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COLLEGE OF HEALTH SCIENCE

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NEONATAL HYPOTHERMIA AND ASSOCIATED FACTORS AMONG NEW BORN ADMITTED TO NEONATAL INTENSIVE CARE UNIT OF GOVERNMENTAL HOSPITALS IN ADDIS ABABA, ETHIOPIA, 2016.

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LIST OF ACRONYMS AND ABBREVIATION

AGA	Appropriate for gestational age
APGAR	Appearance, Pulse, Gremmies, Activity, Respiration;
AOR	Adjusted odd ratio
CI	confidence interval
CPR	cardio pulmonary resuscitation
C/S	Caesarean Section
CSA	central statics agency
EDHS	Ethiopian demographic health survey
ENBC	Essential new born care
KMC	Kangaroo Mother Care
LBW	Low birth weight
MDG	Millennium development goal
NICU	Neonatal intensive care unit
RR	Relative risk
SPSS	Statistical Package for Social Sciences
SDG	Sustainable development goal
^{0}c	Degree centigrade
^{0}F	Degree farhanite
VLBW	Very low birth weight
WHO	World health organization

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ABSTRACT

Introduction: Neonatal hypothermia is a worldwide problem and an important contributing factor to neonatal morbidity and mortality especially in low and middle income countries. High prevalence of hypothermia has been reported from countries with the highest burden of neonatal mortality. Over 1.1 million neonatal deaths occur in sub-Saharan Africa and hypothermia is one of the contributing factors for this mortality; therefore, improving newborn survival through appropriate thermal care is a major priority in child health today.

Objective: To assess the prevalence of Neonatal hypothermia and associated factors among new born admitted to NICU of governmental hospitals in Addis Ababa, 2016.

Methods and materials: An institutional based cross sectional study was conducted from March 30 to April 30, 2016. A total of 356 Neonates with their mother was selected by systematic random sampling technique and Axillary temperate of the new born was measured by digital thermometer at point of admission. Data was cleaned manually, coded and entered into Epi -info version 3.5 and exported to SPSS version 20 software for analysis. Multiple logistic regression, AOR, 95% CI and p-value<0.05 was used to identify Variables which had significant association.

Result: The prevalence of Neonatal hypothermia in the study area was found to be 64%**.** Preterm delivery (AOR= 4.81, 95%CI: 2.67, 8.64), age of neonate ≤ 24 hour old (AOR= 2.26, 95%CI: 1.27, 4.03), no skin to skin contact to their mother immediately after delivery (AOR= 4.39, 95%CI: 2.38, 8.11), delayed initiation of breast feeding within one hour after birth (AOR= 3.72, 95%CI: 2.07, 6.65) and resuscitation at birth (AOR= 3.65, 95%CI: 1.52, 8.78) were significantly associated with hypothermia.

Conclusion and recommendation: The prevalence of Neonatal hypothermia in the study area was high. Preterm delivery, age ≤ 24 hour old, no skin to skin contact, delayed initiation of breast feeding and resuscitation at birth were independent predictors of neonatal hypothermia. Therefore Attention is needed for thermal care of preterm new born and it is recommended to use low-cost newborn thermal protection principles of warm chain especially on early initiation of breast feeding, skin to skin contact and warm resuscitation.

Key words: Hypothermia, new born, NICU.

CHAPTER ONE

1. INTRODUCTION

1.1. BACKGROUND

WHO defined Neonatal hypothermia as an abnormal thermal state in which the newborn's body temperature drops below 36.5 ^{0}C (97.7 ^{0}F). Progressive reduction in body temperature leads to adverse clinical effects ranging from mild metabolic stress to death(1).

The neonatal period represent the most vulnerable time for a child's survival and Hypothermia is a major factor for neonatal morbidity and mortality in developing countries(2). Globally an estimated of four million newborns die within the first 4 weeks of life (the neonatal period) which accounts for almost two-thirds of all deaths in the first year of life and 40% of under five deaths. Most neonatal deaths (99%) arise in low-income and middle-income countries, and approximately half occur at home (2,3).

In 2015, 2.7 million deaths, occur during Neonatal period, of these, almost 1 million (three-quarters) of neonatal deaths occur on the day of birth, and close to 2 million die in the first week of life(3, 4). Despite the reduction in overall under five mortality in developing regions, from 97 deaths per 1000 live births in 1990 to 63 per 1000 live births in 2010, there has been little change in neonatal deaths as a proportion of under five deaths. And the proportion of deaths occurring in the first 28 days of life has increased, from 37 percent in 1990 to 44 percent in 2012(6).

In Ethiopia under-five and Infant mortality has declined by 47% and 42 % respectively and Even though not to the same extent, neonatal mortality has also decreased by 31 percent from 54 deaths per 1,000 live births to 37 deaths per 1,000 live births in 2011(7).Reducing neonatal mortality is increasingly important not only because the proportions of under-five deaths that occur during the neonatal period is increasing as under-five mortality declines but also because the health interventions needed to address the major causes of neonatal deaths generally differ from those needed to address other under-five deaths (4).

1.2. STATEMENT OF THE PROBLEM

Neonatal hypothermia is a worldwide problem especially it is a major contributor cause of significant morbidity and mortality in the developing nations with low resource settings(8). High prevalence of hypothermia has been reported from countries with the highest burden of neonatal mortality, where hypothermia is increasingly gaining attention and significance as a critical intervention for newborn survival(8). Neonatal hypothermia is a serious health problem in both among those born at home (32-85%) and at different levels of hospitals (11 to 90%)(9). And 34% of neonates had hypothermia out of NICU admission(10). Reports in developing country shows that greater than 90% of neonates were hypothermic (temperature less than 36.5°C) and 10.7% of new born were at less than 35.0°C(11,12). In West African sub-region, a prevalence rate of 62% at the point of admission were reported (13). In Ethiopia also there was prevalence of hypothermia ranging from 53 % to 69.8% (9,14).

Over 1.1 million neonatal deaths, comprising 28% of the global burden, occur in sub-Saharan Africa with Nigeria, Ethiopia, Democratic Republic of the Congo and Tanzania contributing 6%, 4%, 3%, and 2% of the global burden of neonatal deaths, respectively(15). Hypothermia plays a significant role in some of these deaths; which accounts fivefold increase in mortality during the first 7 days of life and cause excess mortality beyond the perinatal period up to at least 2 months(16).

Both physical characteristics and environmental factors predispose the preterm infant to hypothermia. The physical characteristics include a thin layer of insulating subcutaneous fat, a large surface area-to-volume ratio, large head in proportion to body, immature skin with minimal stratum corneum, poor vasomotor control, and lack of non-shivering thermogenesis. The environmental factors include low ambient air temperature in delivery rooms and neonatal intensive care unit (NICU) admission rooms, and low surface temperature of beds used at admittance and during resuscitation. (17). And risk factors for neonatal hypothermia include poverty, home delivery, lack of skin to skin contact with the mother ,low birth weight, prematurity, early bathing of babies, delayed initiation of breastfeeding, Traditional Practice of Oil Massage of Neonates and inadequate knowledge of thermal care among health workers(2,18,19).

Although hypothermia is rarely a direct cause of death, it contributes to a substantial proportion of neonatal mortality as a co morbidity of severe neonatal infections, preterm birth, and asphyxia (9). Mortality Rate was significantly higher among hypothermic babies (RR = 2.26, CI = 1.14 – 4.48) and fatality rate was highest among hypothermic babies with severe respiratory distress, sepsis, preterm birth and asphyxia(13). And mortality increase by 80% for every 1^{o}c decrease of body temperature (20). This high burden of neonatal hypothermia in sub-Saharan African is an issue of public health importance because the factors predisposing newborns to the condition are prevalent in the region and are largely preventable(18) even though, the facilities for prevention and treatment of neonatal hypothermia remain scarce and concentrated in secondary and tertiary institutions. Efforts at educating the community on the available low-tech preventive measures and early detection and referral will certainly provide, at least, a noticeable reduction in the incidence of hypothermia in newborns(18).

The WHO also has included thermal care as a component of essential newborn care among a package of basic interventions recommended universally for all babies to decrease neonatal mortality(1). And Ethiopia applies the principle of skin-to-skin contact with the mother and Start breast feeding within the first hour after birth to prevent hypothermia that is recommended by WHO(21).

But lack of thermal protection is still an underappreciated major challenge for newborn survival in developing countries, and Even though MDG 4 had reached to its target Neonatal mortality is stagnant at 37 per 1,000 live birth (7,22). And reaching sustainable development goal (SDG) 3 of ensuring healthy lives and promote well- being for all at all age also require a substantial reduction in newborn mortality. Although addressing neonatal hypothermia might facilitate this goal, it has so far been a neglected challenge(23). Therefore, the purpose of this study was to determine the prevalence of neonatal hypothermia and associated factors among new born admitted to (NICU) of governmental Hospitals in Addis Ababa.

1.3. SIGINIFICANCE OF THE STUDY

Even though providing Essential new born care (ENBC) including Thermal care or prevention of neonatal hypothermia is one parts of nursing care, the problem of neonatal hypothermia remains worldwide problem, especially in sub-Saharan Africa. In Ethiopia, previous studies about the prevalence of Neonatal hypothermia and associated risk factors among new born has not been conducted in the study area. Even studies conducted at regional level are local surveys on a single hospital. So, this study will provide baseline data on the prevalence of neonatal hypothermia.

The identification of possible factors for the onset of neonatal hypothermia in the area will have greater input to program managers and policy makers for designing, proper implementation and evaluation of programs on reduction of neonatal mortality and improvement of new born care to achieve sustainable development goal (SDG) 3 of ensuring healthy lives and promote well- being for all at all age.

In addition, the study will help to suggest interventions to be designed in order to improve quality of new born care specifically thermal protection for nursing profession.

CHAPTER TWO

2. LITERATURE REVIEW

2.1. THE PREVALENCE OF NEONATAL HYPOTHERMIA

Neonatal hypothermia is a worldwide problem in neonates born both at hospitals (prevalence range, 32% to 85%) and homes (prevalence range, 11% to 92%), even in tropical environments(9). A study conducted in Iran showed that a high prevalence of neonatal hypothermia was identified among 522 healthy full term newborn in a Baby Friendly Hospital in Babol; that is 84.5% were hypothermic immediately after birth, 85.1% 1 hour after birth, 86.6% 2 hour after birth and 81.8% 4 hour after birth based on WHO classification of hypothermia (24). A study conducted in Pakistan reported that out of 300 neonates admitted to the neonatal unit, 144 (49.5%) developed hypothermia(25).

A large population based study conducted in southern Nepal (*n* = 23,240) reported that 21,459 (92.3%) had low body temperature < 36.5°C,among hypothermic babies 47.4% were on the range of mild hypothermia and 48.7% of babies were moderate hypothermia. And only 833 (3.9%) babies had measures below 34.0°C and only 23 (0.1%) had one or more measures in the severe hypothermia range (<32.0°C).Almost half (48.6%) of all babies had one or more measures in the moderate or severe hypothermia range(11).Another study within this country also showed that 10% of the babies (n = 2342) were hypothermic ,observed with temperatures of < 35.0° (26).

A study in referral university hospitals in Tehran, Islamic Republic of Iran showed out of 900 neonates (452 males and 448 females) 53.3% were hypothermic immediately after birth, 13.6% on admission to the NICU, and 2.7% 1 hour after admission, 0.5% 2 hours after admission and 0.3% 4 hours after admission(12). Another study conducted in Bangladesh on total of 2310 babies between 0 and 680 h of age showed 34% (785) of the neonates had hypothermia(10).

The prevalence of hypothermia is high in Africa, especially in sub-Sahara Africa; Study from Johannesburg, South Africa suggests that the prevalence of neonatal hypothermia was 21 % during admission (27). And a study from Uganda showed that out of 300 newborns 83% developed hypothermia on admission with a rectal temperature of less than 36°C at 1 hour of

delivery and Prevalence of neonatal hypothermia within 90 minutes postpartum was 79%(19). A similar study conducted in Zimbabwe reported that 85% of newborns had hypothermia at admission with mean axillary temperature of 34.3ºc(28) .

A similar study conducted in Nigerian newborns aged 0 to 648 hours, revealed that out of 150 neonates 93(62%) had hypothermia and out of this 47.3% were Mild hypothermic and 52.7% were moderate hypothermic(13) . And other study conducted in Nigerian intensive care unit showed that out of 111 babies, 75 (67.6%) were hypothermic and the prevalence of hypothermia was high among preterm infants and low birth weight babies(18).

Another study in East Africa, Nairobi, Kenya, shows that the prevalence of neonatal hypothermia was 27% among 533 low birth weight babies on admission(29). And a study from Tanzania, Muhimbili Medical Centre Neonatal Care Unit reported that out of 1,632 babies 366 (22.4%) had hypothermia on admission, and Thirteen percent of the hypothermic neonates had severe hypothermia, with body temperature below 32 ºc on admission (30).

Hospital based study in Ethiopia showed that the prevalence of hypothermia on admission was high and almost more than half of the new born (53%) had hypothermia on admission (9). A similar study conducted recently in northern part of Ethiopia , at Gondar University Teaching and Referral Hospital, Northwest Ethiopia reported that the prevalence of neonatal hypothermia in the study area was found to be 69.8%(14).

Another study conducted in Bahir Dar, Felege Hiwot Referral Hospital, showed that out of 43 neonates that had a temperature recorded at admission 29 (67%) were hypothermic(31).

2.2. ASSOCIATED FACTORS FOR NEONATAL HYPOTHERMIA

There are several socioeconomic, environmental and Physiological factors that potentially expose newborns to a higher risk of hypothermia especially in resource-poor settings, even in warm climates. Although newborns of all gestational ages are at risk of losing body heat after birth, premature and small babies are particularly vulnerable due to their physiologic disadvantages. A newborn's thermal regulatory mechanisms are highly sophisticated, but particularly in babies born prematurely easily overwhelmed(9).

A study in Nepal reported that in addition to season in which the babies were born, weight is an important risk factor for hypothermia and the prevalence of hypothermia were increased among those who weighed < 2000 g [Adj PR = 4.32 (3.73, 5.00)] or < 1500 g [Adj PR = 11.63 (8.10, 16.70)] compared to those of normal weight (> 2500 g). And the risk varied inversely along the entire weight spectrum: for every 100 g decrement hypothermia risk increased by 7.4%, 13.5% and 31.3%% for babies between 3000 g and 2500 g, 2500 g and 2000 g and < 2000 g, respectively. Preterm babies (< 34 weeks), females, those who had been first breastfed after 24 h and those with hypothermic mothers were at an increased risk. Hypothermia was not associated with delayed bathing, hat wearing, and room warming or skin-to-skin contact: that shows they may have been practiced reactively and thereby obscured any potential benefit(26).

A study in Iran shows the prevalence of neonatal hypothermia was significantly observed more in those born at room temperature of the delivery room than in those with temperature >27.5°C ($P <$ 0.01). And adjusted OR for neonatal hypothermia in women who had Spontaneous vaginal delivery was significantly lower than in those with episiotomy ($P < 0.01$). gestational age ,Parity, abortion, and birth weight did not differ significantly when compared newborns babies with hypothermia and those without hypothermia (24). A study in Tehran, Islamic republic of Iran also reported that LBW (p<0.001,OR= 3.27), Prematurity or gestational age <37 weeks (p<0.001,OR=1.73) ,Low APGAR score; <8, (p= 0.031,OR=1.39), CPR received (p=0.001,OR=1.91), Multiple pregnancy (p=0.009,OR=1.65) , and Low environmental temperature (p<0.001,OR=0.81) were significantly associated with neonatal hypothermia on admission(32).

Another study in Imam Hospital in Tehran, Iran also showed that Neonatal hypothermia at birth increases mortality as well as significant morbidity and hospitalization period. And a significant relationship was found between hypothermia and respiratory distress in the first six hours of birth and death, as well as jaundice, hypoglycemia and metabolic acidosis in the first three days of birth (P = 0.0001). Regardless of weight and gestational age, hypothermia at birth alone could increase the risk of neonatal death (OR = 3.64, CI = 1.85-7.18), Respiratory distress (OR = 2.12, CI = 1.53-2.93), metabolic acidosis (OR = 2.83, CI = 1.74-4.59) and jaundice (OR=2.01, CI = 1.45-2.79)(33).

A similar study conducted in Pakistan also showed that Hypothermia was found to be significantly higher amongst LBW 58.1% and preterm 64.2 % as compared to full term and appropriate for gestational age (AGA) babies. 95 (64.2%) of the preterm babies had hypothermia compared with 46 (33.1%) of term babies which is statistically significant (OR = 3.62; CI =2.23–5.90). Babies with hypothermia had significantly lower mean body weight compared with babies with normal body temperature (2.1 ± 0.8 kg vs. 2.6 ± 0.7 kg, $p < 0.01$). And the incidence of hypothermia decreased with increasing of body weight; it was 75.5% for babies < 1.5 kg, 49.1% for babies weighing between 1.5 and 2.49 kg and 37.9% for babies who weighed 2.5 kg or more. Babies requiring active resuscitation and CPR was also associated with 27 % (n = 81) cases of hypothermia(25).

A study conducted in India showed that the majority of the newborns 76.60%(n=280) were washed with warm water and dried up with a clean cloth immediately after birth, while only 10.63% of newborns were not given a bath and only dried up with a clean cloth. And 29.92% mothers who initiated breast feeding after one day, many reasons for late initiation of breastfeeding were given by mothers and 62.50% mothers do not give colostrums because they thought that it is harmful for the baby, this traditional practices were identified as risk factors for hypothermia (34).

Risk factors for neonatal hypothermia in sub-Saharan Africa region include poverty, home delivery, low birth weight, early bathing of babies, delayed initiation of breastfeeding and inadequate knowledge among health workers. Low-tech facilities to prevent heat losses and provide warmth are available(2).

A study in Uganda with randomized, controlled trial showed that bathing of newborns immediately after delivery resulted in a significantly increased prevalence of hypothermia defined as temperature <36.5°C, despite the use of warm water and skin to skin contact before and after bathing for thermal protection of the newborn. Aside from the bathing procedure, no background factor that potentially predisposes the newborns to hypothermia was identified(35).

Another study within this country also reported that Newborns who have no body contact with the mother have high prevalence of hypothermia (87%), whereas this was the case in 75% of non-hypothermic newborns (p=0.03). Low birth weight newborns constituted 10 % among hypothermic newborns, whereas this was 4% among non-hypothermic newborns (p=0.08). Adolescent mothers were encountered more often among mothers with neonatal hypothermia of the newborn than among non-hypothermic newborns (p=0.025). Parity, preterm delivery, daytime or night time delivery, rupture of membranes >24 h did not differ when hypothermic and non-hypothermic newborns were compared(19).

A similar study in Nigeria showed that the incidence of hypothermia was highest (72.4%) among babies aged less than 24 hours and among out-born babies compared to in-born babies (64.4% vs 58.3%). Preterm babies had significantly higher incidence of hypothermia (82.5%) compared with 54.5% of term babies (RR = 1.51; CI = 1.21 – 1.89). The incidence of hypothermia was also highest (93.3%) among very-low-birth-weight babies($t = 3.05$, $p = 0.003$), and the mean age of hypothermic babies was 48.8 ± 110.5 hours compared with 71.9 ± 109.8 hours for normal body temperature without statistical significance ($t = 1.18$, $p = 0.241$)(13).Another study also suggested that the prevalence of hypothermia was high among babies aged <6 h (80.6%), preterm infants (88.9%), low-birth-weight babies (89.1%), babies with birth asphyxia (76.3%), babies without recent oiling of the skin (90.6%) and babies who had not been breastfed (79.2%). Using logistic regression, significant risk factors for early neonatal hypothermia at admission included low-birth-weight (P=0.000) and lack of breastfeeding (P=0.028)(18).

A systemic review conducted in United States of America among low resource setting showed that risk factors for neonatal hypothermia includes; Physiological risks of Low birth weight (LBW) and preterm Delivery and Environmental and behavioral risk factors of room is not warmed , Delivery room is cooled, Newborn is bathed soon after birth, Postpartum confinement and Oil massage are the major risk factors identified(8).

A study in Ethiopia, Gondar university referral teaching hospital sowed that low birth weight, delivery at night, delayed early initiation of breast feeding within one hour, no skin to skin contact to their mother immediately after delivery were significantly associated with occurrence of hypothermia, Neonates with low birth weight were almost 4 times more likely to have hypothermia compared to normal birth weight (AOR=3.75, 95%CI: 1.29, 10.88).Those new born who were delivered during night time were about 6.6 times more likely to develop hypothermia compared to those who were delivered during the day (AOR=6.61, 95%CI: 3.75, 11.66). In the same way, new born who did not put to their mothers abdomen within one hour after delivery were almost 3 times more likely to be hypothermic when compared to those who have skin to skin contact within one hour (AOR=2.81, 95%CI: 1.40, 5.66). Moreover, those new-born for whom breast feeding was not initiated within one hour were about 7.5 times more likely to develop hypothermia compared with those who have started within one hour (AOR=7.58, 95%CI: 3.61, 15.91)(14).

2.3. PREVENTION OF NEONATAL HYPOTHERMIA

Different methods were used for prevention and treatment of hypothermia. One of the most effective treatments and available methods is Kangaroo Mother Care (KMC). A study in India with a randomized controlled trial observed the significant effect of KMC in reducing the prevalence of hypothermia from 36.9% to 5.9 % .It also improves growth in low birth weight infants and has a significant role in protecting the LBW infant from hypothermia, hypoglycemia and sepsis(36).

Neonatal hypothermia in VLBW infants can be prevented by using standardized delivery room care, including a portable chemical warmer, polyethylene wrap, and a dedicated staff to monitor temperature every 5 minutes in the delivery room(17).

Many of the warming technologies that are routinely used in high resource settings, including incubators, but cannot be feasibly adapted to settings that is without reliable infrastructure or power sources. Prevention and management of hypothermia in low resource settings focus on simple and effective low tech interventions combined with behavior change and training on

Practical guides for thermal protection and specific recommendation to delay bathing for at least six hours after birth are included in low resource settings(37).

The WHO Mother–Baby Package and the WHO Thermal Protection of the Newborn provide recommendations to all levels of the health system and its providers to apply warm chain and various interventions for prevention and management of hypothermia have been tested in community as well as hospital settings, and have added to the existing evidence base interventions. And WHO have introduced warm chin in the practical guide for thermal Protection of the Newborn(1).

The 'warm chain' is a set of 10 interlinked procedures to be taken at birth and during the next few hours and days to prevent hypothermia by minimizing heat loss in all newborns .Failure to implement any one of these procedures will break the chain and put the newborn baby at risk of hypothermia(1). The 10 steps of the 'warm chain' includes: warm delivery room; immediate drying, skin-to-skin contact, breastfeeding: should be started immediately after birth before an hour. Bathing and weighing postponed, appropriate clothing/ bedding, mother and baby together, warm transportation, warm resuscitation and training and awareness raising on the importance of keeping the baby warm and recognition of hypothermia risks.

Skin-to-skin care has shown promising results for prevention and management of hypothermia for both low and normal birth weight babies in hospital as well as community settings. Kangaroo Mother Care refers to the technique of prolonged, continuous skin to skin contact between mothers and their LBW infants in the hospital and after discharge. The practice of Kangaroo Mother Care in hospitalized LBW infants has been associated with a number of benefits, and is now considered to be as good as standard care with incubators(38).

2.4. CONCEPTUAL FRAMEWORK OF THE STUDY

This conceptual framework is developed from different literature based on, Mosley and Chen conceptual framework that was proposed in 1984 for the study of the determinants of child survival in developing countries, incorporating both social and biological variables and designed to integrate research methods from demography and epidemiology. The framework has been improved and used in a range of longitudinal and cross-sectional studies of child survival in developing countries. (39).Based on this framework this study conceptualizes Neonatal hypothermia as the result of interaction between various factors, some of which are directly related to Neonatal hypothermia while others are intermediate in nature.

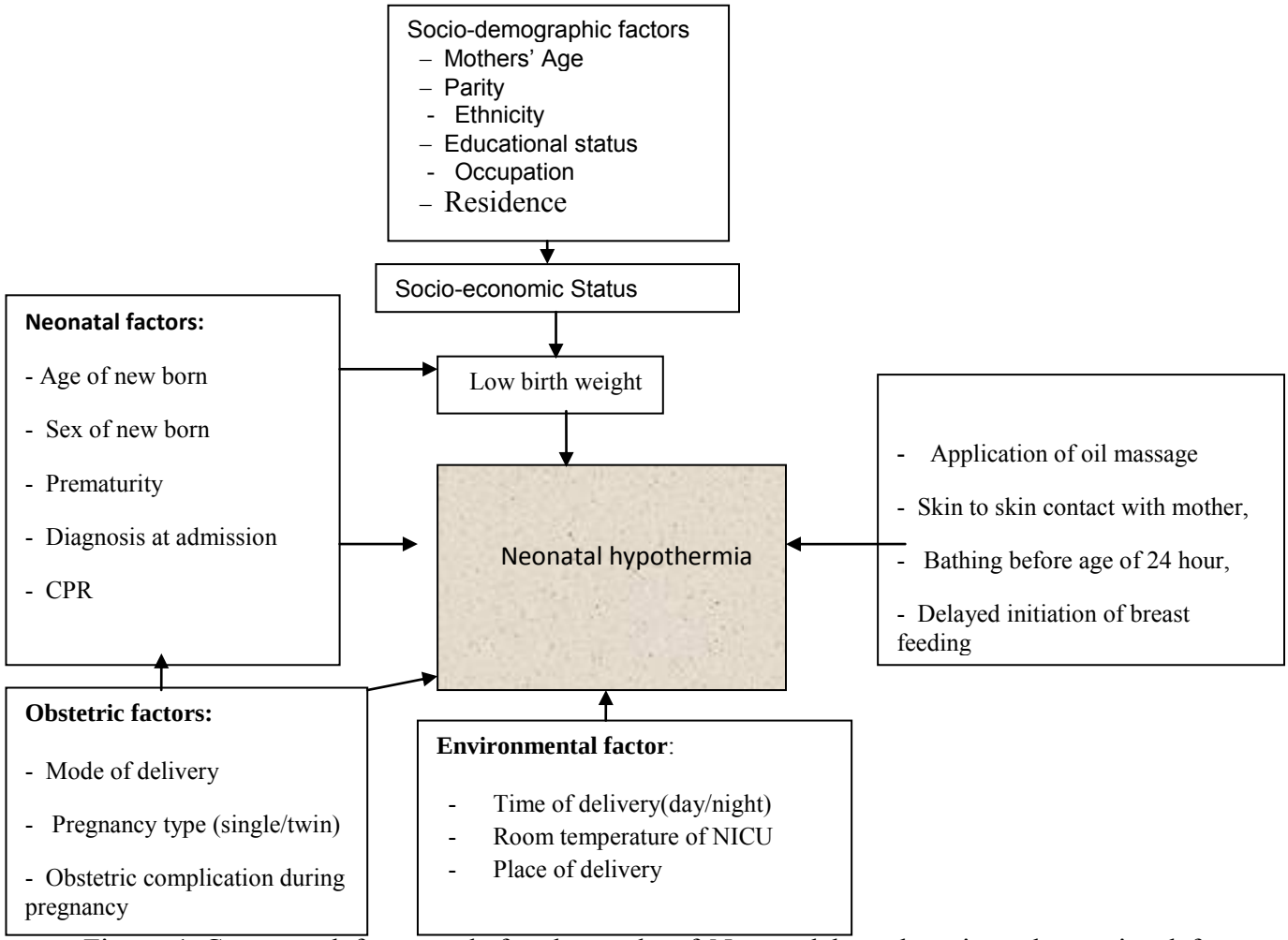

Figure 1 Conceptual framework for the study of Neonatal hypothermia and associated factors adopted and modified from Mosley and Chen conceptual framework (1984).

CHAPTER THREE

3. OBJECTIVE OF THE RESEARCH

3.1. GENERAL OBJECTIVE

To assess the prevalence of Neonatal hypothermia and associated factors among new born neonates admitted to NICU of governmental hospitals in Addis Ababa from March30 to April 30, 2016.

3.2. SPECIFIC OBJECTIVE

- To determine the prevalence of Neonatal hypothermia among new born admitted to NICU of governmental hospitals in Addis Ababa.
- To identify factors associated with neonatal hypothermia among new born admitted to NICU of governmental hospitals in Addis Ababa.

CHAPTER FOUR

4. METHODS AND MATERIALS

4.1. STUDY DESIGN AND PERIOD

An institutional based cross sectional study design using quantitative data collection method was conducted from March30 to April 30, 2016.

4.2. STUDY SETTINGS

The study was conducted in the capital city of Ethiopia, Addis Ababa, which is the center of African union. It is located at an altitude of 2,355 m above sea level. According to 2007 censes Addis Ababa city has a total population of 3,384,569 and estimated area of 526.99 square kilometers. There are 12 governmental Hospitals in Addis Ababa, of these only six hospitals have their own NICU. The study was conducted specifically in these six Hospitals that have their own NICU [Federal Minster of Health](40).

Tikur Anbessa specialized Teaching Hospital is one of the tertiary referral Hospital in the country under Addis Ababa University that established in 1966. Tikur Anbessa Hospital has annual number of delivery of 3500, among these the majority of them are high risk pregnancy which are referred from different Hospital. The Hospital has its own organized Neonatal Intensive Care Unit (NICU) with an average NICU admission of 240 new born per month.

St. Paul's Hospital Millennium Medical College is a referral hospital in Addis Ababa under the Ethiopian Federal Ministry of Health (FMOH). It is the second largest public Hospital in the nation, built in 1961. In 2007 it became a medical college and its core services include the provision of medical care, teaching and research. The Hospital has annual delivery of 3200 new born and it has its own NICU with an average NICU admission of 210 new born per month.

Yekatit 12 Hospital Medical College is one of the governmental Hospitals in Addis Ababa under Addis Ababa city administration health bureau which is located on the south of Addis Ababa University, 6 killo compass and it is established in 1945 E.C. starting from February 2012 it

become one of the medical colleague for the New Innovative medical education Initiative center. And the Hospital has annual delivery of 2500 new born and it has its own NICU with an average NICU admission of 170 new born per month.

Gandhi Memorial Specialized Hospital is one of the governmental Hospitals under Addis Ababa city administration health bureau that established in 1951 E.C and located on south east of Addis Ababa stadium. The hospital has annual delivery of 3400 new born and it has its own NICU with an average NICU admission of 192 new born per month.

Zewditu Memorial Hospital is one of the governmental hospitals in Addis Ababa under Addis Ababa health bureau located 300 meter far from Sheraton Addis international hotel. It was built in 1976. It is Ethiopia's leading Hospital in the treatment of ART patients and currently became the largest HIV clinic in Ethiopia. The Hospital has annual delivery of 1800 new born and it has its own NICU with an average NICU admission of 110 new born per month.

Tirunesh Beijing general hospital is one of the governmental Hospitals in Addis Ababa under Addis Ababa health bureau which is located in Akaki- kality sub city administration established for reminding people about the historical achievement of Ethiopian athletes in 2008 Beijing Olympics. The Hospital has annual delivery of 1500 new born and it has its own NICU with an average NICU admission of 60 new born per month (Source; from log book and report of respective Hospitals).

4.3. SOURCE POPULATION AND STUDY POPULATION

4.3.1. SOURCE POPULATION

All neonates who were admitted to NICU of governmental Hospitals in Addis Ababa.

4.3.2. STUDY POPULATION

Selected neonates admitted to NICU of governmental Hospitals in Addis Ababa from March30 to April 30, 2016 were the study population.

4.4. ELIGIBILITY CRITERIA

4.4.1. INCLUSION CRITERIA

All neonates with their mother admitted to NICU of governmental hospitals in Addis Ababa during the study period were included in the study.

4.4.2. EXCLUSION CRITERIA

Neonates whose mothers were not present at all during the study period or died was excluded from the study because of obstetric complication during pregnancy, skin to skin contact, and initiation of breast feeding within one hour after birth was asked from the mothers.

4.5. SAMPLE SIZE DETERMINATION

S*a*mple size was calculated by using single population proportion formula;

$$n= \frac{(z\alpha/2)2 * pq}{d2}$$

$$n= \frac{(z\alpha/2)2 * p\,(1-p)}{d2}$$

$$n=\frac{(1.96)2[0.698(1-0.698)]}{0.0025}$$

n=324

By considering 10 % none response rate of participants 10 % of the sample size was added. So the final sample size was **356** Neonates.

Where, n=the required sample size

d=margin of error between the sample and population=5%=0.05

Z=standard normal distribution value at 95% confidence level

Z α/2=1.96 for 95% confidence interval

p=Prevalence of Neonatal hypothermia (69.8%) from the previous study conducted in Gondar University Teaching and Referral Hospital, Northwest Ethiopia(14).

4.6. SAMPLING TECHNIQUE AND PROCEDURE

There were a total of six governmental hospitals in Addis Ababa that have their own organized NICU and they have a total average number of 982 admissions to NICU per month and a total sample size of 356 neonates were selected from the six hospitals.

All Neonates from the six hospitals that were admitted during the study period were considered for the study. Then Participants was selected by using systematic random sampling technique until the required sample size was obtained. (K= 2.75 approximately every 3 admission was taken).The number of neonates surveyed from each hospital was allocated proportionally to total average number of admission per month from all hospitals.

The Proportionate allocation was done by the formula: $n_j = \frac{n}{N} N_j$

Where; n_j is sample size of the j^{th} stratum

N_j is population size of the j^{th} stratum

N = Total population or total new born admission to NICU per month in all hospitals)

N = N1+N2+N3+N4+N5+N6

N= 250+212+240+180+210+150 = 982

n =356 which is the total sample size = $n_1 + n_2 + n3+n4+n5+n5+ n_6$.

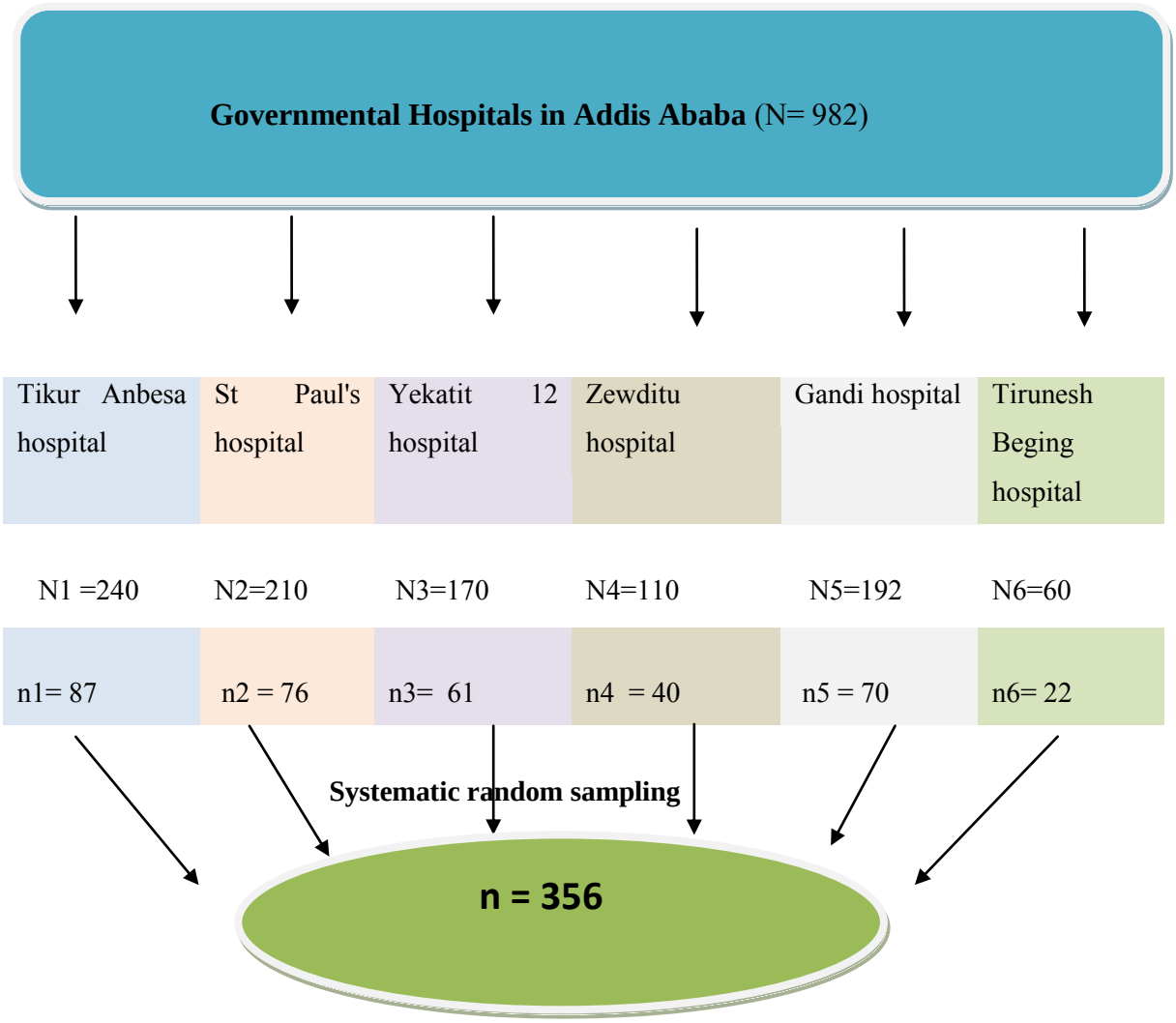

Figure 2 Schematic presentation of sampling procedure

4.7. METHOD OF DATA COLLECTION

The instrument for data collection was semi structured pre tested questionnaire based interview. The questionnaire had contained items to assess the temperature of the new born during admission to NICU and associated factors for the onset of hypothermia.

Axillary temperate of the new born was measured for 3 minute by using digital thermometer (model of MT-101 MT-111) which can measure from 32.0 ^{0}C to 42.90^{0}C (89.6^{0}F to109.9^{0}F) that had measurement accuracy of ± 0.1^{0}C for the temperature range of (35.5^{0}C – 42^{0}C) and ± 0.2^{0}C for the temperature range of (32.0^{0}C -35.5^{0}C or above 42^{0}C) at point of admission.

And other data such as; medical diagnosis, and CPR history was collected from the chart of the newborn and socio demographic data and obstetric history was collected from their mother by using semi structured pre tested questionnaire based interview after written informed consent has been obtained.

Infrared thermometer (model of Kintrex IRT0421) with measurement range of (- 60 ^{0}C to 50 ^{0}C) and measurement accuracy of ± 2^{0}C was used to measure the room temperature of the NICU. And data collection was done carefully by six BSc nurses.

4.8. STUDY VARIABLES

4.8.1. DEPENDENT VARIABLE

- Neonatal Hypothermia

4.8.2. INDEPENDENT VARIABLES

1. **Socio demographic characteristics of the mother**
   - Maternal age,
   - parity,
   - residence,
   - Ethnicity
   - Educational status,
   - occupation and income
2. **Neonatal, obstetric and environmental factors of the new born** :
   - Age of new born in hour,
   - sex of new born,
   - low birth weight
   - mode of delivery
   - pregnancy type(single / multiple)
   - prematurity
   - skin to skin contact with mother,
   - bathing before age of 24 hour,
   - delayed initiation of breast feeding
   - CPR,
   - room temperature of NICU
   - Place of delivery
   - Application of oil massage and obstetric complication during pregnancy
   - Medical diagnosis during admission

4.9. OPRATIONAL DEFINETIONS

- **Hypothermia**: an axilliary temperature of less than 36.5 ^{o}c
- **Cold stress(mild hypothermia)**: an axilliary temperature of 36.0 to 36.4 ^{0}C
- **Moderate hypothermia**: an axilliary temperature of 32.0 to 35.9 ^{0}C
- **Severe hypothermia :** an axilliary temperature of <32.0 ^{0}C
- **Normothermic :** an axilliary temperature of 36.5 to 37.5 ^{0}C
- **Hyperthermia :** an axilliary temperature of >37.5 ^{0}C
- **Admission temperature**: The first temperature obtained from neonates at admission to NICU
- **Inborn** : a new born that was delivered from the study hospital
- **Out born :** a new born that was deliver other than the study hospital

4.10. DATA ENTERY AND ANALYSIS

After data collection the data was cleaned manually, coded and entered into Epi info version 3.5 and exported to SPSS version 20 software for further analysis. After coding, and entering the data to the software descriptive statistics was used to calculate the result in proportion, frequencies, cross tabulation, and measure of central tendency. Tables and graphs were used to present the result. A bivariate binary logistic regression was used to identify candidate variables for final model (multiple logistic regressions) at p- value < 0.20. Finally the independent predictors or variables which had significant association will be identified by using multiple logistic regressions. The cut point to declare the presence of association between dependent and independent variable was p-value<0.05 or AOR, 95% CI.

4.11. DATA QUALITY AND CONTROL

Data collection tool: Amharic version questionnaire was used for data quality and the questionnaire was prepared in English and translated to Amharic, and back translated to English by two language experts to check for consistency of the questionnaire. The tool has been adopted and modified from a study conducted in Ethiopia, Gondar university hospital, Nigeria and Uganda which passed through peer review for validity of the instrument and published(13,14,19).

Similar temperature measuring thermometer (model of MT-101 MT-111) that has measurement accuracy of ± 0.1^0C for the temperature range of (35.5^0C – 42.9^0C) and ± 0.2^0C for the temperature range of (32.0^0C -35.5^0C or above 42^0C) was used. And Infrared thermometer (model of Kintrex IRT0421) with measurement range of (- 60 ^{0}C to 500 ^{0}C) and accuracy of ± 2^0C was used to measure the room temperature of NICU. Thermometer calibration was done for reliability of the thermometer before using the instrument for data collection.

Training of data collectors: One day training and clear orientation was provided on the process of data collection for data collectors and clear explanation and orientation was provided for the semi structured questionnaire and how to measure the temperature of the new born before they started interviewing mothers and measuring new born temperature.

Pretest: Before the actual data collection pretest was done by 5% of the study population at Tikur Anbesa Hospital three weeks before the actual data collection to evaluate the clarity of questions and validity of the instrument and reaction of respondents to the questions.

Supervision: Data collectors were closely monitored and guided by two MSc nurse supervisors during data collection for completeness of the data and appropriate collection of the data.

Multivariate analysis: After data entry multivariate analysis was used to control confounder variable.

4.12. ETHICAL CONSIDERATION

Ethical approval was obtained from Institutional Review Board of Addis Ababa University, School of Allied Health Sciences, Department of Nursing and Midwifery that had approved the study.

Official letter was obtained from Addis Ababa University, School of Allied Health Sciences, Department of Nursing and Midwifery and submitted to each Hospital and allowed by medical directors to do so. But those Hospitals that have IRB approved again by their IRB of the Hospitals.

All mothers that were involved in the study were asked for their willingness and were informed the purpose of the study and additionally confidentiality of all the data gained was maintained.

And an Informed written consent was obtained from all mothers of the new born that were selected for the study.

The study participants right to withdraw from the study at any time during data collection was respected.

The temperature measuring thermometer was disinfected by using 70 % ethyl alcohol disinfectant with a damp cloth after every measure of axillary temperature of the new born to prevent infection transmission.

4.13. DISSEMINATION OF RESULT

The final result (report) will be presented and discussed in Addis Ababa University, School of Allied Health Sciences, Department of Nursing and Midwifery and copy of the research will be sent to Department of Nursing, College of Health Science main library, for each Hospitals and to Minister of Health for utilization and use of the result as a base line data that help to suggest interventions to be designed in order to improve quality of new born care specifically thermal protection. And finally I will prepare manuscript and try to publish the research in internationally recognized journals.

CHAPTER FIVE

5. RESULTS

5.1 Socio-demographic characteristics

A total of 356 mothers with their neonates were included in the study with 100% response rate. The mean age of mothers was 28 years (SD = 5.6) and more than half of the mothers were in the age group between 20-29 (51.1%) years of age. One hundred twenty seven (35.7%) were Oromo in ethnicity and majority of the mothers 206(57.9%) were Orthodox. Two hundred seventy six (77.5%) were urban residents. Eighty respondents (22.2%) were unable to read and write and 144(40.4%) of respondents were house wife. The mean Monthly income of the family was 1250 birr (SD = 250 birr) and 117(32.9%) had monthly income of below average. And 191 respondents (53.7%) were Primiparous. (Table1).

Table 1 socio-demographic characteristics of mothers of new born admitted to Neonatal Intensive Care Unit of Governmental Hospitals in Addis Ababa, Ethiopia, 2016.[n=356]

Variables	Categories	Frequency	Percentage (%)
Age of mother(years)	15-19	17	4.8
	20-29	182	51.1
	30-39	145	40.7
	40-49	12	3.4
Ethnicity	Amhara	121	34.0
	Tigre	55	15.4
	Oromo	127	35.7
	Gurage	37	10.4
	Other	16	4.5
Religion	Orthodox	206	57.9
	Protestant	59	16.6
	Muslim	88	24.7
	Other	3	0.8
Residence	Urban	276	77.5
	Rural	80	22.5

Educational status	Unable to read and write	80	22.5
	Primary school	77	21.6
	Secondary school	102	28.7
	Diploma and above	97	27.2
Occupation	House wife	144	40.4
	Government employ	79	22.2
	Private business	92	25.8
	Student	27	7.6
	Farmer	14	3.9
Monthly income of the family	Below average	117	32.9
	Average(1000-1500 birr)	129	36.2
	Above average	110	30.9
Parity	Primiparous	191	53.7
	Multiparous	165	46.3

5.2. Neonatal factors

Majority of Neonates were males 204(57.3%) and the median age of the new born was 3 hours. And most of the neonates 233(65.4%) were in the age group of ≤24 hour. The mean birth weight was 2440 gram (SD 721 gram). More than half 183(51.4%) of the neonates had birth weight ≥ 2500 gram. The mean gestational age (GA) was 36 weeks ± 2.8 weeks, most of them, 202(56.7%) were with GA <37 weeks. Only 126(35.4%) of neonates had early initiation of breast feeding within one hour after birth. Eighty four (23.6%) had received resuscitation (CPR) during birth. (Table2).

Table 2 Neonatal characteristics of respondents among New Born admitted to Neonatal Intensive Care Unit of Governmental Hospitals in Addis Ababa, Ethiopia, 2016.[n=356]

Variables	Categories	Frequency	Percentage (%)
Age of Newborn (hour)	≤24	233	65.4
	24-72	60	16.9
	>72	63	17.7
Sex of new born	Male	204	57.3
	Female	152	42.7
Birth weight(grams)	<1000	10	2.8
	1000-1499	32	9.0
	1500-2499	131	36.8
	2500-4000	179	50.3
	>4000	4	1.1
Gestational age (weeks)	<28 weeks	2	0.6
	28- <32 weeks	25	7.0
	32- <37weeks	175	49.2
	37-42weeks	152	42.7
	>42weeks	2	.6
Started breast feeding within one hour after birth	Yes	126	35.4
	No	230	64.6
Received CPR during birth	Yes	84	23.6
	No	272	76.4

5.3. Obstetric and environmental factors

Most of the pregnancies 311(87.4%) were single and majority of neonates 286(80.3%) were born without any Obstetric complication. More than half 213(59.8%) were delivered through SVD. Sixty five (18.3%) of new born were bathed before 24 hours old and more than half of neonates 188(52.8%) had no skin to skin contact immediately after birth. And 41(11.5%) had Oil massage of the skin after birth. One hundred seventy (47.8%) were out born neonates and of them 9(2.5%) delivered at home. More than half 190(53.4%) deliver during day time. Majority of neonates 329(92.4%) were admitted to NICU at room Temperature ≥ 25 ^{0}C (Table 3).

Table 3 Obstetric and Environmental characteristics of respondents among New Born admitted to Neonatal Intensive Care Unit of Governmental Hospitals in Addis Ababa, Ethiopia, 2016.[n=356]

Obstetric complication during pregnancy	Yes	70	19.7
	No	286	80.3
pregnancy type	Single	311	87.4
	Twine	41	11.5
	Triple	4	1.1
Mode of delivery	SVD	213	59.8
	Instrumental	32	9.0
	C/S	111	31.2
skin to skin contact immediately after birth	Yes	168	47.2
	No	188	52.8
Place of delivery	Inborn	186	52.2
	Out born	170	47.8
setting for out born delivery	Missing (Inborn)	186	52.2
	Other Hospital	69	19.4
	Health Centre	76	21.3
	Private health facility	13	3.7
	Traditional birth center	3	0.8
	Homes	9	2.5
Oil massage of the skin immediately after birth	Yes	41	11.5
	No	315	88.5
Bathed the new born before 24 hours old	Yes	65	18.3
	No	291	81.7
Time of delivery	Day time	190	53.4
	Night time	166	46.6
Room Temperature of NICU	<25 ^{0}C	27	7.6
	≥ 25 ^{0}C	329	92.4

Medical diagnoses during admission were reviewed from medical record of the New born and 116(32.6%) were admitted for the reason of Respiratory distress, 173(48.6%) diagnosed as low birth weight and 202(56.7%) were diagnosed as preterm, and 84(23.6%) diagnose as perinatal asphyxia (Table 4).

Table 4 Medical diagnoses of neonates during admission among New Born admitted to Neonatal Intensive Care Unit of Governmental Hospitals in Addis Ababa, Ethiopia, 2016.[n=356]

Variable	Categories	Frequency	Percentage (%)
Diagnosis during Admission	Respiratory distress	116	32.6
	Preterm	202	56.7
	Jaundice	55	15.4
	Sepsis	83	23.3
	LBW	173	48.6
	Perinatal asphyxia	84	23.6
	Congenital anomaly	35	9.8
	Meconium aspiration syndrome	22	6.2
	Small for gestational age	15	4.2
	hypoglycemia	15	4.2
	Other	16	4.5

* The total cumulative frequency for diagnosis is greater than 100% because the Neonate may have more than one clinical diagnosis during admission.

5.4. The prevalence of Neonatal hypothermia

The prevalence of neonatal hypothermia among new born admitted to Neonatal Intensive Care Unit of Governmental Hospitals in Addis Ababa was 228 (64%). More than half of Neonates 184(51.7%) were moderate hypothermic which is 80.7% among hypothermic babies (Figure3).

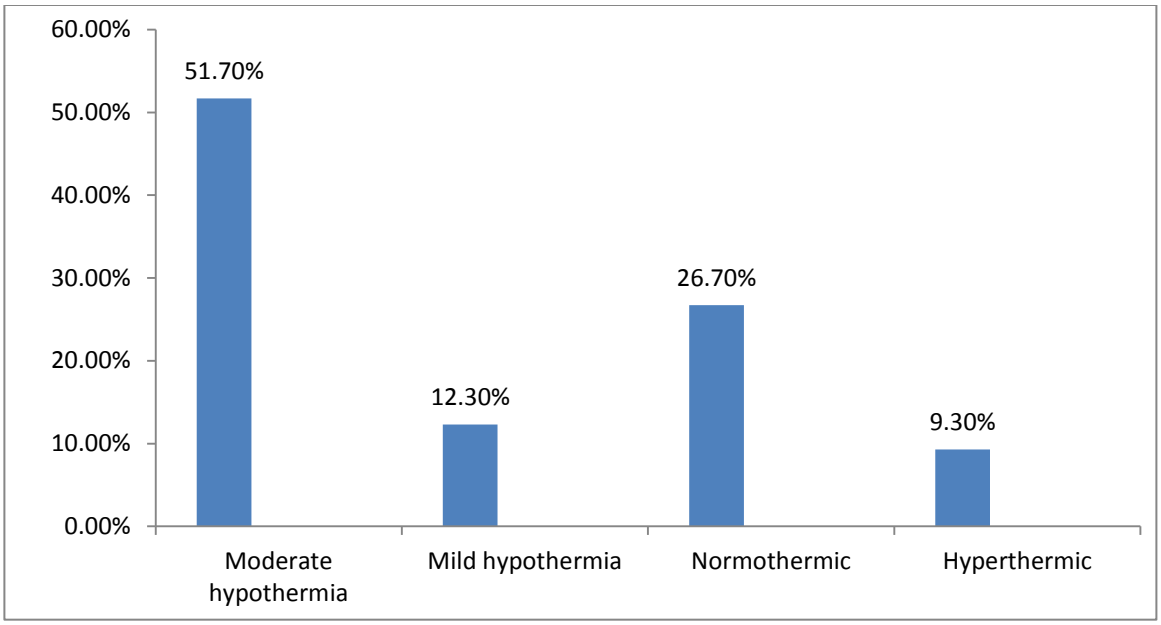

Figure3 Classification of temperature among new born admitted to Neonatal Intensive Care Unit of Governmental Hospitals in Addis Ababa, Ethiopia, 2016.[n=356]

The prevalence of hypothermia was high among preterm 155(76.7%), low birth weight 127(73.4%), age ≤24 hour 171(73.4%), and among out born delivery 112(65.9%). (Figure4).

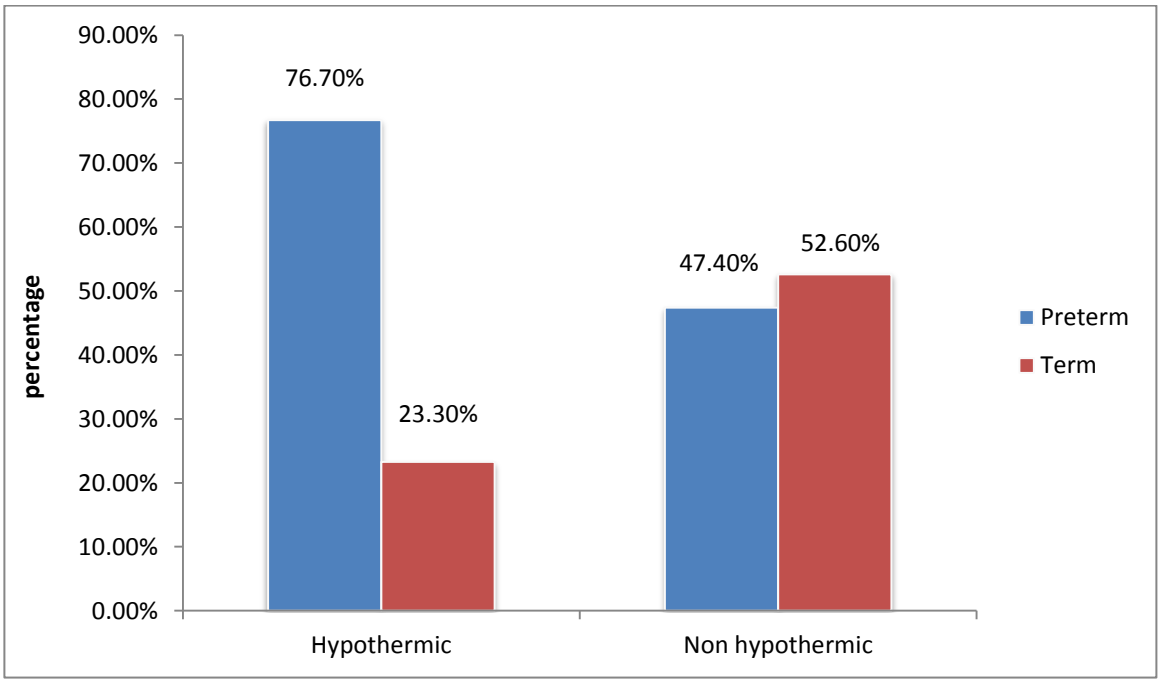

Figure 4 Comparison of Hypothermia with gestational age among New Born admitted to Neonatal Intensive Care Unit of Governmental Hospitals in Addis Ababa, Ethiopia, 2016.[n=356]

5.5. Factors associated with Neonatal Hypothermia

In bivariate logistic regression analysis factors which were significantly associated with hypothermia were age of new born ≤ 24 hour old, low birth weight, preterm delivery, no skin to skin contact to their mother immediately after delivery, no early initiation of breast feeding within one hour, resuscitation at birth (CPR) , Obstetric complication during pregnancy, multiple Pregnancy and night time delivery. Variables revealed as significant on bivariate analysis were introduced into multiple logistic regression.

In multiple logistic regression analysis factors that were significantly associated with hypothermia were, ages of new born ≤ 24 hour old, preterm delivery, no skin to skin contact to their mother immediately after delivery, no early initiation of breast feeding within one hour and resuscitation (CPR) at birth . Neonates with the age of ≤ 24 hour old were 2 times more likely to have hypothermia when compared to age greater than 24 hour. (AOR= 2.26, 95%CI: 1.27, 4.03).

Preterm Neonates are 4.8 times more likely to have hypothermia when compared to term delivery (AOR= 4.81, 95%CI: 2.67, 8.64). And new born who had no skin to skin contact to their mother immediately after delivery were 4.3 times more likely to be hypothermic when compared to those who have skin to skin contact (AOR= 4.39, 95%CI: 2.38, 8.11).Those neonates who had no early initiation of breast feeding within one hour after birth were 3.7 times more likely to develop hypothermia when compared to those who have started within one hour after birth (AOR= 3.72, 95%CI: 2.07, 6.65). And neonates who had resuscitation at birth (CPR) were 3.6 times more likely to be hypothermic when compared to those who had no resuscitation (AOR= 3.65, 95%CI: 1.52, 8.78) (Table 3).

Table 5 Bivariate and multivariate logistic regression analysis of associated factors among New Born admitted to Neonatal Intensive Care Unit of Governmental Hospitals in Addis Ababa, Ethiopia, 2016.[n=356]

Variables	Hypothermic (228) N (%)	Non Hypothermic (128) N (%)	COR(95%CI)	AOR(95%CI)	P - value
Age of Neonate(hour)					
≤ 24	171(73.4)	62(26.6)	3.19(2.02,5.05)	2.26(1.27, 4.03)	.005*
>24	57(46.3)	66(53.7)	1.0	1.0	
Birth weight(grams)					
<2500	127(73.4)	46(26.6)	2.24(1.44,3.5)	1.33(0.75,2.36)	0.331
≥2500	101(55.2)	82(44.8)	1.0	1.0	
Gestational age (weeks)					
< 37	155(76.7)	47(23.3)	3.66(2.32,5.76)	4.81(2.67, 8.64)	0.001 *
≥ 37	73(47.4)	81(52.6)	1.0	1.0	
skin to skin contact					
Yes	71(42.3)	97(57.7)	1.0	1.0	0.001*
No	157(83.5)	31(16.5)	6.92(4.23,11.32)	4.39(2.38, 8.11)	
Early initiation of breast feeding					
Yes	45(35.7)	81(64.3)	1.0	1.0	0.001*
No	183(79.6)	47(20.4)	7.0(4.32,11.38)	3.72(2.07, 6.65)	
CPR received					
Yes	76(90.5)	8(9.5)	7.5(3.48, 16.15)	3.65(1.52, 8.78)	0.004*
No	152(55.9)	120(44.1)	1.0	1.0	
Obstetric complication during pregnancy					
Yes	62(88.6)	8(11.4)	5.6(2.59, 12.13)	1.43(0.57, 3.56)	0.440
No	166(58)	120(42)	1.0	1.0	
Pregnancy type					
Single	190(61.1)	121(38.9)	1.0	1.0	0.145
Multiple	38(84.4)	7(15.6)	3.46(1.45,7.99)	2.14(0.77, 5.97)	
Time of delivery					
Day time	108(56.8)	82(43.2)	1.0	1.0	0.352
Night time	120(72.3)	46(27.7)	1.98(1.26, 3.09)	1.32(0.73, 2.37)	

CHAPTER SIX

6. DISCUSSION

The prevalence of neonatal hypothermia among new born in this study was 64%. Which is almost similar with a study conducted in Nigeria (62%)(13), in Bahir Dar, Ethiopia (67 %,)(31) Gondar, Northwest Ethiopia (69.8%)(14).And it was lower than study conducted in Nepal (92.3%)(11), Zimbabwe (85%)(9), and Uganda (83%) (19). But it was higher than a study conducted in South Africa (21%)(27) , Bangladesh (34%)(10) and Pakistan (49.5%)(25). This variation might be due to the difference in temperature measuring instrument, study design, temperature measurement site, Ecological, Economical and cultural difference between the study areas.

There was high prevalence of hypothermia among out born delivery (65.9%) this might be due to lack of proper thermal care practice during inter facility transportation. Neonates are transported from ward to ward or to the hospital without proper wrapping. This finding was higher than study done in Bangladesh which was 43% for out born and 22% for inborn but lower than Nigeria which was 90.9% for out-born and 61.1% for in born (10,13,27).This might be due to the difference in Inter-hospital transport thermal care services , distance traveled to the hospital and economical difference.

This study revealed that neonates with the age of 24 hour old or less were 2 times more likely to have hypothermia than age greater than 24 hour (AOR=2.26, 95%CI: 1.27, 4.03).This could be due to the fact neonates that will be admitted to NICU are either preterm, extremely low birth weight or had delivery complication and critically ill that needs immediate admission after birth .And they are not capable for thermoregulation. This is similar with a study conducted in Bangladesh,(AOR= 2.23 95%CI: 1.22-4.0) (10).

Preterm Neonates were 4.8 times more likely to have hypothermia when compared to term neonates (AOR= 4.81, 95%CI: 2.67, 8.64). The possible reason is Preterm neonates have immature and thin skin that increase heat loss through radiation, underdeveloped hypothalamic control, they lack the efficient neural mechanisms for temperature control by shivering, have decreased glycogen stores, have decreased fat for insulation and have less brown adipose tissue, so

they have decreased ability to regulate their body temperature, by producing heat through non-shivering thermogenesis(2,41,42). This is almost similar with a study done in Pakistan in which preterm neonates were 4 times more likely to develop hypothermia when compared to term new born(25).But it is higher than a study conducted in Iran in which preterm neonates were 1.73 times more likely to be hypothermic than term one(43). This variation might be due to the difference in the thermal care of preterm new born, standard of delivery room and NICU.

Neonates who had no skin to skin contact to their mother immediately after delivery were 4.3 times more likely to be hypothermic when compared to those who have skin to skin contact (AOR= 4.39, 95%CI: 2.38, 8.11). The possible reason could be in the utero body temperature of the fetus is consistent with maternal temperature; Neonates who had skin to skin contact immediately after delivery with their mother gain heat through conduction which is consistent with their temperature in the womb during exposure of the new born to extra uterine environment.(44). This finding is almost similar with a study conducted in Gondar, North west Ethiopia in which those who had no skin to skin contact were 3 times more likely to develop hypothermia (14).

Those neonates who had no early initiation of breast feeding within one hour after birth were 3.7 times more likely to develop hypothermia when compared to those who have started within one hour after birth(AOR= 3.72, 95%CI: 2.07, 6.65). This might be due to the fact that neonates who didn't breast feed within one hour could be susceptible to hypoglycemia, have no energy or calories to produce heat for thermoregulation which results in hypothermia(41).And it is consistent with a study done in Nigeria but lower than a study done in Gondar, North west Ethiopia in which those who were delayed in initiation of breast feeding were 7.5 times more likely to be hypothermic (14,18). This difference in magnitude might be due to difference in study setup, knowledge of mothers on good positioning and attachment of breast feeding and difference in place of delivery.

Neonates who had resuscitation (CPR) at birth were 3.6 times more likely to be hypothermic when compared to those who had no resuscitation (AOR= 3.65, 95%CI: 1.52, 8.78). This is due to the fact that neonates who need resuscitation are those who had birth asphyxia; there is no enough oxygen which is needed for mitochondrial oxidation in the brown adipose tissue, for heat production. And during resuscitation at birth temperature control may not be properly taken care

of; during emergency condition resuscitation may be done without wrapping the baby and in cold table. This finding is higher than study done in Bangladesh in which neonates that had resuscitation were 2 times more likely to be hypothermic(AOR= 2.15 , 95%CI:1.4-3.32)(10),and study done in Iran in which those who had resuscitation at birth was almost 2 times more likely to be hypothermic(AOR=1.91,p value= 0.001)(43) . This variation may be due to difference in thermal care practice during resuscitation, warm resuscitation or not and difference in time of resuscitation.

In bivariate analysis low birth weight were statistically significant with the onset of hypothermia but in multiple logistic regression analysis it was not significant but there was high prevalence of hypothermia among low birth weight neonates 127(73.4%) compared with 101(55.2%) normal birth weight .This is consistent with a study done in Pakistan 58.1%, Nigeria 89.1% and Gondar, North west Ethiopia 58(89.2%)(14,18,25).

CHAPTER SEVEN

7. STRENGTH AND LIMITATION OF THE STUDY

7.1 STRENGTH OF THE STUDY

- Most of previous studies are single center study but this study was conducted on six different setting (Hospitals) hence the results can be generalized.
- Probability sampling was used to select participants.

7.2 LIMITATION OF THE STUDY

- The study is conducted only in one season so seasonal variation may be a factor for neonatal hypothermia but this was not addressed.
- The study was conducted with cross sectional study design so it does not show cause and effect relationship.

CHAPTER EIGHT

8. CONCLUSION AND RECOMMENDATION

8.1 CONCLUSION

The prevalence of Neonatal hypothermia among new born neonates admitted to Neonatal Intensive Care Unit of governmental hospitals in Addis Ababa was high 228(64%).

Preterm delivery, age of new born ≤ 24 hour, no skin to skin contact to their mother immediately after delivery, delayed in early initiation of breast feeding within one hour after birth and resuscitation at birth were factors that were significantly associated with neonatal hypothermia among new born neonates admitted to Neonatal Intensive Care unit of governmental hospitals in Addis Ababa. Therefore Attention is needed for thermal care of preterm new born and on the principle of warm chain especially on early initiation of breast feeding, skin to skin contact and warm resuscitation.

8.2 RECOMMENDATION

- **For Health Professionals**
  - It is recommended to practice warm resuscitation principle of warm chain for those neonates who need resuscitation to prevent hypothermia.
  - It is better to give priority for preterm and new born of age 24 hour or less during thermal protection.

- **For Hospitals**
  - It is recommended to give attention to preterm neonates on thermal care and provide intensive care on separate room that has adjusted room temperature for preterm babies.
  - It is better to increase the practice of skin to skin contact immediately after delivery which is the effective warm chain principle especially in developing countries in which advanced warming instruments and incubators are not present.
  - It is recommended to prepare adequate post natal ward and initiate early breast feeding within one hour after delivery through proper stimulation of sucking reflex and by providing health education on proper attachment and positioning of breast feeding for mothers by skilled birth attendants.
- **For Ethiopian Federal Minsters of Health**
  - It is better to facilitate all hospitals that provide delivery service to prepare their own organized NICU because most of hospital deliveries are high risk pregnancies that are referred from health centers which needs immediate intensive care but during referral to other hospital that had NICU heat loss will be occur during transportation.

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ANNEXES

ANNEX I. INFORMATION SHEET

***Title of Research*:** Neonatal hypothermia and associated factors among new born admitted to Neonatal intensive care unit of Governmental Hospitals in Addis Ababa, Ethiopia, April, 2016.

***Institution*:** Addis Ababa University, College of Health Sciences, School of Allied Health Sciences, Department of Nursing and Midwifery (Graduate Program)

Name of sponsor: Addis Ababa University

***Principal Investigator*:** Birhanu Wondimeneh (BSc.)

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***Advisor*:** Balcha Berhanu (MSc, BSc, RN)

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***Background Information*:** Neonatal hypothermia is a worldwide problem and an important contributing factor to neonatal morbidity and mortality especially in low and middle income countries and has been associated with mortality risk in new born. Mortality Rate is significantly higher among hypothermic babies. Therefore the aim of this study is to assess the prevalence of Neonatal hypothermia and associated factors among new born admitted to Neonatal intensive care unit of Governmental Hospitals in Addis Ababa, from March 30 to April 30, 2016.

ANNEX II. AMHARIC VERSION INFORMATION SHEET

የመረጃ መሰጫ ቅጽ

የጥናቱ ርዕሱ አዲስ አበባ በሚገኙ የ መንግስት ሆስፒታሎች ማሞቂያ ክፍል ላይ ያለው የጨቅላ ህፃናት የሙቀት መቀነስ መጠን እና ለሙቀት መቀነስ የሚያጋልጡ ተዛማጅ ምክንያቶች ፣ ሚያዝያ 2008 ዓ.ም.

ጥናቱን የፈቀደው ተቋም - አዲስ አበባ ዩኒቨርሲቲ ፣ ጤና ሳይንስ ኮሌጅ የጤና ሳይንስ ትምህርት ቤት የነርሲንግ እና ሚድዋይፈሪ ትምህርት ክፍል

ድጋፍ ያደረገለት ተቋም - አዲስ አበባ ዩኒቨርሲቲ

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ANNEX III: CONSENT FORM

ADDIS ABABA UNIVERSITY COLLEGE OF HEALTH SCIENCE SCHOOL OF ALLIED HEALTH SCIENCES DEPARMENT OF NURSING AND MIDWIFERY

QUESTIONNAIRE FOR ASSESSMENT OF NEONATAL HYPOTHERMIA AND ASSOCIATED FACTORS AMONG NEW BORN ADMITTED TO NEONATAL INTENSIVE CARE UNIT OF GOVERNMENTAL HOSPITALS IN ADDIS ABABA FROM MARCH 30 TO APRIL 30 ,2016 ADDIS ABABA ETHIOPIA.

Questionnaire code…….

INTRODUCTION

Hello!! dear participants, this questionnaire is prepared by Birhanu Wondimeneh, Masters of science student in Addis Ababa university in the field of pediatrics and child health nursing to assess the prevalence of Neonatal hypothermia and associated factors among new born neonates admitted to neonatal intensive care unit of governmental hospitals in Addis Ababa from March 30 to April 30, 2016 Addis Ababa Ethiopia. The aim of this study is to determine the prevalence of neonatal hypothermia and to identify the possible associated risk factors for neonatal hypothermia among new born admitted to neonatal intensive care unit of governmental hospitals in Addis Ababa that will provide base line data to find possible solutions, for neonatal thermal care and new born survival. During the study your neonate axillary temperature will be measured at admission, so your honesty will help us to get accurate information; your new born body temperature will be measured and your response will be kept confidentially, there is no name identified or anonymity will be kept and there will be no any visible risk with you and your neonate for your participation. There is no payment for your participation but we greatly thank for your participation and you have the right to refuse from participation at any time.

Are you voluntary to participate?

1. **Yes** I have understand the above information and I am volunteer to participate in a study conducted on Neonatal hypothermia and associated factors among new born neonates admitted to neonatal intensive care unit of governmental hospitals in Addis Ababa from March 30 to April 30, 2016 Addis Ababa Ethiopia.
   Signature ---------- Date----------

   Data collector's signature---------- Date -------

2. No if not voluntary please stop here.

If you are voluntary to participate in the study; we kindly request you to provide your genuine response for the interview.

Thank you for your volunteer participation!!!

ANNEX IV: ENGLISH VERSION QUESTIONNAIRE

General instruction

1. For multiple choice questions chose one best answer
2. If your answer is not listed among alternatives, please tell your own answer for data the collector
3. If you have any question on the interview you can ask the data collector
4. If there is any problem during the study call with 0920251457/0938613602

Part one

I. Socio demographic characteristics

No		
101	Age of the mother	_____
102	Ethnicity	A. Amhara B. Tigre C. Oromo D. If other specify_____
103	Religion	A. Orthodox B. Muslim C. Protestant D. Catholic E. If other specify…….
104	Residence	A. Urban B. Rural
105	Educational status of the mother	A. Unable to read and write B. Primary school C. Secondary school D. Diploma and above
106	Occupation of the mother	A. House wife B. Government employ C. Private business D. Student E. Farmer

107	Monthly income of the family	……
108	Parity	A. Primiparous B. Multiparous

Part two

II. Hypothermia and Associated factor assessing question

109	Age of new born in hours	_____
110	Sex of new born	A. male B. Female
111	Birth weight	……
112	Gestational age (GA)	……
113	Axillary temperature of the new born At admission	……..
114	Have you ever bathed your baby before 24 hours old?	A. Yes B. No
115	Have you provide skin to skin contact immediately after birth?	A. Yes B. No
116	Have you apply oil massage of the skin immediately after birth?	A. Yes B. No
117	Did the new born started breast feeding within one hour after birth?	A. Yes B. No
118	Did the new born received CPR during birth?	A. Yes B. No

119	Did you had obstetric complication during pregnancy?	A. Yes B. No
120	How was the pregnancy type?	A. Single B. Twine C. Triple D. Quadruple
121	What was the mode of delivery?	A. Spontaneous Vaginal delivery B. Instrumental C. C/S
122	Where did you deliver?	A. Inborn B. Out born
123	If your delivery is out born in which setting you deliver?	A. Other Hospitals B. Health Centre C. Private health facility D. Traditional birth center E. Homes
124	What was the time of delivery?	A. Day time B. Night time
125	How much was the room temperature of NICU	……
126	What is the Clinical diagnoses during admission	…….

ANNEX V: AMHARIC VERSION CONSENT FORM

የፍቃደኝነት ማረጋገጫ ቅፅ

አዲስ አበባ ዩኒቨርሲቲ ፣ ጤና ሳይንስ ኮሌጅ

የጤና ሳይንስ ትምህርት ቤት

የነርሲንግ እና ሚድዋይፈሪ ትምህርት ክፍል

አዲስ አበባ በሚገኙ የ መንግስት ሆስፒታሎች ማሞቂያ ክፍል ላይ ያለውን የጨቅላ ህፃናት የሙቀት መቀነስ መጠን እና ለሙቀት መቀነስ የሚያጋልጡ ተዛማጅ ምክንያቶችን ከ መጋቢት 21 እስከ ሚያዝያ 21 2008 ዓ.ም ለማጥናት የተዘጋጀ አማርኛ መጠይቅ

የመጠይቁ መለያ ቁጥር----------

መግቢያ

ጤና ይስጥልኝ ! ዉድ ተሳታፊዎች ይህ መጠይቅ የተዘጋጀዉ በአዲስ አበባ ዩኒቨርሲቲ የነርሲንግ እና ሚድዋይፈሪ ትምህርት ክፍል የ 2ኛ አመት የህፃናት ህክምና እና ህፃናት ጤና ነርሲንግ ተመራቂ ማስተርስ ተማሪ በሆኑት በ አቶ ብርሃኑ ወንድሜነህ ሲሆን ጥናቱም አዲስ አበባ በሚገኙ የ መንግስት ሆስፒታሎች ማሞቂያ ክፍል ላይ ያለውን የጨቅላ ህፃናት የሙቀት መቀነስ መጠን እና ለሙቀት መቀነስ የሚያጋልጡ ተዛማጅ ምክንያቶችን ከ መጋቢት 21 እስከ ሚያዝያ 21 2008 ዓ.ም ለማጥናት ነው፡፡የጥናቱ ዋና ዓላማ አዲስ አበባ በሚገኙ የ መንግስት ሆስፒታሎች ማሞቂያ ክፍል ላይ ያለውን አዲስ የተወለዱ ጨቅላ ህፃናት የሙቀት መቀነስ መጠን ምንያህል እንደሆነ ለማወቅ እና ለሙቀት መቀነስ ሊያጋልጡ የሚችሉ ተዛማጅ ምክንያቶችን ለማወቅ ነው፡፡በዚህ ጥናት ላይ በመሳተፍዎም ሆነ መጠይቁን በመመለስዎ የተዘጋጀ ክፍያ የለም ነገር ግን ከዚህ ጥናት የሚገኘው መረጃ ለጨቅላ ህፃናት ጤና ደህንነት እና የ ሙቀት እንክብካቤ ለመስጠት እንዲሁም ልዩ ትኩረት ለመስጠት እና ለችግሩ የመፍትሄ እርምጃ መዉሰድ ለሚሹ ህጋዊ አካላት ትልቅ አስተዋጽኦ አለዉ ::በ ጥናቱ ወቅት የ ጨቅላ ህፃንዎ የ ብብት የሙቀት መጠን አንድ ጊዜ ይለካል፡ ስለዚህ እርስዎ ይህንን ቃለ መጠይቅ ስንጠይቅዎ ትክክለኛ መረጃ መናገርዉ እና የእርስዎ ቅንነት ለዚህ አላማ መሳካት ትልቅ አስተዋጽኦ አለዉ:: በመጠይቁ ላይ ስምዎትን አይጠየቁም :: እንዲሁም መልሶቻችሁ በምስጢር ስለሚያዙ በምንም አይነት መንገድ ጉዳዩ ለማይመለከታቸዉ አካላት አይገለጽም በዚህ ጥናት በመሳተፍዉ በልጅዉ ወይም በእርስዉ ላይ የሚደርስ ጉዳት የለም እንዲሁም በዚህ ጥናት በመሳተፍዉ የሚከፈል ክፍያ የለውም:: የእርስዎ በዚህ ጥናት ላይ መሳተፍ በፍላጎትዎ ላይ የተመሰረተ ነው:: መጠይቁን ሙሉ ለሙሉ ያለመሙላት ወይንም የማቋረጥ መብትዎ የተጠበቀ ነዉ::

በጥናቱ ዉስጥ ለመሳተፍ ፈቃደኛ ነዎት? 1. አዎ ፊርማ _____ ቀን _____

የመጠይቁ ሰብሳቢ ፊርማ_____ ቀን _____

2. አይደለሁም ---- እባክዎን እዚህ ጋር ይቁሙ

በጥናቱ ዉስጥ ለመሳተፍ ፈቃደኛ ከሆኑ ትክክለኛ የሆነ መልስ እንዲሰጡን በትህትና እንጠይቃለን::

ስለትብብርዎ በቅድሚያ እናመሰግናለን !! !

ANNEX VI: AMHARIC VERSION QUESTIONNAIRE

አማርኛ መጠይቅ

አጠቃላይ መመሪያ

1. ለምርጫ ጥያቄዎች ከቀረቡት አማራጮች አንዱን ይምረጡ
2. ከ ቀረቡት አማራጮች መልስ ካላገኙ የራስዎን መልስ ለመረጃ ሰብሳቢዉ አካል ይንገሩት
3. በመጠይቁ አሞላል ላይ ጥያቄ ካለሽ መረጃ ሰብሳቢዉን አካል መጠየቅ ይችላሉ
4. በ ጥናቱ ወቅት ችግር ካለ በ ስልክ ቁጥር 0920251457 /0938613602 ደውለው መጠየቅ ይቻላል

ክፍል አንድ

ı. አጠቃላይ ሁኔታን የሚመለከቱ ጥያቄዎች

ተ.ቁ		
101	የ እናት እድሜ	----------
102	ብሔር	ı. አማራ 2. ትግሬ 3. ኦሮሞ 4. ሌላ ካለ ይጠቀስ----------
103	ሀይማኖት	ı. ኦርቶዶክስ 2. ፕሮቴስታንት 3. ሙስሊም 4. ሌላ ካለ ይጠቀስ---------
104	የመጡበት አካባቢ	ı. ከተማ 2. ገጠር
105	የ እናትዬዋ የትምህርት ደረጃ	1. ማንበብ ና መፃፍ አትችልም 2. የመጀመሪያ ደረጃ ትምህርት 3. የሁለተኛ ደረጃ ትምህርት 4. ዲፕሎማ ና ከዛበይ
106	የ እናትዬዋ ስራ	ı. የቤት እመቤት 2. የመንግስት ሰራተኛ 3. የግል ስራ 4. ተማሪ 5. አርሶ አደር
107	የቤተሰብዎ ወርሃዊ ገቢ ምንያህል ነዉ	.....
108	ስንት ልጆች ወልደሻል	1. አንድ ብቻ 2. ሁለትና ከዛ በላይ

ክፍል ሁለት

2. የሙቀት መጠን መቀነስ እና ለሙቀት መቀነስ የሚያጋልጡ ተዛማጅ ምክንያቶችን መጠየቂያ

ተ.ቁ		
109	የጨቅላ ህፃኑ/ኗ እድሜ በሰዓት	--------
110	የጨቅላ ህፃኑ/ኗ ፆታ	1. ወንድ 2. ሴት
111	ሲወለድ የነበረው የክብደት መጠን	----------
112	የእርግዝና ዕድሜ በ ሳምንት	……..
113	ወደ ማሞቂያ ክፍል ሲገባ ያለው የጨቅላ ህፃኑ/ኗ የብብት የሙቀት መጠን?	……..
114	ጨቅላ ህፃኑን/ኗን ከ 24 ሰዓት በፊት ገላዋን/ውን አጥበዋታል/አጥበውታል?	1. አዎ 2. አይደለም
115	ጨቅላ ህፃኑ/ኗ እንደተወለደ/ች ወዲያውኑ ከሰውነትሽ ቆዳ ጋር በማነካካት አቅፈሽዋል?	1. አዎ 2. አይደለም
116	ጨቅላ ህፃኑ/ኗ እንደተወለደ/ች ወዲያውኑ ዘይት ቀብተሽ አሽተሽዋል?	1. አዎ 2. አይደለም
117	ጨቅላ ህፃኑ/ኗ በተወለደ/ች በአንድ ሰዓት ውስጥ ጡት መጥባት ጀምሯል/ራለች?	1. አዎ 2. አይደለም
118	ጨቅላ ህፃኑ/ኗ እንደተወለደ/ች የ አተነፋፈስ እና ልብ ምት እገዛ (CPR) ተደርጎለት/ላት ነበር?	1. አዎ 2. አይደለም
119	በ እርግዝና ወቅት የገጠመሽ የተወሳሰበ ችግር ነበር?	1. አዎ 2. አይደለም
120	የእርግዝናው አይነት እንዴት ነበር?	1. አንድ ብቻ 2. መንታ 3. ሦስት 4. አራት
121	የወለድሽበት አይነት ምንድን ንው?	1. በማህፀን 2. በመሳሪያ በመታገዝ 3. በቀዶ ጥገና

122	የት ነው የወለድሽው?	1. በዚህ ሆስፒታል 2. ከዚህ ሆስፒታል ውጭ
123	የ ወለድሽው ከዚህ ሆስፒታል ውጭ ከሆነ የት ቦታ ወለድሽ ?	1. ሌላ ሆስፒታል 2. ጤና ጣቢያ 3. የ ግል ጤና ተቋም 4. የባህል ማዋለጃ ቦታ 5. ቤት ውስጥ
124	የወለድሽበት ጊዜ ምን ነበር?	1. ቀን 2. ሌሊት
125	የማሞቂያ ክፍሉ የሙቀት መጠን ስንት ነው?	----------
126	ጨቅላ ህፃኑ/ኗ ወደ ማሞቂያ ክፍል ሲገባ የነበረው የበሽታ አይነት?	----------

ANNEX VII: DECLARATION SHEET

I, Birhanu Wondimeneh hereby declare that to the best of my knowledge this thesis is my own work; it has not been presented to any institution either partially or in total for any academic award or for publication. The works herein are original, where the works of others are quoted and appropriate reference has been given.

I hereby presented this thesis for partial fulfillment of degree of Master of Science in Pediatrics and child health nursing of Addis Ababa University.

Investigator:

Name: Birhanu Wondimeneh (BSc)

Signature _____ Date _____

This thesis has been submitted with the approval of the following supervisor and examiner

Advisor:

Name: Mr. Balcha Berhanu (MSC, BSC, RN)

Signature _____ Date _____

Internal Examiner:

Name: Sr. Semerya Berhe (MSc,BSc,RN)

Signature _____ Date _____