mortality rate was 45 per 100,000 births in West Bank and Gaza, while it was only 5 per 100,000 in Israel. The infant mortality rate (<1year) was 17 per 1000 live births in the West Bank and Gaza, while only 3 per 1000 in Israel, depicting the imbalance between the occupied people and the population of the country that has occupied them for more than 50 years (57).

Al-Adili et al. found that the main direct obstetric causes of the 36 reported maternal mortality cases in the West Bank during 2000 and 2001 were postpartum haemorrhage and eclampsia, while indirect causes were related to cardiovascular diseases and anaemia. Death was found avoidable in 69% of the classified cases, as they could have been prevented or treated with optimal care, and some saved without delay at military checkpoints (58).

Rural women seem to leave the hospital early to get back home to the village, as 40.7% of them left hospital within 6 hours postpartum, and 73% did not receive additional postnatal care (55). In a cross-sectional study from 2008, Dhaher et al. found that only 36.7% of all women received or obtained postnatal care (59). The study revealed that women who used private care providers, or had complications, like caesarean sections and instrumental assisted births, sought postnatal care more frequently (59). Another cross-sectional study in Palestine from 2013, found that poor women were less likely to have postnatal care (60). The governmental guidelines follow the WHO recommendations and require nurses in primary clinics to do postnatal home visits, but without provision of resources to implement such standards, almost no mothers received postnatal home visits (61, 62). The prevalence of postpartum depression seems to be high among Palestinian women, with one study from 2016 estimating it to be 28%, compared to the global prevalence of between 10 and 15% (23, 63). There is an association between anaemia and increased risk of postpartum depression (64, 65). Women who experience intimate partner violence, as well as political violence and war, seem to have higher risk for maternal depression, compared to women not experiencing such circumstances (66). The prevalence of women who had experienced any kind of partner violence in the Palestinian population was measured to be 29.9% in the West Bank, in a cross-sectional national survey on violence conducted by Palestine Central Bureau of statistics in 2011 (67). A study conducted by Clark et al. (2010) found that exposure to political violence was associated with an increase in intimate partner violence in

the occupied Palestinian territories (68). Exposure to violence during pregnancy increase the risk of premature birth and low birth weight, and psychological health problems (69). The Israeli military authorities prevent the Palestinian civil police to access most of the rural areas, and they are therefore unable to assist women if they should call for help (53).

Palestinian midwives working in the governmental sector in Palestine are challenged in an overcrowded, understaffed and fragmented maternity health care system (51, 70). In such environment it is challenging to establish good and respectful relations, and to meet each woman's individual needs. In a cross-sectional study from 2006, Giacaman et al. identified that Palestinian women were not satisfied with the place they gave birth, and that their choice was constrained by availability, affordability and limited access due to Israeli military closures and sieges (71). A descriptive study from eight governmental hospitals by Wick et al. in 2005 found understaffed maternal care, with overcrowded labour rooms that prohibited women from bringing a birth companion; further, they reported over-medicalization and unnecessary interventions in normal births (70). A qualitative study involving maternal care providers in a governmental hospital found that midwives had restricted scope of practice and little autonomy, and midwives were not used by the Ministry as autonomous antenatal care providers before the implementation of the midwife-led continuity model of care (44).

2.3. Midwife-led continuity models of care

The overall concept of midwife-led continuity models of care is that women receive care from a primary midwife or a small team of midwives through the continuum of pregnancy, labour and early postnatal period (72). The midwife in such models leads the planning, coordination, organisation, and delivery of care to a woman, in cooperation with physicians and specialist care when needed, enhancing a relational continuity (7).

The concept of continuity in care is broadly defined, and for many this merely means that the patient's information is accessible to involved health providers at different levels. But to gain trust between the patient and a responsible care provider within the fragmented health system, interpersonal or relational continuity is important (73). A hierarchical definition of midwifery continuity of care was presented by Homer et al. 2008, a definition which was derived from Saultz's article on the subject from 2003 (72, 73). In the hierarchy, the most basic level is informational continuity, where all necessary information about a pregnant woman is available for professionals caring for her. In addition, at a higher level, longitudinal continuity is

important, which means that the woman has access to a familiar setting where she receives care. Finally, on the top of the hierarchical structure, resting on the other levels, we find relational continuity, where a personal and professional trustful relationship is established between the recipient of care and an individual care provider, in this case a woman and her midwife (72, 73).

The introduction of lifesaving medical interventions during the previous century, such as instrumental assisted birth, anaesthesia, and caesarean section, prompted in moving the event of labour and birth from the women's homes to birth facilities in hospitals. Care through the continuum became fragmented within the modern division of primary and secondary healthcare systems. Within such systems, care during pregnancy and follow-up postnatal care is usually the responsibility of primary healthcare providers, while care for women with high-risk pregnancies, women in labour, and women immediately after birth, is the responsibility of providers in hospitals. Movements to regain continuity and midwife-led care started in many high-income countries in the 1980s as a response to fragmented and overmedicalized care (72).

In the updated systematic review from 2016, Sandall et al. concluded with high evidence that midwife-led continuity models of care reduce the use of medical interventions, such as regional anaesthesia and instrumental assisted births, as well as improving neonatal health outcomes, such as reduced preterm births and foetal loss and neonatal death before and after 24 gestational weeks. They also found that such models improved women's satisfaction with care (7). The Lancet Series on Midwifery in 2014 emphasised the potentials for scaling up midwifery globally to reduce unnecessary medicalization, and improve maternal and neonatal outcomes, and enhance respectful care (1, 74-77). The results from research on midwife-led continuity models of care in high-income countries led to the recommendation of adapting such models to low- and middle-income countries, coordinated with implementation research (25, 78, 79).

There are several ways to organize midwife-led continuity of care, and two main concepts are described in the literature: the *caseload model* and the *team midwifery model* (72). In both models it is important to assure that a woman has a midwife she knows to care for her during labour. This requires that midwives are on call and ready to join the woman whenever labour starts. To make this possible, midwives working full time in the caseload model commonly limit the number of women they care for to 36 - 40 women yearly, depending on the woman's individual needs (80). The primary midwife will follow up during pregnancy, labour, and early

postnatal period, usually up until six weeks postpartum. Back-up is usually organized within the group of midwives providing caseload care, where all midwives provide back-up for between 36 and 40 women in addition to their primary caseload. The caseload may be restricted to only healthy pregnant women, or may include women with pregnancy complications, then in cooperation with specialist care (72). The value of continuity might be even more important when complications occur. The primary midwife can advocate for the woman's individual needs when coordinating referrals, and the midwife can reduce fear and continue to support normal processes, like breastfeeding and bonding (72, 81). The advantage with caseload midwifery is that it facilitates the building of trustful relationships between the woman and her midwife.

In the *team midwifery model* a group of 4-6 midwives provide care throughout pregnancy, labour, and postnatally for a group size from 250 to 360 women yearly. This model can be organized in various ways, and it facilitates a more predictable working schedule for the midwives, including fewer days on call for labour care. Shared care during pregnancy reduces number of times that a woman meets the same midwife and thereby limits relational continuity. The time it takes to build trust can vary, and for many women this might not be so important. But it is not always predictable who would benefit from relational continuity. Especially those who have experienced a previous serious breach in trust may need more time to build a trustful relationship with a healthcare provider. A meaningful relation with a trusted midwife can prevent fear and escalation of problems (82). The suffering from experiencing childhood abuse and intimate partner violence can affect birth and parenthood negatively (66, 83, 84). A trustful relationship with a caring midwife can contribute to identifying women at risk and the midwife can introduce initiatives that might control and prevent violence (69). Women in general seem to highly value the relational continuity offered through caseload midwifery (85, 86). Relational continuity and a broad scope of practice is also valued by midwives and has been linked to improved job satisfaction, empowerment, and enhanced retention in the profession (9, 86, 87). Working in a continuity of care model and being on call requires devotion to the philosophy of midwifery and continuity, along with a cooperating and flexible spouse and family. An integrative literature review found that caseload midwives actually did not feel as much stress, as the number of actual calls were limited to their caseload, and most days were without calls, while team midwives were more frequently called upon while they had their on-call duty (87).

Good management and teamwork are important to prevent burnout and to sustain the midwifery workforce (29, 88, 89).

Midwife-led continuity models of care have proven to be a cost-efficient alternative to medical-led care (7, 30, 72). The reduction of medical interventions and the improved health outcomes for mothers and babies reduce overall costs by more than offsetting implementation and running costs (11, 31).

2.4. Regular maternal care in the rural West Bank, during the study period

Governmental services in the West Bank require a low-cost tax insurance, and thus they are free of charge and are the main health provider for poor people, especially from rural areas (55). The rural population accounted for 25.5% of the total population of 2.9 million in the West Bank in 2016 (54).

Regular maternal care for women living in rural villages were offered from the governmental clinics and/or private medical doctors. Most villages had a governmental clinic, and the location varied from small shelters with two rooms to new buildings with many rooms, and some with a simple medical laboratory. Around 70% of the rural women registered for antenatal care in governmental clinics, where regular care providers were nurses, midwives and medical doctors (90). Women who considered giving birth in a governmental hospital were required to register at a governmental clinic for antenatal care. The governmental care providers in clinics with regular care had various responsibilities and tasks. Besides maternal care, they were also responsible for regular patient treatment, vaccinations, and minor emergency cases. The nurse or midwife in regular care would assist the physician by doing necessary tests before the pregnant woman consulted the physician. Physicians alternated between clinics, while nurses were mainly permanent staff. Healthcare providers in community clinics offering regular care had no working relation to the hospitals. Many doctors had a private practice beside the work in the clinic, where women also could receive antenatal care. It was also common for specialists who work in public hospitals to have a separate private clinic. Women often sought primary health care from both governmental and private providers. Women in families who could afforded the costs usually chose to give birth in private hospitals, where the doctors offered antenatal- and birth care, though a midwife would usually provide care during labour under the supervision of the private doctor who would be in charge during birth. The private hospitals had private labour rooms, and women could bring a birth companion. The Palestinian Multiple

Indicator Cluster Survey from 2014 revealed that 66.4% of rural women would give birth in a public hospital, while 59.3% of urban women would do the same (55).

The village clinics were responsible for the PKU screening of all newborns, and thereby for the registration of newborns for follow-up and vaccination.

All governmental services, including the midwife-led model, followed the same MoH standards of care. These included detailed procedures, recommendations on information, education, referral lines, and general values of respectful care. Women with medical complications would either be referred to primary high-risk care centres for follow-up, or directly to hospital. Medical doctors who were specialised in ultrasound, visited the clinics on a regularly basis to provide the three ultrasounds required by the guidelines during pregnancy (91). Informational continuity is maintained by the Mother and Child Handbook, a home-based document provided to all pregnant women who register for governmental care. This book is supposed to follow her and the baby from pregnancy to early childhood (92).

3.0. Implementation research

Implementation research is defined as “the scientific inquiry into questions concerning implementation — the act of carrying an intention into effect, which in health research can be policies, programmes, or individual practices” (32, 93).

The intention of implementation research is to investigate widely the process and effects of translating evidence-based practice to real life settings, using a variety of methods (93). Implementation research is seen as especially important when introducing complex interventions, such as healthcare programs in weak healthcare systems in low- and middle-income countries where context is central. The process of the implementation, such as testing the implementation in a pilot, evaluations, and scale-up, should be described so that applications to other settings can use the lessons learned (94-96). Collaborative, embedded implementation research is considered an advantage to understanding the context, complexity, and modifications that characterize the process (33). It is crucial to understand why and how the implementation works by enhanced attention and adaptation to local context, stakeholders, local care resources, and end-user engagement (94). Nevertheless, embedded research requires rigorous, high-quality scientific methods to obtain the necessary distance and objectivity and reliable results. Implementation research is relevant to facilitate application of useful interventions to other societies striving to improve maternal health services globally (97).

3.1. Validating the midwife-led continuity model of care in Palestine by implementation research

The implementation research strategy for validating the midwife-led continuity model of care in Palestine includes three novel quantitative observational studies presented in the three papers in this thesis. These studies have investigated different quantitative outcomes associated with the implementation. A previous qualitative study and an external evaluation related to the midwife-led model was conducted when the implementation was piloted. These will be briefly summarized when describing the pilot to provide a deeper understanding of the complex implementation and the context.

This thesis will shed light on the implementation of a recommended evidence-based practice of midwife-led continuity of care, which has widely been studied in high income countries and is recommended by the WHO (25). In the antenatal care recommendations for a positive pregnancy experience the WHO states: “*Midwife-led continuity-of-care models, in which a known midwife or small group of known midwives supports a woman throughout the antenatal, intrapartum and postnatal continuum, are recommended for pregnant women in settings with well-functioning midwifery programmes. (Context-specific recommendation)*” (25). The model was introduced to the Palestinian system by me as a solidarity response to challenges faced by rural women in the occupied West Bank. The solidarity approach has advantages in understanding the local context and gaining trust from a population that has lived under military occupation for several decades (98). Engagement in the implementation gave me important insight and contextual knowledge, factors that are highly recommended when conducting implementation research (94). Consequently, my objectivity as a researcher became challenged and thus required strict awareness in the selection of research methods, and in data collection and analysis (33, 94).

Triangulation of methods is recommended in implementation research to investigate the process, adaptations, and influence.

The comprehensive information and findings will be discussed from an implementation research approach and concluded in relation to the Framework for Quality Maternal and Newborn care presented by Renfrew et al. 2014 (1, 97).

4.0. Pre-study - implementation

4.1. The pilot implementation

The implementation started in Ramallah 2007. The Palestinian Ministry of Health had been on strike for a long time and thus it was implemented in the Palestinian Red Crescent Society (PRCS) Hospital in cooperation with the solidarity organisation, Palestine Committee of Norway. The project was funded by the Norwegian Ministry of Foreign Affairs. An outreach midwife-led caseload model was developed and adapted to the Palestinian setting and tested for four years (Figure 1). The model implied that midwives employed at the hospital provided antenatal care in governmental clinics in designated rural villages and followed up with postnatal home visits. The main objective was to improve care for the disadvantaged women in these rural areas. As could be read in the chapter describing regular care in Palestine (page 26), the midwife workforce's scope of practice was mainly limited to the hospital setting, where their autonomy was restricted under the leadership of an obstetrician and/or resident doctors (99). Most of the care providers in this hospital's labour ward were *practical midwives*, with shorter education and less autonomy than licenced midwives. The implementation was complex and involved several steps:

- One Palestinian senior midwife was employed to supervise the implementation in cooperation with one Norwegian midwife, functioning as practical and administrative coordinators.
- Stakeholders from PRCS and the Ministry of Health selected which governmental rural village clinics would be included.
- Stakeholders from the hospital, the included communities and Palestine Committee of Norway were involved in the planning, budgeting and implementation.
- To enable the implementation, midwives educated at bachelor level were employed and replaced five practical midwives, who received a scholarship and upgraded their education at the university.
- The number of midwives at the hospital was scaled up so that they could serve seven villages in the hospital vicinity.
- The caseload midwives had an initial two-day seminar. They were introduced to the Ministry of Health's protocol for ante- and postnatal care. They were presented the concept and philosophy of midwifery continuity of care and relational continuity. They received practical upgrading in skills like measuring fundal height, Leopold's manoeuvre, and respectful communication.
- A car was purchased for transportation to the villages. The PRCS did not accept that the implementation funded driving licence for the midwives, so they could not drive the car themselves. Therefore, during the implementation period, the supervising midwife had to drive the primary midwives to their designated village.
- Later, when the funding and implementation period ended, the hospital had to solve how the future transportation would be sustained.

The pilot implementation was evaluated stepwise after the first-, second- and fourth years (100). After the funded implementation period of four years ended, the pilot model continued only for one and a half years. The main reasons that the implemented pilot model halted was related to the economy. Firstly, the PRCS hospital did not receive any payment for providing midwives to the governmental community clinics; and secondly, transport was costly and inefficient, as the hospital had to designate their driver daily to transport the midwives to the villages. However, the main purpose of the pilot was achieved: adapting and testing the feasibility of the midwife-led continuity model of care in the Palestinian context. The next step was to learn from the pilot experiences and develop the midwife-led continuity model according to the evaluation, and then advocate for scaling up the implementation in the Palestinian governmental system.

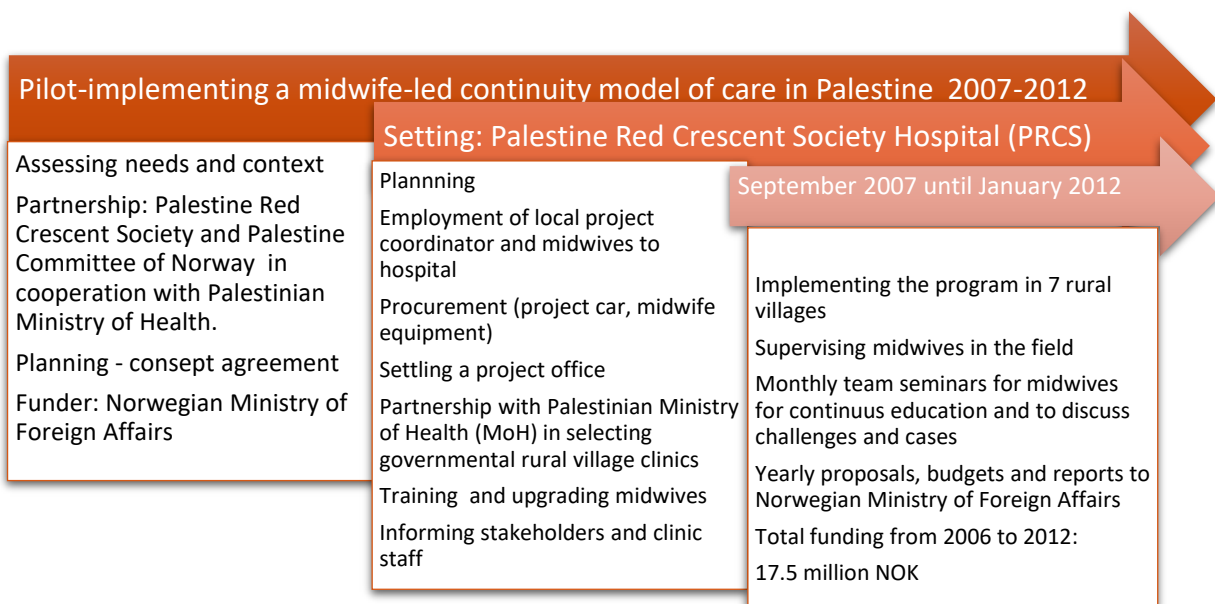


Figure 1 Pilot implementation process 2007-2012

4.1.1. Midwives experiences - a qualitative study during the pilot implementation (101)

The midwife-led continuity model of care was tested for feasibility in the Ramallah region between 2007 and 2012. During this period, I did a qualitative master's study in practical knowledge to investigate how the midwives experienced working with midwife-led continuity of care. In addition, the research which used an anthropological approach, facilitated critical reflections towards my own role in the implementation process. The master's thesis "*To be veiled or not to be - what unites is the question - Experiences from a continuity of Midwifery Care Model in Palestine and Norway*" was based on a hermeneutic-phenomenological design

with focus group discussions among the midwives working in the model. The reflections and narratives were presented as an essay in my master's dissertation (101).

The narratives expressed deep involvement from the midwives in women's personal and intimate life and challenges. They expressed how these relations gave them important insight in rural women's vulnerability and needs. They gained new experience, from the personal relations with the women and from the new field of practice, thus improving their professional skills. One midwife explained it simply as, "I give care and receive knowledge." The midwives felt proudly empowered by becoming women's advocates in a fragmented healthcare system, guiding and supporting them through pregnancy, labour and the postnatal period, while living in an unsafe environment.

The narratives gave insight into the encounters between the midwives and women in the unique context under the Israeli military occupation. This insight was crucial to understand how the relational continuity works in this special environment. One of these meetings was with the pregnant woman, Aname, quite recently after the implementation had started in 2007. She later told her story in a Norwegian TV-documentary about the project in 2008.¹ Aname came to the clinic to meet the midwife she had heard about from the nurse. She carried a heavy burden, an experience of a traumatic birth at a checkpoint in 2002, causing the death of her child. She had hesitated to get pregnant again, but the time had come, and she came to seek antenatal care, filled with anxiety. Earlier in pregnancy, she had visited a private specialist to get an ultrasound to feel safer, but he did not ask about her previous experience, and she did not want to take his time. She met the midwife, Khadidja, and me, and we encouraged her to tell us, to let us understand. Weeping, she told her story, how the Israeli soldiers had shot and halted the ambulance at a checkpoint and did not allow them to pass through to reach the hospital in Ramallah. A caesarean section was urgently necessary because her baby came with feet first. She told us how the soldiers opened the ambulance door, they could see her frightened in terrible pain, the baby's feet were born, while the head was stuck in the uterus. The medics and her husband were humiliated in useless argument and the ambulance had to return to the small village hospital where the baby was born dead. Aname bonded with the midwife who followed

¹ New life in the line of fire (Nytt liv I skuddlinjen) Norwegian broadcasting (NRK), Producer Gerd Inger Pollen, <https://tv.nrk.no/serie/faktor/2008/OAHA14000208>

her closely through the pregnancy. This child had a breech presentation too, and the midwife was on call to join her during the planned caesarean and followed up with home visits. Some relationships, like this one, become very special and then the midwives made an extra effort to be on call.

This is an example how the woman needs to trust that her health provider has time to listen and care before she can talk comfortably about sensitive matters. Specialist doctors in Palestine have a high demand for performing ultrasound. For most women, ultrasound is their best and only assurance that their pregnancy is healthy. In this circumstance, it is as if ultrasound becomes a substitute for relational care. Improving relational care can relieve obstetricians from unnecessary demands and give them more time for pregnant women who need specialist care. This also might explain why doctors in general have supported the implementation.

Other midwife narratives described dilemmas occurring when women disclosed intimate partner violence. Compared to my own experience with Norwegian women, it seemed easier and less shameful for Palestinian women to talk about partner violence with their midwife. This could be because their natal family was deeply involved in the selection of the spouse, making the choice a shared responsibility. If a newly married woman experienced that her husband was violent, it would not be her judgement alone but her family's judgement that failed, and that might make it easier to involve them and oblige them to help her. In any event, the midwives could meet women with necessary cultural insight into various histories. Some women needed external help and shelter because they had no native family in the village to help them, and some had experienced violence in their native family too. The Ministry of Health had developed a program to assist women who experienced intimate partner violence, and the midwife could help women in the isolated villages to get in contact with personnel in this program and to seek legal assistance if necessary (53).

The narratives in the qualitative study gave insight into how varied, complex, and sensitive relational continuity can be. The "average person" does not exist, as everyone lives a unique life. They illustrated the importance of cultural sensitivity and of space and time to build trust to enable good care. They also gave insight into the importance of an arena for collegial discussions to help the midwives find courage to encounter and solve delicate dilemmas, and to build professional empowerment. The midwives' satisfaction from working in the pilot

implementation became essential for midwives in the governmental hospitals to embrace the implementation in the next phase.

4.1.2. Stakeholders and women's views – an external evaluation of the pilot process (100)

The external evaluation after four years of pilot testing highlighted the implementation's relevance (100). Ms. Maha Fatho, a midwife scholar at Bethlehem University who had been involved in the initial planning of the model, conducted the evaluation together with a co-evaluator, using both qualitative and quantitative methods. The methods were mixed: desk review, service users questionnaires answered by 120 women, two focus group discussions, where one included 21 interdisciplinary co-workers, and one included ten practicing midwives, and finally individual interviews with five key stakeholders and decision makers (100).

They found that the implementation was in line with the UN millennium goal number 3 promoting gender equality and empowering women, goal number 4 reducing child mortality, goal number 5, improving maternal health, and goal number 8 on global partnership for development. The implementation was found relevant in enhancing the national efforts to make good quality prenatal, natal, and postnatal services available, accessible, and affordable to vulnerable women in rural areas. The complexity of the implementation was special because it involved two organisations and two care levels. The hospital was run by Palestinian Red Crescent Society, a charitable organization, and the primary healthcare clinics which were in the Palestinian governmental healthcare system.

The evaluation confirmed a rise in number of women who registered for antenatal care at the clinics offering midwife-led care. The evaluation did not validate these findings by comparing with the numbers of registrations in governmental clinics with regular care. However, nurses who worked in the clinics on a daily basis had assumed that this increase was linked to the implementation, because women wanted to receive antenatal care from the midwife who came from the hospital. Replies to the questionnaires disclosed that most women confirmed that being cared for by the same midwife through the continuum decreased their worries and even reduced pain in childbirth. Women were satisfied with how the midwives treated them politely and respectfully, maintaining confidentiality and involving them in their care. This suggests that the midwife contributed to their empowerment. Co-working nurses and doctors in the clinics expressed in the focus group discussions how the cooperation with the midwife made them trust her competence and role. They were relieved from the responsibility of maternal care and could

concentrate on following up with children and vaccination programmes. The doctors appreciated having more time to follow up with the sick.

The evaluation pointed at several limitations of the pilot implementation:

- Limited administrative staff to plan, organize and monitor the implementation in all involved institutions.
- The PRCS headquarters administration had refused midwives permission to obtain driving licenses financed by the implementation project, despite the fact that this had been emphasised as important to enable sustainability of the outreach program. After the funding ended, a driver from the hospital was assigned to drive the midwives to the villages and home visits.
- Underdeveloped documentation of baseline and follow-up data to measure the impact of the implementation.

5.0. Main objectives

The main objective of this PhD project was to examine the quality and influence of the scaled-up implementation of the midwife-led continuity model of care within the Palestinian governmental maternal health service, by conducting three quantitative observational studies.

The comprehensive findings will be discussed within an implementation research approach to validate the midwife-led continuity model of care in Palestine.

The aims of the three studies were to investigate

- a) whether the midwife-led model influenced the utilisation of maternity services and selected quality indicators at facility level.
- b) any association between the Palestinian midwife-led continuity model of care and medical interventions, maternal and neonatal health outcomes.
- c) if and how the midwife-led model influenced rural women's satisfaction with care, through the continuum of antenatal, intrapartum and postnatal period, and to explore the association between the model and duration of exclusive breastfeeding.
- d) if and how the model can contribute to new knowledge and sustainable improvements within an implementation research approach including previous research and evaluations, and whether it may be applicable to other similar recourse-constrained settings, and in developed countries that strive to build bridges between primary and secondary healthcare systems.

5.1. Research questions

1. Did the introduction of a midwife-led continuity model of care influence women's utilisation of maternity services and/or any other quality indicators, such as referral mechanism and postnatal care, at a service facility level? (Paper I)
2. Did receiving the midwife-led model of care influence the rate of unplanned caesarean sections or any other medical interventions during labour and/or did it influence maternal and/or neonatal health outcomes? (Paper II)
3. Did receiving midwife-led continuity of care influence on women's satisfaction with care through the continuum of antenatal, intrapartum, and postpartum period? (Paper III)
4. Did receiving midwife-led continuity of care influence women's breastfeeding practice? (Paper III)

6.0. Methods

6.1. The implementation

The evaluated and adapted midwife-led continuity model of care will be presented as it was implemented within the governmental health system. This is the intervention that the three novel observational qualitative studies presented in this thesis investigated.

6.1.1 Implementation of the midwife-led continuity model of care in the governmental system

The piloted model was adopted by the Palestinian Ministry of Health in 2012 to improve services in rural areas. Thus, a cooperation with the non-governmental humanitarian organization, Norwegian Aid Committee (NORWAC), was established. The Norwegian Ministry of Foreign Affairs funded the stepwise implementation of the modified midwife-led continuity, *caseload*-model.

Improvements from the pilot:

- An important organisational problem from the pilot was solved since all service levels, including hospital and clinics, now were governmental.
- A condition in the Memorandum of Agreement stated that the midwives themselves would be driving to the villages.
- Thus, all midwives involved in the governmental implementation received driving lessons and were certified as drivers of the cars purchased for the purpose, to facilitate transportation between hospital and the rural village clinics and homes. The cars were marked with the Ministry of Health and Midwifery Care logos, to facilitate security.

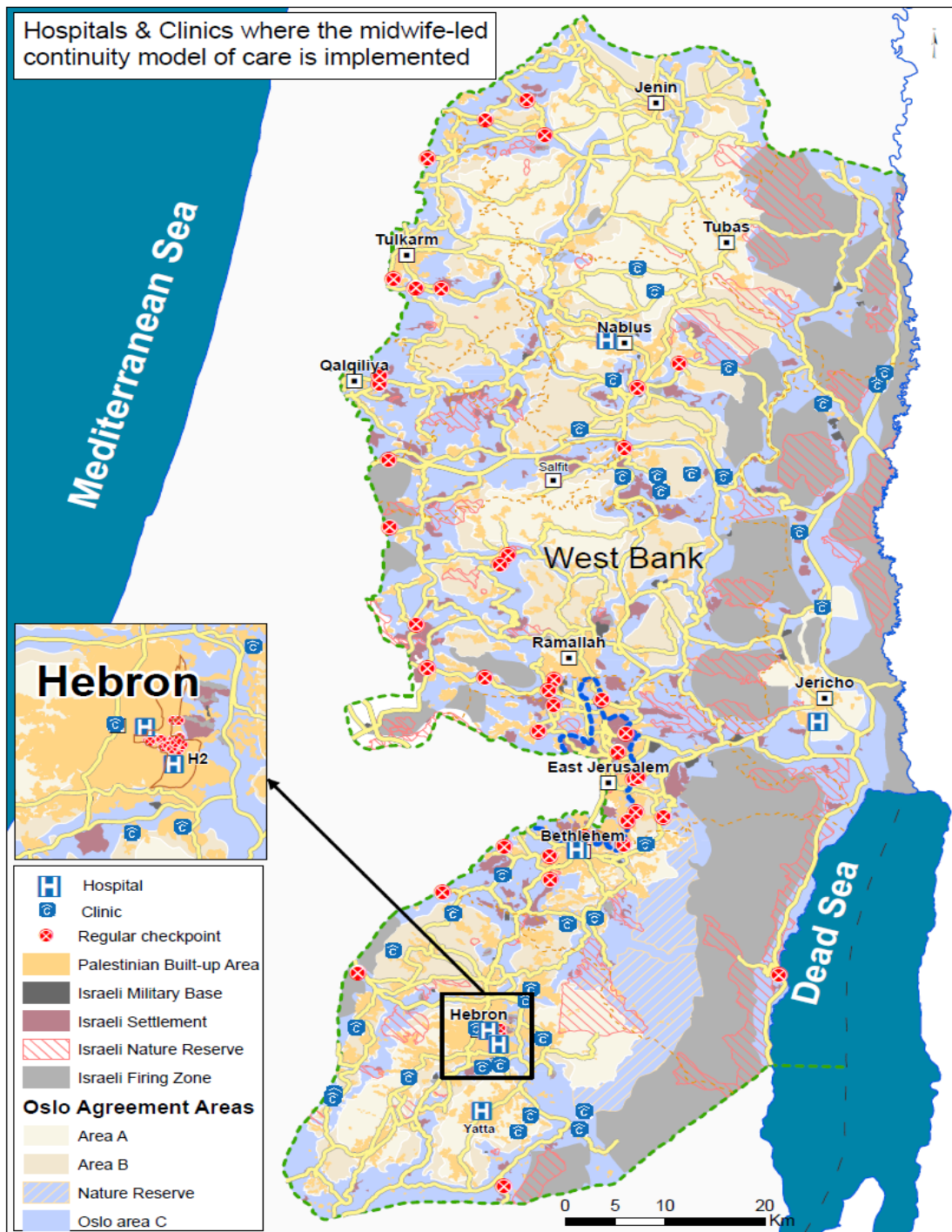


Figure 2 Map of the implementation area²

² Provided by United Nations Office for the Coordination of Humanitarian Affairs (OCHA) (The map was developed by using ArcGIS software, and the attribute/database are part of the same application.)

Important steps of the complex intervention:

- The implementation was stepwise, and started in two areas, Nablus and Jericho governmental hospitals and 15 surrounding rural villages in 2013, then in Bethlehem, Hebron and Yatta (South Hebron) involving four governmental hospitals and 22 rural villages. The funding halted in 2016, and six remaining regions in the West Bank are without the implementation. Currently, (2019) the model operates in six governmental hospitals and 37 rural villages in the West Bank (Figure 2).
- The hospitals' midwifery resources determined the number of rural villages that could be served, then extra midwives were employed to replace the number of midwives who daily reached out for the villages. In Nablus for example, there were ten skilled midwives that would serve ten villages each week, meaning two midwives five days a week would drive to their designated village. Therefore, the hospital was scaled up with three new midwives so that the labour resources would not be reduced.
- All caseload midwives received a two-day initial training, where stakeholders and village clinic nurses and doctors were invited to participate in the training, which involved a thorough description of the model's practical and philosophical principles. Midwives from the pilot phase were involved in the first training. Then midwives from the first step of implementation were involved in the next step's training sessions.

6.1.2. The midwife-led continuity model of care's core components

After initial planning, agreements, information and training involving various stakeholders and health providers the practical implementation of the midwife-led continuity model was conducted (Figure 3).

The implementation and the model consisted of the following core components:

- Scarce midwifery resources were organised with a broader scope of practice and intermittent deployment to outreach services from hospitals to disadvantaged populations in rural communities.
- Regional supervisor midwives coordinated the service and schedule between the head midwife in the labour ward and the regional nurse supervisor who organized the work in primary health clinics
- Midwives were equipped with smartphones, included in the Ministry of Health service system, to ensure communication and coordination between midwives, the interdisciplinary team, women, clinics, and hospitals, as well as to enable contact between the women and midwives in case of any emergency or arranging appointments.
- Continuity of care where the midwife linked primary (community) and secondary (hospital) facility levels: midwives worked in hospitals and drove to their designated village weekly to follow up their

caseload of women during pregnancy and early postnatal period. Women usually gave birth at the governmental hospital where the midwives worked full time when not on outreaching service.

- The midwives could not guarantee that they would be on duty and available for the woman during labour. Due to high workload and limited midwifery resources it was not possible to be on call.
- The caseload size was flexible and depended on the number of pregnant women in the village who registered for antenatal care at the governmental clinic. If the caseload was less than 25 women yearly, the midwife would visit the village every second week; if it exceeded 100 women, the caseload was divided between two midwives.
- Relational continuity: Establishing a meaningful relationship building on trust and respect was fundamental for enabling care tailored to the woman's circumstances and needs.
- Midwives provided education, information, and health promotion.
- The midwives performed initial assessments, screening and care planning in cooperation with a physician, and autonomously followed up with healthy pregnant women.
- The midwives promoted a normal process of pregnancy, labour, and breastfeeding, and prevented complications by individual care and advice according to needs.
- The midwives detected complications and potential risks and referred to a physician or directly to specialist care. If necessary, the midwife brought the woman/child with her directly to the hospital in the midwife car. She continued to follow women with complications in cooperation with specialist care.
- Monthly midwife-team seminars were conducted during the first year of implementation in new areas to allow the discussion of experiences and challenges and to share/disseminate up-dated information about guidelines and support services. The team seminar should thereafter continue quarterly.
- The midwives' cultural and clinical competence were utilized in a broad and autonomous manner, aiming at empowering both themselves and the women receiving their care.

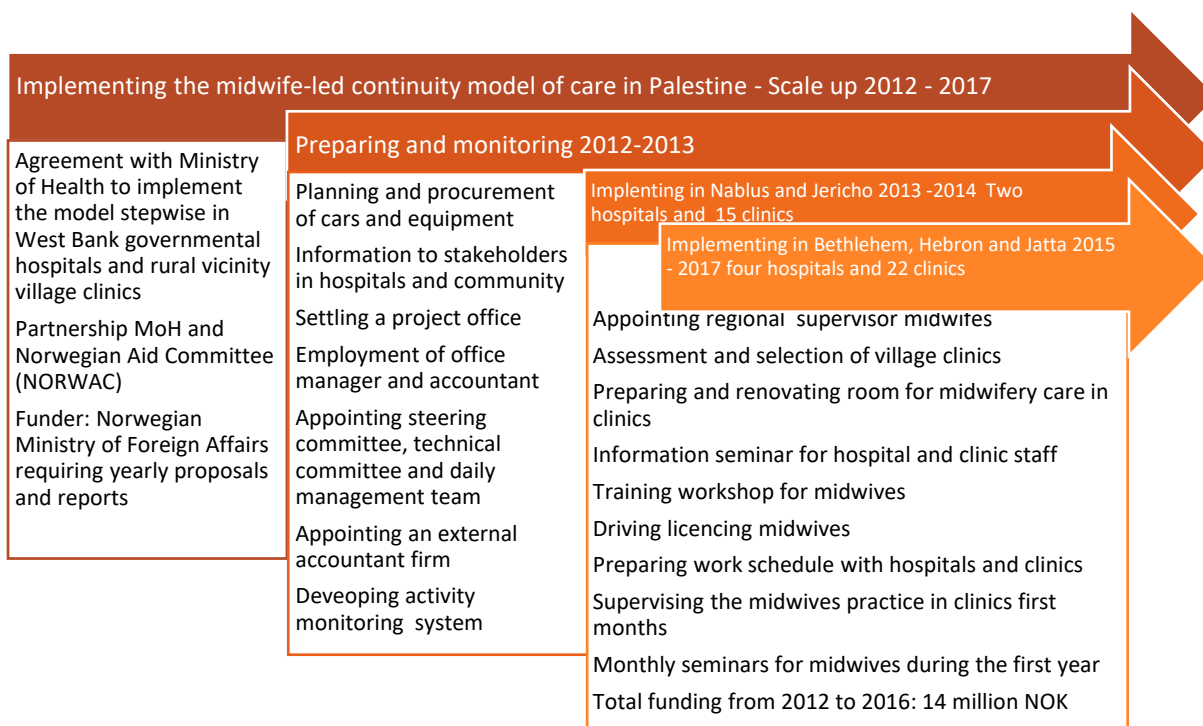


Figure 3 The scaled-up implementation 2012-2017

6.2. Regular care

The effect of the implementation is measured by comparing with regular care. Regular care is presented on page 26.

6.3. Study population and design

The three quantitative studies presented in this thesis used three different quasi-experimental or observational designs, one pre-post-non-randomized controlled study, one cohort- and one case-control study, all recommended in implementation research (102). The initial protocol had included a study of the implementation's impact on midwives. The protocol was revised to be able to thoroughly investigate the model's impact on women within the time limit of the research project. The revision was acknowledged by the Research Council of Norway (Annex 1).

The three studies involved a total of 30,508 women and newborn babies residing in rural villages in different regions in the West Bank. All studies compared clusters or individuals that had received the midwife-led continuity of care with clusters, or individuals, who had received

regular care. The three studies involved three different datasets, one at the cluster level and two at the individual level (Table1).

The first dataset (Paper I) included 39 governmental clinics (clusters) in rural villages in two neighbouring regions, Nablus and Jericho. There were 14 cluster with the implementation and 25 with regular care. The sample size was given by the available clusters at the time of the study and was considered solid. Data were obtained from the facility-based registry in the Ministry of Health and were only available at the cluster level. The set involved 10,034 women and 15,872 newborn babies registered at the clinics before the implementation in 2011 and 2012, and after the implementation in 2014 and 2015. The baseline data from before the implementation were compared with data after the intervention for both groups. The difference was then compared between the implementation and regular care.

The second dataset (Paper II) involved 2201 women and 2201 newborns registered at Rafidia Hospital in Nablus from January 1st, 2016 to May 31st, 2017. The sample size had been calculated based on an estimation of an unplanned caesarean section rate of 20% with a potential of detecting 5% difference between the groups with 80% power and 5% significance level. The individual data were obtained from the hospital's handwritten and electronic registry, cross checked and entered into an Excel sheet developed for the purpose. Data was collected by a previous head midwife at the hospital who knew the registry and registration procedures well and who was trusted by the Ministry of Health to access the data. She was a senior supervisor in the Ministry of Health who knew the details of the implementation and could detect with precision whether the women and newborn babies in the registry belonged to the exposed or the unexposed group in the cohort.

The third dataset (Paper III) involved 200 women, 100 cases and 100 controls from various regions where the midwife-led model was implemented. The sample size had been calculated from Forster et al.'s study on satisfaction with midwife-led continuity of care in Australia in 2016 (103). Data were obtained from rural women who have had a singleton pregnancy and had given birth within the last one to six months. They answered a questionnaire that included descriptive information, self-reported health information, and a seven-point Likert scale measuring satisfaction with care through the continuum of pregnancy, peripartum, and the postnatal period (Annex 3). The scale had been used previously in similar studies and evaluated as a useful tool (104). The questionnaire was translated by a professional translator, piloted and

revised before the data collection was conducted. Two research midwives were trained in data-collection; they were not employed by the Ministry of Health and were not involved in the implementation. They contacted the primary health supervisors to be directed to the eligible village clinics on days when women came for immunization of their babies. Eligible women were then provided with a consent form (Annex 2). If they agreed to participate, they answered by individual face-to-face interviews, while the midwives entered their answers in the questionnaire. This method was chosen to prevent exclusion of illiterate women and to assure they understood the questions.

Study	Design	Level	Study population			Study period	Data source
			Women (n)	Newborn babies (n)	Total participants (n)		
Paper I	Non-randomized, before and after, intervention study	39 Clusters	10034	15872	25906	2011/2012 and 2014/2015	Facility based governmental registry
Paper II	Retrospective cohort	Individual	2201	2201	4402	January 1, 2016 to May 31, 2017	Hospital medical handwritten and electronic registry with individual data
Paper III	Case-control	Individual	200		200	May1, 2017 to May 31, 2018	Questionnaire answered by individual interviews
Total Participants					30508		

Table 1 Overview of methods, participants and data-sources

6.4. Outcome variables

The outcomes were chosen by their relevance to previous studies on midwife-led models of care and their relevance to context. The choice of outcomes also depended on which data were available in the governmental registries. Framework for Quality Maternal and Newborn care presented by Renfrew et al. in the Lancet Series of Midwifery in 2014 is a tool used for mapping and evaluating models of care (1, 105). The measured outcomes and their assumed relevance

to the different components of the framework are presented in Figure 4.

Outcome measurements within the three quantitative studies	Relevance to the quality framework for maternal and newborn care(1)				
	Practice categories (Education, Information, health promotion, assessment, screening, care planning, promotion of normal process and prevention of complications)	Organisation of care (Acceptability, availability, good quality service, adequate resources, competent workforce, Continuity services, integrated across community and facilities)	Values (Respect, communication, community knowledge and understanding. Care tailored to women's circumstances and needs)	Philosophy (Optimising biological, psychological, social and cultural processes; Strengthening woman's capabilities, Expectant management, using interventions only when indicated)	Care providers (Practitioners (Midwives) combining clinical knowledge and skills with interpersonal and cultural competence. Dividing roles and responsibilities based on need, competencies and resources)
Proportion of women registered for ANC*	Partly-relevant Information/announcement	Partly-relevant Availability and accessibility	Not relevant	Not relevant	Not relevant
Number of ANC visits	Very relevant	Relevant	Very relevant	Relevant	Very relevant
Number of referrals to higher level of care	Relevant	Relevant	Relevant	Relevant	Very relevant
Number of Postnatal Contacts Mother	Very relevant	Relevant	Relevant	Relevant	Very relevant
Number of Postnatal Contacts newborn	Very relevant	Relevant	Relevant	Relevant	Very relevant
Mode of birth**	Very relevant	Relevant	Relevant	Very relevant	Very relevant
Induction of labour	Very relevant	Very relevant	Relevant	Very relevant	Very relevant
Postpartum anaemia	Very relevant	Very relevant	Relevant	Very relevant	Very relevant
Preterm birth	Very relevant	Very relevant	Relevant	Relevant	Very relevant
Low birth weight	Very relevant	Relevant	Relevant	Relevant	Very relevant
Apgar score	Relevant	Relevant	Partly relevant	Relevant	Very relevant
Newborn admitted to intensive care	Relevant	Relevant	Partly relevant	Relevant	Very relevant
Neonatal death	Relevant	Relevant	Partly relevant	Relevant	Very relevant
Satisfaction with care***	Very relevant	Very relevant	Very relevant	Very relevant	Very relevant
Duration of Breastfeeding	Very relevant	Very relevant	Very relevant	Very relevant	Very relevant

Figure 4 *Paper I, **Paper II ***Paper III

6.5 Statistical analysis

6.5.1 The non-randomized cluster intervention study, Paper I

Mean, standard deviation and range were given for normally distributed and count variables. Percentage and total number were given for categorical variables.

Change in the intervention and control group data were determined by comparing data from two years before the intervention to data two years after. Differences between the groups' changes, were examined by using mixed effects models. In the mixed models, the clinic was specified as cluster (i.e. random variable), time and group, and interaction between time and group were fixed variables.

Normally distributed outcome data were fitted by mixed effects linear regressions. Before fitting, the outcome variables were divided by the number of registered pregnant women or

newborn babies to calculate average values. Because the computed averages are based on different numbers of pregnant women (heteroscedasticity), variance weights for each average were computed and included in a variance formula in the model.

Mixed effects Poisson regressions were used to fit non-normally distributed outcome data, and an offset variable was used to adjust for the total number of (individual) registrations that were under risk in the models.

Measured potential confounding variables, which could have influenced the key estimates, were: the village's population size, whether the clinic had an employed community midwife and laboratory equipment, regular military check points between village and hospital, and distance to hospital. These possible confounders were included in the mixed models for adjusting.

Adjusted regression coefficient as means and rate ratios with 95% confidence intervals were given. Two-sided p-values of less than 0.05 were considered statistically significant.

The analyses of mixed effect models were performed with R version 3.4 and STATA version 14. Descriptive analyses were carried out using IBM-SPSS version 21 for Windows.

6.5.2. The register based retrospective cohort study – Paper II

Descriptive statistics were used to calculate means, standard deviations, medians, interquartile ranges, ranges, frequencies, and percentages. The chi-squared tests were used for categorical variables, and Mann-Whitney U tests were used for continuous variables to explore any differences between the groups. Multivariate analyses with generalized linear models (GLMs) for binary outcomes with the log link were conducted to estimate adjusted risk ratios (aRR) and 95% confidence intervals. Age, parity, and previous caesarean section that are known to affect birth outcomes were included in the GLMs for adjusting. To check if the differences in time for completing data collection influenced the outcome, year of current birth was also included in the GLMs for adjusting. Additionally, we used the GLMs to examine whether the impact of previous caesareans on the maternal outcomes differed between the two groups by testing the interaction between group and previous caesarean.

Stata version 15 was used to calculate the sample size for the study. Data were analysed using SPSS version 25 and *p* values of <0.05 were considered statistically significant.

6.5.3. The case-control study – Paper III

Differences in characteristics between the intervention and control groups were analysed by two independent samples t tests, Mann-Whitney U tests, chi-squared or Fisher's exact tests, as appropriate.

The Likert scale ordinal variables were highly skewed and first analysed by conducting ordinal regression because this method had been used by Forster et al. using a similar Likert scale (103). After fitting the ordinal regression, the proportional odds assumption was inspected by a Brant test in Stata/SE, version 14. Results from the test showed that the proportional odds assumption was violated for several ordinal outcomes, which could be because our study had a much smaller sample size.

Therefore, we summarized the scale scores, and the groups' mean sum scores of satisfaction were compared by bootstrapping linear regression. The primary outcome, mean sum score of satisfaction through the continuum of antenatal, intrapartum, and postnatal care, included 53 different questions of satisfaction. Negative questions, such as *I felt that nobody really cared for me during labour and birth*, were turned positive so that satisfaction could be interpreted equally in all questions and the mean sum scores thereby read as 1 (lowest) and 7 (highest). One question from the antenatal period was not included, as it investigated whether occupation soldiers or settlers limited women's access to the clinic rather than investigating satisfaction with care. The question could therefore not be directly related to satisfaction with care. The eight questions involving satisfaction with care during home visits only applied to the group receiving the midwife-led model and were not included in the sum score. The questions of satisfaction included in the mean sum score variables were assessed for internal consistency, and Cronbach's Alpha was between 0.90 and 0.95.

The only factor which influenced the difference between groups was place of birth (private or governmental hospital), and it was included for adjusting. Adjusted bias-corrected and accelerated bootstrap estimates (BCa) with 95% confidence intervals were given for non-normally distributed ordinal outcomes and based on 10000 bootstraps.

For breastfeeding practice as binary outcome, multiple logistic regression analyses were used to test the difference between the groups and to adjust for possible confounding variables. The significance level was set at 0.05. The analyses were performed with IBM SPSS 25.

6.6. Ethical considerations

Conducting research requires adherence to international ethical standards for research (106). Doing research within a foreign country requires sensitivity and respect for context and unfamiliar traditions and culture. The Palestinians are living in an insecure and threatening environment, with a hostile Israeli military occupation and aggressive settlers. Poor, rural women are furthermore a disadvantaged and vulnerable population within the Palestinian community, and collecting data within this population requires caution and respect for their internal vulnerability and external security. This also applies to midwives as a profession with limited autonomy and power within the Palestinian healthcare system. All these factors required that I, as a foreign researcher, show the utmost respect and sensitivity. My long relation to Palestine and its people made this task possible. I still had to be aware of things that were unfamiliar, learn new things, and take the time to build trust. Through each step of the implementation and the research, I strived to involve and discuss ethical considerations with local scholars and professionals. My role as a midwife, and my involvement in the midwives' close contact and interaction with the users of services, enabled me to develop a sensitivity for the user's perspective. The cluster- and case-control studies involved anonymous participants, while the cohort involved deidentified participants. The deidentified data was transferred in a code-locked USB-pen to Oslo University Hospital's system for sensitive data. In the cluster study and the cohort study it would be impossible to obtain consent. In the case-control study, women gave their oral consent because a signature could potentially expose the participants identities and could be experienced as threatening to their security. In any event, the research presented minimal risk of harm for the involved, and therefore no procedure for which written consent is normally required. The research midwives conducting the interviews were carefully instructed to avoid making the women feel pressured to participate but to assure them both orally and in the provided written information that declining participation did not involve any negative consequences.

The Palestinian Ministry of Health approved all the quantitative studies and subsequent access to data registries and data collection. Ethical approval for all three studies was granted from the Norwegian Regional Committee for Medical Health Research Ethics South East (REK) with identification number 2015/1235 (Annex 1). The Oslo University Hospital approved secure storage of the deidentified dataset in their system for sensitive data. All studies were registered

in clinicaltrials.gov. with numbers, Paper I: NCT03145571, Paper II: NCT03640663, Paper III: NCT03863600

7.0. Summary of results

Results and descriptive data from the three studies, the cluster study (paper I) and the other two studies at individual level, the cohort study (paper II), and the case control study (paper III), will be presented subsequently. The core findings from the three studies can be read directly from the articles in this thesis. Each study was conducted to answer a specific research question. This summary of results will present findings that contributed to answer each research question. The three studies had different study populations and independent findings, but the study populations were all rural women from the West Bank who experienced the same implementation. Therefore, any findings from the three studies that contribute to answer any of the research questions will be presented.

7.1. Findings related to answer research question one –

Did the introduction of a midwife-led continuity model of care influence women's utilisation of maternity services and/or any other quality indicators, like referral mechanism and postnatal care, at a service facility level?

Facilities with the midwife-led continuity model of care had a significantly higher increase in mean number of antenatal visits per woman than facilities with regular care. Comparing two years before the implementation with two years after, the mean number of antenatal visits increased from 3.7 to 4.7, while in facilities providing regular care the mean number of visits decreased from 4.6 to 4.2. The adjusted mean difference was 1.55 (95% CI 0.90 to 2.21) p-value=0.0007 (Paper I)(90). The cluster study did not include any individual information about when women booked for antenatal care. This information was available as descriptive data in the case-control study (Paper III), where women who received midwife-led care booked significantly earlier, at median 6.5 gestational week, compared to women receiving regular care who booked at median 10th gestational weeks (p value = 0.003). Further descriptive information from the case-control study revealed that only 8% of the women who had regular care chose governmental service as their exclusive antenatal care provider, while 42% of the women who received the midwife-led care had governmental service as their sole antenatal care provider.

The mean number of referrals during pregnancy to higher level of care increased significantly from 7.3% to 25.6% in facilities with the midwife-led model, compared to the clusters providing

regular care, where the proportion of referrals moved from 12 to 12.8% during the study period. (Paper I) This indicated an improved detection of pregnancy related complications which is in line with the WHO predicted proportion of 25% pregnant women who will need special care (107). Detection and prevention of complications during pregnancy are important to improved maternal and neonatal health outcomes. The findings from the cohort study (Paper II) confirmed an association between receiving midwife-led care and improved health outcomes, such as reduction in preterm birth, very low birth weight, and postpartum anaemia.

The implementation of the model led to a substantial increase in home visits from 1.7% to 41.8%, which can be interpreted as a causal effect of continuity with care and facilitated transportation (Paper I). During the same period, home visits decreased from 1.5% to 0.7% for women who received regular care. The mean number of total postnatal contacts with health services per woman increased significantly from 0.9 before the implementation of the model to 1.4 after, whereas no increase from a mean of 1.0 contacts was observed at clinics with standard care, an adjusted mean difference of 0.60 (95% CI 0.46 to 0.75) $p < 0.0001$. The mean number of total contacts with primary care per newborn within clusters providing the midwife-led model increased significantly from 1.8 to 2.2 contacts after the implementation, while for newborn babies in clusters providing standard care the mean number was stable at 1.9 contacts, an adjusted mean difference of 0.33 (95% CI 0.16 to 0.52) $p = 0.0004$. In the case-control study (Paper III) only women who had received the midwife-led continuity model of care reported that they received home visits after birth and expressed great satisfaction with this service, while most women who received regular care reported that they would like to receive postnatal home visits.

The findings from the cluster study (paper I) showed improvement in utilisation of services through the continuum after rural clinics had implemented the midwife-led continuity model of care, compared with rural clinics providing regular care. These improvements were important quality indicators such as more adequate number of antenatal visits, good referral lines and early postnatal follow up.

These findings allow us to answer research question number one as follows: The introduction of a midwife-led continuity model was associated with a positive influence on women's utilisation of maternity services and/or any other quality indicators, such as referral mechanism and postnatal care at a service facility level.

7.2. Findings to answer research question two –

Did receiving the midwife-led model of care influence the rate of unplanned caesarean sections or any other medical interventions during labour and/or did it influence maternal and/or neonatal health outcomes?

Women who had received midwife-led care were significantly less likely to experience unplanned caesarean section, 12.8% compared to 15.9% in the group receiving standard care. The crude risk ratio changed significantly from 0.81 (95% CI 0.64 to 1.01) to 0.80 (95% CI 0.64 to 0.99) after adjusting for age and parity (108) (Paper II). There were no statistical differences between the two groups regarding any other modes of birth. Associations to reduced medical interventions were also confirmed by a statistically significant reduction in rate of induced labour, 8.7% among women receiving midwife-led care versus 12% among women who received standard care, (adjusted p-value = 0.004). In addition, an association between receiving midwife-led care and improved maternal health outcome was found, as a substantially lower proportion of women had postpartum anaemia. The proportion with Hb < 11g/dl was 19.8% compared to 28.6% (adjusted p-value < 0.0001), and the proportion with Hb < 9.5g/dl was 4.0% compared to 6.6% (adjusted p-value = 0.026) of the women receiving standard care. Accordingly, the difference in number of women receiving blood transfusions was 0.4% compared to 2.9% (adjusted p-value = 0.001) in the group receiving standard care. Age and parity were adjusted for and changed the results significantly, while previous caesarean section and year of current birth did not.

The midwife-led model was also associated with improved neonatal health outcomes. Newborn babies born by mothers who received midwife-led care were significantly less likely to be born preterm, and adjustment did not change the results significantly. Proportion of preterm births before gestational week 37 was 13.1% among the exposed group versus 16.8% among the unexposed group, with an adjusted risk ratio of 0.79 (95% CI 0.63 to 0.98), and before 32 weeks the proportion was 0.4% versus 1.5%, with an adjusted risk ratio of 0.27 (95% CI 0.08 to 0.91). There was no significant difference between the groups in babies born with birth weight less than 2500 grams. Babies with a mother who had received midwife-led care had a significantly lower risk of being born with birth a weight of 1500g or less, 0.1% compared to 1.1%, with a risk ratio of 0.13 (95% CI 0.02 to 0.97) and where adjusting for age and parity changed the result significantly. The rate of newborns transferred to intensive care was significantly lower for babies with mothers who received midwife-led care, 6.6% versus 9.9% receiving standard

care. A risk ratio of 0.71 (95%CI 0.52 to 0.98) without significant change after adjusting. There was no statistically significant difference between the groups regarding Apgar score and number of neonatal deaths. Adjusting for previous caesarean section and year of current birth did not influence the results.

The cluster study's findings (Paper I) of increased number of antenatal visits and increased detection of complications are both important factors in preventing complications and improving health outcomes for mothers and babies.

These findings answer research question two: Receiving the midwife-led continuity model of care was associated with a positive influence on the reduction of the rate of unplanned caesarean sections, and on the reduction of induced labour. It was also associated with improved maternal and neonatal health outcomes.

7.3. Findings related to answer research question three –

Did receiving midwife-led continuity of care influence on women's satisfaction with care through the continuum of antenatal, intrapartum and postpartum period?

The group receiving the midwife-led care was associated with statistically higher satisfaction with care through the continuum of pregnancy, intrapartum, and postnatal period. On the seven-point scale, where 1 indicates very unsatisfied and 7 indicates very satisfied, women receiving midwife-led care had a crude mean sum score of 5.2 versus 4.8 among women receiving regular care. The statistically significant higher satisfaction with care for women who had received midwife-led care persisted during the various periods of care.

Measurement of satisfaction with the period of antenatal care revealed a mean sum-score of 5.7 for women who received midwife-led antenatal care and 5.3 for women receiving regular antenatal care (Paper III). These findings support an interpretation of results from the cluster study (Paper I) that women increased the utilisation of antenatal care services as a result of experiencing improved quality at facility levels.

Women who received midwife-led care were more satisfied with care during labour and birth, with a mean satisfaction sum score of 5.1 compared to 4.7 for those receiving regular care. Adjusting for those who gave birth in private hospitals increased the difference between the two groups significantly, from a crude mean difference of 0.5 (95%CI 0.04 to 0.68) to 0.7 (95%CI 0.21 to 1.13). As many as 33% of women who received regular care gave birth in private

hospitals, while only 11% in the group who received midwife-led care. Adjusting for age, parity, employment, time since birth, or if the parents lived in the same village, had no significant influence on the results.

The biggest difference in satisfaction with care was seen in postnatal care where the sum score for women who received midwife-led care was 5.0 compared to only 4.2 for women who received regular care. The satisfaction with care during home visits was generally high, with a mean sum score of 5.8, though only the group receiving the midwife-led continuity received home visits. The improved satisfaction with postnatal care could be influenced by many factors, such as improved maternal and neonatal health outcomes (Paper II), by the implementation of home visits (Paper I), and by the relational continuity through the continuum (Paper III). The detailed results in the full scales are presented in Annex 4 and envisages the different aspects of care that mainly influenced the difference between the groups. One interesting difference between the groups that was not disclosed in the published paper was satisfaction with information and advice regarding family planning and contraceptives. Women who received midwife-led care gave a sum score of 4.5 while women receiving regular care scored 3.7, a mean difference of 0.76 (95% CI 0.18 to 1.32) $p=0.012$. Sum score of satisfaction with receiving family planning information during home visits was as high as 5.3 (Annex 4).

These findings answer research question number three: Receiving midwife-led continuity of care was associated with a positive influence on women's satisfaction with care through the continuum of antenatal, intrapartum, and postpartum periods.

7.4 Findings related to research question four –

Did receiving midwife-led continuity of care influence women's breastfeeding practice?

Women were interviewed at median 16 weeks after birth in both groups. This allowed a comparison between the two groups to determine the proportion of women who were still exclusively breastfeeding, as a secondary outcome in the case control study (Paper III). A high number in both groups were still breastfeeding when the interview was conducted, namely 96% of those who receiving midwife-led care and 88% of those receiving regular care. For those exclusively breastfeeding, a statistically significant higher rate was found among women receiving midwife-led care, 67% versus 46% for women receiving regular care. Adjusting for age, parity and number of weeks since birth did not change the results significantly. Only three women who received standard care reported that they never had breastfed, and none in the

midwife-led group. Subgroup analyses that were not published, showed that the duration of exclusive breastfeeding for first-time mothers was the same in both groups, regardless type of care, with 46.9% of 32 first-time mothers receiving the midwife-led model of care and 47.4% of 38 first-time mothers receiving regular care.

These findings answer research question four: Receiving midwife-led continuity of care was associated with a positive influence on women's breastfeeding practice, but the influence on breastfeeding should be further investigated.

7.5. Continuity measures

The midwife-led continuity model's ability to assure continuity with the same midwife through the continuum was reported by the 100 women in the case-control study (Paper III). A proportion of 23% of the women received care during labour from their known midwife, and 34% reported receiving care from her at the hospital's postnatal ward. A proportion of 69% of the women received home visit from their antenatal-midwife, while 7% had home visits from the nurse whom they also knew from the clinic. In this context, 17% met their midwife through the whole continuum of antenatal, intrapartum, and postnatal periods, while 8% did not receive care from their midwife elsewhere than during the antenatal period.

Free text recommendations were added by 101 beneficiaries to the questionnaire suggesting improvements in the governmental services. These recommendations were mainly from women receiving regular care. Allowing a companion to join them during labour and birth was the advice from the majority; secondly, they recommended provision of human, respectful and sensitive care during labour and birth. Other recommendations were to implement an appointment system for the antenatal care and improved equipment and utilities in clinics.

8.0. Discussion

8.1 Discussion of findings within an implementation research approach

The main findings from the three studies confirm an association between the midwife-led continuity model of care and improved service outcomes, individual maternal and neonatal health outcomes, reduced medical interventions, improved satisfaction with care and longer duration of exclusive breastfeeding.

The value of improvements at the service level should be validated by combining outcomes confirming accessibility, availability, acceptability, and quality (109). Improved adherence to

care, improved referral mechanisms, and enhanced postnatal follow-up for mothers and babies were the three main findings from the non-randomised cluster study. The adherence to care, without other incentives than the midwife-led model, can be interpreted as a confirmation that women's interpersonal relationship with the midwives was experienced as respectful and empowering (21, 22, 110). The descriptive individual data from the case-control study affirmed the groups' difference in adherence to care, as women receiving midwife-led care reported a median of nine antenatal visits versus six visits for women receiving regular care. In addition, women who received the midwife-led care came earlier for booking. The recommended number of antenatal visits has been disputed, and from advising a minimum of four focused antenatal visits after a randomized trial in 2001, the WHO revised their guidelines in 2016. After considering new evidence, a minimum of eight visits, the first before week 12, is recommended to assure adequate care during pregnancy (25, 111, 112).

The results also confirm the findings from the two comprehensive external evaluations of the midwife-led continuity model in Palestine, where women in interviews expressed appreciation for the midwives' respectful and empathic caring (100, 113). In the external evaluation from 2017, commissioned by the local WHO office, women expressed their close relationship with their midwife and referred to her with expressions like "she is like my sister" or "she is my close friend". One woman warned that she would arrange a demonstration, where all women in the village would join, if the Ministry of Health removed their midwife from the clinic (113). The interpretation of enhanced respectful care is also confirmed by the study on satisfaction with care through the continuum, which revealed that women who received the midwife-led model were more satisfied with the care through the whole continuum and with the care during the different periods of pregnancy, labour, and after birth. They scored high on satisfaction especially with the components that involved a relation with the midwives (Annex 4).

The significant increase in detection of complications during pregnancy leading to referrals indicated improved prevention of maternal and neonatal morbidity. And improved referral lines are an important quality indicator. The midwives often consulted their specialist colleagues at the hospital if they needed second opinion of what to do.

Preterm births and low birth weight are reported as the main reasons for infant mortality and morbidity (114). We found an association between the midwife-led continuity model of care and fewer preterm births and children with very low birth weight (≤ 1500 grams); consequently,

deploying the model reduced the need for treatment in the neonatal intensive care unit. Preventing anaemia in pregnancy by the use of iron supplements during pregnancy might have influenced and reduced the risk of preterm births and low birth weight (115). The reduction in preterm births, without reduction of birthweight less 2500 grams was in compliance with the existing evidence of midwife-led care, but we found a reduction in birthweight less than 1500 grams, which was not an outcome in previous studies on midwife-led models of care (7).

The reduction of medical interventions and improved maternal and neonatal outcomes was associated with receiving midwife-led continuity care. This could reasonably be a result of adherence to quality antenatal care with an efficient referral system. Preventing medical interventions are connected to provision of information, education and support that empower the pregnant woman to trust to her own capability, her body, and in the care provided to her (86, 116). There could be a general demand for induction of labour from women in rural areas, perhaps linked to their anxiety about not reaching the hospital, and being held back in Israeli military checkpoints (71). WHO recommends induction of labour only with a clear medical indication (117). Although the proportion of births with induced labour in Palestine are in line with other Asian countries and lower than in many high-income countries, inductions with unclear medical indication are rising along with the caesarean section rate (118, 119). Studies have shown that the risk for caesarean section increases with unnecessary induced labour (120). Women also seem to experience induced labour as more challenging (121). There is a growing attention on potential maternal and neonatal risks, side effects, and costs related to unnecessary caesarean sections, and on how to keep the rate within the optimal 15-20 percent (122-124). The importance of reducing the growing caesarean section rate is important in a population with high fertility, as frequent caesareans increase the risks for placental pathology; thus, more effort should be made to prevent caesareans in nulliparous women (125). Interventions that can reduce caesarean section rates include facilitating midwife-led woman centred care, continuous support during labour, and relational continuity (120, 126). We know from our measurements of continuity that 23% of the women who received midwife-led care actually had the midwife they knew from pregnancy as care provider during labour. This might have had a positive impact on reducing caesareans, even in this setting where obstetricians are in charge of labour wards and strongly influence the caesarean section rate. If labour proceeds normally and the woman is coping well, the doctors often leave the care to the midwife. A local study by Zimmo et al. (2018) described a big difference between the various Palestinian governmental hospitals'

caesarean section rate, and suggests that these differences could be linked to the skills and attitude of individual obstetricians, or to their fear for litigation (127). It seems that our multifaceted intervention had a positive influence in reducing the rate of unplanned caesarean section and induction of labour, although the direct causal pathway is not clear. The continuity, satisfaction with care, the increased utilisation of services, improved health outcomes, and the women's statements are all important when interpreting the associations between the implementation and the outcomes.

The most prominent effect of the midwife-led model on any of our research outcomes was the reduction in maternal postpartum anaemia and the increased postpartum follow-up. Anaemia is an underestimated health outcome that has not been measured in the previous studies on midwife-led models of care in high-income countries (128). The prevalence varies across countries and populations. The prevalence of postpartum anaemia <11g/dl in women registered at the clinics postpartum was reported by the Palestinian Ministry of Health to be 23.4% while 28.2% of women were registered with anaemia in pregnancy (54). Anaemia before and during pregnancy is the main reason for postpartum anaemia, as it increases the risk for intrapartum haemorrhage (129). Previous studies on midwife-led models of care used antepartum haemorrhage as an outcome, not anaemia (7). We found it more reliable to use the routine haemoglobin measurements that were documented in the hospital registry rather than the estimations of antepartum haemorrhage. In addition, we measured the proportion of women who received blood transfusions, and the compliance of these outcomes increased the reliability of the measurements. Pregnant women with anaemia are highly at risk. Anaemia is the main cause for severe maternal morbidity, it also increases the risk for low birth weight and maternal depression (64, 130, 131). The high fertility in Palestine makes addressing this outcome even more important. Due to a high incidence of anaemia in pregnant women, the MoH guidelines recommend that all pregnant women take 60mg iron daily and 400µg folic acid as daily supplementation for six months during pregnancy. If anaemia is diagnosed, it should be treated with 120mg iron, in line with WHO standards (91). This requires that women receive, understand, and trust provided information. The increased adherence to the maternal service enhanced the midwife's chance to follow up. Haemorrhage caused by caesarean section is another cause for anaemia, and reduced risk of an unplanned caesarean section could explain some of the reduction in maternal postnatal anaemia. Anaemia is associated with postpartum

depression; thus, preventing anaemia could have a positive influence on satisfaction with care (64, 132).

The improved postnatal care by providing early individual home visits is an important indicator of improved quality (133). The continuity of care enables the midwife to follow up with women she knows are at risk and prevent morbidity that is likely to develop later (134).

We were able to investigate the duration of breastfeeding in the case-control study as a secondary outcome. We could not find that this had been investigated in previous studies on midwife-led care, where rather initiation of breastfeeding after birth has been the outcome measurement. We found increased duration of exclusive breastfeeding among women who received midwife-led care. This can be related to many factors, such as reduction in neonatal morbidity and postpartum anaemia (135). The women's knowledge about the benefits of exclusive breastfeeding is an important factor as well (136). The midwife-led model provided continuity with breastfeeding information and support during pregnancy and after birth in hospital and home visits. A systematic review conducted by McFadden et al. (2017) concluded that predictable, standard breastfeeding support during antenatal and/or postnatal care, tailored to women's needs and given face to face, seems to increase the duration of exclusive breastfeeding (137). This indicates that the improved postnatal care by individual home visits could be a reasonable explanation of why women who received midwife-led care breastfed exclusively for a longer period. Exclusive breastfeeding up to six months of age is considered an important protection against infections. Breastfeeding always provides available safe and sound nutrition for the baby. Breastfeeding has several long term health benefits, both for women and their children (138). It reduces neonatal infectious mortality and morbidity, and growing evidence show reduction in obesity and diabetes. Breastfeeding women have reduced risk of breast cancer, and it is associated with reduced risk for ovarian cancer and diabetes (138).

Another finding in the satisfaction with care study was the higher satisfaction with information related to family-planning for the women who received midwife-led care. This is interesting because this scope of practice was not yet fully developed for the midwives; nevertheless, it seemed that the midwives gave important and useful information regarding alternatives of contraceptives and family planning. A national cluster survey in 2014 revealed that 11% of Palestinian women had an unmet need for contraceptives (55). In the qualitative study that investigated the midwives experience working with a broader scope of practice, during the

pilot-implementation, midwives described some women's need for spacing between births. Women expressed need for improved access to contraceptives, and sometimes for the possibilities of facilitating safe abortion, in their intimate communication with the midwives (101).

The continuity of care from midwives seemed to improve antenatal, intrapartum, and postnatal care for women in the rural West Bank. The external evaluations, first from the pilot implementation and later from the scaled-up implementation, recommended improved monitoring and examinations of the model's impact (100, 113). These three studies have contributed to fulfil that request. Both evaluations emphasised the model's positive impact on interdisciplinary cooperation, and both nurses and doctors appreciated the midwives' competence and the fact that she relieved them to concentrate on patients who needed them (100). None of the evaluation covered full cost-benefit analyses, but the last evaluation stated that the implementation's costs had been well monitored and invested in necessary equipment, professional training, and upscaling of human resources. The evaluation estimated that the achievements were most likely reducing overall costs (113). The manner in which the implementation can be further scaled up in Palestine in the future depends on several political circumstances, as well as economic development and external funding (139). To expand the demands on the midwives might damage much of what has been achieved. The midwives' driving licence and the vehicles' role in the logistics of autonomous movements should not be underestimated. This component has been a disputed part of the implementation but has been highly protected at the level of various Palestinian Health Ministers during the implementation. Solving the issue of transportation is critical, as it has been seen as a main barrier in providing care for rural populations (140). Succeeding in an implementation often means persistence in addressing such intransigent details as this. The implementation of the midwife-led continuity model of care in Palestine has engaged all levels of the Palestinian Ministry of Health, and led to its success.

This discussion envisaged how the outcomes measured in the three studies are intertwined and confirm each other. The findings are in line with evaluations of the Palestinian model and with existing evidence on the advantages of midwife-led continuity of care. This research has contributed to new knowledge regarding the implementation of midwife-led continuity of care for vulnerable women in a low-resource setting.

8.2 Methodological considerations

The midwife-led continuity model of care, as a package of care, is a complex intervention with multiple components, involving individuals, teams, and different levels of the healthcare system, adapted to local context (100, 141, 142). Evaluating complex interventions is challenging and requires a triangulation of quantitative and qualitative methods to investigate the variety of different outcomes that are expected to be influenced by the intervention's various components (141, 143, 144). The three quantitative studies presented in this thesis used three different quasi-experimental or observational designs, one pre-post-, one cohort- and one case-control study (102). Randomized controlled trials (RCT) are the optimal valid and reliable research design. Preparing a complex intervention for RCTs demands comprehensive planning (145). The implementation of the midwife-led continuity model of care in Palestine started without the resources and knowledge to plan for an optimal research method. A cluster randomization would have been possible if a valid randomization process had been conducted. Therefore, a quasi-experimental approach involving three different designs and datasets, was used for the quantitative studies involved in the evaluation of the model. The results from these prospective observational studies had to be adjusted accordingly, as possible factors that could lead to bias existed. Such factors, or confounders, can only be adjusted for as long as data are available, by including variables representing the potential confounders in the models of statistical analyses. In RCTs the inclusion criteria select similar participants to the intervention or control group by randomization, either individually or in clusters, minimizing bias and confounders. The selection of participants is pivotal for the validity of observational studies. The inclusion of rural women within the same region, the West Bank, enabled comparison between groups. Two of the studies (paper I and II), used registry data which minimize selection bias. Using available register data enables retesting and increases the study's reliability. The pre-post cluster study used interrupted time series, comparing the groups' baseline data with data after the implementation. This means that we measured the baseline in each group in a time series of two years before the intervention. The measurement was interrupted during the year of implementation. Then similar measurements were taken in a time series of two years after the implementation. The change within each group could then be compared, which made it possible to investigate whether the change could be associated with the implementation and not associated with other factors during the study period. The use of such time series strengthens the study's internal validity (102). The two studies using registry data had intervention/exposed groups that were smaller than the control/unexposed groups, as the midwife-led model was

offered to a limited number of women in the involved populations. We chose this uneven group sizes because the risk for potential bias would have been higher if we had to exclude clusters/women in the unexposed groups. To reach the required sample size in the exposed group in the cohort study (Paper II), we had to collect data for a longer period than the unexposed group. This could have introduced possible unmeasured potential confounders, although the investigations at the study site reported that no interventions had been done during those four months. The analysis was adjusted for the difference in time without this influencing the findings. The participants in the case control study (Paper III) were selected by the research midwives after contacting the regional nursing directorate, who directed them to the village clinics that had child vaccination that day. Which day the interviewers could collect data depended on their working schedule. Which village clinics they could visit also depended on the weather, the available transportation, and on closures imposed by Israeli occupation soldiers. The midwives performing the interviews were not involved in the work of the midwife-led continuity model of care; they had master's degrees and were trained in data collection and the principles of avoiding bias. The interviews were conducted to avoid participation barriers related to illiteracy or cognitive understanding (146). To secure the women's anonymity, the location of the clinics and birth facilities were not identified, and it was therefore not possible to control for this in the analyses. However, the midwives conducted the interviews in a representative variety of the locations, involving 20 village clinics in all the regions where the model was implemented. The descriptive data of the two groups showed that the two groups were quite similar.

Various studies have measured satisfaction with care through the continuum of antenatal, intrapartum, and postnatal periods, albeit inconsistently. A systematic review by Perriman et al. (2016) investigated methods used in measuring satisfaction with care through the continuum, and suggested developing a more robust tool (104). We chose the most frequently used scale also evaluated in this systematic review (103, 147). Forster et al. (2016) conducted a randomized study using the same scale, and our sample size calculations were based on their results (103). Foster's study found more than a 20% difference in satisfaction with care between the groups randomly selected to midwife-led care or standard care. Detecting such difference in Palestine required 200 participants. Expecting such a big difference between the groups was optimistic and including only 200 could have resulted in a type II error, meaning not confirming a difference between the groups because of limited power $1 - \beta$. One disadvantage in using

randomization in measuring satisfaction with care is that women who are allocated to the control group will not receive the model of care they actually opted for, which could cause disappointment (148). This could contribute to a greater difference in satisfaction between two groups in a randomized study as compared to an observational study, where the control group is unaware of what they missed. This makes it likely to interpret that the differences between the groups that were identified in our study measuring satisfaction are reliable. Assessments for internal consistency between questions included in the sum score found Cronbach's Alpha values between 0.90 and 0.95, which indicates good reliability.

The general analysis of breastfeeding practice was based on a secondary outcome, which increases the risk of a type I error, meaning revealing a difference which is not real. The subgroup analysis was based on a small sample size, which could lead to type II error, meaning not revealing a difference which exists. Therefore, we recommend that further investigations be done to investigate the implementation's influence on breastfeeding practice.

The internal validity of the findings in the three studies depends on the efforts in reducing risk of bias and errors. Efforts have been made to minimize bias and errors and to enhance external validity, which justifies discussing the findings within an implementation research approach.

In implementation research, a range of empirical and systematic methods can be used to document implementations of programs to improve health systems within real local contexts (94). The findings are relevant to evaluate the implementation's feasibility, adoption, acceptance, and its ability to reach disadvantaged populations (94). This thesis has presented three novel studies and discussed them by involving a previous qualitative study and evaluations that investigated different phases and outcomes from implementing the midwife-led continuity model in Palestine. The thesis has described the context, the planning, the preparations, and the challenges while scaling up the complex implementation. Implementation research requires a pragmatic approach to real life settings in contrast with typically randomized research where the setting should be controlled (93). Implementation research recognizes the complexity of implementing best practice into a healthcare system and thus recommends a collaborative approach where the researchers are embedded partners with policy makers, implementers, and communities (32, 33, 94). My role in the implementation and the research involved a deep immersion approach as described by Churacca et al. (2018) in their paper, *The time has come: Embedded implementation research for health care improvements* (33). The

paper highlights the importance of researchers understanding of the context and following the implementation in progress to understand challenges and improvement strategies. My involvement in the whole process of planning, implementing, and researching the midwife-led model in Palestine allowed a great emphasis on understanding context and process; on the other hand, it challenged the objectivity that is held high in research. The two external evaluations that have been included in the discussion are both important contributors to balance bias and questions or strengthen findings from my own research. Most important is the validity of the methods used in the three studies. These has been thoroughly presented and discussed.

9.0. Conclusions and future implications

The various outcomes' relevance to the different components within the framework for quality maternal and newborn care was addressed in figure 4 (page 42). The thesis description of context, the content of the model, and the findings confirming improved outcomes indicates the relation to the framework's components.

The midwives' *practice categories* include education, information, health promotion, assessment, care planning, and promotion of normal process and prevention of complications. These components are in agreement with the MoH guidelines, and the outcomes indicate that the midwife-led model of care enhanced implementation of these components, while conditions in regular care seem to limit its implementation. Further improvements of midwives' autonomy in labour care could increase the impact of the midwife-led model. Such improvement could involve establishing an alongside midwife-led labour unit at the hospital, where women with healthy pregnancies could give birth and avoid unnecessary medical interventions; thus, allow doctors to give more attention to women with complications. The labour rooms in the governmental hospitals were often overcrowded with women having mixed risks factors. The lack of differentiated care and high demand on doctors and midwives could easily prevent women with high-risk pregnancies from gaining appropriate attention and interventions, while healthy women with normal labour would be at risk for unnecessary medical interventions. Such differentiated birth care has been successfully implemented in some high-middle income countries, like South Africa and China (27, 149). Establishing a midwife-led labour unit would require more midwives, more space, and renovation of buildings. It would facilitate more privacy and possibilities for women to bring a companion of their choice (150). Developing the

model in this direction would be in line with research evidence, and should be implemented along with research (151).

The *organization of care* has been thoroughly described in this thesis. The aspects of acceptability and good quality service are reflected through the research findings. Adequate resources are still lacking in governmental services, and the implementation was one attempt to start solving the problem. More policy involvement addressing scaling up number of midwives is needed to make a competent workforce more available. Continuity service integrated across community and facilities has been thoroughly described.

The *values* incorporated in the midwife-led continuity model of care have been to enhance respect and communication by building a trustful relationship through continuity between the woman and her care provider. The local midwives' initial cultural knowledge and deployment to their rural settings is likely to have increased their understanding of rural women's situation in general and how to meet the needs of each woman. To maintain and enhance the values of respect and communication, one implication for practice is to facilitate regular team meetings, where midwives can discuss cases, critically reflect on their practice, find support and continuously update their knowledge (152).

The *philosophy* of the midwife-led model of care in Palestine is grounded in each midwife's basic professional knowledge and was emphasised in the initial training before each midwife started her work within the model. The medicalized approach in the labour setting and the hierarchical system leaves the midwives to mainly prevent complications through information and education. The midwife's position to empower the woman is through strengthening the woman's capabilities and trust. This might promote a more relaxed attitude and thereby reduce the woman's demands for interventions, such as induced labour. The midwives' role in reducing anaemia should be further investigated. Anaemia is an important maternal outcome where midwife-led continuity models of care in low-resource setting seems to have an important impact. This implicates that new evidence of midwife-led continuity models of care needs to be investigated and could be feasible by using a randomized controlled cluster design.

The *care providers* involved in the midwife-led continuity model of care are midwives who work in close cooperation with nurses and general practitioners at the community level and with specialist care at both community and hospital levels. They bridge an important gap and reduce fragmentation. Their skills are comprehensively developed through a broad scope of practice,

training, and team discussions. There are many possibilities for improving maternal care providers working conditions, such as facilitating professional seminars and reflections in teams, employing more midwives, improving the environment in labour settings, and better supply of basic equipment.

This research regarding the implementation of the midwife-led continuity model of care in Palestine has contributed to new knowledge regarding improvements in maternal and newborn care that seem feasible and sustainable. The model's association with improved maternal and neonatal health outcomes, reduced medical interventions, and improved satisfaction with care is promising.

The model could be applicable in other similar settings. The new knowledge is significant to low-middle income countries with an appropriate education of midwives. The implementation of the midwife-led continuity model of care in Palestine, and the findings and lessons learned should apply to any country or institution that strives to enhance woman-centred care.

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Papers I – III

BMJ Open Can a midwife-led continuity model improve maternal services in a low-resource setting? A non-randomised cluster intervention study in Palestine

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ABSTRACT

Objectives To improve maternal health services in rural areas, the Palestinian Ministry of Health launched a midwife-led continuity model in the West Bank in 2013. Midwives were deployed weekly from governmental hospitals to provide antenatal and postnatal care in rural clinics. We studied the intervention's impact on use and quality indicators of maternal services after 2 years' experience.

Design A non-randomised intervention design was chosen. The study was based on registry data only available at cluster level, 2 years before (2011 and 2012) and 2 years after (2014 and 2015) the intervention.

Setting All 53 primary healthcare clinics in Nablus and Jericho regions were stratified for inclusion.

Primary and secondary outcomes Primary outcome was number of antenatal visits. Important secondary outcomes were number of referrals to specialist care and number of postnatal home visits. Differences in changes within the two groups before and after the intervention were compared by using mixed effect models.

Results 14 intervention clinics and 25 control clinics were included. Number of antenatal visits increased by 1.16 per woman in the intervention clinics, while declined by 0.39 in the control clinics, giving a statistically significant difference in change of 1.55 visits (95% CI 0.90 to 2.21). A statistically significant difference in number of referrals was observed between the groups, giving a ratio of rate ratios of 3.65 (2.78–4.78) as number of referrals increased by a rate ratio of 3.87 in the intervention group, while in the control the rate ratio was only 1.06. Home visits increased substantially in the intervention group but decreased in the control group, giving a ratio of RR 97.65 (45.20 - 210.96)

Conclusion The Palestinian midwife-led continuity model improved use and some quality indicators of maternal services. More research should be done to investigate if the model influenced individual health outcomes and satisfaction with care.

Trial registration number NCT03145571; Results.

INTRODUCTION

As a low/middle-income country under occupation, Palestine depends largely on foreign aid.¹

Strengths and limitations of this study

- The pragmatic approach strengthens the applicability to real-life settings.
- The high number of clusters and the robust cluster data strengthen the study.
- A randomised allocation of clusters was not possible because the implementation of the midwife-led continuity model started before the study was planned.
- The ministry implemented the programme in the clinics they found appropriate which could have led to bias.
- The facility-based registry did not include data at individual level.

The Palestinian authority is responsible for Palestinian health services in the occupied territories of the West Bank and Gaza. In 2013, the Palestinian Ministry of Health registered 61 405 births and a fertility rate of 4.0 per woman in the West Bank.² Maternal health services were provided by the Palestinian government, and by private and non-governmental organisations. Less than 1% of the women give birth at home. Governmental facilities covered 45.6% of antenatal care in 2013. The Palestinian Multiple Indicator Cluster Survey from 2014 found that 66.4% of rural women gave birth in governmental hospitals. Of these 40.7% left hospital within 6 hours post partum, and 73% did not receive any additional postnatal care.³

In 2009, the Palestinian governmental maternal services were described as of poor quality due to concerns for being overcrowded and understaffed. Patients reported dissatisfaction with care as antenatal visits were short and lacking content.⁴ Overcrowded labour rooms prohibited women from bringing a birth companion.⁵ Midwives had restricted scope of practice and little autonomy and were not used by the Ministry

as antenatal care providers.⁴ The clinics were not able to carry out postnatal home visits as required by governmental standards.⁶ Poor women were less likely to have postnatal care.⁷

Poverty, deprived infrastructure, military checkpoints and armed Israeli settlers restrict freedom of movement and reduce access to central health facilities and legal assistance in rural areas.^{8,9} During an escalation of the conflict between the years 2000 to 2006, it was reported that 69 women gave birth at military checkpoints, causing casualties in both mothers and babies, as they were not allowed to reach hospitals.⁴ Although the political situation in the West Bank was less volatile in the following decade, rural women are still vulnerable and depend more on governmental facilities than women in urban areas as rural private services are scarce.⁹

Several studies describe how midwife-led continuity models improved health for mothers and babies. Most studies were from high-income countries.^{10–16} The WHO recommends implementation and research on midwife-led continuity models to improve quality in low/middle-income countries.¹⁷ Two main ways of organising such models are described in the literature. In the caseload model, one midwife cares for up to 45 women and facilitate relational continuity, while in the team midwifery model, a group of four to six midwives can provide care for up to 360 women through the pregnancy, intrapartum and postnatal period. Ideally, in both models, women during labour are cared for by a known midwife.^{11,17}

To improve services in rural areas, the Palestinian Ministry of Health, in cooperation with the non-governmental humanitarian organisation Norwegian Aid Committee, launched the implementation of a modified midwife-led continuity, caseload model, in 2013, starting in the Nablus and Jericho Governmental hospitals and surrounding villages. The implementation involved the communities as well as several levels in the Ministry of Health to overcome known barriers to quality of care.¹⁸

The aim of this study was to investigate whether the Palestinian midwife-led continuity model had an impact on the use of maternity services and selected quality indicators at the two regions' clinics after 2 years of experience.

METHODS

Implementation of the Palestinian midwife-led continuity model

The modified caseload model aimed at establishing a relationship between the pregnant woman and her midwife during pregnancy and the postnatal period. The midwife also worked at the governmental hospital, where most women would give birth unless they chose a private hospital.

Once assigned, midwives in Nablus and Jericho governmental hospitals received training. Under supervision, they provided antenatal care in clinics and postnatal home visits in the surrounding villages. The hospital in Nablus had enough midwives to serve 10 villages per

week, meaning two midwives would leave hospital each weekday, 5 days a week. Midwives from Jericho hospital served five villages in the Jordan Valley, with one midwife visiting one village every weekday. Three extra midwives were employed in the hospital in Nablus, and two in Jericho, to maintain the capacity at the labour ward. All midwives worked full time, as part time employment was not possible at the Ministry of Health. The same midwife visited the same village, usually once a week. If the designated midwife was on holiday or sick leave one of the other midwives would cover her village. The ideal case load per midwife was around 50 pregnant women yearly but should not exceed 100. Thus, the smallest village with 16 registered pregnant women per year was visited every second week only, and the largest village with 163 registered pregnant women was shared by two midwives weekly. The remaining working days the midwife spent in the labour ward. All pregnant women were informed that their midwife during pregnancy also worked at the local governmental hospital. Independent of place of delivery, all women registered at the clinic were to be offered postnatal home visits. All pregnant women were informed that the limited numbers of midwives and the large workload in the labour ward made it difficult to ensure they would meet the midwife they knew from antenatal care during labour. Women were given the phone number for their midwife in case of an emergency. The level of relational continuity was limited to the antenatal and postnatal period.

Nevertheless, a relational continuity was possible also during labour if their known midwife happened to be on duty. Implementing the model aimed to strengthen the relationship between the woman and her midwife, improve interdisciplinary cooperation and reduce the barrier between hospital and primary healthcare. The midwives received driving lessons to obtain a driving license and used designated cars with the Ministry of Health logo and marked Midwifery Care to facilitate transportation to villages and homes. Standard care in the clinics without this model was offered mainly by nurses or midwives and medical doctors (general practitioner) working only in primary healthcare.

Study design

As the implementation started before the study, a non-randomised intervention design was chosen to evaluate the model, based on registry data at cluster level from two complete years before (2011 and 2012) and two complete years after (2014 and 2015) the intervention. Clinics where the model was implemented were compared with clinics where the model was not implemented. Both arms of the study followed the same written governmental procedures.

The study was part of an implementation research project aiming at documenting the effect of the midwife-led continuity model. The study was approved by the Regional Ethical Committee of South East Norway and by the Palestinian Ministry of Health.

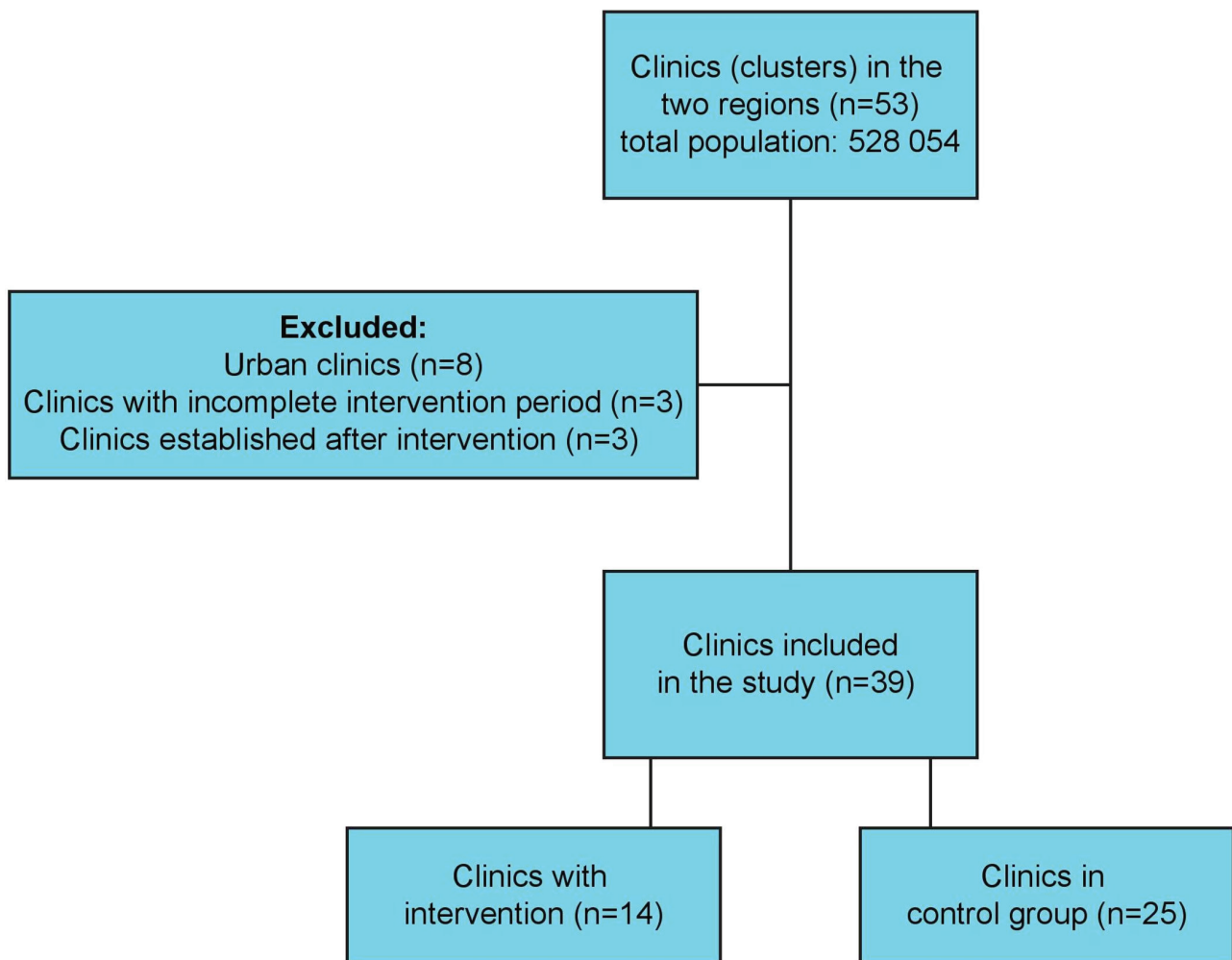


Figure 1 Flow chart showing the stratification of all clusters in the study area.

Clusters

The clusters consisted of governmental primary health village clinics in Nablus and Jericho regions. There were 53 active clinics during the study period. During autumn 2013, the midwifery model was implemented in 16 clinics.

All clinics were stratified for inclusion by rural and urban location, activity period and intervention period.

Exclusion criteria

Clinics located less than 3 km from Nablus and Jericho centre were defined as urban, thus pregnant women had better access to private and non-governmental services. Clinics in urban areas were therefore excluded. Clinics opened during the study period were excluded due to incomplete data.

Clinics where the intervention was prematurely terminated or introduced later during the study period, were excluded because of contaminated data.

Outcomes

The number of antenatal visits was chosen as the primary outcome. Secondary outcomes were number of pregnant women referred to higher level of care and number of

women receiving postnatal home visits. Other outcomes were number of women registered at the clinic for antenatal care, number of pregnant women referred for abnormal blood sugar levels, number of women seen by doctor after birth, number of newborns seen by doctor after birth and number of total postnatal consultations for mother and newborn.

Statistical analysis

Aggregated data were retrieved from the governmental registry. The registry consisted of anonymous data reported monthly from all clinics to the central statistical database in the Ministry of Health. The registry did not include data at an individual level.

Mean, SD and range were given for normally distributed and count variables. Percentage and total number were given for categorical variables.

Change from baseline in the intervention and standard care groups and any differences between the groups' changes were examined by using mixed effects models. In the mixed models, the clinic was specified as cluster (ie, random variable), time and group, and

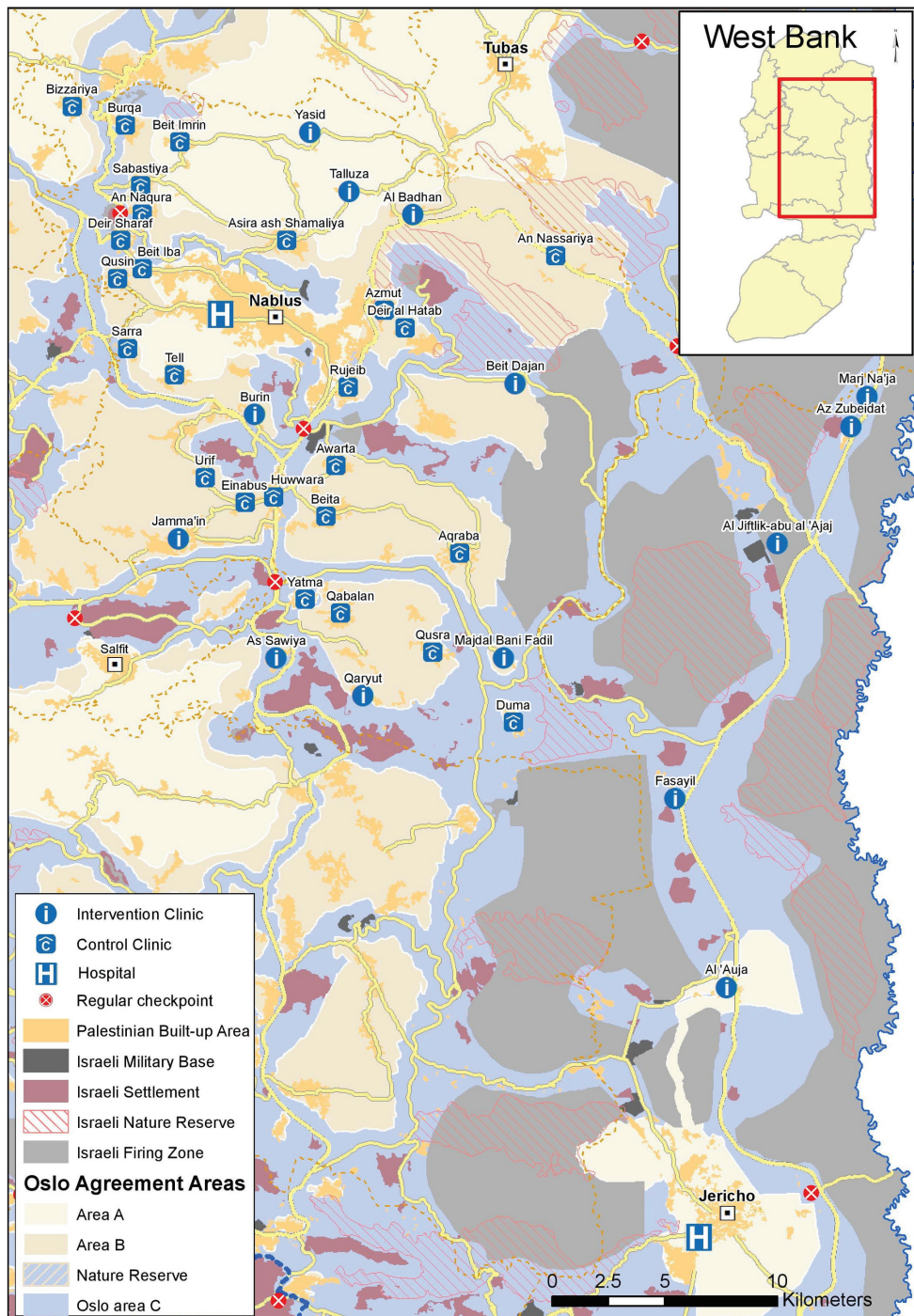


Figure 2 Map showing the location of all included clusters in the study area.

interaction between time and group were treated as fixed variables.

Approximately, normally distributed count outcomes were fitted by mixed effects linear regressions. Before fitting, the outcome variables were divided by the number of registered pregnant women, or newborns, to calculate average values. Variance weights for each average were then computed and included in a variance formula in the model because of heteroscedasticity, since the computed

averages are based on different numbers of pregnant women.

Mixed effects Poisson regressions were used to fit non-normally distributed count outcomes, and an offset variable was used to adjust for the total number of (individual) registrations that were under risk in the models.

Measured confounding variables, which could have influenced the key estimates, were: the village's population size, whether the clinic had an employed community

Table 1 Characteristics of clusters*

Characteristics		Intervention	Control
Population served	Mean	3402	4636
	Minimum/maximum	1000/7554	1875/11 017
Distance to hospital (km)	Mean	23	12.6
	Minimum/maximum	5/59	3/28
Number of clinics with employed community midwife		0	8
Number of clinics with laboratory		5	10
Additional clinics in village (NGO)		4	2
Number of clinics with regular military check points between village and hospital		6	14

*14 clinics with intervention and 25 clinics with standard care (control). NGO, non-governmental organisation.

midwife and laboratory equipment, regular military checkpoints between village and hospital and distance from hospital. These possible confounders were included in the mixed models for adjusting.

Adjusted regression coefficient as means and rate ratios (RRs) with 95% CIs were given. Two-sided *p* values of less than 0.05 were considered statistically significant.

The map was developed by using ArcGIS software, and the attribute/database is part of the same application.

The analyses of mixed effect models were performed with R V.3.4 and STATA V.14. Descriptive analyses were carried out using IBM-SPSS V.21 for Windows.

RESULTS

After stratification, 39 clinics were included in the study: 14 as intervention and 25 as control clinics (figure 1).

In total, 10 034 women booked at the 39 included clinics during the study period, 2784 in the intervention clinics and 7250 in the control clinics.

The clinic locations are presented in figure 2.

The Palestinian Ministry of Health confirmed that no other activities were introduced unequally to the groups during the study period. The clinics were located in a region where political unrest and economic hardship most likely would affect the intervention and control groups similarly during the study period. The measured possible confounders presented in table 1 were adjusted for in the final results; none had significant confounding effect.

Descriptive statistics of primary and secondary outcome variables such as number of individuals registered, mean, SD and range for the two time points in the intervention and standard care are presented in table 2.

Change within the intervention and standard care group as means and RRs and difference between the changes within the two groups, controlled for potential confounding covariates are presented in table 3.

Antenatal use

There was statistically significant difference in average change in mean number of antenatal visits between the groups by 1.55 (1.38–1.54), *p*=0.0004. Mean number of visits increased by 1.16 visits with the new model, while standard care declined with -0.39 visits. In other words, clinics with the new model had an increase from 3.7 mean number of antenatal visits per pregnant woman before the model was introduced to 4.7 mean number of antenatal visits per woman after, while in the control clinics, mean number of antenatal visits per woman decreased from 4.6 to 4.2 visits.

Referrals

A statistically significant difference in change between the groups' number of referrals to a higher level of care was observed giving a ratio of RRs of 3.64 (2.78–4.78), *p*<0.0001. For the intervention group, referrals increased by a RR 3.87, meaning that the number of referrals increased from 7.3% to 25.6% of all registered women in the clinics, while the control group only had a change RR 1.06, meaning that the percentage of referrals moved only from 12% to 12.8% during the study period.

Postnatal service

Postnatal home visits increased substantially at the intervention clinics, whereas at the control clinics it dropped giving a ratio of RRs 97.65 (45.20–210.96), *p*<0.0001.

With women in the intervention group, mean number of postnatal contacts with health services increased significantly, whereas no increase was observed at clinics with standard care, giving a ratio of RRs of 0.60 (95% CI 0.46 to 0.75) *p*<0.0001. Also, a significant increase in mean number of newborn's healthcare contacts were observed with the new model, but not in group with standard care, giving a ratio of RRs 0.33 (0.16–0.52) *p*=0.0004.

Table 2 Descriptive statistics for primary and secondary outcomes at baseline and 2 years after the implementation

	Groups/clusters (n=39)*	Time point†	N‡	Mean§	SD	Range	
						Minimum	Maximum
Number of women registered for ANC during study period	Intervention	Before	1094	39	18	12	95
		After	1690	60	33	16	163
	Standard care	Before	3180	64	36	3	168
		After	4070	81	42	23	213
		Total	10034				
Number of newborns registered during study period	Intervention	Before	2220	79	42	27	176
		After	2470	108	61	29	217
	Standard care	Before	5416	88	46	33	291
		After	5771	115	67	36	298
		total	15877				
Number of antenatal visits and mean visit per woman per cluster (recurrent visits divided on number of registered women)	Intervention	Before	4015	3.7	0.9	1.9	5.6
		After	7994	4.7	1.2	3.0	7.0
	Standard care	Before	14657	4.6	1.4	2.4	8.6
		After	16769	4.2	1.1	2.4	6.8
Number of referrals to higher level of care (mean % of registered pregnant per cluster)	Intervention	Before	79	7.3	8.3	0	36.4
		After	456	25.6	14.2	2.3	54.1
	Standard care	Before	427	12.0	11.7	0	45.5
		After	549	12.8	13.2	0	66.7
Number of registered pregnant women receiving home visits after birth (mean % of registered pregnant per cluster)	Intervention	Before	12	1.7	4.7	0	17.7
		After	721	41.8	25.2	0	97.5
	Standard care	Before	42	1.5	4.9	0	25.5
		After	22	0.7	2.3	0	11.5
Coverage—ratio % between number of registered newborns and registered pregnant per cluster	Intervention	Before		57	27	21	109
		After		71	22	37	131
	Standard care	Before		61	23	7	119
		After		74	16	47	113
Number of referrals because of abnormal blood sugar (mean % of registered pregnant per cluster)	Intervention	Before	29	2.6	3.4	0	10.0
		After	81	4.5	7.4	0	30.2
	Standard care	Before	90	2.6	3.5	0	14.9
		After	105	2.7	3.6	0	13.0
Number of mothers seen by doctor postnatally (mean % of registered newborns per cluster)	Intervention	Before	208	12.3	20.0	0	0.7
		After	461	20.1	32.4	0	94.0
	Standard care	Before	534	12.1	20.5	0	93.0
		After	225	4.8	10.0	0	57.0
Number of newborns seen by doctor postnatally (mean % of registered newborns per cluster)	Intervention	Before	1670	79.6	24.5	29.7	118.6
		After	2173	91.4	29.8	34.8	172.4
	Standard care	Before	4338	85.2	26.8	21.8	162.2
		After	5082	90.4	21.6	47.5	142.1
Total postnatal consultation for newborn	Intervention	Before	3902	1.8	0.3	1.3	2.2
		After	5364	2.2	0.4	1.7	3.1
	Standard care	Before	9796	1.9	0.3	1.2	2.6
		After	10875	1.9	0.2	1.5	2.4

Continued



Table 2 Continued

	Groups/clusters (n=39)*	Time point†	N‡	Mean§	SD	Range	
						Minimum	Maximum
Total postnatal consultations for mothers of registered newborn	Intervention	Before	1830	0.9	0.4	0.2	1.7
		After	3637	1.4	0.4	0.8	2.1
	Standard care	Before	5073	1.0	0.5	0.2	3.1
		After	5399	1.0	0.7	0.2	1.6

*14 intervention clusters and 25 standard care clusters.

†Two years before intervention (2011 and 2012) and 2 years after intervention (2014 and 2015).

‡Number of total individual registrations.

§The mean at cluster level.

ANC, antenatal care.

DISCUSSION

In the clinics with the midwife-led continuity intervention, a significant rise in mean number of antenatal visits per woman was observed, whereas number of visits per woman decreased in the clinics with standard care during the same period. It is thus likely that the improved use was a result of the intervention. WHO recommended in 2002 a

minimum of four focused antenatal visits for healthy pregnant women.¹⁹ After evaluating new evidence, the recommendation was revised in 2016 to a minimum of eight antenatal visits to reduce perinatal mortality and improve women's satisfaction.^{17 18 20} The women's increased adherence to service in clinics with midwife-led continuity may indicate that women experienced improved quality of

Table 3 Change before and after intervention in both groups and multiplicative difference of changes between the groups

Outcome*	Group	Change in groups before and after	Difference in changes between groups	P values
		Adjusted† mean (95% CI)	Adjusted mean (95% CI)	
Mean number of antenatal visits per pregnant	Intervention	1.16 (0.60 to 1.72) p<0.0001	1.55 (0.90 to 2.21)	0.0007
	Control	-0.39 (-0.73 to 0.05) p=0.026		
Number of newborn's mothers who registered at clinic during their pregnancy	Intervention	18.2% (10.0 to 26.4) p<0.0001	6.6% (-3.1 to 16.4)	0.179
	Control	11.6% (6.3 to 16.9) p<0.0001		
Number of newborns seen by doctor postnatally	Intervention	12.8% (-1.8 to 27.3) p=0.085	4.7% (-12.7 to 21.9)	0.599
	Control	8.1% (-1.3 to 17.5) p=0.089		
Total number of postnatal consultations for newborns	Intervention	0.41 (0.26 to 0.57) p<0.0001	0.33 (0.16 to 0.52)	0.0004
	Control	0.08 (-0.02 to -0.18) p=0.126		
Total number postnatal consultations for mothers	Intervention	0.64 (0.52 to 0.77) p<0.0001	0.60 (0.46 to 0.75)	<0.0001
	Control	0.04 (-0.04 to -0.12) p=0.321		

Outcomes‡	Group	Adjusted Rate Ratio RR (95% CI)	Adjusted RR (95% CI)	P values
Number of referrals to higher level of care	Intervention	3.87 (3.04 to 4.92) p<0.0001	3.64 (2.78 to 4.78)	<0.0001
	Control	1.06 (0.94 to 1.21) p=0.353		
Number of registered pregnant who received postnatal home visits	Intervention	37.42 (21.14 to 66.22) p<0.0001	97.65 (45.20 to 210.96)	<0.0001
	Control	0.38 (0.23 to 0.64) p<0.0001		
Number of referrals because of abnormal blood sugar	Intervention	1.78 (1.16 to 2.72) p=0.008	1.83 (1.10 to 3.05)	0.021
	Control	0.97 (0.73 to 1.29) p=0.846		
Number of mothers seen by doctor postnatally	Intervention	1.94 (1.65 to 2.29) p<0.0001	4.87 (3.88 to 6.10)	<0.0001
	Control	0.40 (0.34 to 0.47) p<0.0001		

*Mixed effect linear regression was used to analyse change in and between clusters when data had normal distribution.

†All outputs were adjusted for potential confounders without any change in value. Covariates adjusted for were: distance from clinic to city hospital (km), population in village, if there were additional clinic in village, clinics with community midwife, clinics with laboratory and clinics with a regular checkpoint on the way to hospital.

‡Mixed-effect Poisson regression was used to analyse the change in clusters when data was not normal distributed.

the services. Relational continuity is an important tool to enhance communication and thus satisfaction with care.¹⁶ The association between improved quality of care and increased use is supported by several previous studies and by WHO recommendations to improve use and quality by introducing midwife-led continuity of care.^{12 14 17 18}

It is a possibility that the pregnant woman would feel safe knowing that the midwife following her throughout pregnancy also worked at the public hospital where she would give birth, and that her midwife would visit her at home after birth. Due to the heavy workload, the midwives could not be on call to attend birth. Midwife-led continuity of care in settings with few midwife resources and heavy workload must balance the demands on the midwives. Although women were not guaranteed that the same midwife providing them antenatal and postnatal care would attend their labour, their midwife's connection to the governmental hospital might have reduced the alien barrier to the hospital and restored a feeling of security for the rural women.

A qualitative study investigated midwives' experience of working with a similar model in the Ramallah region from 2007 to 2011. The midwives described how the model enabled them to give individualised care and how the broader scope of practice and increased autonomy gave them important experience and tools for their work.²¹ This could serve to explain women's adherence to the antenatal service, because building a relationship with competent, respectful and motivated midwives probably increased their wish to return to receive more care.

In the intervention group, a change in referral mechanisms was observed. The midwives working with the new model identified significantly more risk factors leading to referral to higher level of care than in clinics with standard care. The finding of more women with abnormal blood sugar level indicates that the model improved the identification of important risk factors. The proportion of pregnant women referred to higher level of care increased to 25.6% with the new model versus 13% with standard care during the study period. The proportion in the new model is in line with the WHO estimate presented in guidelines from 2001, that in general 25% of pregnant women would need additional antenatal care due to health complications before or during pregnancy.²² The village clinics had little, if any, technical resources to investigate risk signs, so referral to higher level of care was necessary to follow-up any possible complications.

One important quality indicator of antenatal care is the ability to detect possible complications and involve specialist care when necessary. Kearns and Caglia demonstrate that improved referral networks are a key element for improving quality in low-resource settings.²³ The process of information and referral within the system is also highlighted by the WHO framework as one core indicator of quality of services.^{24 25} Some countries have much higher level of maternal health risks than others due to poverty, high fertility rate and general health challenges.^{10 26} A Palestinian study from 2015 revealed that

26.9% of women who gave birth experienced one or more morbidities.²⁷ The rise in numbers of referrals after introducing the new model matched the WHO and the local estimates. Thus, it seems reasonable to suggest that the intervention improved the referral system.

The results furthermore showed a substantial increase in the number of postnatal care contacts for mothers and newborns, including home visits. The WHO recommendation for postnatal care is a minimum of three postnatal contacts and a minimum of one home visit preferably during the first week after birth.²⁸ The result from the study consequently indicates that the implementation of midwife-led continuity models may contribute to reach such a goal.

Filby *et al* describe how lack of transportation hamper quality improvements in other rural resource-constrained settings.²⁹ The implementation in rural Palestine included a designated vehicle and driving skills for the midwives. Facilitation of transportation was consequently a key factor in reaching out to the villages and home visits.

The fact that women receiving midwife-led continuity were more frequently seen by a doctor in the clinic after birth (20.1% vs 4.8%), in addition to the midwife, indicates improved interdisciplinary cooperation. When midwives undertook home visits and discovered health problems or risks, they involved the doctor. The findings also showed that there was a systematic check of newborn babies by doctors in all the village clinics, and the home visit from the midwife added to this. The increase in, and variation of, postnatal contacts including home visits, make it reasonable to conclude that the midwifery model improved both use and quality of postnatal care at a cluster level.

Limitations of the study

The study was carried out after the implementation of the midwife-led continuity model started. This prevented a randomised allocation of clinics to intervention and control clusters. The number of midwives available in the hospitals limited the number of clinics for implementation to a total of 15 in these regions. The Ministry chose to implement the programme in the clinics they found appropriate. The baseline data show that a reason for choosing these clinics were due to challenges in service provision, thus improvements could have been easier achieved and lead to bias.

Another limitation was weak data because the facility-based registry did not include data at individual level. This is a common problem in low/middle-income countries.²³ Lack of an individual reproductive health registry prevented measuring individual impact and an intra-cluster coefficient. Thus, it was not possible to know when women registered at the clinic or who came back for recurrent antenatal visits or the reasons for referrals.

Strength of the study and further recommendations

The high number of clusters and the robust cluster data strengthen the study. The organisational leadership,

engagement and adherence of the multidisciplinary team strengthen the sustainability of a complex intervention and its applicability to real-life settings. The findings make it reasonable to conclude that the new model had an effect on the use and on some quality indicators of the maternal services. The study can be a useful tool in power calculations and planning of randomised trials for future implementation of the model.

Triangulation of methods within an implementation research framework would be useful to investigate the broader effect of the implementation. This is highly recommended when introducing evidence-based interventions to improve health service delivery in real-world settings where context is an important factor.³⁰ Further research should be done to investigate if the model could have an impact on individual health outcomes for mother and newborn and on satisfaction with care. Previous research has described midwife-led models as a cost-saving way to improve maternal health in developing countries.^{12 31} A study of this model's cost-effectiveness would be useful. The general understaffing of both primary and secondary governmental health services should be taken into consideration. This calls for an increase in the number of midwives to improve quality. By implementing the model, more midwives were employed at the hospitals to serve the community, enhancing the workforce of trained midwives in both primary and secondary health service. The benefit of the midwife's broader scope of practice and experience and the improved interdisciplinary cooperation should be investigated. The cost of transportation was reduced to a minimum by enabling the midwives to drive the vehicle themselves, as employing drivers would have added unsustainable cost to the model.

CONCLUSION

The findings make it reasonable to conclude that the new model had an effect on the use and on some quality indicators of the maternal service.

The positive change in facility-level outcomes show that clinics with the midwifery model in the regions of Nablus and Jericho improved services during pregnancy and during postnatal period. The findings indicate the improvement of use and some quality indicators linked to facility-level outcomes, such as continuity, functioning referral system and postnatal home visits.

The results of this study support the expansion of the model to new areas in Palestine. We believe the model can be useful for other low/middle-income countries to improve use and quality of care.

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Research Paper

Improving Maternal and Neonatal Health by a Midwife-led Continuity Model of Care – An Observational Study in One Governmental Hospital in Palestine

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ABSTRACT

Background: From 2013 a midwife-led continuity model of care was implemented in the Nablus region in occupied Palestine, involving a governmental hospital and ten rural villages. This study analysed the relation between the midwife-led model and maternal and neonatal health outcomes.

Method: A register-based, retrospective cohort design was used, involving 2201 singleton births between January 2016 and June 2017 at Nablus governmental hospital. Data from rural women, with singleton pregnancies and mixed risk status, who either lived in villages that offered the midwife-led continuity model and had registered at the governmental clinic, or who lived in villages without the midwife-led model and received regular care, were compared. Primary outcome was unplanned caesarean section. Secondary outcomes were other modes of birth, postpartum anaemia, preterm birth, birth weight, and admission to neonatal intensive care unit.

Findings: Statistically significant less women receiving the midwife-led model had unplanned caesarean sections, 12.8% vs 15.9%, adjusted risk ratio (aRR) 0.80 (95% CI 0.64–0.99) and postpartum anaemia, 19.8% vs 28.6%, aRR 0.72 (0.60–0.85). There was also a statistically significant lower rate of preterm births within the exposed group, 13.1% vs 16.8, aRR 0.79 (0.63–0.98), admission to neonatal intensive care unit, 7.0% vs 9.9%, aRR 0.71 (0.52–0.98) and newborn with birth weight 1500 g and less, 0.1% vs 1.1%, aRR 0.13 (0.02–0.97).

Interpretation: Receiving the midwife-led continuity model of care in Palestine was associated with several improved maternal and neonatal health outcomes. The findings support further implementation of the model. Implementation research, including randomised studies, would be useful to further investigate the effect and feasibility of the model in a low resource setting.

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1. Introduction

Interventions to achieve sustainable, accessible, appropriate, and woman-centred care globally are requested [1]. Midwife-led continuity models of care, where a known midwife supports a woman throughout pregnancy, birth and the postnatal period, are recommended in settings

with functioning midwife education [2,3]. Sandall et al. [3] concluded in a Cochrane review that midwife-led models of care improved several health outcomes for mothers and babies. For healthy mothers with normal pregnancies such models of care decreased the risk of interventions during birth, such as instrumental birth and regional anaesthesia, and reduced the rate of preterm births <37 weeks [3]. In settings with high caesarean rates, previous studies have shown that midwife-led continuity models of care were associated with decreased caesarean section rates [4,5]. Furthermore, such models of care seem to be a cost-efficient way to improve maternal health services [14]. Midwife-led continuity

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Panel: Research in Context*Evidence Before This Study*

Midwife-led continuity models of care, where a known midwife supports a woman throughout pregnancy, birth and the postnatal period, are recommended in settings with well-functioning midwife education. Evidence from high income countries found such models to be a cost-efficient way to improve health outcomes, reducing medical interventions and increasing satisfaction with care. Studies of midwife-led models adapted to low- and middle-income countries have been requested.

Added Value of This Study

Between 2013 and 2016 the Palestinian ministry of Health implemented a midwife-led continuity model of care in six hospitals and 37 villages. To our knowledge this is the first study of maternal and neonatal health outcomes after implementing a midwife-led continuity model of care integrated in a low-middle income country's governmental health system. The complex intervention gives new useful insight in how such models can be adapted to and made feasible in settings with limited resources. We investigated the association between receiving midwife-led continuity of care and different outcomes for mothers and babies after birth in a governmental hospital in the West Bank, Palestine. We compared the outcomes of 703 women who received the midwife-led model with 1498 women who received regular care. We found that receiving midwife-led continuity of care was associated with several improved maternal and neonatal health outcomes and reduced medical interventions.

Implications After All the Available Evidence

This study provides new information on how midwife-led continuity models of care can influence maternal and neonatal health outcomes in low- and middle-income countries with well-functioning midwife programmes. The findings support further implementation of the model to new regions. Implementation research including randomised studies would be useful to further investigate the effect and feasibility of the model in low resource settings.

of care is mainly organised as *caseload- or team-midwifery models*. In the *case-load model*, one midwife cares for up to 45 women and facilitates relational continuity, while in the *team-midwifery model* a group of 4–6 midwives provide care for up to 360 women through pregnancy, birth and the postnatal period. Ideally, in both models, women are cared for during birth by a known midwife [2,6]. The case-load model facilitates a relationship between the woman and a midwife, which has been especially valued by women [6]. A trustful relationship can be an important tool to cope with sensitive physical and psychological conditions and social challenges, like intimate partner violence, a threat facing pregnant women globally [10,19].

Previous studies related to midwife-led continuity of care are mainly from high-income countries [3,7]. The needs and challenges in low- and middle-income countries vary, and cultural and contextual sensitivity is essential when introducing improvement strategies to new settings [8,9]. Implementation research is recommended to investigate how midwife-led models can be adapted to low income countries [8,10].

Appropriate and timely medical interventions during pregnancy, birth and the postnatal period save lives and improve health outcomes, while unnecessary interventions can disturb an otherwise healthy natural process and cause serious side effects [11].

1.1. Palestinian Context

Palestine is divided into the regions of West Bank, East Jerusalem and Gaza, occupied by Israel in 1967. Since 1994, The Palestinian Ministry of Health (MoH) has been responsible for the Palestinian health system. Nevertheless, Israeli military checkpoints and armed settlers restrict freedom of movement and reduce access to central health-facilities and medical assistance for people in rural areas [12].

According to World Bank data from 2015, the maternal mortality rate was 45 per 100,000 births in West Bank and Gaza, versus 5 per 100,000 in Israel. The infant mortality rate (<1 year) was 17 per 1000 live birth in the West Bank and Gaza, versus 3 per 1000 in Israel [13]. This study was performed at a West Bank hospital.

In 2016, MoH reported 72,327 births in the West Bank, whereas 53·6% of these were in governmental hospitals, 46·3% in private hospitals, and 0·1% gave birth outside institutions. The fertility rate was 3·7 per woman and the overall caesarean section rate in governmental hospitals was 24·9%. It was reported that 5·6% of the newborn had low birth weight (<2500 g) and that 28·2% of pregnant women had anaemia (Hb < 11 g/dl). Prematurity and low birth weight were reported as reasons for 24·6% of the infant deaths [14].

Governmental services are free of charge and mainly used by poor people, often from rural areas [15]. The rural population accounted for 25·5% of the total population of 2·9 million in the West Bank [14].

Previous local studies have presented a variety of challenges in Palestinian governmental maternal health services. Rahim et al. described in 2009 overcrowded and understaffed facilities and short antenatal visits lacking content [16]. Women reported dissatisfaction both with provider's attitude and interactions [16]. Overcrowded labour rooms prohibited women bringing a birth companion, and over-medicalization and unnecessary interventions were reported in normal births [17].

Since 1990 a growing number of universities and colleges in Palestine offers bachelor's degree in Midwifery. Before the midwife-led continuity model was introduced, Palestinian midwives who worked in the Ministry of Health had restricted scope of practice and little autonomy [16].

To improve services in rural areas, the MoH, in cooperation with the non-governmental humanitarian organisation Norwegian Aid Committee (NORWAC), started a stepwise implementation of a modified midwife-led continuity, *case-load-model* of care, in 2013. By 2016 the model was implemented in six governmental hospitals and 37 villages. The model implies that midwives from the hospitals offer outreaching caseload ante- and postnatal care to pregnant women in rural village's clinics and homes.

In the Nablus region the midwife-led model was implemented in ten of the 40 village clinics by 2014. The low number of available midwives employed in the governmental hospital limited the number of villages. Selection was done by supervisors in the MoH based upon village clinics in most need of improvements. The implementation was associated with increased utilisation of services, number of detected pregnancy complications causing referrals to higher level of care, and a substantial increase in postnatal home visits [18].

The aim of this study was to investigate the association between the Palestinian midwife-led continuity model of care and maternal or neonatal health outcomes, by analysing data of rural women giving birth in a governmental tertiary, referral and teaching hospital in Nablus.

2. Methods**2.1. Design and Participants**

A registry-based, retrospective cohort design was conducted.

Women with a singleton pregnancy and mixed risk status, who resided in rural villages more than 3 km away from Nablus city centre, and who gave birth at Rafidia governmental hospital in Nablus, were included in the study. Women who lived in villages with a governmental

clinic that offered the midwife-led continuity model where they had received antenatal care, were allocated to the exposed group, and women in villages without the midwife-led model, and who had received regular care, were allocated to the unexposed group. The two groups were expected to be comparable as they presented a rural population within the same region, with similar health status, using governmental health services.

Ethical approval for the study was granted from the Norwegian Regional Committee for Medical Health Research Ethics South East (REK) with id number: 2015/1235. Oslo University Hospital and the Palestinian Ministry of Health also approved the study. The research presented minimal risk of harm to subjects and involves no procedures for which written consent is normally required.

2.2. The Midwife-led Continuity Model of Care

Midwives educated at bachelor level and who were employed in Nablus governmental hospital, received theoretical and practical updating, including the Ministry of Health standards for primary health care and the principles of continuity of care. They also received driving lessons and were certified as drivers of cars with Ministry of Health logo, marked Midwifery Care, to facilitate transportation between hospital and the rural village clinics, and homes. The hospital had enough midwives to serve ten villages per week, meaning two midwives would leave the hospital each weekday to serve two villages, five days a week. Three extra midwives who were employed at the hospital to maintain the capacity at the labour ward, were also involved in the training. All midwives employed in the MoH are obliged to work full time. A regional midwife supervisor was appointed to assist the head midwife in scheduling at the labour ward and to follow up with the primary health system and supervising the midwives in the program.

The same midwife served the same village, usually once a week. When pregnant women booked for antenatal care they would also receive a consultation with the physician serving the clinic, who would decide in cooperation with the midwife, the further involvement in the care according to the woman's needs. The midwives followed up her case-load of women by individual consultations through pregnancy. They informed about normal pregnancy, labour and birth, and breastfeeding. They assessed health status and risk factors and referred to appropriate specialist care when necessary. The midwife continued to follow up women with detected health risks in collaboration with specialist care. The smallest villages with less than 25 pregnant women per year were visited by one midwife every second week, and the largest one, with more than 100 pregnant women per year was shared by two midwives, each following up a caseload of women. Most villages had one midwife serving them weekly. The midwives spent the remaining working days at the hospital. During vacation or sick leave, the midwives would cover each other's villages. The pregnant women were informed that the midwives providing them antenatal care also worked at Nablus governmental hospital, and that she would visit them at home after birth. They were also informed that their midwife could not ensure they would be on duty or available for them during labour or postnatal care at the hospital, because of the limited number of midwives and the large workload in the labour ward. Women were given the phone number of the midwives to call in case of an emergency. The level of ensured relational continuity was limited to antenatal care and postnatal home visit. Nevertheless, a relational continuity was possible during labour and postnatal hospital stay if their known midwife was on duty. Implementing the model aimed at strengthening the relationship between the woman and her midwife, enhance respectful care, improve midwives' skills, experience and autonomy and improve interdisciplinary cooperation between levels of care.

2.3. Regular Care

Women in the group receiving regular care, lived in rural villages where the midwife-led model was not implemented. They received

care either from governmental clinics or private doctors. Approximately 70% of women in rural villages register for governmental antenatal care [18]. Regular governmental antenatal care was provided by midwives, nurses and physicians who only worked with primary health care and who had a variety of other responsibilities, like vaccination, regular health care and minor emergencies.

All governmental facilities, including the one offering the midwife-led model, followed the same MoH standards of care. Female physicians rotated to all governmental clinics, including those with the midwife-led model, offering ultrasound examinations. All women who were included in this study gave birth at the same governmental hospital in Nablus.

2.4. Hospital Setting and Birth Registry

Rafidia governmental hospital in Nablus has a labour and a postnatal ward, and a neonatal intensive care unit. In 2016, the hospital registered 5408 births and a total caesarean section rate of 35.1% [14]. The hospital had both a handwritten and an electronic birth registry, where maternal and neonatal characteristic, health status and interventions were registered continuously by doctors and midwives. Mode of birth was described by doctors who defined planned and unplanned caesarean section, and vacuum extraction. Routine ultrasound during pregnancy defined the gestational age. A routine blood test before leaving hospital defined the haemoglobin level postpartum.

2.5. Outcome Variables

Outcomes were limited to the available and reliable information at the hospital's birth registry. Unplanned caesarean section rate was the primary outcome. Secondary maternal outcomes were planned caesarean section, spontaneous vaginal birth, vacuum extraction, induction of labour, postpartum anaemia ($Hb < 11$ g/dl and $Hb < 9.5$ g/dl) and postpartum blood transfusion. Neonatal outcomes were rate of preterm newborn (≤ 37 gestational weeks), and very preterm newborn (≤ 32 gestational weeks), low and very low birth weight (≤ 2500 g and ≤ 1500 g), admission to neonatal intensive care unit (NICU), Apgar score after 5 min, and perinatal deaths, including stillbirths and deaths during postpartum hospital stay.

2.6. Sample Size and Statistical Analyses

Power calculations were based on the total caesarean section rate of 35.6% at the hospital in 2015. Whereas the published reports from the MoH did not differentiate between planned and unplanned caesareans, we assumed that the unplanned caesarean section rate was around 20%. The proportion of the rural women who received the midwife-led continuity model were much smaller than the proportion who received regular care. To ensure that data were collected within a time frame as equal as possible, a group size of 2:1 was necessary. A sample size of 2200 births, with a ratio of the exposed group size to the unexposed group of 1:2, was adequate to detect a difference of 5% in caesarean section rate between the groups receiving midwife-led and regular care, with a power of 80% and a significance level of 5%.

Descriptive statistics were used to calculate means, standard deviations, medians, interquartile ranges, ranges, frequencies, and percentages. The chi-squared tests were used for categorical variables and Mann-Whitney *U* tests were used for continuous variables to explore any differences between the groups. Multivariate analyses with generalised linear models (GLMs) for binary outcomes with the log link were conducted to estimate adjusted risk ratios (aRR) and 95% confidence intervals. Age, parity and previous caesarean section that are known to affect the birth outcomes, were included in the GLMs for adjusting. Since there was a difference of 4 months in length of data collection period between the two groups, year of current birth was also included in the GLMs for adjusting. Additionally, we used the GLMs to examine whether the impact of previous caesarean on the maternal outcomes differed between

the two groups by testing the interaction between group and previous caesarean.

Stata version 15 was used to calculate the sample size for the present study. Data were analysed using SPSS version 25 and p values of <0.05 were considered statistically significant.

2.7. Data Collection

Women and newborn's place of living, personal and medical information were recorded routinely by midwives and doctors both in a hand-written and in an electronic registry at the hospital. A designated midwife extracted the data, and entered it to a code locked excel form, developed for the purpose by the first author. Data were extracted from the hospital's birth registry until the required number of births in each group was obtained, starting from January 1st 2016 until February 1st 2017, 13 months, for the unexposed group and until May 31st 2017, 17 months, for the exposed group (Fig. 1). The data were cross-checked with both registries to assure validity and that all eligible births were consecutively included. Identities were cross-checked with registries at the governmental clinics offering the midwife-led model to confirm that women allocated to the exposed group actually had received antenatal care at the clinic. All identifications were removed before the data were transferred to Oslo University Hospital's repository for sensitive data, in compliance with Norwegian regulations for individual privacy.

3. Results

All together 2201 women were included in the study, 703 receiving midwife-led care and 1498 receiving regular care. Table 1 presents the available personal characteristics for the study participants.

Table 1

Participants demographic and obstetric characteristics.

	Midwife-led care (n = 703)	Regular care (n = 1498)	p value*
Age (years)	26(7/16–45)	26(8/15–44)	0.572
Data missing	0	0	
Parity	2 (3/1–11)	3 (3/1–13)	0.115
Data missing	0	0	
Nulliparous women	206 (29.3%)	396 (26.4%)	0.160
Data missing	0	0	
Previous caesarean	106 (15.1%)	232 (15.5%)	0.804
Data missing	0	0	
Birth year 2016	516 (73.4%)	1326 (88.6%)	0.0001
Data missing	0	0	
Birth year 2017	187 (26.6%)	172 (11.5%)	0.0001
Data missing	0	0	

Data are in n (%) or median (IQR/min-max). PP = postpartum.

* Pearson's chi-squared test and Mann-Whitney U test.

3.1. Maternal Outcomes

Statistically significant less women receiving the midwife-led continuity model underwent unplanned caesarean section (CS), 12.8% vs 15.9%, an adjusted risk ratio (aRR) of 0.80 (95% CI 0.64–0.99). There were no statistically significant differences between the two groups regarding any other modes of birth: planned CS 11.9% vs 10.7, aRR 1.14 (0.97–1.34), total CS (planned and unplanned) 24.8% vs 26.6%, aRR 0.95 (0.82–1.11), spontaneous vaginal birth 71.4% vs 70.9%, aRR 1.02 (0.96–1.08) or vacuum extraction 3.7% vs 2.5%, 1.19 (0.72–1.97). Statistically less women exposed for the midwife-led model of care had induced labour, 8.7% vs 12% aRR 0.66 (0.49–0.88).

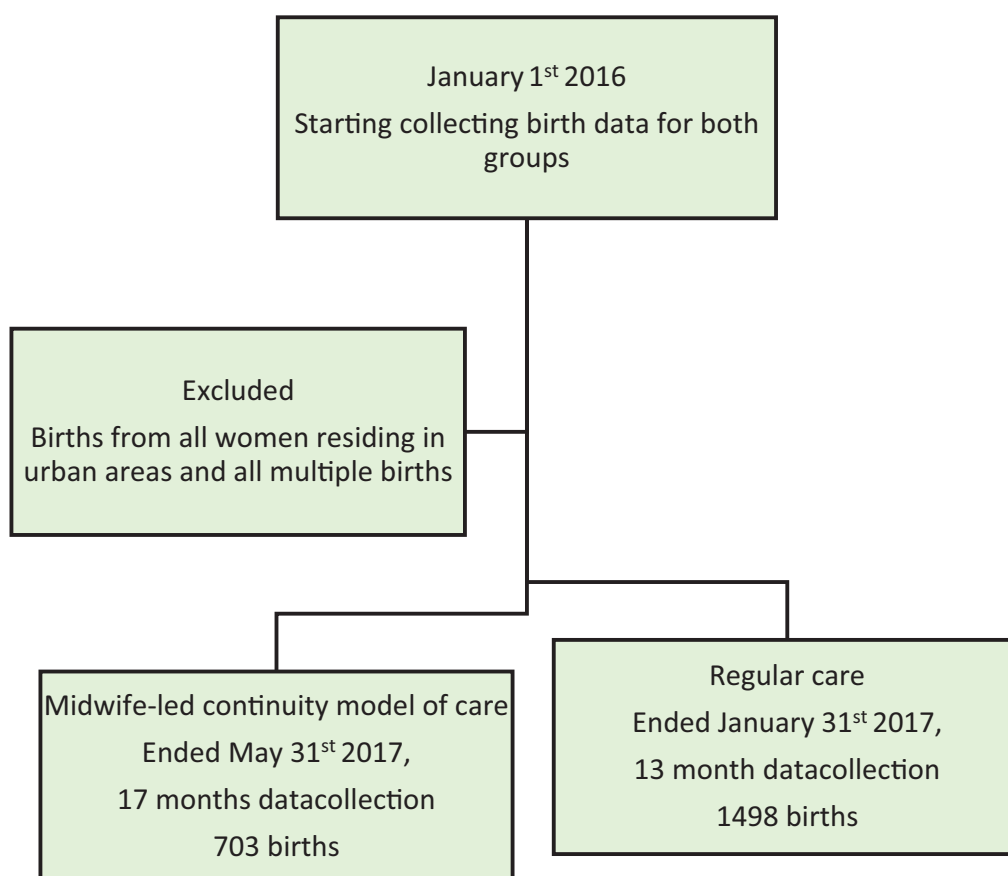


Fig. 1. Flowchart of the data-selection process.

Table 2
Maternal outcomes.

Outcomes	Outcome category	Midwife-led care (n = 703)	Regular care (n = 1498)	Unadjusted risk ratio ^a RR (95% CI)	p value	Adjusted risk ratio ^b aRR (95% CI)	Adj p value
Unplanned CS	No	613 (87.2%)	1269 (84.1%)	1 (ref)		1 (ref)	
	Yes	90 (12.8%)	238 (15.9%)	0.81 (0.64–1.01)	0.060	0.80 (0.64–0.99)	0.043
Data missing		0	0				
Planned CS	No	619 (88.1%)	1337 (89.3%)	1 (ref)		1 (ref)	
	Yes	84 (11.9%)	161 (10.7%)	1.11 (0.87–1.43)	0.403	1.14 (0.97–1.34)	0.105
Data missing		0	0				
Total CS (planned and unplanned) ^c	No	529 (75.2%)	1099 (73.4%)	1 (ref)		1 (ref)	
	Yes	174 (24.8%)	399 (26.6%)	0.93 (0.80–1.08)	0.350	0.95 (0.82–1.11)	0.520
Data missing		0	0				
Spontaneous vaginal birth ^c	No	201 (28.6%)	436 (29.1%)	1 (ref)		1 (ref)	
	Yes	502 (71.4%)	1062 (70.9%)	1.01 (0.95–1.07)	0.804	1.02 (0.96–1.08)	0.566
Data missing		0	0				
Vacuum extraction	No	677 (96.3%)	1461 (97.5%)	1 (ref)		1 (ref)	
	Yes	26 (3.7%)	37 (2.5%)	1.50 (0.91–2.45)	0.109	1.19 (0.72–1.97)	0.490
Data missing		0	0				
Induction of labour ^d	No	565 (91.3%)	1176 (88.0%)	1 (ref)		1 (ref)	
	Yes	54 (8.7%)	161 (12.0%)	0.72 (0.54–0.97)	0.031	0.66 (0.49–0.88)	0.004
Maternal anaemia postpartum Hb < 11 g/dl	>11 g/dl	564 (80.2%)	1069 (71.4%)	1 (ref)		1 (ref)	
	<11 g/dl	139 (19.8%)	429 (28.6%)	0.69 (0.58–0.81)	0.0001	0.72 (0.60–0.85)	0.0001
Data missing		0	0				
Maternal anaemia postpartum Hb < 9.5 g/dl	>9.5 g/dl	675 (96.0%)	1399 (93.4%)	1 (ref)		1 (ref)	
	<9.5 g/dl	28 (4.0%)	99 (6.6%)	0.60 (0.40–0.91)	0.015	0.62 (0.41–0.95)	0.026
Data missing		0	0				
Maternal blood transfusion postpartum	No	700 (99.6%)	1455 (97.1%)	1 (ref)		1 (ref)	
	Yes	3 (0.4%)	43 (2.9%)	0.15 (0.05–0.48)	0.001	0.14 (0.04–0.47)	0.001
Data missing		0	0				

Data are in n (%) and risk ratio RR (95% CI) and adjusted risk ratio aRR (95% CI). CS = caesarean section. The table includes singleton births by women from rural areas.

^a Univariate analyses using Pearson's chi-squared tests.

^b Multivariate analyses using generalised linear models for binary outcomes with the log link to adjust for mothers' age, parity, previous CS and year of current birth.

^c Proportion of previous CS could not be adjusted for due to the number who had vaginal birth combined with previous CS was less than 1%.

^d Planned CS was excluded from reference group.

The occurrence of postpartum anaemia, (Hb < 11 g/dl), was statistically significant lower in the exposed group, 19.8% vs 28.6%, aRR 0.72 (0.60–0.85). Accordingly, the difference in number of women receiving blood transfusion was 0.4% vs 2.9%, aRR 0.14 (0.40–0.47) (Table 2). Adjusting for age and parity changed the results significantly, while adjusting for previous caesarean section and year of current birth gave no significant change. We did not find any statistically significant interactions between maternal outcomes and previous caesarean section in the subgroup analysis.

3.2. Neonatal Outcomes

A statistically significant difference was observed in favour of those who received the midwife-led continuity model of care regarding rate of preterm newborn, 37 weeks and less, 13.1% vs 16.8, aRR of 0.76 (0.58–0.99). The rate of newborn with low birth weight, 2500 g and less, was 7.0% for the exposed group and 8.9% for the unexposed group. The difference was not statistically significant. The rate of newborn with very low birth weight, 1500 g and less, was 0.1% of babies born from mothers receiving midwife-led care compared to 1.1% receiving regular care, aRR of 0.13 (0.02–0.96) and was statistically significant, as was the admission rate to NICU, with 6.6% in the midwife-led care vs 9.9% regular care, aRR 0.66 (0.46–0.93). There was no statistically significant difference in Apgar score and number of neonatal deaths (Table 3). Adjusting for age and parity changed results significantly, while adjusting for previous caesarean section and year of current birth gave no significant change.

4. Discussion

Several improved outcomes both for mothers and babies were observed when women received the midwife-led continuity model of care during pregnancy. The findings are in line with the existing

evidence on Midwife-led continuity models of care. A Cochrane review by Sandall et al. from 2016 found that midwife-led continuity of care reduces preterm births, and randomised studies in setting with high caesarean section rates found that Midwife-led models reduced the rates significantly [3–5]. The Palestinian midwife-led model of care can be evaluated based on the Framework for quality maternal and newborn care, presented by Renfrew et al. in the Lancet series on Midwifery in 2014 [19]. As such the implementation aimed at improving the midwives scope of practice, strengthen the organisation of care, enhance woman-centred values and a philosophy of relational care, improving referral lines and interdisciplinary cooperation. But the midwives' role during labour, where medical doctors were in charge, was less autonomous than their role as antenatal care providers. Thus, it is surprising that the model also seemed to have impact on the rate of medical interventions during labour, such as unplanned caesarean section and induction of labour. We assumed that indications for planned caesarean section would affect all women equally, thus we chose unplanned caesarean section as main outcome to investigate if the model would have an effect. The possible impact of the midwives' role through the pregnancy could be related to information, education, trust and empowerment. If women felt more confident and relaxed before and during labour, it could have an indirect impact on medical interventions like induction of labour and unplanned caesarean section rates. The relation to a midwife that works in the labour ward could indirectly make the women feel more familiar with her midwives' colleagues when she came to the hospital to give birth. The governmental hospital in Nablus had, according to Zimmo et al. [20], one of the highest rates of unplanned caesarean sections in Palestine and consequently a potential for reductions [20]. The total caesarean rate of 35.1% at the hospital was high, even for a tertiary referral hospital. An optimal general caesarean section rate is disputed, but rates above of 15%–20% are not associated with lifesaving benefits [21,22]. The statistically significant reduction of unplanned caesarean sections with 3.1% in the

Table 3
Neonatal outcomes.

Outcomes	Outcome category	Midwife-led care (n = 703)	Regular care (n = 1498)	Unadjusted risk ratio RR ^c (95% CI)	p value	Adjusted risk ratio aRR ^d (95% CI)	Adj p value
Preterm birth ≤ 37 weeks	>37 w	613 (86.9%)	1247 (83.2%)	1 (ref)		1 (ref)	
	≤37 w	92 (13.1%)	251 (16.8%)	0.78 (0.63–0.98)	0.029	0.79 (0.63–0.98)	0.035
Data missing		0	0				
Very preterm birth ≤ 32 weeks	>32 w	700 (99.6%)	1475 (98.5%)	1 (ref)		1 (ref)	
	≤32 w	3 (0.4%)	23 (1.5%)	0.28 (0.08–0.92)	0.036	0.27 (0.08–0.91)	0.035
Data missing		0	0				
Birthweight ≤ 2500 g	>2500 g	652 (92.7%)	1364 (91.1%)	1 (ref)		1 (ref)	
	≤2500 g	51 (7.3%)	134 (8.9%)	0.81 (0.60–1.11)	0.185	0.79 (0.58–1.09)	0.146
Data missing		0	0				
Birthweight ≤ 1500 g	>1500 g	702 (99.9%)	1482 (98.9%)	1 (ref)		1 (ref)	
	≤1500 g	1 (0.1%)	16 (1.1%)	0.13 (0.02–1.00)	0.050	0.13 (0.02–0.97)	0.046
Data missing		0	0				
Apgar score at 5 min	>7	683 (97.2%)	1433 (95.7%)	1 (ref)		1 (ref)	
	≤7	20 (2.8%)	65 (4.3%)	0.66 (0.40–1.07)	0.093	0.70 (0.43–1.15)	0.156
Data missing		0	0				
Neonatal death ^a	No	697 (99.1%)	1484 (99.1%)	1 (ref)		1 (ref)	
	Yes	6 (0.9%)	14 (0.9%)	0.91 (0.35–2.37)	0.852	0.90 (0.34–2.37)	0.832
Data missing		0	0				
Newborn admitted to NICU ^b	No	654 (93%)	1349 (90.1%)	1 (ref)		1 (ref)	
	Yes	49 (7%)	149 (9.9%)	0.70 (0.51–0.96)	0.025	0.71 (0.52–0.98)	0.036
Data missing		0	0				

Data are in n (%), risk ratio RR (95% CI) and adjusted risk ratio aRR (95% CI).

^a Neonatal deaths include stillbirths and deaths during hospital stay.

^b NICU = neonatal intensive care unit. The table includes singleton births by women from rural areas.

^c Univariate analyses using Pearson's chi-squared tests.

^d Multivariate analyses using generalised linear models for binary outcomes with the log link. Adjusted for mothers' age, parity, previous CS and year of current birth.

group receiving the Midwife-led continuity model of care depended on increases in vaginal births and in planned caesarean sections. The reduction in the total caesarean section rate of 2.2%, was not statistically significant, but could be clinically interesting when discussing further action to reduce the caesarean section rate. Caesarean section increases maternal risk for infections, haemorrhage, placental pathology in later pregnancies, as well as neonatal respiratory distress and gastrointestinal allergy [21,23,24]. Thus a reduction in the caesarean section rate has short and long-term positive effects for both mothers and their babies. Unlike the evidence from the Cochrane review on midwife-led models of care, this study found that the model was associated with reduction of induced labour, which could also be related to the experience of psychological support during pregnancy. Consequently, women who received information and education from a midwife they trusted could be more prepared for the labour process, encounter less stress and hence present less demands of induction of labour. An overuse of inductions and augmentations increases the risk of uterus rupture and perineal- and anal-sphincter trauma [11].

Regional anaesthesia is a relevant outcome for midwife-led models in high-income settings. We chose maternal anaemia as an outcome as it is more relevant in low- and middle-income countries [2,7,25]. The high incidence and risks related to maternal anaemia require priority attention globally, especially in low and middle-income countries [26,27]. Postpartum anaemia and blood transfusion are important indicators of morbidity and give more accurate information than estimations of blood loss. This important information was available as all women had their haemoglobin measured before leaving hospital.

Less postpartum anaemia and blood transfusions in the exposed group are positive outcomes that seem strongly related to the midwife-led continuity model of care. This result is promising and a reasonable consequence of being followed up closer through pregnancy with haemoglobin measurements, iron supplements and nutritional advice. Postpartum anaemia is caused mainly by anaemia in pregnancy and/or intrapartum haemorrhage [28]. Due to a high incidence of anaemia in pregnant women, the MoH guidelines advice to treat all pregnant women with 60 mg iron daily and 400 µg folic acid as daily supplementation for six months during pregnancy. Anaemia should be treated with

120 mg iron, in line with WHO recommendations [2]. Nevertheless, good standards are not enough if women do not use or trust the services provided. Women who received the midwife-led model of care, seem to have stronger adherence to the service provided, which increases the midwife's chance to follow up [18]. Another reason for postpartum anaemia is related to haemorrhage caused by caesarean section, and the reduced unplanned caesarean section rate could explain some of the difference between the groups. Postpartum anaemia causes both physical and psychological morbidity, such as fatigue and infections, and is associated with postpartum depression [28].

The reduction in preterm births and low birth weight in the group receiving midwife-led care is important, as these are the main reasons for infant mortality and morbidity. The findings from this study suggest that there is an association between the midwife-led continuity model of care and less preterm births and children with very low birth weight (≤1500 g). Reduced preterm births and low birth weight consequently reduce the need of treatment in the neonatal intensive care unit. A Cochrane review found that receiving iron supplement during pregnancy reduces the risk of preterm births and low birth weight [29]. This implies that the outcomes are linked to each other and the causal path is not straight forward in maternal care. Further studies should consequently be done to investigate complex interventions that can improve care and important health outcomes. The neonatal death rate, stillbirths and neonatal deaths during hospitalisation were 0.9% and similar in both groups, indicating that a larger sample size would be necessary to detect any impact on mortality or a more efficient intervention is needed to reduce neonatal mortality. It would be interesting to investigate what long term impact the model could have on maternal and/or neonatal morbidity.

The costs related to education and training, investments and running costs were initially supported by Norwegian humanitarian aid, and subsequently taken over by the Palestinian Ministry of Health. The costs should be justified in relation to the benefit of improved care and health outcomes. A review concluded that midwife-led models of care would be a cost-efficient way to improve maternal services in low- and middle-income countries [30]. The implementation process included cooperation between Palestinian and Norwegian midwife kadres in the

initial planning, further a broad collaboration between all levels in the Palestinian Ministry of health was required to anchor the model within the MoH system and make the model sustainable. The implementation process including cost analysis should be studied and described in detail.

The strength of this study is the pragmatic approach to improve maternal services and the available information of the midwife-led continuity model. The large sample size and complete data on important clinical outcomes furthermore strengthen the study. This study confirms that the Midwife-led continuity model can be implemented in new settings. However, further research with high quality methods is required to describe the implementation in detail to make the model applicable to other settings.

Limitations of the study are related to the risk of bias in observational design and lack of data on potential confounders such as socioeconomic factors, indications for caesarean sections and more detailed health information on pregnancy complications. Information on whether the women in the exposed group also received care elsewhere, or if the proportion of women that could have belonged to either group chose to give birth in another hospital could be valuable. It would also be useful to know the number of urban women and women with multiple pregnancies that were excluded. The study also lacks information on the grade of continuity, how many times women met the same midwife, and if they met their midwife during labour or postnatal ward. A potential bias could also be related to the different group size, and the difference in time of data collection, as a longer period was needed to reach the required sample size for the group receiving the midwife-led care. Information from the hospital implies that there were no other interventions affecting the outcomes at the hospital during those extra months in 2017, and this makes it unlikely that the difference in time had an influence on the results.

5. Conclusion

Receiving care from the midwife-led continuity model in Palestine was associated with reduced unplanned caesarean sections and other medical interventions during labour as well as reduced maternal and neonatal morbidity. These factors may contribute to improved quality of life and to reduced hospital- and social costs. The results support expansion of the model. Further implementation research and randomised studies can produce useful knowledge on the effect and feasibility of such models in low resource settings. The experience from the Midwife-led continuity model of care in Palestine could be useful for others who strives to improve mothers and babies' health globally.

Contributors

BM was involved with the implementation, study design, preparation of data collection, data analysis, data interpretation and writing. MaL was involved with study design, data interpretation and writing. LMD was involved with study design, data analysis and writing. MiL was involved with study design, data interpretation and writing. KA were involved with the implementation and data collection. EF was involved in study design, data collection, data analysis, data interpretation and writing. BM drafted the article and tables. All authors have reviewed and approved the final manuscript. The corresponding author had full access to all the data in the study and had final responsibility for the decision to submit for publication.

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Declaration of Interest

EF is the director of Norwegian Aid Committee (NORWAC). BM was partly employed by NORWAC until February 2017 as project manager for implementing the model. All other authors have nothing to disclose.

Data Sharing Statement

Data can be obtained upon request to the Palestinian Ministry of Health.

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WOMEN'S SATISFACTION WITH MIDWIFE-LED CONTINUITY OF CARE – AN OBSERVATIONAL STUDY IN PALESTINE

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ABSTRACT

Objectives: A midwife-led continuity model of care had been implemented in the Palestinian governmental health system to improve maternal services in several rural areas. This study investigated if the model influenced women's satisfaction with care, during antenatal-, intrapartum- and postnatal period.

Design: An observational case-control design was used to compare the midwife-led continuity model of care with regular maternity care.

Participants and setting: Women with singleton pregnancies, who had registered for antenatal care at a rural governmental clinic in the Israeli-occupied West Bank, were between one to six months after birth invited to answer a questionnaire rating satisfaction with care in 7-point Likert scales.

Primary outcome was the mean sum-score of satisfaction with care through the continuum of antenatal, intrapartum and postnatal period, where mean sum-scores range from 1 (lowest) to 7 (highest). Secondary outcome was exclusive breastfeeding.

Results: Two hundred women answered the questionnaire, one hundred who received the midwife-led model and one hundred who received regular care. The median timepoint of interview were 16 weeks postpartum in both groups. The midwife-led model was associated with a statistically significant higher satisfaction with care during antenatal, intrapartum and postnatal period, with a mean sum-score of 5.2, versus 4.8 in the group receiving regular care. The adjusted mean difference between the groups' sum-score of satisfaction with care was 0.6 (95% CI 0.35 to 0.85) $p < 0.0001$. A statistically significant higher proportion of women who received the midwife-led continuity model of care were still exclusively breastfeeding at the timepoint of interview, 67% versus 46% in the group receiving regular care, an adjusted odds ratio of 2.56 (1.35 – 4.89) $p = 0.004$.

Conclusions: There is an association between receiving midwife-led continuity of care and increased satisfaction with care through the continuum of pregnancy, intrapartum and postpartum period, and an increased duration of exclusive breastfeeding.

Trial registration number NCT03863600

Key words: Case-load Midwifery, Satisfaction with care, Experience, Continuity of care, Maternal care, Developing country

STRENGTHS AND LIMITATIONS OF THE STUDY

- The study adds new information from a low-middle income country to existing evidence on midwife-led continuity of care
- The study's complete data obtained from face to face interviews brings information on satisfaction with care from a marginalized group of women
- The study investigated to what extent a pragmatic implementation could improve continuity with care in a low resource setting
- The main limitation of this study is the observational, retrospective design comparing groups with potential unmeasured confounders.
- Not knowing the woman's village of origin and in which governmental hospital the women gave birth, could represent potential bias. However, the women in both groups represented a quite similar rural population from villages in different regions in the West Bank.

BACKGROUND

Yearly, more than 300 000 women die from preventable causes related to pregnancy and childbirth, and 99% of them are from low- and middle-income countries¹ It is estimated that in the shadow of each maternal death, between 50 and 100 women suffer severe maternal morbidity.^{1,2} A newborn child's prospects of survival, good health, and wellbeing is closely linked to their mother's survival, health and wellbeing.² Several studies investigating disrespectful and abusive treatment of women in maternity care, suggest this may explain why many women choose not to use available services.^{3,4} In a literature review from developing countries in 2015, Srivastava *et al.* investigated what determines women's satisfaction with maternal health care.⁵ They found that being treated respectfully, in terms of courtesy and non-abuse, irrespective of socio-cultural or economic context, is especially important to women.⁵ Interpersonal behaviour was the most prominent reported determinant of maternal satisfaction, more than structural factors as cleanliness and physical environment.⁵ Around the world women seek dignity, empathy and respect while obtaining maternal care and women's experience with disrespectful care and abuse in health care has been investigated in

both low- and high-income settings.^{4,6} Based on the research evidence, the World Health Organization (WHO) has recommended interventions that scales up midwifery and facilitate continuity with care to enhance respectful relations in maternal care.^{1,7-11}

Midwife-led continuity of care described in the literature, can be organized as *case-load-* or *team-midwifery* models.¹² In the case-load model one designated midwife cares for a group of up to 45 women, while in team-midwifery four to six midwives share the care of a group of up to 360 women. In both models, women are followed up through the continuum of pregnancy, intrapartum- and postnatal period. The case-load model facilitates an individual relationship between the woman and her midwife. Ideally, in both models, women will be cared for during labour by a midwife they know from antenatal care.^{7,12} A Cochrane review on continuity of midwifery care models, conducted by Sandal *et al.* in 2016, reported improved health outcomes for women and babies. Several studies in the review also confirm satisfaction with midwife-led continuity models of care, but the studies lacked consistency in how satisfaction with continuity of care was measured.⁸ Perriman and Davis identified in a systematic

integrative review from 2015, four suitable instruments to measure satisfaction with continuity of care through the continuum of pregnancy, birth and the early postpartum period.¹³

Palestinian context

According to Ministry of Health's 2016 report there were 208 midwives employed at the West Bank's governmental hospitals covering 36 050 births and care in postnatal wards. Palestinian midwives worked in an overcrowded, understaffed and fragmented governmental maternity care system.^{14,15} Midwives scope of practice within the governmental system was limited to labour and postnatal care in hospitals. If midwives provided antenatal care, they were in an assisting role.¹⁵ In such environment it was challenging to establish good relations and to meet each woman's individual needs. In a study from 2006, Giacaman *et al.* identified that Palestinian women were not satisfied with the place they gave birth, and that their choice were constrained by availability, affordability and limited access due to Israeli military closures and sieges.¹⁶ To address the challenge faced by Palestinian women living under Israeli occupation in rural areas in the West Bank, the Palestinian Ministry of Health implemented a modified midwife-led case-load model of care, in cooperation with a Norwegian humanitarian organization, The

Norwegian Aid Committee (NORWAC). The model was implemented between 2013 to 2016 in six governmental hospitals from where midwives provided outreaching antenatal and postnatal care in 37 rural villages. The implementation was associated with increased number of antenatal visits, number of detected pregnancy complications referred to higher level of care, and number of postnatal home-visits.¹⁷ It was further associated with reduced unplanned caesarean sections and induced labour, and improved important maternal and neonatal outcomes.¹⁸ When the midwife-led model was tested in the region of Ramallah between 2007 and 2011, the midwives described in a qualitative study, how the model enabled them to provide personalized care related to the individual woman's needs and how the broad scope of practice gave them new and important experience and knowledge.¹⁹

The aim of this study was to investigate if and how a modified case load midwife-led continuity model of care, in the governmental system in Palestine, influenced rural women's satisfaction with care, through the continuum of antenatal, intrapartum and postnatal period. A secondary aim was to explore the association between the model and duration of exclusive breastfeeding.

METHODS

Study design

An observational case-control design was used to compare satisfaction with care. The cases were women who had received the midwife-led continuity model and controls were women who had received regular maternity care, through the continuum of antenatal, intrapartum and postnatal period. Common inclusion criteria for cases and controls were having a singleton pregnancy, having registered for antenatal care at a rural governmental clinic in the West Bank in the regions where the midwife-led model of care had been implemented, and having given birth between the last one to six months.

Power and sample size

The power calculations were based on the results from a recent study in Australia, as we found no available studies on satisfaction with midwife-led continuity models of care in low – middle income countries.²⁰ A sample of 164 to 186 (82 to 93 in each group) was required to detect a difference of 20% between the control and intervention group's proportions of satisfaction, given a significance level of 0.05 and 80% power. Considering the novel context, we decided to collect answers from two-hundred women, 100 in each group, to assure enough power.

Models of care

The midwife-led continuity of care model, modified to the Palestinian setting, implies that midwives who work in governmental hospitals was assigned to weekly visits to rural areas. Midwives drove from their base at their governmental hospitals in designated marked cars, to provide antenatal care in rural clinics and postnatal home-visits. Each midwife visited the same area and clinic each week, thereby following up the same case-load of between 30 to 100 women to enhance relational continuity. The midwife from the regional hospital had an autonomous role and relieved the regular nurses and doctors at the rural governmental clinics from antenatal care. She involved physicians when needed and referred to higher level of care when complications occurred. The obligation to work full time and the heavy workload at the hospital prevented the midwives from being on call to attend labour and birth, as such the women were not assured having a known midwife during labour. A more detailed framework of the model is described elsewhere.^{17,18}

Regular maternal care for women living in rural villages was offered from the governmental clinics and/or private medical doctors. Around 70% of the rural women registered for antenatal care in governmental clinics, where regular care

providers were nurses or midwives and medical doctors.¹⁷ Besides maternal care, governmental providers in regular care were also responsible for general patient treatment, vaccinations and minor emergency cases. The nurse or midwife in regular care would assist the physician by doing necessary tests, before the pregnant woman consulted the physician. Physicians alternated between clinics, while nurses were mainly permanent staff. Healthcare providers in community clinics offering regular care had no working relation to the hospitals. Women receiving private antenatal care could potentially meet their doctor if they gave birth at a private hospital.

Participants and data-collection

Women were asked to participate when they came with their child for vaccination at the same governmental clinic where they received antenatal care. Two midwives, who were not working with governmental primary health care, nor in the midwife-led continuity model, were trained in data collection. The research midwives travelled to rural villages scattered in different regions of the West Bank, that either offered the midwife-led continuity model or regular care. They invited eligible women to participate after providing them an information and consent form in Arabic, explaining the study. Women were assured

anonymity if they participated, and that they would not be affected negatively if they did not accept to participate. To assure anonymity, the women were informed that neither their identity, village, clinic, nor birth facility could be traced. Their consent was given orally by accepting to answer the questionnaire by an interview. The research midwives collected the data in the women's homes or in a private place in the clinic. Each woman was given an Arabic version of the questionnaire. The research midwife then filled the questionnaire forms while interviewing the women to assure they understood the questions. The research midwives tested how long time the interviews took and how to approach the women, by conducting five test-interviews each before starting the data-collection. These interviews did not result in adjustments of the questionnaires and were not included in the study. The interview was estimated to take 30 minutes. The research midwives transferred the women's responses to the University of Oslo via the web-form, "nettskjema.no".

The questionnaire

The questionnaire (supplementary file1) was based on previous studies measuring satisfaction with midwife-led continuity and evaluated as suitable for this purpose.^{20,21,13} The questionnaire included 62 questions measuring women's

satisfaction with antenatal, intrapartum and postpartum care using a 7-point Likert scale, where usually 1 signified “disagree strongly” and 7 signified “agree strongly”. Women were further asked to what extent they received care during intrapartum and postpartum period from the provider they knew from antenatal care, and they were asked about their breastfeeding practice. The participants were invited to add recommendations to improve governmental services, in an open text section in the questionnaire. The content of the final questionnaire was tested for contextual and cultural sensitivity with a group of five Palestinian midwives. After minor adjustments the questionnaire was translated to Arabic by a professional translator, retested and adjusted for accuracy.

Outcomes

Primary outcome was the mean sum-score of satisfaction with care through the continuum of antenatal, intrapartum and postpartum period. Secondary outcomes were satisfaction with care related to the different episodes of care, and proportion of women that still practiced exclusive breastfeeding at timepoint of interview. Grade of continuity was measured by number of women who received care from their antenatal midwife during labour, at

postnatal hospital ward and/or at home-visits.

Statistical analysis

Difference in characteristics between the intervention and control groups were analysed by two independent samples t tests, Mann-Whitney U tests, chi-squared or Fisher’s exact tests, as appropriate.

The Likert scale ordinal variables were highly skewed and first analysed by conducting ordinal regression because this method had been used in previous studies using similar Likert scales.¹⁹ After fitting the ordinal regression, the proportional odds assumption was inspected by a Brant test, using brant command in Stata/SE, version 14. Results from the test showed that proportional odds assumption was violated for several ordinal outcomes.

Therefore, we summarized the answers, and the groups’ mean sum-scores of satisfaction were compared by bootstrapping linear regression. The primary outcome, mean sum-score of satisfaction through the continuum of antenatal, intrapartum and postnatal care, included 53 different questions of satisfaction. Negative questions, such as: *I felt that nobody really cared for me during labour and birth*, were turned positive so that satisfaction could be interpreted equally in all questions and the mean sum-scores thereby read as 1(lowest)

and 7 (highest). One question from the antenatal period was not included, as it investigated if occupation soldiers or settlers limited women's access to the clinic and not satisfaction with care. Neither were eight questions involving satisfaction with care during home-visits, as it only applied to the group receiving the midwife-led model. The questions of satisfaction included in the mean sum-score variables were assessed for internal consistency and Cronbach's Alpha was between 0.90 and 0.95.

Factors which could influence the difference between groups were included for adjusting. Adjusted bias-corrected and accelerated bootstrap estimates (BCa) with 95% confidence intervals were given for non-normally distributed ordinal outcomes and based on 10000 bootstraps. For breastfeeding practice as binary outcome, multiple logistic regression analyses were used to test the difference between the groups and adjusting for possible confounding variables.

Significance level was set at 0.05. The analyses were performed with IBM SPSS 25.

Patient and public involvement

Women were not directly involved in the planning of the study, but in testing the feasibility of the questionnaire. The results

will be disseminated in scientific publications, in public media and in local and international conferences.

Ethical considerations

The Palestinian Ministry of Health approved the study and the research assistants' access to the health facilities, allowing them to contact women who had registered at the governmental clinic to ask them for consent to participate in the study. Ethical approval for the study was granted from the Norwegian Regional Committee for Medical Health Research Ethics South East (REK) with id number: 2015/1235.

RESULTS

Participants characteristics

Between May 1st, 2017 to May 31st, 2018, 200 women from 20 villages answered the questionnaire, 100 who received the midwife-led continuity model and 100 who received regular care. There were 26 women who abstained from participating, of them 22 received regular care and 4 received midwife-led care. Groups characteristics, presented in table 1, were mainly homogenous. The time point of interview was median 16 weeks postpartum in both groups, with no statistically significant differences related to age, education, employment or parity. Less women who received the midwife-led

model of care had parents living in the same village as themselves.

Table1 Participants characteristics			
Characteristics	Midwife-led care (n=100)	Regular care (n=100)	p-value ****
Timepoint of interview/weeks since birth*	16.0 (11.0-18.8)	16.0 (8.0-22.8)	0.499
Age**	26.6 (5.6)	26.3 (5.6)	0.688
Age at marriage*	20.3 (18.0-22.0)	20.7 (18.0-22.8)	0.812
Age at first birth*	21.5 (19.0-23.0)	21.8 (19.3-23.0)	0.997
Nulliparous***	32	38	0.459
Multiparous***	68	62	0.459
Number of previous pregnancies*	2.0 (1.0-3.0)	2.0 (1.0-3.0)	0.125
Number of live born children*	2.0 (1.0-3.0)	2.0 (1.0-3.0)	0.104
Education level***			
Up to master's degree after high school	46	37	0.251
High school	54	63	0.251
Employment***			
Woman has employment (full- or part-time)	15	10	0.393
Woman not employed	85	90	0.393
Husband has regular employment	64	49	0.020
Husband employed now and then	32	50	0.014
Husband not employed	4	1	0.369
Social***			
Husband must live outside home to work	9	15	0.119
Women's parents live in same village	34	63	0.001
Not Smoking ***	94	86	0.097

*n=number of women, no missing, *Median(IQR), **Mean(SD), *** % ****Mann-Whitney U tests, independent samples t- or chi-squared tests*

Characteristics of obtained care

Women who received the midwife-led continuity model of care booked significantly earlier for antenatal care at the governmental clinic, reporting a gestational age of median 6.5 weeks, compared to median ten weeks gestation for the group who received regular care (table 2). The group receiving the midwife-led model of care had median nine antenatal visits, and only two women reported less than four

visits, while the group receiving regular care had median six antenatal visits and 28 women reported having less than four visits at the governmental clinic. While 42% in the midwife-led group, received antenatal care exclusively from the governmental clinic, only 8% in the regular care group reported the same. Subsequently, women who had regular care received more additional care from private doctors and 33% gave birth at a private hospital, compare to only 11% of women who

received the midwife-led care. There were no missing data except two women in the group receiving midwife-led care, who gave birth under transportation and therefore did

not report satisfaction with intrapartum care. Only women who had received the midwife-led continuity model of care received home-visit after birth.

Table 2 Characteristics of obtained care

Characteristics	Midwife-led care (n=100)	Regular care (n=100)	p-value ***
Antenatal care (ANC)			
Gestation at booking visit*	6.5 (4.0-11.8)	10.0 (5.0-19.5)	0.003
Number of ANC visits at government clinic*	9.0 (8.0-10.0)	6.0 (3.0-9.0)	0.001
Less than 4 ANC visits at government clinic**	2	28	0.0001
Number of ANC visits with doctor at government clinic*	4.0 (3.0-5.0)	5.0(2.0-8.0)	0.066
Number of ANC visits at private doctor*	2.0 (0.0-3.0)	6.0 (3.0-10.0)	0.0001
ANC care only from governmental clinic**	42	8	0.0001
Referred once or more to high risk care**	36	22	0.004
Place of birth of last child**			0.035
Governmental hospital	87	67	0.0001
Private hospital	11	33	0.0001
Under transportation	2	0	
Hours spent at postnatal ward postpartum*	24.0 (18.0-24.0)	15.0 (8.5-24.0)	0.0001
Number receiving postnatal home-visits	76	0	0.0001

n=number of women, *Median(IQR), **% ***Mann-Whitney U or chi-squared tests

Satisfaction with care

The groups' mean sum-scores, including crude and adjusted mean differences in satisfaction with care, are given in table 3. For the primary outcome, a statistically significant higher satisfaction with care was observed in favour of the group receiving the midwife-led care, through the continuum of pregnancy, intrapartum and postnatal period, with a crude mean sum-score of 5.2 (SD 0.86) versus 4.8 (SD 0.96) in the group receiving regular care. The adjusted mean difference between the groups was 0.6 (95% CI 0.35 to 0.83)

$p < 0.0001$. The statistically significant difference in favour of the midwife-led model persisted during the various periods of care. The adjusted mean difference in satisfaction with care during pregnancy was 0.4 (0.06 to 0.65) $p = 0.021$ and with care during labour and birth 0.5 (0.14 to 0.87) $p = 0.008$. The highest difference in satisfaction was with postpartum care, an adjusted mean difference of 0.8 (0.53 to 1.16) $p < 0.0001$. Adjusting for the number of women who had given birth in private hospitals, influenced, but did not significantly change the primary outcome.

Neither did it change satisfaction with care during pregnancy or postnatal period. However, a significant higher proportion of women who received regular care gave birth in private hospitals and adjusting for this factor significantly changed the difference in satisfaction with intrapartum care in governmental hospitals, in favour of the midwife-led model. We did not adjust

for age, parity, employment, time since birth, or if the parents lived in the same village, as we found no significant influence from these covariates in univariate analyses. The satisfaction with care during home-visits was generally high. However, it only applied to the group receiving the midwife-led continuity model of care.

Table 3 Satisfaction with antenatal, intrapartum and postpartum care

	Mean sum-scores**		Crude difference***	Adjusted difference***	
	Midwife-led care*	Regular care*	Mean (95%CI)	Adjusted mean(95%CI)	Adj. p-value
Primary outcome					
Satisfaction with all care through the whole continuum (53)	5.2 (0.86)	4.8 (0.96)	0.5(0.25 to 0.73)	0.6(0.37 to 0.81)	<0.0001
Descriptive outcomes					
Satisfaction with care from midwives/nurses during pregnancy (6)	6.2 (0.92)	5.7 (1.22)	0.6(0.25 to 0.84)	0.6(0.22 to 0.82)	<0.001
Satisfaction with pregnancy care from doctors (5)	5.4 (1.50)	5.2 (1.47)	0.2(-0.18 to 0.66)	0.2(-0.23 to 0.55)	0.351
Satisfaction with all care during pregnancy (15)	5.7 (0.99)	5.3 (1.19)	0.4(0.08 to 0.68)	0.4(0.06 to 0.64)	0.021
Satisfaction with midwives' care during labour and birth (5)	5.5 (1.75)	5.1 (1.79)	0.5(-0.04 to 0.93)	0.7(0.21 to 1.13)	0.008
Satisfaction with doctor's care during labour and birth (3)	5.0 (1.69)	4.7 (1.87)	0.3(-0.20 to 0.78)	0.5(0.06 to 0.95)	0.038
Satisfaction with all care during labour and birth (17)	5.1 (1.29)	4.7 (1.34)	0.3(-0.04 to 0.68)	0.5(0.18 to 0.83)	0.006
Satisfaction with care and advice related to baby after birth (5)	4.8 (1.23)	4.1 (1.44)	0.7(0.41 to 1.01)	0.8(0.44 to 1.21)	<0.0001
Satisfaction with care related to yourself after birth (9)	5.0 (1.07)	4.3 (1.1)	0.8(0.37 to 1.11)	0.8(0.44 to 1.08)	<0.0001
Satisfaction with all care after birth (21)	5.0 (1.04)	4.2 (1.14)	0.8(0.46 to 1.08)	0.8(0.50 to 1.19)	<0.0001

*100 women in each group, no missing except two women who gave birth under transportation in the group receiving midwife led care did not report satisfaction with care during labour and birth ** Mean(SD) sum-score is calculated from the 1-7 likert scale where 1 means very low satisfaction and 7 means very high ***BCa estimates with 95% confidence intervals, analysed by bootstrapping linear regression, adjusted for place of birth (private or governmental hospital), Number in bracelets reflects the number of questions included in the sum-score.

The detailed results in the full scales are presented in supplementary file 2 and shows which aspects of care that influenced the difference between the groups. This scale also reveals that both groups scored equally high in wishing that someone from their family could accompany them during birth.

Breastfeeding

As the interview was done at an approximately equal timepoint of median 16 weeks after birth in both groups we compared the proportion of women who were still breastfeeding. Most women were

still breastfeeding at this timepoint, respectively 96% receiving midwife-led care and 88% receiving regular care (table 4). Of these a statistically significant higher rate of women receiving midwife-led care were still exclusively breastfeeding, 67% versus 46%. After adjusting for age, parity and number of weeks since birth the difference was still statistically significant with an adjusted odds ratio of 2.56 (95% CI 1.35 – 4.89) $p=0.004$. Only three women in the control group had never breastfed, and none in the midwife-led group.

Table 4 Breastfeeding practice

	Midwife-led care*	Regular care*	Difference between groups**		
			OR(95%CI)	Adj. OR(95%CI)	Adj. p-value
Still exclusively breastfeeding	67%	46%	2.38(1.34 to 4.23)	2.56(1.35 - 4.88)	0.004
Still breastfeeding (exclusively and partly)	96%	88%	3.27(1.02 to 10.52)	2.76(0.84 - 9.09)	0.096
Never breastfed	0	3%			0.246

*100 women answered, no missing ** Odds ratio (OR) with 95% confidence intervals from binary logistic regression analysis, adjusted for age, parity and timepoint of interview/weeks since birth, regular care was set as reference

Continuity measures

Women who received regular care reported they often met the same provider during antenatal care, none in the control group reported they met the healthcare provider again during hospital or postnatal care. While investigating the midwife-led model's actual continuity with care from the same midwife through the continuum (table 5), we found that 23% of the women

received care from their antenatal-midwife during labour, and 34% received care from her at the hospital's postnatal ward. Of the 100 women, 69% received home-visit from their antenatal-midwife, while 7% received home-visits from the nurse who they also knew from the clinic. As many as 17% met their antenatal-midwife through the whole continuum of antenatal, intrapartum and postnatal period, while 8% did not receive

care from their antenatal-midwife elsewhere.

Table 5 Continuity measures (n=100)	%
Number who met their ANC-midwife during labour	23
Number who met their ANC-midwife at hospital's postnatal ward	34
Number who met their ANC-midwife at home-visit	69
Number who met their ANC-midwife through the whole continuum	17
Number who only met their midwife in ANC	8
Numbers of meetings with the same provider	8 (7-9)*

*n=number of women, only from the group receiving midwife led care, *median (IQR)*

Women’s recommendations

Free text recommendations to improve governmental services were recorded from 101 women, 76 from the group receiving regular care and 24 from the group receiving midwife-led care. The recommendations were organized in 13 themes and coded in an excel sheet where their frequencies were calculated. The most prominent recommendation, expressed from 38 women were to allow bringing a companion to join them during labour and birth, 35 women recommended more human, respectful and sensitive care during labour and birth, while 24 women recommended to implement an appointment system for the antenatal visits.

DISCUSSION

Compared with regular care, the midwife-led model was associated with a higher sum-score of satisfaction with care through the continuum of antenatal, intrapartum and

postpartum period. The highest satisfaction reported in both groups, were with care during pregnancy, where the mean sum-score differed least. The difference between groups during pregnancy was most prominent related to satisfaction with being involved and the emotional support from the midwives. The general high satisfaction with pregnancy care could be explained by that this period is less demanding and stressful for most women and recall bias might have influenced. Care during labour and birth was presented with the lowest satisfaction scores in both groups. This is not surprising considering the overcrowded and understaffed environment in the government hospitals labour wards, as previously described by other studies from Palestine.^{15,16} Another important explanation could be the statement from a clear majority of women in both groups: “I wish someone from my family could accompany me during labour and birth”. The request of having a

companion during labour was confirmed by the women's main recommendation. The value of a companion is important to improve birth outcomes and improve women's birth experiences.²² WHO recommends that health facilities give every woman the option to experience labour with a companion of her choice.²³ Nevertheless, knowing a midwife at the labour ward seemed to influence the difference between the two groups' satisfaction with care during labour and birth, a difference that increased after adjusting for the subgroup of women who gave birth in private hospitals. Interestingly, the difference in satisfaction with care from doctors also increased to a significant level after this adjustment. This suggests that the enhanced relation between the woman and her midwife also seemed to reduce the alienation to doctors. An important contextual question revealed that women receiving the midwife-led model were less afraid of being stopped at Israeli military checkpoints on their way from the village to hospital. This reduced anxiety could be related to that women's relation with their midwife made them feel safer, also knowing they could call their midwife in an emergency. The increased satisfaction with care during the intrapartum period among women receiving midwife-led care, could reasonably be explained by that nearly a quarter was cared for during labour by the

midwife they knew. The relational continuity seemed to enhance women's perception of receiving respectful care during labour and birth. The most prominent difference between the two groups' satisfaction was with care during postpartum period, despite the exclusion of the high score of satisfaction with care related to home-visits. The highest difference between the groups was seen in satisfaction with care at the postnatal ward and could be explained by the high number who met their midwife from pregnancy there. The difference between the group's satisfaction with care in this study seems to be less prominent compared to studies of satisfaction with continuity models of care in high income countries.²⁰ Nevertheless, this study confirms the general findings of improved satisfaction with midwife-led continuity models of care.^{8,20,24-26}

The results from this study also demonstrate an association between receiving the midwife-led model of care and increased duration of exclusive breastfeeding. The midwife-led model provided continuity with breastfeeding information and support during pregnancy and after birth in hospital and home-visits. McFadden *et al.* concluded in a systematic review that predictable, standard breastfeeding support during antenatal and/or postnatal care, tailored to women's needs and given face to

face, seem to increase duration of exclusive breastfeeding.²⁷ Continuous postnatal breastfeeding support is also recommended.²⁸ Exclusive breastfeeding up to six months in life is considered an important protection against infections, malocclusions, and breastfeeding has in general several long term health benefits both for women and their children.²⁹ Although midwives were prevented from being on call, a high number of women receiving the midwife-led model were cared for during labour and at the postnatal ward by the midwife they knew. The high rate of continuity was possible because all midwives worked full time at the hospital beside their outreaching program once a week.

This study implies that midwife-led continuity contributes to sustainable improvements within a system with limited resources, enabling midwives to improve quality of care to vulnerable women in their own population. The experience and findings from this implementation are an important contribution to reach the UN sustainable development goal number three towards 2030, promising good health and wellbeing for all.³⁰

Limitations and strengths

The main limitation of this study is the observational, retrospective design

comparing groups with potential unmeasured confounders. Because the model had already been implemented randomization was not possible. It would have been an advantage to know village of origin and in which governmental hospital the women gave birth, as it could represent potential bias. However, the women in both groups represented a quite similar rural population from villages in different regions in the West Bank.

Investigating such complex and sensitive outcomes of an implementation in a low-middle income setting is the main strength of this study. The pragmatic and novel approach, adapting the model to the Palestinian context and implementing it within the public health system provided a unique experience of how midwife-led continuity of care can work in a low-middle income setting. Engagement from local midwives, nurses and doctors who have been deeply involved in developing and adapting the model to the context, facilitated anchoring the model in the Palestinian public health system. The model was implemented with Norwegian funding in six governmental hospitals and 37 villages in the West Bank, but since February 2017 it has been administrated and sustained by the Palestinian Ministry of Health.³¹ A strength of the study is the focus on satisfaction with care provided to the

poorer part of the population, who are in most need of quality improvements. Another strength is the comprehensive questionnaire with a Likert scale used in previous studies that measured satisfaction with midwife-led continuity models, using the recommended focus on women's satisfaction with process of care and interpersonal behaviour throughout the continuum.^{5,13,20,24}

Conclusion

This study has investigated a midwife-led continuity model of care that has been adapted to a low-middle-income setting under long-term military occupation. The findings indicate that midwife-led continuity of care is associated with improved satisfaction with care also in such settings. There are increased user expectations for qualitative and safe care in low and middle-income countries, including respectful and sensitive care.^{9,32} Further qualitative research could investigate how and why women find this model useful. There is a high potential to improve quality of maternal care in Palestine, by increasing number of midwives, by introducing more privacy in the labour ward to facilitate that women can experience labour with a companion of their choice, and by introducing midwife-led continuity of care to more women.

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Contributors

BM was involved with the Implementation, study design, preparation of data collection, data analysis, data interpretation and writing. LMD was involved with study design, data analysis and writing. MiL was involved with study design, data interpretation and writing. MaL was involved with study design, data interpretation and writing. ID and DE were involved with the data collection and data interpretation. EF was involved in study design, data collection, data analysis, data interpretation and writing. BM drafted the article and tables. All authors have reviewed and approved the final manuscript. The corresponding author had full access to all

the data in the study and had final responsibility for the decision to submit for publication.

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Competing interests EF is director of NORWAC. BM were partly employed by NORWAC until February 2017 as project manager for implementing the model.

Ethics approval

The study was approved by the Norwegian Regional Committee for Medical Health research Ethics South East (REK) id number: 2015/1235. It was also approved by the Palestinian Ministry of Health.

Data sharing statement

Data can be shared upon request to the first author

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Annex 1



Region: REK sør-øst	Saksbehandler: Hege Holde Andersson	Telefon: 22845514	Vår dato: 17.09.2015	Vår referanse: 2015/1235 REK sør-øst B
			Deres dato: 16.06.2015	Deres referanse:

Vår referanse må oppgis ved alle henvendelser

Erik Fosse
Oslo universitetssykehus HF

2015/1235 Effekt av modell for kontinuerlig jordmorsomsorg i Palestina

Forskningsansvarlig: Oslo universitetssykehus HF
Prosjektleder: Erik Fosse

Vi viser til søknad om forhåndsgodkjenning av ovennevnte forskningsprosjekt. Søknaden ble behandlet av Regional komité for medisinsk og helsefaglig forskningsetikk (REK sør-øst) i møtet 19.08.2015. Vurderingen er gjort med hjemmel i helseforskningsloven (hfl.) § 10, jf. forskningsetikkloven § 4.

Prosjektleders prosjektbeskrivelse

"Palestina innfører en modell for kontinuitet i jordmorsomsorgen. Reformen er et samarbeid mellom Norwegian Aid Committee, NORWAC og Palestinske helsemyndigheter, finansiert av det norske utenriksdepartementet. Dette Phd-prosjektet vil gjennom tre studier undersøke effekten av modellen. Jordmødre fra de offentlige sykehusene kjører ut til avsidesliggende landsbyer, for å gi svangerskaps- og barsel- omsorg. De besøker samme landsby hver uke. De ulike studiene: Studie 1: Har modellen betydning for kvinnenes bruk av helsetilbudet? Studie 2: Har modellen innvirkning på kvinner og barns helse? Studie 3: Påvirker modellen jordmødrenes ferdigheter og trivsel? Både kvantitative og kvalitative forskningsmetoder skal tas i bruk for å få fram ny kunnskap om kontinuitet i jordmorsomsorg i et lav-middels inntektsland under militær okkupasjon. Studiene kan bidra til universell kunnskap, også for høyinntektsland, som ønsker å bygge bro mellom primær- og sekundære helsetjenestene."

Komiteens vurdering

Komiteen har ingen forskningsetiske innvendinger til at prosjektet gjennomføres.

Studien består av tre deler, og det skal benyttes både kvantitative og kvalitative forskningsmetoder. Strukturerte intervju/spørreskjema, fokusgrupper og registerdata. Sistnevnte gjelder tidligere registrerte opplysninger om bruk av helsetilbud og kvinners/barns helse. Dette hentes fra palestinske register Det innhentes også data fra pasientjournaler. Til studiens del 1 & 3 skal det innhentes samtykke fra de inkluderte. Del 2 av studien omhandler registerdata og samtykke innhentes ikke. Man bruker anonymiserte, generelle data som brukes i palestinske helsemyndigheters statistiske rapporter allerede.

Komiteen har ingen innvendinger til dette. Komiteen forutsetter at man innhenter nødvendige tillatelser og godkjenninger for studien fra lokale myndigheter.

Vedtak

Komiteen godkjenner prosjektet i henhold til helseforskningsloven § 9 og § 33.

Godkjenningen er gitt under forutsetning av at prosjektet gjennomføres slik det er beskrevet i søknaden.

Tillatelsen gjelder til 31.03.2019. Av dokumentasjonshensyn skal opplysningene likevel bevares inntil 31.03.24. Opplysningene skal lagres avidentifisert, dvs. atskilt i en nøkkel- og en opplysningsfil. Opplysningene skal deretter slettes eller anonymiseres, senest innen et halvt år fra denne dato.

Forskningsprosjektets data skal oppbevares forsvarlig, se personopplysningsforskriften kapittel 2, og Helsedirektoratets veileder ”Personvern og informasjonssikkerhet i forskningsprosjekter innenfor helse- og omsorgssektoren”

Sluttmelding og søknad om prosjektendring

Dersom det skal gjøres endringer i prosjektet i forhold til de opplysninger som er gitt i søknaden, må prosjektleder sende endringsmelding til REK. Prosjektet skal sende sluttmelding på eget skjema, se helseforskningsloven § 12, senest et halvt år etter prosjektslutt.

Klageadgang

Du kan klage på komiteens vedtak, jf. forvaltningslovens § 28 flg. Klagen sendes til REK sør-øst B. Klagefristen er tre uker fra du mottar dette brevet. Dersom vedtaket opprettholdes av REK sør-øst B, sendes klagen videre til Den nasjonale forskningsetiske komité for medisin og helsefag for endelig vurdering.

Komiteens avgjørelse var enstemmig.

Med vennlig hilsen

Grete Dyb
førsteamanuensis dr. med.
leder REK sør-øst B

Hege Holde Andersson
komitésekretær

Kopi til:

- Oslo universitetssykehus HF ved øverste administrative ledelse

Region: REK sør-øst	Saksbehandler: Gjøril Bergva	Telefon: 22845529	Vår dato: 18.05.2017	Vår referanse: 2015/1235/REK sør-øst B
			Deres dato: 04.04.2017	Deres referanse:

Vår referanse må oppgis ved alle henvendelser

Erik Fosse
Oslo universitetssykehus

2015/1235 Effekt av modell for kontinuerlig jordmorsomsorg i Palestina

Forskningsansvarlig: Oslo universitetssykehus HF
Prosjektleder: Erik Fosse

Vi viser til søknad om prosjektendring datert 04.04.2017 for ovennevnte forskningsprosjekt. Søknaden er behandlet av leder for REK sør-øst på fullmakt, med hjemmel i helseforskningsloven § 11.

De omsøkte endringene er beskrevet i skjema for prosjektendringer og gjelder:

-Innholdet i de opprinnelige to første studiene er nå mer spesifisert og oppdelt i tre ulike studier. Det som opprinnelige var studie 3 er fjernet.

Komiteens vurdering

Komiteen har ingen innvendinger til de omsøkte endringene.

Vedtak

Komiteen har vurdert endringsmeldingen og godkjenner prosjektet slik det nå foreligger med hjemmel i helseforskningsloven § 11.

Godkjenningen er gitt under forutsetning av at prosjektet gjennomføres slik det er beskrevet i endringsmeldingen.

Komiteens vedtak kan påklages til Den nasjonale forskningsetiske komité for medisin og helsefag, jf. Forvaltningslovens § 28 flg. Eventuell klage sendes til REK Sør-øst. Klagefristen er tre uker fra mottak av dette brevet.

Vi ber om at alle henvendelser sendes inn via vår saksportal: <http://helseforskning.etikkom.no> eller på e-post til post@helseforskning.etikkom.no.

Vennligst oppgi vårt referansenummer i korrespondansen.

Med vennlig hilsen

Grete Dyb
dr med
seksjonsleder



Women`s satisfaction of care through the continuum of pregnancy, birth and postpartum period

Invitation to participate in a survey to examine Palestinian women`s satisfaction of the care received from Palestinian Ministry of Health facilities during pregnancy, birth and after birth. This study is done among women in selected villages to compare the health services after introducing a Continuity of Midwifery Care model to some clinics. This knowledge is important in order to document the effect of implementing the Continuity of Midwifery Care model in the West Bank.

We invite you to assist us by answering questions designed for this study and other satisfaction of care studies.

We envisage that the interview will take approximately 30 minutes of your time.

The interview has two parts. The first part collect demographic and social data and the last part collect data related to reproductive health and services. A research assistant will help you answer the questionnaire by performing an interview according to the attached questions. The research assistant is committed to keep all information strictly confidential.

If you want to make any additional comments, you can ask the research assistant to write it on the back page of the questionnaire, or you can write yourself.

Before you join the interview, you must answer **yes** to confirm that you have received this information; that you last pregnancy was singleton and that you registered at a MOH clinic last pregnancy. When you agree to answer the questionnaire you consent to participate in the study. The survey is anonymous, not including any personal information so your answer will not be possible to trace back to you later. You should answer this questionnaire only once.

Please be assured that you are **not** obligated to sign and join this survey.

It will not affect you personally in any way whether you choose to participate or not. Your participation is of great importance for the development of the care provided and the future of the Continuity of Midwifery Care model in Palestine.

Please feel free to contact the below named responsible persons if you have any questions regarding this project. Permission to conduct this study has been granted from the Palestinian Ministry of Health.

Thank you!

1. Berit Mortensen, Norwegian Project Manager, Norwegian Aid Committee (NORWAC) mortensen@norwac.com, telephone: 0597872802
2. Kefaya Atie, Midwife Senior Supervisor, Ministry of Health, telephone 0562402255

Women`s satisfaction of care through the continuum of pregnancy, birth and postnatal period

Side 1

Consent and general information

- **I read the information sheet about the study, I registered at a Governmental clinic during pregnancy, my last pregnancy was singleton and I wish to participate ***

- Yes
- No

- **What type of care were you offered at the local Governmental clinic? ***

Intervention: Continuity of Midwifery Care Model: care from a midwife also employed at the local hospital.

Control: Regular care from staff employed at the clinic

Påfølgende elementer vises kun dersom følgende alternativer er valgt på spørsmål «I read the information sheet about the study, I registered at a Governmental clinic during pregnancy, my last pregnancy was singleton and I wish to participate»: Yes

- **If you had regular care, who provided care for you?**

- Staff nurse
- Practical nurse
- Health worker
- Male doctor
- Female doctor
- Midwife
- I don`t know
- Other

- **Where did you receive care during pregnancy from others than governmental facilities? ***

- UNRWA
- Private doctor
- NGO
- Only Governmental

Other

Demographic and social information

- How old are you? *

- What was your age when you got married? *

- What was your age first time you gave birth? *

- **What is the highest level of education you have completed? ***

- Primary school
- High School
- Diploma 2 years after High school
- Bachelor
- Master
- Phd
- Other

- If other, what kind of education?

- **Are you a paid employee? ***

- Yes, full time
- Yes, part time
- No

- **Does your husband have a paid work? ***

- Yes, regularly
- Yes, now and then
- No

- **Does your husband have a job requiring living outside home for longer periods?**

- Yes
- No

- **Where does your parents live? ***

- In the same village/town as me
- In another neighboring village
- In another town in the West Bank
- Outside West Bank

Reproductive information

- How many pregnancies did you have that went beyond 6 months? *
- How many live born children do you have? *
- If you experienced stillbirth, how many times? *
- How many pregnancies did you have without pregnancy care at all? *

Health information about you last pregnancy, birth and postnatal period

- How many weeks is it since your last birth? *
- At which pregnancy week did you register at the Governmental clinic? *
- How many pregnancy-visits did you have at the Governmental clinic last pregnancy? *

- **Do you smoke ***

- No, never
- Yes, cigarettes now and then
- Yes, cigarettes daily
- Yes, Argile (water-pipe) now and then
- Yes, Argile (Water-pipe) daily

- **Mark if you experience any of the following complications during last pregnancy? ***

- Anemia Hb 9 or less
- Pre-eclampsia
- Eclampsia
- Placenta Previa
- Vaginal bleeding
- Reduced fetal growth
- Gestational diabetes

- Previous cesarean section
- Pelvic pain
- Violations in the home
- Violations from occupation soldiers/settlers
- Rhesus negative blood type.
- Vomiting causing hospitalization
- Other
- I had had no complications during pregnancy

- If other, describe short what kind of pregnancy complications?

- How often did a doctor do the pregnancy check-ups in the governmental clinic? *

- How many pregnancy-visits did you have to a private doctor during last pregnancy? *

- If you used private doctor in addition to Governmental clinic, describe short why you choose to use both:

- **Where you referred to high risk care clinic, hospital or specialist doctor during pregnancy? ***

- Yes, once
- Yes, more than once
- Yes, I was referred but I was not able to go
- No, I was not referred

- **Mark if you experience any of the following complications during last birth? ***

- Birth during transportation
- Instrumental delivery: vacuum
- Instrumental delivery: forceps
- Hemorrhage - severe bleeding
- Elective cesarean section
- Eclampsia
- Acute cesarean section
- Premature birth before 37 weeks` pregnancy
- Premature birth before 34 weeks` pregnancy
- Premature birth before 30 weeks` pregnancy
- other
- I had no medical complications during birth

- If other, describe short what, And/or why cesarean section:

• **Did you experience any of the following complications related to YOURSELF after last birth? ***

- I had anemia, 9 g/dl or less
- I had Infection treated with antibiotics
- Eclampsia
- Perineal tears that caused much pain
- Perineal tears causing infection and fever
- Perineal tears that caused incontinence of faeces
- Problems with breasts causing problems with breastfeeding
- I had painful infection or problems with my breasts
- Feeling so unhappy that I for days cried most of the time
- Feeling so sad that harming myself sometimes occurred to me
- other
- No I had no complications after last birth

• If other explain in few words

• **Mark if your CHILD have any of the following complications after last birth? ***

You can choose more than one alternative:

- My child was transferred to intensive care after birth
- My child had problems breathing that needed treatment
- My child had problem sucking the breast
- My child had jaundice that needed treatment
- My child got infection treated with antibiotics
- My child re-hospitalized after going home
- My child had problems gaining weight
- Other
- My child had no complications

• If other, explain in few words:

• **Duration of breastfeeding your last child ***

- I never breastfed my last child
- I still breastfeed my child, without giving additional food/milk
- I still breastfeed daily and also give additional food/milk
- I stopped breastfeeding

• If you stopped breastfeeding, how many weeks did you breastfed your last child without giving additional food.

- **How often did you meet the same health provider from the Governmental clinic during the whole period of pregnancy, birth and postnatal period? ***

- Two times
- Three times
- Four times
- Five times
- Six times
- Seven times
- Eight times
- Nine times
- More than nine times
- I met different people each time

- **If you met the same Governmental health provider more than once, please explain: ***

- I met the health provider from pregnancy during labour
- I met the health provider from pregnancy in postnatal ward at hospital
- I met the health provider from pregnancy postnatal home visit
- The person I met most times was the nurse
- The person I met most times was the midwife
- The person I met most times was the doctor
- I don't know the profession of the person I met most times

- **If you used the Governmental service less than four times during pregnancy, why?**

- No female doctor
- No midwife
- No regularity
- No ultrasound
- Bad quality
- Complicated to reach the clinic
- I don't know
- Other

- If other, explain shortly:

Your satisfaction of care during pregnancy

Describe at what degree you were satisfied with the care you received from the Governmental clinic during pregnancy by choosing between 1 meaning that you totally disagree and 7 totally agree in the following statements:

	1 Totally disagree	2	3	4	5	6	7 Totally agree
At my pregnancy check-ups I was always asked whether I had any questions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The midwives/nurses always kept me informed about what was happening related to my pregnancy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The doctor always kept me informed about what was happening related to my pregnancy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was always given an active say in decisions about my care in pregnancy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I always felt my worries, anxieties or concerns about the pregnancy and the baby were taken seriously by the midwives/nurses	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I always felt my worries, anxieties or concerns about the pregnancy and the baby were taken seriously by the doctors	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
At my check-ups the midwives/nurses often seemed rushed and busy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	1 Totally disagree	2	3	4	5	6	7 Totally agree
At my check-ups the doctors often seemed rushed and busy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Care in pregnancy was provided in a competent way	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was happy with the emotional support I received in pregnancy from midwives/nurses	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	1 Totally disagree	2	3	4	5	6	7 Totally agree
I was happy with the emotional support I received in pregnancy from doctors	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was happy with the physical care I received in pregnancy from midwives/nurses	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was happy with the physical care I received in pregnancy from doctors	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My privacy was very well respected and taken care of from midwives/nurses	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was afraid that I would have problems to reach pregnancy care because of occupation soldiers or settlers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Describe your overall satisfaction with the care you received during last pregnancy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

1 **Totally disagree** 2 3 4 5 6 7 **Totally agree**

at the MOH clinic (1 is very bad and 7 in very good)

Your satisfaction of care during birth

- Where did you give birth? ***

- Governmental hospital
- Private hospital
- UNRWA hospital
- PRCS hospital
- Israeli hospital
- Under transportation (car)
- Ambulance
- Other

- If other, where?

Describe at what degree you were satisfied with the care you received at hospital during labour and birth by choosing between 1 meaning that you totally disagree and 7 totally agree in the following statements:

1 **I totally disagree** 2 3 4 5 6 7 **I totally agree**

The midwives always kept me informed about what was happening during birth

The doctors always kept me informed about what was happening during birth

	1 I totally disagree	2	3	4	5	6	7 I totally agree
I was always given an active say in decisions about my care during labour and birth	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The midwives were encouraging	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The doctors were encouraging	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The midwives provided reassurance if I needed it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The doctors provided reassurance if I needed it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt nobody really cared for me during labour and birth	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was happy with the emotional support I received from the midwives	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was happy with the emotional support I received from the doctors	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	1 I totally disagree	2	3	4	5	6	7 I totally agree
Care during labour and birth was provided in a professional way	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I wish someone from my family could accompany me during labour and birth	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My privacy was well respected during labour and birth	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	1 totally disagree	2	3	4	5	6	7 totally agree
I felt badly treated by the midwives during labour and birth	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt badly treated by the doctors during labour and birth	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When labour started I was afraid that I would not reach hospital because of the military checkpoints and occupation soldiers or settlers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Overall, how would you describe the care you received in labour and birth (1 very poor, 7 very good)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Your satisfaction with the care you received after birth

- How many hours did you spend in hospital after your last birth? *
- What was the birth-weight of your last child? *

Describe at what degree you were satisfied with the care you received after birth in the hospital choosing between 1 meaning you totally disagree and 7 totally agree in the following statements:

	1 Totally disagree	2	3	4	5	6	7 Totally agree
I was given the advice I needed with breastfeeding at hospital	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	1 Totally disagree	2	3	4	5	6	7 Totally agree
I was given the advice I needed about how to handle, settle or look after my baby in the hospital	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was given the advice I needed about any problems with the baby`s health and progress in the hospital	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was given the advice I needed in hospital about my own health and recovery in after birth	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Care after birth in hospital was provided in a competent way	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Midwives in hospital were supportive after birth	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Doctors in hospital were supportive after birth	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was happy by the emotional support from midwives after birth in hospital	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My privacy was taken good care of at the hospital after birth	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Overall, how would you describe the care you received in hospital after birth (1 is very poor and 7 is very good)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

- **From where did you receive care for yourself and your baby after leaving hospital? ***

You can choose more than one alternative:

- Governmental clinic
- Governmental home-visit
- UNRWA clinic
- Private doctor
- NGO clinic
- Only family cared for me, the baby got vaccination
- No one cared for me, they only cared for the baby
- Home-visit from UNRWA/NGO
- Other

- If other, from whom did you receive care?

- **Who did the home-visit after birth? ***

- My midwife from pregnancy care
- The nurse from the clinic
- The doctor
- My midwife from pregnancy and the nurse from the clinic
- Other
- I had no home visit

- If other, who did the home visit?

- How many home visits did you receive?

- How many days after birth did you receive home visit?

If you received home visit after birth:

Describe at what degree you were satisfied with the care you received after birth in your home choose between 1 meaning you totally disagree and 7 totally agree in the following statements:

Dette elementet vises dersom et av følgende alternativer er valgt på spørsmål «From where did you receive care for yourself and your baby after leaving hospital?»: Governmental homevisit

	1	2	3	4	5	6	7
	Totally disagree						Totally agree
During the home visit the midwife/nurse gave me the advice I needed with breastfeeding	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
During home visit I was given the advice I needed to handle and look after my baby	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
During the home visit I was given the advice I needed to look after my own health and recovery after birth	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I got enough time to ask all the questions I had during home visit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I receive helpful information about family planning during the home visit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was happy for the emotional support I received from the midwife/nurse during home visit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Overall, how would you describe the care you received for yourself at home visit (1 means very bad and 7 means very good)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Overall, how would you describe the care your baby received at home visit (1 means very bad and 7 means very good)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

1 **Totally disagree** 2 3 4 5 6 7 **Totally agree**

yes no I don't know

If you did not receive home visit after birth, would you like to have had the possibility

Describe at what degree you were satisfied with the care you received after birth in the Governmental clinic, choose between 1 meaning you totally disagree and 7 totally agree in the following statements:

1 **Totally disagree** 2 3 4 5 6 7 **Totally agree**

I was given the advice I needed at the clinic about how to handle, settle or look after my baby

At the clinic I was given the advice I needed about any problems with the baby's health and progress

At the clinic I was given the advice I needed about my own health and recovery after the birth

At the clinic, the nurse only had time to vaccinate the baby, no time for individual information

My privacy was taken good care of at the clinic

1 **Totally disagree** 2 3 4 5 6 7 **Totally agree**

I was happy for emotional support I received at the clinic after birth

I received good advice regarding family planning and contraceptives at the clinic

Overall, how would you describe the care your baby received at the clinic after birth (1 is very bad and 7 is very good)

Overall, how would you describe the care you received for yourself at the clinic after birth (1 is very bad and 7 is very good)

1 **Very bad** 2 3 4 5 6 7 **Very good**

Overall how satisfied were you with all care after birth that you received from Government services on a scale from 1 (Very bad) to 7 (very good)?

1 **Very bad** 2 3 4 5 6 7 **Very good**

Overall how satisfied were you with the total Governmental services on a

1
Very bad 2 3 4 5 6 7 Very good

scale from 1 (very bad) to 7 (very good)

- Do you have any recommendations to improve the Governmental service?

Thank you very much for your participation, your answers will guide us to develop the future services.

Nettskjema v81.1

Annex 4

Detailed Likert scales scores, satisfaction with care

	Midwife-led care	Regular care	Adj. Mean difference	95%CI	adj. p value
Satisfaction with care during pregnancy					
At my pregnancy check-ups I was always asked whether I had any questions	5.61(1.54)	4.55(2.19)	1.06	0.54 to 1.59	<0.001
The midwives/nurses always kept me informed about what was happening related to my pregnancy	6.10(1.24)	5.53(1.77)	0.54	0.12 to 0.95	0.014
The doctor always kept me informed about what was happening related to my pregnancy	5.13(1.67)	5.06(1.90)	-0.004	-0.52 to 0.48	0.982
I was always given an active say in decisions about my care in pregnancy	4.40(1.84)	4.31(2.06)	0.08	-0.45 to 0.65	0.768
I always felt my worries, anxieties or concerns about the pregnancy and the baby were taken seriously by the midwives/nurses	5.90(1.44)	5.57(1.59)	0.34	-0.10 to 0.76	0.123
I always felt my worries, anxieties or concerns about the pregnancy and the baby were taken seriously by the doctors	5.36(1.69)	5.15(1.87)	0.20	-0.34 to 0.69	0.461
At my check-ups the midwives/nurses often seemed rushed and busy	1.30(1.02)	2.18(1.89)	-0.88	-1.32 to -0.47	<0.001
At my check-ups the doctors often seemed rushed and busy	2.03(1.90)	2.38(2.10)	-0.33	-0.90 to 0.25	0.246
Care in pregnancy was provided in a competent way	5.24(1.33)	5.42(1.49)	-0.19	-0.58 to 0.21	0.336
I was happy with the emotional support I received in in pregnancy from midwives/nurses	6.11(1.20)	5.19(1.84)	0.92	0.46 to 1.33	<0.001
I was happy with the emotional support I received in in pregnancy from doctors	5.22(1.64)	4.76(2.1)	0.40	-0.17 to 0.93	0.154
I was happy with the physical care I received in pregnancy from midwives/nurses	5.98(1.30)	5.72(1.77)	0.26	-0.17 to 0.67	0.234
I was happy with the physical care I received in pregnancy from doctors	5.45(1.74)	5.36(2.01)	0.03	-0.56 to 0.53	0.906

My privacy was very well respected and taken care of from midwives/nurses	6,58(0.89)	6.43(1.01)	0.26	-0.17 to 0.67	0.234
I was afraid that I would have problems to reach pregnancy care because of occupation soldiers or settlers	1.03(0,30)	1.14(0,87)	-0.10	-0.31 to 0.06	0.275
Describe your overall satisfaction with the care you received during last pregnancy at the MOH clinic	5.57	5.38	0.16	-0.18 to 0.46	0.335
Satisfaction with care during labour and birth					
The midwives always kept me informed about what was happening during labour and birth	5.29(1.89)	4.84(2.04)	0.62	0.06 to 1.18	0.030
The doctors always kept me informed about what was happening during labour and birth	4.60(1.93)	4.29(1.89)	0.52	-0.09 to 1.10	0.099
I was always given an active say in decisions about my care during labour and birth	3.91(2.05)	3.8(2.24)	0.49	-0.11 to 1.07	0.103
The midwives were encouraging	5.27(1.99)	4.94(1.14)	0.56	-0.05 to 1.15	0.067
The doctors were encouraging	4.70(2.02)	4.44(2.35)	0.46	-0.18 to 1.12	0.166
The midwives provided reassurance if I needed it	5.41(2.13)	4.85(2.12)	0.79	0.19 to 1.39	0.010
The doctors provided reassurance if I needed it	4.79(2.18)	4.32(2.36)	0.73	0.10 to 1.37	0.027
I felt nobody really cared for me during labour and birth	2.51(2.24)	2.54(2.22)	-0.29	-0.93 to 0.33	0.363
I was happy with the emotional support I received from the midwives	5.19(2.14)	4.67(2.22)	0.79	0.18 to 1.39	0.013
I was happy with the emotional support I received from the doctors	4.52(2.08)	4.32(2.36)	0.47	-0.17 to 1.11	0.158
Care during labour and birth was provided in a professional way	4.72(1.85)	4.83(1.94)	0.10	-0.43 to 0.64	0.704
I wish someone from my family could accompany me during labour and birth	6.05(1.82)	5.99(2.19)	0.03	-0.56 to 0.64	0.914

My privacy was well respected during labour and birth	6.00(1.49)	5.23(1.96)	1.00	0.52 to 1.50	<0.001
I felt badly treated by the midwives during labour and birth	1.55(1.55)	1.91(1.89)	-0.56	-1.08 to -0.07	0.031
I felt badly treated by the doctors during labour and birth	1.51(1.47)	1.68(1.72)	-0.33	-0.85 to 0.13	0.168
When labour started I was afraid that I would not reach hospital because of the military checkpoints and occupation soldiers or settlers	1.36(1.36)	2.24(2.15)	-0.79	-1.34 to -0.24	0.008
Overall, how would you describe the care you received in labour and birth (1 very poor, 7 very good)	5.14(1.53)	4.88(1.75)	0.51	0.06 to 0.98	0.028
Satisfaction during postnatal hospital stay					
I was given the advice I needed with breast feeding at hospital	4.48(2.24)	3.19(2.30)	1.35	0.69 to 2.19	<0.001
I was given the advice I needed about how to handle, settle or look after my baby in the hospital	4.28(2.19)	2.68(2.27)	1.68	1.03 to 2.43	<0.001
I was given the advice I needed about any problems with the baby's health and progress in the hospital	4.45(2.24)	2.83(2.29)	1.72	1.02 to 2.53	<0.001
I was given the advice I needed in hospital about my own health and recovery in after birth	4.37(2.33)	3.03(2.20)	1.42	0.78 to 2.11	<0.001
Care after birth in hospital was provided in a competent way	4.81(1.87)	3.69(1.99)	1.20	0.61 to 1.88	<0.001
Midwives in hospital were supportive after birth	5.48(1.85)	4.05(2.12)	1.52	0.92 to 2.17	<0.001
Doctors in hospital were supportive after birth	4.70(1.87)	3.25(2.30)	1.53	0.90 to 2.26	<0.001
I was happy by the emotional support from midwives after birth in hospital	5.42(1.95)	3.68(2.16)	1.81	1.19 to 2.47	<0.001
My privacy was taken good care of at the hospital after birth	6.21(1.16)	4.89(2.03)	1.38	0.89 to 1.99	<0.001

Overall, how would you describe the care you received in hospital after birth (1 is very poor and 7 is very good)	5.01(1.52)	4.1(1.85)	0.98	0.49 to 1.57	<0.001
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Satisfaction with care received from Governmental clinic after birth

I was given the advice I needed at the clinic about how to handle, settle or look after my baby	4.83(1.84)	4.37(2.21)	0.49	-0.10 to 1.04	0.097
At the clinic I was given the advice I needed about any problems with the baby's health and progress	5.06(1.58)	4.61(2.04)	0.49	-0.03 to 1.05	0.060
At the clinic I was given the advice I needed about my own health and recovery after the birth	4.38(2.00)	4.03(2.27)	0.35	-0.25 to 0.94	0.244
At the clinic the nurse only had time to vaccinate the baby, no time for individual information	2.54(2.07)	2.10(1.93)	0.83	-0.18 to 0.90	0.185
My privacy was taken good care of at the clinic	5.98(1.12)	6.03(1.14)	-0.04	-0.38 to 0.32	0.803
I was happy for emotional support I received at the clinic after birth	4.95(1.83)	5.09(1.72)	-0.12	-0.63 to 0.37	0.641
I received good advice regarding family planning and contraceptives at the clinic	4.51(2.05)	3.74(2.21)	0.76	0.18 to 1.32	0.012
Overall, how would you describe the care your baby received at the clinic after birth (1 is very bad and 7 is very good)	5.43(1.2)	5.80(1.01)	-0.34	-0.67 to -0.02	0.032
Overall, how would you describe the care you received for yourself at the clinic after birth (1 is very bad and 7 is very good)	4.61(1.44)	4.79(1.15)	-0.17	-0.60 to 0.24	0.447
Overall how satisfied were you with all care after birth that you received from Government services	4.79(1.15)	4.93(1.14)	-0.12	-0.46 to 0.19	0.460
Overall how satisfied were you with the total Governmental services on a scale from 1 (very bad) to 7 (very good)	5.04(1.35)	4.88(1.15)	0.16	-0.19 to 0.51	0.366

Satisfaction during postnatal home visit

During the home visit the midwife/nurse gave me the advice I needed with breastfeeding	5.91(1.42)
During home visit I was given the advice I needed to handle and look after my baby	5.63(1.57)
During the home visit I was given the advice I needed to look after my own health and recovery after birth	6.01(1.54)

I got enough time to ask all the questions I had during home visit 5.51(1.37)

I receive helpful information about family planning during the home visit 5.26(2.04)

I was happy for the emotional support I received from the midwife/nurse during home visit 6.50(0.87)

Overall, how would you describe the care you received for yourself at home visit (1 means very bad and 7 means very good) 6.05(0.98)

Overall, how would you describe the care your baby received at home visit (1 means very bad and 7 means very good) 5.83(1.18)

Annex 5

Erratum

Page	Line	Original text	Type of correction	Corrected text
43	3	Figure 2	Corr.	Figure 4