An observational study of newborn care at Jimma University Specialized Hospital (JUSH), with emphasis on thermal protection

*Part of the WANT-study*

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*Women And Newborn cohort (see chapter 1.1)
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Abstract

This is an observational study of the newborn care at Jimma University Specialized Hospital (JUSH) in Ethiopia, with emphasis on thermal protection. The thesis is a part of the Women And Newborn cohorT (WANT), an observational study conducted by personnel from the University of Oslo winter 2014. By clarifying conditions at JUSH, we preposition for future interventions aiming at increasing quality of health services. This thesis discusses in particular the handling of the newborn child. This theme is of current interest as we are approaching the end of 2015, the target year of the Millennium Development Goals (MDGs) presented by the United Nations in the year 2000. The MDGs are a set of ambitious goals aiming at increasing welfare and equity for the people of the world, several of these dealing with fundamental health issues including children’s health. Several guidelines and recommendations are developed, including those of the World Health Organization (WHO). I found that several of the WHO recommendations concerning newborn care are not complied with at JUSH, increasing risk of hypothermia and its associated complications. Especially recommendations concerning drying, wrapping and keeping the baby and mother together involving skin-to-skin contact were not satisfactorily met. By securing the quality of health services, including ensuring that practice is based on updated knowledge, newborn care at JUSH has a potential for improvement.
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Introduction

1.1 Problem statement

This student thesis is a part of the WANT-study (appendix), conducted by 5 medical students and two professors from the University of Oslo and Oslo University Hospital in cooperation with Jimma University Specialized Hospital in Jimma, Ethiopia. WANT is an abbreviation for Woman And Newborn cohort, an observational study of the procedures for birth and newborn care at JUSH.

The focus for this thesis will be the newborn part of the WANT-study, with the problem statement as follows: An observational study of the newborn care at Jimma University Specialized Hospital (JUSH), with emphasis on thermal protection.

1.2 Background

1.2.1 Ethiopia and Jimma: Geography and environment (1)

Ethiopia is situated on the Horn of Africa, surrounded by Sudan, Eritrea, Djibouti, Somalia, Kenya and South Sudan. The country lost its coastline in 1993, when Eritrea became independent. Highlands dominate the landscape, brought forth by volcanic activity over thousands of years. In these areas the climate is cool, whereas subtropical temperatures characterize the rest of Ethiopia. The amount of precipitation varies greatly, which occasionally entails crop failures and subsequent famine.

Jimma (or Jima), situated 350 km Southwest of Addis Ababa and 1750 meters above sea level (2), is a medium sized city with a population estimated to be at least 100,000. Due to the altitude the temperatures fluctuate widely, and can reach low levels especially during the night (as low as 0°C (32°F) in the night in the cold season).

1.2.2 Ethiopia: History, community, politics and economics (1, 3)

According to the legend, the history of Ethiopia reaches more than 3000 years back in time, initially founded by Menelik I, son of King Solomon and the Queen of Sheba. Recent research, on the other hand, tells a slightly different story. There are remnants
of Egyptians following the Nile in search of gold and slaves before 1000 BC, when
Arabic merchants crossed the Red Sea and founded trade posts along the shore of
today’s Eritrea. There they laid the foundation of the Kingdom of Aksum about 500
years BC. Christianity became the state religion under the leadership of Emperor
Ezana (320-350 AD). During the years that followed there were several dynasties,
kingdoms and Muslim sultanates. Today, Christians and Muslims are the two main
religious groupings in Ethiopia.

After 44 years as head of state from 1930 to 1974, the absolutist emperor Haile
Selassie was deposed due to corruption and stagnation. Ethiopia was then declared a
socialist republic by a military junta (known as the Derg, which is a short name for
the Coordinating Committee of the Armed Forces, Police and Territorial Army)
supported by the Soviet Union and Cuba. This republic eventually became a
dictatorship, led by the despised Mengistu Haile Mariam. A famine was the triggering
factor of an armed revolt, which in 1991 removed Mengistu Haile Mariam from his
position. This insurrection was brought forth by the Eritrean People’s Liberation
Front (EPLF) in cooperation with the Ethiopian People’s Revolutionary Democratic
Front (EPRDF). A part of this cooperation was the agreement to establish Eritrea as a
sovereign state, which was effected in 1993. However, border disputes between
Ethiopia and Eritrea have claimed 80,000 lives over the period from 1998-2000, and
up until today this conflict remains unsolved.

EPRDF is still in power in Ethiopia, having been re-elected by a large majority in
May 2015, though claims of fraud were raised by the opposition. This can partly be
explained by the improved living standards for the general population under this
regime, but according to the UN, the government has also been silencing opponents
through harassment and total control over the country’s media.

Even though Ethiopia is considered one of the most stable countries in Africa,
unsolved military conflicts and disagreements with neighbouring countries Eritrea and
Somalia still constitute a considerable threat, likewise a number of internal conflicts.
Today, Ethiopia is dependent on international loans and remedial action. Most
Ethiopian’s live in rural districts with substantial occurrence of illiteracy, famine and
death by contagious diseases. The building of The Grand Ethiopian Renaissance Dam
on the Nile is intended to provide the country with a stable income by exportation of electricity, and at the same time give the country’s industry a much-needed boost. Simultaneously, the controversial project constitutes a threat to stability in the region, as the resource the water represents has a central role in all civilizations downstream along the Nile (4).

Ethiopia is regarded as the place of origin of coffee, which is a considerable commercial product also in Jimma – by some held to be the very birthplace of this world-renowned recreational substance.

### 1.2.3 Ethiopia: Statistics

In 2013, the total population in Ethiopia was 94,101,000 people. The annual number of births was 3,113,000, and the annual number of deaths under 5 was 196,000. That gives an under-five mortality rate (U5MR) of 64 per 1,000. For comparison, the U5MR of Sub-Saharan Africa totals at 92. In Norway, this number is 3. These numbers rank Ethiopia as number 39 on the list of countries with the highest U5MR in the world with Angola as number 1 with a U5MR of 167, according to UNICEF. (5)

Focusing on the neonatal period (the first 4 weeks of life), the 2013 mortality rate in Ethiopia was 28 (per thousand). In the same year, the overall neonatal mortality rate in Sub-Saharan Africa was 31. (5)

An encouraging development is revealed when we compare the 2013 statistics to the 1990 statistics. The U5MR in Ethiopia in 1990 was as high as 205. This means that the U5MR was reduced by 68,8% over these 23 years. The Millennium Development Goals (MDGs), target 4.A, aimed to: ”Reduce by two thirds, between 1990 and 2015, the under-five mortality rate” (6). When assessing the Ethiopian numbers isolated, this MDG was achieved in 2013.

These statistics are collected as part of the MICS-programme (Multiple Indicator Cluster Surveys), initiated by UNICEF for achieving a standardised data collection for the follow-up of the Millennium Development Goals (MDG’s). The first Multiple Indicator Cluster Survey, MICS1, was initiated in 1995. The statistics presented in the
former paragraphs are from MICS4, with data collection period from 2009-2012. MICS5 are under way, with data collected between 2013 and 2015. The Multiple Indicator Cluster Surveys are based on face-to-face interviews with an adult person from a representative sample of households, performed by specially educated fieldwork teams. These households are chosen as probabilistic, random samples. The average sample size of MICS4 was 18,122 households per country. (7)

1.2.4 Jimma University Specialized Hospital (JUSH) (8)
Originally, what is now known as Jimma University Specialized Hospital was built by the Italians in the 1930s as a field hospital for treatment of wounded soldiers during the Italian war on Ethiopia. Since the withdrawal of the occupation forces Ethiopian authorities have governed the hospital. Over the years, the hospital has received repeated upgrades and expansions. At the time of our visit in January 2014, there were extensive building activities on the site, including a new main building. This new 600-bed hospital is scheduled to be complete by the end of September 2015.

JUSH has a catchment population of 15,000,000 people, as the only teaching and referral hospital in Southwestern Ethiopia. From this immense number of people, the hospital staff annually handles 15,000 inpatients and 160,000 outpatients, including 11,000 emergency cases and 4,500 deliveries.

1.2.4.1 The Maternity Ward
This building, in which we conducted our observations, was built with money from the German foundation Menschen für Menschen. The Maternity Ward was located on the ground floor, with the paediatric ward upstairs in the same building. This way, the transfer time between the wards was minimized. For the delivering mother, the course of events leading to birth started already outside the building. After travelling for up to several days, the women had to wait outside before the delivery process started. Then, she was taken to a room with 8 beds where doctors or medical students examined her. The actual birth was in a second room, with up to 4 women giving birth in the same room at the same time.

Originally, the building was built with the intention of having running water. There were both water taps and flush toilets installed. Sadly, the water supply to the building
was insufficient, and we never observed any running water during our stay. This, of course, negatively impacted the opportunities for adequate hygienic conditions.

Additionally, the ward contained an operating theatre, a postnatal and a post-operative ward, offices and a room for sterilization of medical devices. The paediatric ward housed a sparsely equipped neonatal intensive care unit (NICU) – for instance, there were no fully functioning incubators and limited access to phototherapy equipment. Also, because mains electricity could not be relied upon, machinery which needed a stable electric supply did not achieve full usefulness.

1.2.5 Hypothermia in infants: A brief historical overview

The importance of thermal protection of the newborn is not a new discovery. Soranus of Ephesus (98 to 138 AD) alludes to this in his four-volume writings ‘On Diseases in Women’ (9). More familiar to some, the practice is also described in the Bible: ‘And she brought forth her firstborn son, and wrapped him in swaddling clothes, and laid him in a manger’ (Luke 2: 7). As recently as the 18th century, publications from French lying-in hospitals showed that “endurcissement”, a hardening of the infants skin following hypothermia, was a common cause of death in newborn infants (10, 11). The Parisian obstetrician Dr Pierre Budin (1846-1907) developed early models of the incubators that are now considered mandatory in every neonatal intensive care unit (NICU). He also included “warmth” and “keeping the baby with the mother” as key components of high-quality maternity care (12).

Despite this knowledge, a majority of the 4 million newborn deaths in the world is still associated with hypothermia such as in e.g. prematurity and infections (9).

1.2.6 Thermal regulation of the newborn

Human beings are considered homeothermic, a quality which makes us capable of conserving our body heat despite of fluctuating surrounding temperatures. Directly after birth, however, newborns are exposed to quite hostile circumstances compared to those inside the womb. In these circumstances, the newborn baby is best considered functionally poikilothermic or at best only partially homeothermic. A newborn, naked baby in a surrounding temperature of 23°C (73.4°F) will lose heat at the same rate as a naked adult does at a surrounding temperature of 0°C (32°F) (13). Several
conditions, including a high surface:mass ratio compared to adults, results in rapid heat loss in newborns through the following 4 basic mechanisms (12): Evaporative heat loss (especially evaporation of amniotic fluid, which is the most important mechanism), conduction (direct transfer of heat to contact surfaces), convection (transfer of heat to surrounding air) and radiation (indirect transfer of heat to nearby objects). The body physiologically responds to the lowered body temperature through several regulatory processes. These include vasoconstriction of cutaneous vessels, shivering and non-shivering thermogenesis. The capacity of these processes in the newborn is substantially inferior to those in adults.

The single most important mechanism of heat production in newborns is chemical or non-shivering thermogenesis, driven by lipolysis of brown adipose tissue. Exposure to cold environments trigger peripherally and centrally located thermoreceptors, signalling through the hypothalamus, resulting in norepinephrine release which in turn sets off lipolysis (9). The metabolic rate of a newborn baby is about 35-40 kcal kg$^{-1}$ day$^{-1}$ during the first day of life. Temperature control can be disturbed by a number of factors, like infections. Other illnesses, such as asphyxia, starvation and deep sleep reduce the metabolic rate. Newborns with these conditions are at increased risk of hypothermia (13).

Premature or LBW’s (low birth weight) are especially vulnerable to hypothermia as they have limited vasoconstriction capability, greater surface:mass ratio, immature skin and less brown fat deposits than term infants (12).

Last, but not least, an important mechanism of thermal regulation is behavioural: The crying baby compels the mother to pick it up, cuddle it and/or breastfeed it – all of these acting positively to conserve body temperature (9).

1.3 Literature review

1.3.1 World Health Organization (WHO)

As the official health organization of the United Nations, WHO holds the overall responsibility for monitoring and acting accordingly to current health situations and threats to public health arising anywhere in the world.
1.3.1.1 WHO: MDGs

The Millennium Development Goals (MDGs) is a set of 8 ambitious goals for world health. They were agreed to by all the world's countries and 23 international organizations in the year 2000 (14). By accepting these MDGs, the countries committed themselves to work towards fulfilling these goals by the end of 2015. The target values of the MDGs are compared to 1990 numbers. The MDGs are:

- **MDG 1**: To eradicate extreme poverty and hunger.
- **MDG 2**: To achieve universal primary education.
- **MDG 3**: To promote gender equality and empower women.
- **MDG 4**: To reduce child mortality.
- **MDG 5**: To improve maternal health.
- **MDG 6**: To combat HIV/AIDS, malaria and other diseases.
- **MDG 7**: To ensure environmental sustainability.
- **MDG 8**: To develop a global partnership for development.

The most relevant MDG in the context of the present study is MDG 4: Child mortality. This emphasizes the goal of reducing by two thirds the under-fives mortality rate from 1990 to 2015 (6). The interim report concluded that we still have a long way to go to reach the envisioned target. Nevertheless, if one counts the fate of individuals, there still has been impressive progress. 17,000 fewer children die every day now compared to in 1990.

Concerning MDG 5, maternal health, much is also still to be done here. The specific targets are: 5.A “Reduce by three quarters, between 1990 and 2015, the maternal mortality ratio” and 5.B “Achieve, by 2015, universal access to reproductive health”. For the time being, maternal mortality has declined by 45% since 1990, but only half of women have access to reproductive health care during pregnancy (15).

Considering goal attainment in other MDGs, we see that a few targets have already been reached (16). These are MDG 1.A (halve the proportion of people living in extreme poverty), MDG 6.C (Have halted and begun to reverse the incidence of malaria and other major diseases) and MDG 7.C (halve the proportion of the population without sustainable access to safe drinking water). We are also close on
fulfilling MDG 3.A (Eliminate gender disparity in education). MDG 8 has no measurable terminus. All together it is safe to say that we still have much work to do concerning the MDGs.

1.3.1.2 WHO: Guidelines (17)
WHO has, in cooperation with The United Nations Population Fund, UNICEF and The World Bank, published a guide for essential practice concerning pregnancy, childbirth, postpartum and newborn care. The guide contains evidence-based recommendations for clinical decision-making. As mentioned in the preface of this publication, there is a comprehensive misunderstanding concerning the dimensions of advanced medical equipment that is needed to dramatically reduce infant and maternal morbidity and mortality. Actually, the core elements include basic pregnancy check-ups, skilled attendance during childbirth and the following couple of days and a few interventions directed at critical events during the first days of life.

In brief, these are the most critical stages during childbirth and immediately after:

**Delivery:** Immediately after delivery, the newborn should be placed on the mother’s abdomen or chest. This is known as kangaroo-mother care, and is important both for temperature conservation and for stimulation of oxytocin production in the mother, which works to prevent postpartum bleedings. The baby should immediately be dried and covered by a dry towel and a hat. The newborn should receive an identification label.

**Further observations and actions within the first hour after delivery:** The newborn should be monitored regularly with enhanced attention to breathing and temperature. Additional drying and wrapping in warm, dry towels might be necessary. Skin-to-skin contact remains of highest importance. Mother and baby should not be separated, but should be kept in the same room. Dry the eyes and apply an antimicrobial (either 1% silver nitrate drops or 2.5% providone iodine drops or 1% tetracycline ointment). Do not bathe the baby or remove the vernix. Blood or meconium should be wiped away with a dry towel. When the baby seems ready, breast-feeding should be encouraged. One hour after the delivery, the newborn should receive a thorough examination.
1.3.1.3 WHO: The warm chain (18)

In 1997, World Health Organization presented the warm chain, a list of 10 important measures to avoid hypothermia in newborn babies. If any of these are compromised, it implies a risk of hypothermia. They state that the lack of knowledge and awareness constitutes a more substantial threat of hypothermia than lack of equipment. The guidelines are important for all, also healthy term babies, but LBW’s and premature newborn needs even closer follow up with higher temperatures over a longer period of time.

The warm chain consists of 10 focus areas:

1) Warm delivery room
Ambient temperature should be at least 25-28°C (77.0-82.4°F). As a rule of thumb, when temperatures climb above what is comfortable for an adult person with short sleeves, it’s becoming suitable for the newborn. Attention should also be directed at avoiding any drafts.

2) Immediate drying
Two dry towels should be used: One for drying and another one for wrapping. Towels should be pre-heated especially if surrounding temperatures are lower than recommended. Drying should be executed during skin-to-skin contact directly after birth, alternatively on a heated mattress.

3) Skin-to-skin contact
Kangaroo care, placing the newborn directly on to the mother’s chest or abdomen after birth decreases risk of hypothermia. In addition to being important immediately after the delivery, this is also a good way of ensuring optimal thermal protection for the newborn in the hours following delivery and during transportation.

4) Breast-feeding
This should be encouraged as early as possible. Especially the first milk, known as the colostrum, is of great importance to the child. This contains important nutrients and
antibodies. Concerning hypothermia, the calories are important fuel for thermogenesis.

5) **Bathing and weighing postponed**
Bathing should be postponed a couple of days, at least not done the first 6 hours after birth. It is of special importance to ensure that the water is warm, that bathing goes quickly and is followed by thorough drying.

Weighing of the child should be delayed for several hours to prevent hypothermia, with the baby covered. The weight of the towel can be subtracted afterwards.

6) **Appropriate clothing/bedding**
Compared to an adult, a newborn needs 1-2 more layers of clothing given the same ambient temperature. As an uncovered head accounts for up to 25% of the heat loss, placing a cap directly after birth is of highest importance. It is important to notice that swaddling the child tight, leaving little or no trapped air between the layers, gives less thermal insulation and higher risk of hypothermia. Additionally, the restriction on chest movement predispose for pneumonia and other lung infections.

7) **Mother and baby together**
This increases the likelihood for adequate temperature control and gives ample access to breast-feeding, which is important both during day and night.

8) **Warm transportation**
Transportation carries an increased risk of hypothermia, therefore additional precautions should be taken. Skin-to-skin contact is the superior and preferred method of temperature conservation during transportation.

9) **Warm resuscitation**
Asphyxiated newborns has an insufficient heat production, hence a higher risk of hypothermia. Therefore, one should devote even greater attention to temperature conserving measures.
10) Training and awareness raising
Any professional affiliated with deliveries or newborn care should be aware of the importance of hypothermia prevention and techniques to do so, parents likewise. Enlightenment of entire communities would also be beneficial.

1.3.2 Consequences of child morbidity and mortality in the developing world
In many developing countries, the family is the main provider of social security in old age. With high child mortality rates, the safest way of attaining this security is by high fertility. The continuing series of pregnancies, often combined with an early marriage, results in a maternal strain described in the literature as ‘maternal depletion’ (19, p. 10). The combination of high fertility and high child mortality gives what is known as a ‘wasteful fertility pattern’, a state that ties up a large amount of human resources in a country. By reducing child mortality, the rate of births will consequently drop because chances are that the children are still alive when the parents are approaching the sunset of life (20, p. 31). Consequently, reducing wasteful fertility patterns makes more human resources accessible to the society.

Other consequences of child morbidity and mortality, like in e.g. the impact on mental health, social difficulties associated with a young and rapidly expanding population (20, p. 298) and the importance of adequate child spacing for achieving proper growing up conditions (19, p. 64) are equally important but not discussed in further detail here.

1.3.3 Neonatal hypothermia

1.3.3.1 Definition (13, 18)
Neonatal hypothermia is defined into different temperature ranges below the normal range of 36.5-37.5°C (97.7-99.5°F). There are three stages of hypothermia:

36.0-36.4°C (96.8-97.5°F) indicates a condition of cold stress or mild hypothermia; this gives rise to concern and should initiate warming of the baby and an attempt to identify cause(s).
32.0-35.9°C (89.6-96.6°F) corresponds to moderate hypothermia; this signals danger and demands immediate warming.

Below 32.0°C (89.6°F) is considered severe hypothermia; readings below this level indicates impending mortal danger and a need for urgent, skilled care.

1.3.3.2 Incidence

Neonatal hypothermia is not, as one might figure, a problem reserved only for latitudes known for cold climate, during night or in cold seasons. High incidences of neonatal hypothermia are seen even at ambient temperatures as high as 26-30°C (78.8-86°F). A study at a special care unit in Ethiopia revealed hypothermia in as many as 67% of admitted LBW’s (low birth weight) and high-risk infants (18).

Neonatal hypothermia is a major threat to newborn health in many parts of the developing world, and lack of knowledge and awareness are important factors which contribute to this situation. The extent of hypothermia is not very well registered, but even though estimates vary it is clear that the incidence is extensive (21). There are some studies from Africa which include temperature measurement, all of them are hospital based. They found a high prevalence of hypothermia in many different countries (22): 44%-69% in Zambia, 53% in Ethiopia, 62% to 68% in Nigeria, and 85% in Zimbabwe. One of several possibilities for the variations in prevalence is because there were varying case definitions of hypothermia from 35.0°C to 36.5°C, in addition to different climate conditions and seasonal variations (22).

1.3.3.3 Clinical signs

The clinical signs of hypothermia are ambiguous and non-specific; hence a broad approach is fundamental when suspicion arises. Especially, symptoms of septicaemia are significantly overlapping with those of hypothermia. Knowing that hypothermia also predisposes to infection and vice versa, this differential diagnosis is particularly important to rule out at an early stage (13). Early signs of hypothermia include cold feet, subsequently more generalised coldness of the skin. The infant becomes less active, suckles poorly and cries weakly. More advanced stages of hypothermia manifest itself by a light red colour in the face and on the extremities, sometimes accompanied by sclerema, a hardening of the skin. The neonate becomes lethargic,
with slow, shallow and irregular breathing. Bradycardia, falling blood sugar and metabolic acidosis follow before reaching the end stage with generalised internal bleeding, most typically pulmonary. (18)

1.3.3.4 Preventive measures
Neonatal hypothermia is more a result of inadequate knowledge levels than inadequate equipment (18). The most important measures in the prevention of hypothermia are the foundation of the WHO guidelines known as ‘the warm chain’ (chapter 1.3.1.3).

Another interesting means of thermal protection is described in an article by Belsches TC et al (23), who make mention of plastic bags to prevent term neonatal hypothermia. This represents a widened area of utilization, as these plastic bags are already used on LBW’s (low birth weight) and preterms in the developed world. The study was carried out in a University Teaching Hospital in Zambia. The researchers revealed that neonates in plastic bag had a lower rate of hypothermia compared to standard thermoregulation care (60% vs 73%) one hour after birth. As they conclude, placement in plastic bags reduces the incidence of hypothermia, however most neonates remain hypothermic.

In the context of hypothermia prevention, it is simultaneously important to emphasize the risk attached to hyperthermia. Hyperthermia is equally dangerous to the child as hypothermia. Early signs of hyperthermia are tachypnea, tachycardia, warm skin, red extremities and flushing of the face. Late signs are restlessness and crying, subsequently lethargy, shock, convulsions, coma and eventually death. (18)

2 Objectives

2.1 Broad objective
The main aim of the study was to observe the clinical routines of newborn care in JUSH and compare the current practice to WHO guidelines. A secondary aim was to recognize and suggest simple, specific measures to improve newborn health at JUSH.
2.2 Specific objectives
As mentioned in the problem statement, this thesis focuses on the care of the newborn child immediately after birth, with emphasis on thermal protection.

3 Methodology

3.1 Study area
The present study is conducted on the catchment population of JUSH in the Southwestern part of Ethiopia.

3.2 Study design
The study design is an observational study. For the collection of data we developed a form for registration of observational data during our presence in the maternity ward. A total of 5 medical students recorded observations on the same forms, constituting the total data material of the WANT-study, from which several student theses are written. The WANT registration form is included in the appendix.

3.3 Study population
The total catchment population covered by JUSH totals 15,000,000 people, including both sexes. From this population, more than 90% of deliveries take place outside hospital walls. According to hospital staff more deliveries by women in Jimma take place at the hospital, whereas the fraction of home deliveries increased corresponding to an increasing distance to hospital. High-risk deliveries were preferably referred to JUSH if practically feasible. Hence, the study population is not representative for all deliveries in the region.

3.4 Inclusion
During our data collection period in Jimma from 30th of January to 11th of February 2014, we were present at the maternity ward between 8.30 am and 8.00 pm. Every delivery within this time period was recorded, and amounted to 59 recorded delivered babies. We did not stay during the night for several reasons, most importantly because we were too few to manage the shifts and because of security precautions.
3.5 Exclusion

Women arriving at the maternity ward close to 8.00 pm were not registered if we assessed that they would not deliver very soon. Some registrations were started but not completed because of slow progression of labour. Thus, we recorded every completed delivery at the maternity ward which occurred during the period that we were present. A large, important non-included group consist of those who delivered at home or in other places outside the hospital. This is a difficult but important population to study on subsequent occasions.

3.6 Sample size/technique

Out of 87 initiated registrations, 56 delivered while we observed, three of them being twin births. As this thesis focuses on the events immediate subsequent to the actual delivery, the sample size in the material is also 56. The data collection technique was as a rule strictly by passive observation, but as discussed in subsection 5.3 some exceptions were made.

3.7 Data analysis plan

The WANT registration forms (appendix) were plotted into Microsoft Excel on a computer, with additional comments registered in Microsoft Word documents linked to the Excel forms by use of the CRF (Case Report Form) numbers. Data was analysed manually, with regard to trends and registrations supporting our general impression.

4 Results

4.1 Hypothermia

We did not observe any systematic measuring of temperature; hence we have no data of the actual occurrence of hypothermia.

4.1.1 Drying and wrapping

Of 52 live born babies 20 of them (38,5%) were wrapped in the same wet towel that was used to dry them. The rest were wrapped in dry fabrics. Accordingly, every
newborn was wrapped in some kind of fabric. Chiefly, wrapping occurred promptly after drying, but a delay of up to 10 minutes between delivery and wrapping was recorded. Even though every newborn was wrapped, lack of consistent surveillance caused situations where the wrapping came loose, leaving the baby naked and exposed to surrounding air. On the basis of ethical considerations, further discussed in subsection 5.3, we chose to wrap the babies ourselves instead of passively recording time until staff did so – even though this would be in line with the intent of the study.

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Wrapped</th>
<th>Wet fabric</th>
<th>Dry fabric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>52</td>
<td>52</td>
<td>20</td>
<td>32</td>
</tr>
<tr>
<td>Percentage</td>
<td>-</td>
<td>100%</td>
<td>38,5%</td>
<td>61,5%</td>
</tr>
</tbody>
</table>

### 4.1.2 Heat source

Initially, there was no functioning heat source in the delivery room or close to the table where the newborn babies were attended. There were, however, two radiant heaters mounted on the wall, but clearly they had been out of use for a while. Also, there were burn marks on the mattress indicating that there had been a heat source placed there in the past. Only a couple of days after our arrival a heater matching the burn marks were placed on the table with the newborn babies. This was a standard household heater run on electricity.

### 4.2 Attendance

#### 4.2.1 Time away from mother

Because of the comprehensive focus on the mother after delivery, newborn considerations appeared to become a secondary concern. After the delivery, the newborn was only attended to briefly, being dried and wrapped, and ascertained to be breathing. Extensive examinations were not observed to be conducted. After these first couple of minutes, the newborn was mostly left alone while the mother was attended to. Average duration between delivery and reunion of mother and baby was 39 minutes. The longest duration measured was 1 hour 50 minutes.
4.2.2 Name tags

Even though up to three newborns were placed on the same table simultaneously after delivery, only 3/59 (5.1%) received any kind of nametag. Considering the large number of medical staff handling these babies, the risk of mixing the babies up seemed substantial. We never observed anything indicating that this actually happened on our shifts, but routines where not sufficient to safely prevent this from happening.

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>With nametag</th>
<th>Without nametag</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>59</td>
<td>3</td>
<td>56</td>
</tr>
<tr>
<td>Percentage</td>
<td>-</td>
<td>5,1%</td>
<td>94,9%</td>
</tr>
</tbody>
</table>

4.3 Birth weight

All liveborns where weighed. Weighing was carried out by placing the newborn on a non-heated metal scale pan on a paper wrapping from sterile gloves, with an analogue scale. Average weight was 3069 gram, with a range from 900 to 4500 gram.

4.4 Resuscitation

During our data collection period we included 15 cases in module 4, resuscitation (appendix). From these 15 newborns, 8 were given respiratory support alone and 3 received full resuscitation with chest compressions. Of the 7 stillborn, none were attempted resuscitated. The remaining 4 out of the 15 included cases in module 4 that did not receive respiratory support nor chest compressions were included because they needed tactile stimulation for at least 2 minutes after birth before starting to breathe.

4.5 Stillbirths

The total number of delivered babies numbered 59. From these 59, 52 were live births (88,1%). Hence, 7 stillbirths were recorded. The mothers were offered to take the dead bodies home, but we never observed anyone accepting this offer. Routines were that the bodies were discarded and placed in garbage cans, often located by the foot of the mother’s bed, accompanied by placenta and disposable articles used during the
delivery. On one special occasion, a woman lay in a bed for several hours with her dead baby in the garbage can next to her bed before the garbage can was emptied.

<table>
<thead>
<tr>
<th></th>
<th>Total delivered</th>
<th>Live births</th>
<th>Stillbirths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>59</td>
<td>52</td>
<td>7</td>
</tr>
<tr>
<td>Percentage</td>
<td>-</td>
<td>88.1%</td>
<td>11.9%</td>
</tr>
</tbody>
</table>

5 Discussion

5.1 Discussion of main results

When discussing the results of our study, it is of great significance to clarify the reference for goal attainment. I have chosen to emphasize guidelines and targets defined by the World Health Organization (WHO) for the region when problematizing practice and suggesting areas of improvement (chapter 6). In the following I will point out what I consider the most important of our findings.

5.1.1 Prevention of hypothermia

Several deviations from WHO guidelines were revealed in our study, and many of these are low-tech and easy to put straight. With reference to subsection 1.3.1.3: WHO: “The warm chain”, several of the 10 recommendations are of particular interest. Lack of conformity with the guidelines was most obvious regarding the following recommendations:

1) Immediate drying (“The warm chain” number 2): Here, wrapping in dry and preferably pre-heated towels are also stressed. This is a great contrast to our observations in Jimma. Even though every newborn we observed was wrapped in the first place, both the large fraction receiving wet towels and the large number where the wrapping loosened makes it important to emphasize this precaution.

2) Skin-to-skin contact, breast-feeding and mother and baby together (“The warm chain” number 3, 4 and 7): These bullet points should be addressed together. These are important and easy measures to increase the survival chances of a newborn, and
are amongst the most low-tech but still very efficient means to prevent hypothermia. The reasons why these guidelines was not met is probably multifaceted. As discussed in subsection 5.1.3, we often sensed an emotional distance between mother and baby after the delivery. This could be one of the reasons why they were held separated so long. Additionally, the staff was conscious about the woman’s need for rest after the delivery, and this implied that others should attend to the baby the first period of time. Nevertheless, WHO guidelines (17) include a clear recommendation of the kangaroo-mother care as an important action both for the newborn child as well as for the mother, as mentioned in subsection 1.3.1.2.

3) Appropriate clothing/bedding: ("The warm chain” number 6): In addition to the dry and warm towels recommended earlier, the use of caps is stressed. This was also a request from the paediatricians in Jimma, and we actually brought a large number of hand-knitted caps for the newborn babies upon our arrival. These were knitted by Norwegian friends, family and actually also strangers, including three school classes at Kampen school in Oslo. A predictable and constant supply of caps to Jimma is needed. An alternative is community education, to arrange for mothers to provide appropriate clothing including caps to their newborn children.

Obtaining reliable heat sources is also a basic and urgent need. Nevertheless, compared to the preceding discussion of interventions, this is more complicated and expensive to obtain. Apart from procuring adequate materials for swaddling/clothing in sufficient amounts, a steady power supply is needed.

5.1.2 Resuscitation
The numbers presented are insufficient for making general comments, but they can be reflected upon individually. Our main impression was that there was a lack of quality control. Quality varied greatly depending on the personnel present, from quite good to poor. Lack of adequate equipment and preparation was an important factor. To illustrate this, a resuscitation example is presented in the following:

One of two twins was lifeless at birth. It was taken to the NICU upstairs in the same building, where it took 2 minutes to find a paediatrician, who used 2-3 minutes to find sterile gloves. After this, resuscitation was initiated with a mask that was too large. 3-4 minutes after initiation of the first resuscitation
attempt, the correct size mask was obtained. Subsequently, the newborn aspirated. Initially, a manual suction was used. Because of insufficient effect, there was a pause in resuscitation while looking for a connector socket for an electrical suction device. After 10 minutes, adequate resuscitation with ventilation and chest compression was resumed. The newborn was moved to another room, and died shortly after.

In fairness, this was the most complicated and unfavourable of the resuscitations we observed. It is important to have in mind that even though some of the personnel were inadequately trained for resuscitation, circumstances themselves often made resuscitation very difficult. Power outages, equipment shortcomings and demotivating settings were all factors contributing to inadequate resuscitations.

5.1.3 Mental impact on personnel and parents

If comparing circumstances in Jimma to corresponding hospital environments and conditions in Norway much is different. As a health professional myself, I admire the perseverance many of the doctors, nurses and midwives demonstrated despite the tremendously difficult working conditions. The sense of hopelessness could easily become dominating if not focusing on defined, concrete potentials for improvement, perhaps one at a time. Considering the parents, we were surprised to see the distance in the relationship between mother and child subsequent to the delivery. Many mothers declined when they were offered to see and hold their child. We were told that common practice was to arrange a celebration a couple of weeks after the delivery, welcoming the child into the family. One of several explanations for this practice is the need for emotional self-protection considering the high child mortality during the first days of life. This emotional distance, which may quite possibly be inevitable in this context, could perhaps explain the practice pertaining to stillbirths and the concomitant handling of the body. In some Beduin cultures, a new infant is fed, changed and clothed, but no interaction in the form of talking, singing, playing, or activation occurs before the infant is 9 months old, at which time the infant is actively engaged on the social level under the assumption that she/he will now survive (Hansen, TWR, 2015, personal communication).
5.2 Shortcomings of the study model

Several weaknesses and potentials for bias are obvious. First and foremost is the impact of observation itself; our presence alone may certainly have caused alterations in practice. An example of this is when someone placed an electric heater on the table where the newborn babies were placed after birth a couple of days subsequent to our arrival. Burn marks on the mattress indicated that the heater had also been used in previous occasions, but we cannot know the real extent of usage. Another important concept to discuss is the use of convenience samples. This is when the researcher chooses a population because it is easy to study rather than choosing the most important population to acquire knowledge about. In this context, one could argue that a comprehensive survey aimed at the more than 90% of mothers delivering at home would have a bigger impact on maternity health issues in Ethiopia. The timing of our presence at the maternity ward was also influenced by convenience considerations on our side. This, combined with the sample size, is important to bear in mind when interpreting data from this study. Nevertheless, as this study should be regarded as a pilot for a prospective and more comprehensive intervention in the future, some of these shortcomings can be justified.

5.3 Ethical discussion

The observational technique entailed some very difficult ethical challenges. Whilst our mission originally was strictly observational, ethically challenging situations at times forced us to deviate from our intended non-interventionist approach. One of these is already mentioned, when we chose to wrap the newborn babies who kicked away their towels. We found it impossible to stand on the sideline, passively watching a newborn child become hypothermic when we had the opportunity to prevent it, even though it clearly impacted our data sampling. Finding our role in the maternity ward as visitors, but also health professionals, also posed difficulties. An example of this was when we observed a woman with eclampsia. She lost consciousness and had a snoring respiration, indication partially occluded airways. By raising her chin her respiration became much more effortless – we were, nevertheless, instructed not to do this by the woman’s doctor, as he meant her airways was more secure while laying on her back with her head to the left. The snoring respiration resumed, and we found ourselves forced into a passive role. Last but not least, the view of women imposed a
challenge to our integrity, as rough treatment including physical violence from the staff towards the women was an almost everyday experience.

To meet these challenges, we had to be true to our motive. To help improve the health system in Jimma, cooperation and a systematic approach were paramount. Reducing the quality of our observational data was an inevitable consequence in order to meet these ethical demands.

5.4 Conclusion
Our main purpose was to perform an observational study with minimal influence on registered data, to gain a baseline understanding of routines and conditions in the maternity ward at JUSH that could work as reference for future interventional studies. After taking into consideration the shortcomings discussed in subsection 5.2, my opinion is still that we did acquire a reasonable representative perspective on conditions at the hospital. We were able to expose several deviations from the WHO guidelines that would not be resource-demanding to adjust, further discussed in chapter 6.

6 Recommendations
On the basis of our observational study, the following are some recommendations aimed at improving the quality of the neonatal care at JUSH.

1) Implementing the WHO ‘warm chain’ guidelines
The practical guide developed by WHO presents important steps concerning neonatal care adapted to conditions like those in Jimma. Through simple, but important, means the risk of hypothermia and its associated complications will be reduced.

2) Invest in an academically inspiring working environment
Increasing the quality and extent of research, in-service training, quality improvement projects and focus on evidence-based medicine would be important measures to ensure an inspiring and motivating academic environment, providing a breeding ground for quality enhancement and employee welfare. Implementing these measures
on all levels would undoubtedly contribute to ensuring a consistently high quality of health services in all sections.

3) Improve technical facilities
This is an obvious but difficult recommendation to make. Covering basic needs, especially steady and reliable supplies of running water and electricity are paramount for further development of the health services.

7 Acknowledgements
I wish to address my thanks to the staff at JUSH for allowing us to visit their hospital. We were welcomed with great hospitality, and other things were set aside to meet our needs. For this I am very grateful. A special thanks is directed to dr. Netsanet Workneh, MD, for her hospitality, interest and academic discussions. In addition, I wish to thank the faculty of medicine at the University of Oslo for making our journey to Jimma possible. Their arrangements, encouragements and financial support have been important in the implementation of the project. A special thanks should be addressed to Tolesa Tilahun Hafte, PhD, for his friendly attitude and practical support concerning all aspects of our journey. His presence in Jimma was very helpful. Thanks also to professor Jeanette Magnus, professor Ingrid Os and Sverre Bjerkeset of the Faculty of Medicine in Oslo for their role in making the trip to Jimma possible.

At last I wish to address my deepest gratitude to my supervisors, professor Thor Willy Ruud Hansen, MD, PhD, and consultant Katariina Laine, MD, PhD. Their support on all aspects of both our visit in Jimma and during the writing of this thesis has been paramount for the result. I wish to address a special thanks to Thor Willy Ruud Hansen for his extensive contribution during the writing of the thesis. His enthusiasm and professional commitment has been and will continue to be an inspiration for me in the practice of my profession.
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Appendix: WANT-study reg. form

WANT- study:
Woman And Newborn CohorT in Jimma, Ethiopia 2014 -An observational study

By
Fanny Andersson (100-199)
Kine Lunde Frydenberg (200-299)
Fredrik Hjortaaas (300-399)
Kaja Langeland (400-499)
Linn Oftenes Lie (500-599)

Supervisors, Collaborators, Contributors:
In Norway:
Thor Willy Ruud Hansen
Katariina Laine
Jeannette Magnus
Ingrid Os

In Ethiopia:
Demisew Amenu
Netsanet Workneh

Content:
Module 1. Mother attended
Module 2. Delivery
Module 3. Newborn
Module 4. Newborn emergency
Module 1. Mother attended
Observation of clinical routines at mothers’ arrival and during delivery

1. Date and time: __________________ (dd.mm.yyyy) __________________ (00:00)

2. Blood pressure □ Measured: ______________ □ Recorded □ No

3. Temperature □ Measured: ______________ □ Recorded □ No

4. Urine dip stix □ Yes □ No
   a. Protein □ Measured: ______________ □ Recorded □ No
   b. Gluc □ Measured: ______________ □ Recorded □ No
   c. Leuk □ Measured: ______________ □ Recorded □ No

5. Hemoglobin □ Measured: ______________ □ Recorded □ No

6. HIV □ Yes □ No □ Unknown status

7. Hepatitis □ Yes □ No □ Unknown status

8. ABO-blood type □ Determined: __________ □ Recorded □ No

9. Rh type □ Determined: ______ □ Recorded □ No

10. Does she have a health card or other paper from health worker □ Yes □ No

Status

11. Examination of the fetal position and presentation
   a. Leopold maneuver/ abdominal palpation □ Performed □ Recorded □ No
   b. Position of presenting part in pelvis □ Performed □ Recorded □ No
   c. Assessment of cervical opening □ Performed □ Recorded □ No
   d. Assessment of sutures and fontanels □ Performed □ Recorded □ No
   e. Frequency of contractions □ Measured: ______ /min □ Recorded □ No
   f. Fetal heart rate □ Measured: ______ /min □ Recorded □ No

Other information recorded by interview

12. Obstetrical variables/history:
   a. Reason for referral to hospital:

   ________________________________________________________________

   b. Recording of illnesses during pregnancy; which illnesses:

   ________________________________________________________________

   c. Known term date? □ Yes: ______________ □ No
   d. Based on □ Ultrasound □ LMP
   e. How is pregnancy duration estimated?

   ________________________________________________________________

   f. Parity; number of previous deliveries: ______
   g. Number of children alive now: ______
   h. Number of stillbirths or newborn death first week (perinatal mortality):

   ________________________________________________________________

   i. Deceased children at the age of 7-28 (neonatal mortality): ______
   j. Deceased children after 28 days of age: __________
   k. At what age? __________________________
   l. Abortions: ____________________________

13. Maternal demographics:
   a. Maternal age: ________ years
   b. Language spoken: □ Oromo □ Amharic □ Other: __________
   c. Mothers or fathers cell phone number: __________
   d. Residence; distance from hospital: ___________________________
Module 2. Delivery

First and second stage of labour:

14. Who are present at the delivery
   a. Number of persons: __________________
   b. Professions:
      □ Midwife □ Medical student □ Nurse □ Ob-Gyn doctor
      □ Other: ____________________________
   c. Spouse □ Yes □ No
   d. Other relatives □ Yes, number? □ No

15. Use of partogram □ Yes □ No

16. Repeated examinations during delivery:
   a. Blood pressure □ Measured □ Recorded □ No
   b. Temperature □ Measured □ Recorded □ No
   c. Position of presenting part in pelvis □ Performed □ Recorded □ No
   d. Assessment of cervical opening □ Performed □ Recorded □ No
   e. Assessment of sutures and fontanels □ Performed □ Recorded □ No
   f. Frequency of contractions □ Measured □ Recorded □ No
   g. Fetal heart rate □ Measured □ Recorded □ No

17. Interventions during labour:
   a. Amniotomy if not ruptured membranes □ Performed □ Recorded □ No
   b. Oxytocin use for labour augmentation □ Performed □ Recorded □ No
   c. Duration of rupture of membranes: ___________________ hours
   d. Vaginal exploration after rupture of membranes? How often; once per hour?
      Describe: ______________________________________________________
      __________________________________________________________________

18. Pain relief administered: □ Yes □ No

19. Type of pain relief
   a. □ Morphin injections  b. □ Nitrous oxide
   c. □ PCB  d. □ Pudendal block
   e. □ Epidural  f. □ Spinal
   g. □ Other: ____________________________

20. Fetal monitoring during delivery
   a. □ CTG  b. □ Pinard stethoscope  c. □ Other: ____________________________ d. □ No

21. Duration of second stage of delivery (pushing): ___________ min

22. Perineal protection by hands
   1) □ One hand slowing the baby’s head
   2) □ One hand protecting the perineum
   3) □ Using both hands, 1 + 2
   4) □ Hands-off
   5) □ Other: _________________________

23. Episiotomy □ Yes □ No

24. Episiotomy type: □ Mediolateral □ Lateral □ Medial (left or right?)

25. Perineal tear: □ No - intact perineum  Degree: □ 1. □ 2. □ 3. □ 4.

26. Mode of delivery
   1) □ Spontaneous vaginal delivery
   2) □ Vacuum extraction
   3) □ Forceps
   4) □ Caesarean section
   5) □ Attempted operative vaginal delivery with following cesarean

27. Fetal presentation
Cephalic normal  □  Cephalic abnormal: ________________  □  Breech

28. Number of babies
   □  One  □  Twins  □  Triplets

29. Indication for operative delivery or caesarean:
   a. □  Slow progression stage 1 (caesarean only)
   b. □  Slow progression stage 2
   c. □  Fetal asphyxia
   d. □  Fetal infection
   e. □  Maternal infection
   f. □  Maternal seizures (Eclampsia, cerebral malaria)
   g. □  Maternal hypertension or preeclampsia
   h. □  Other: _____________________________

Third stage of labour:

30. Time from birth to cutting of umbilical cord in seconds: __________

31. Where is the baby when umb cord is cut
   1) □  On mothers chest
   2) □  Below placenta level
   3) □  Over placenta level
   4) □  Other, describe: _____________________________

32. Postpartum Oxytocin i.m. routinely □  Yes  □  No

33. Estimation of blood loss? □  Yes: _________ ml  □  No

34. In case of excessive bleeding:
   a. □  Fluid recovery
   b. □  Blood transfusion
   c. □  Oxytocin
   d. □  Methergine (methylergometrine)
   e. □  Misoprostol
   f. □  External massage of uterus
   g. □  Other: _____________________________

35. Procedure if placenta delivery is delayed
   a. □  External massage of uterus
   b. □  Oxytocin
   c. □  Methergine (methylergometrine)
   d. □  Misoprostol
   e. □  Other: _____________________________

If manual removal of placenta:

36. □  In labour room  □  In operation theatre

37. □  Without anesthesia/pain relief  □  With pain relief, describe: _____________________________

38. Placental assessment
   a. Visual □  Performed □  Recorded □  No
   b. Weight □  Measured: _______ g □  Recorded □  No
   c. Cord length □  Measured: _______ cm □  Recorded □  No
   Descibe: _____________________________

39. Mother alive 1 hour after delivery: □  Yes  □  No
**Module 3. Newborn**

40. Who takes care of the newborn – profession:
   - [ ] Midwife
   - [ ] Birth attendant
   - [ ] Nurse assistant
   - [ ] Physician

41. Born date: ___________________ (dd.mm.yyy)
42. Born time: ___________________ (00:00)
43. Baby sex: [ ] Girl  [ ] Boy
44. The newborn: [ ] Liveborn  [ ] Stillbirth  [ ] Living after one hour

45. Attempt of drying the newborn  [ ] Yes  [ ] No
   If yes:
46. How many towels were used:_________
47. What kind of towels are used
   1) [ ] Warm
   2) [ ] Not warm
   3) [ ] Fabric mother has from home

48. Bathing of the newborn? [ ] Yes  [ ] No
49. Is the baby wrapped?  [ ] Yes  [ ] No
   1) [ ] Dry towel
   2) [ ] Dry and warm towel
   3) [ ] Wet towel (the same as the baby was dried with)
   4) [ ] Other:____________________________________________________

50. Use of hat/knit cap  [ ] Yes  [ ] No

51. When after delivery is the baby given to the mother
   1) [ ] Immediately on mothers breast (kangaroo)
   2) [ ] After wrapping/bath/measures
   3) [ ] Describe:________________________

52. Temperature measurement
   1) [ ] No
   Yes: 2) [ ] Axillary  3) [ ] Rectal  4) [ ] Other:________________________

53. When temp measured
   1) [ ] 0-5 min
   2) [ ] 5-60 min
   3) [ ] 1-4 hours
   4) [ ] 4-8 hours
   5) [ ] >8 hours, still in the hospital
   6) [ ] At discharge

54. Other temperature precautions
   a. [ ] Incubator
   b. [ ] Warming lamp
   c. [ ] Other:________________________

55. K vitamin  [ ] Yes  [ ] No
56. Anti HIV  [ ] Yes  [ ] No

**Newborn measurement:**

57. Birthweight [ ] Yes: ___________ grams  [ ] No
58. Length ☐Yes ________ cm ☐No
59. Head circumference ☐Yes ________ cm ☐No

60. APGAR score ☐Yes ☐No
   a. ☐1 min ______
   b. ☐5 min ______
   c. ☐10 min ______

61. Physical examination of newborn at delivery ☐Yes ☐No
62. Describe: __________________________________________________________

Newborn at discharge:
63. Physical examination of newborn at discharge ☐Yes ☐No
64. Describe: __________________________________________________________
65. Age of newborn at discharge: _________ hours
66. Pulse oximetry (foot) at discharge ☐Yes ☐No
67. Estimation of gestational age by Finnström method at discharge (weeks)
   1) ☐Yes
   2) ☐Impossible to assess
68. WHO growth standard
   1) ☐SGA
   2) ☐AGA
   3) ☐LGA
Module 4. Newborn emergency

69. Tactile stimulation:
   a. ☐ Drying with towel
   b. ☐ Rubbing the back
   c. ☐ Stimulation of sole of the foot
   d. ☐ Other
   e. ☐ No

70. Suction meconium ☐ Yes ☐ No

71. Secure open airways
   a. ☐ Positioning of the head
   b. ☐ Placing of towel beneath shoulders
   c. ☐ No

72. Ventilation with mask and bag
   a. ☐ Use of oxygen
   b. ☐ Use of roomair
   c. ☐ Use of CPAP/neopuff
   d. ☐ No

73. Assessment of heart rate
   a. ☐ Auscultation
   b. ☐ Pulse in umbilical cord
   c. ☐ Assessment of pulse in brachialis artery
   d. ☐ Assessment of pulse in femoral artery
   e. ☐ No

74. Chest compressions performed ☐ Yes ☐ No

75. Administration of drugs
   a. ☐ Epinephrine
   b. ☐ Other
   c. ☐ No

76. Duration of resuscitation measures – minutes: _________ min

77. Infusion of fluid; type of fluid: ___________________________

78. Blood samples from umbilical cord ☐ Yes ☐ No

79. Other: _________________________________________________________