ADDIS ABABA UNIVERSITY

COLLEGE OF HEALTH SCIENCES

SCHOOL OF NURSING AND MIDWIFERY

DEPARTMENT OF NURSING

POST GRADUATE STUDIES

SURVIVAL STATUS AND PREDICTORS OF MORTALITY AMONG PRETERM NEONATES ADMITTED TO NEONATAL INTENSIVE CARE UNIT OF ADDIS ABABA PUBLIC HOSPITALS, ETHIOPIA, 2021. A PROSPECTIVE COHORT STUDY

PRINCIPAL INVESTIGATOR: DIRES BIRHANU

A RESEARCH THESIS TO BE SUBMITTED TO THE DEPARTMENT OF NURSING, SCHOOL OF NURSING AND MIDWIFERY, COLLEGE OF HEALTH SCIENCE, ADDIS ABABA UNIVERSITY FOR PARTIAL FULFILLMENT OF THE REQUIREMENTS OF MASTER'S DEGREE IN NEONATAL NURSING.

JUNE, 2021

ADDIS ABABA, ETHIOPIA

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APPROVAL BY THE BOARD OF EXAMINATION

THIS THESIS BY DIRES BIRHANU MIHRETIE (BSC NURSE) IS ACCEPTED IN ITS PRESENT FORM BY BOARD OF EXAMINERS AS SATISFYING THESIS REQUIREMENT FOR THE DEGREE OF MASTERS IN NEONATAL NURSING.

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ABBREVIATIONS AND ACRONYMS

AGA	Appropriate For Gestational Age
AHR	Adjusted Hazard Ratio
AOR	Adjusted Odds Ratio
APGAR	Appearance, Pulse, Grimace, Activity, Respiration
APH	Antepartum Hemorrhage
CHS	College of Health Science
CI	Confidence Interval
CPAP	Continuous Positive Airway Pressure
DM	Diabetes Mellitus
DHN	Dehydration
EDHS	Ethiopian Demographic Health Survey
HAI	Hospital Acquired Infection
HIV/AIDS	Human Immune Virus /Acquired Immuno Deficiency Syndrome
HR	Hazard Ratio
KMC	Kangaroo Mother Care
LGA	Large For Gestational Age
NEC	Necrotizing Enterocolitis
NICU	Neonatal Intensive Care Unit
OR	Odds Ratio
PNA	Perinatal Asphyxia
PPROM	Preterm Prolonged Rupture Of Membrane
RR	Relative Risk
SGA	Small For Gestational Age
VDRL	Venereal Disease Research Laboratory
WHO	World Health Organization

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ABSTRACT

Background: Preterm neonates have much greater risk of death and disability compared with term neonates due to immature organ system which makes them unable to tolerate the extra uterine environment. In Ethiopia almost 90% of neonatal deaths are due to three preventable causes among which preterm complications are the one. The country accepts initiatives to decrease preterm mortality and much is already being done to decrease mortality related to preterm complications. But studies about time to death in prospective design are limited.

Objective: The main aim of this study is to determine survival status and predictors of mortality among preterm neonates admitted to public hospitals in Addis Ababa, 2021.

Methodology: An institutional based prospective follow up study was conducted among 358 preterm neonates admitted to selected public hospitals in Addis Ababa, Ethiopia from February 12 to May 12, 2021. Ethical approval was obtained from Institutional Review Board (IRB) AAU, CHS. Data was collected prospectively using structured questioner which was adapted from previous literatures. Data was entered into Epi Data version 4.6 and exported to STATA version 14 for analysis. Descriptive statics to describe variables, the Kaplan Meier failure estimate curve to estimate the cumulative time to death and Log rank tests were used to compare probability of hazard between different categories. Bi-variable and multi-variable Cox proportional hazards models were used to identify predictor variables and variables having p value < 0.05 were considered as statistically significant.

Result: At the end of this cohort, 125(34.9%) of the neonates died, with incidence rate of 36.4/1000 person-day. The first 7days after admission was the hazard time to death in which 105(84%) of preterm neonates died. Being born to APH mother (AHR: 3.1, CI; 1.4-6.6), lack of KMC (AHR: 5.8, CI; 2.37-14.33), unable to start feeding with in 24hours of admission (AHR: 6.4, CI: 3.33 -12.28), apnea (AHR: 2.4, CI: 1.3-4.7) and dehydration during the follow up period (AHR: 2.33, CI: 1.3-4.3), were identified predictors of time to death.

Conclusion and Recommendation: The proportion of preterm death in this study was high compared to the pervious study conducted in Tikur Anbesa Specialized Hospital. Being born to APH mother, lack of Kangaroo Mother Care, unable to start feeding with 24hour, Apnea and dehydration were the predictors' time to death. Therefore, intervention that focuses on the identified predictors could have a paramount effect in reducing preterm death.

Key word: Preterm, survival status, Predictors, Addis Ababa, Ethiopia

1. INTRODUCTION

1.1. Background

Preterm neonates are newborns delivered before 37 completed weeks' (259^{th} day) of gestation, counting from the first day of the last menstrual period(1–3).

Based on gestational age, preterm neonates can be classified as; extremely preterm (less than 28 weeks), very preterm (28 to 32 weeks), moderate preterm (32 to 33 weeks and 6days) and late preterm(34 to 36 weeks and 6days(4).

Preterm neonates can have normal birth weight (2500-3999 gram), low birth weight (1500-2499 gram), extremely low birth weight (1000-1499 gram) and extremely very low birth weight (less than 1000 gram). With respect to standardization of birth weight and gestational age, preterm neonates can be small for gestational age (SGA) (less than10%) , appropriate for gestational age (AGA) (between 10% and 90%) and large for gestational age LGA (above 90%) percentile (5).

Globally, an estimate of 15 million preterm neonates are born every year, over 84% occur at 32–36 weeks of gestation, 10% are born at 28–32 weeks of gestation and only about 5% fall into (<28 weeks) of gestation (6).

Preterm neonates have much greater risk of death and disability compared with term neonates due to immature organ system which makes them unable to tolerate the extra uterine environment. For effective intra uterine to extra uterine transition complex physiological changes are crucial. Clearance of fetal lung fluid, adequate surfactant secretion, breathing, transition of fetal to neonatal circulation, decrease in pulmonary vascular resistance, increased pulmonary blood flow and endocrine support of the transition are essential components which are not well functioning in preterm neonates. Due to this, preterm babies are not fully prepared to live outside their mother's womb(7).

Preterm related mortality can be reduced through interventions provided to the mother before or during pregnancy and to the preterm neonates after birth(8). World Health Organization (WHO) also sets ten recommendations. These are antenatal corticosteroids, tocolysis, magnesium sulfate, antibiotic prophylaxis, mode of preterm birth (to mother) and neonatal kangaroo mother care, plastic wraps, continuous positive airway pressure therapy, surfactant and oxygen therapy (8).

Barros et al in his interventional study identified eleven interventions to improve survival of preterm babies in low- and middle-income countries. These include interventions during delivery such as, prophylactic steroids administration, antibiotics for premature rupture of membranes, vitamin K supplementation at delivery and delayed cord clamping before birth. Interventions after birth are management of neonatal sepsis, room air for resuscitation, hospital-based kangaroo mother care, early breastfeeding, thermal care, surfactant therapy and application of continuous positive pressure for respiratory distress syndrome(9). If these interventions are implemented universally with 95% coverage, almost one million premature babies could be saved each year(10).

Even if the chance of preterm survival depends on birth weight and gestational age, with advanced treatment and care the likely- hood survival of the neonates at gestational age of 23 weeks 17%, 24 weeks 39%, 25 weeks 50% , 26 weeks 80% , 27 weeks90% , 28 to 31 weeks 90 to 95%, 32 to 33 weeks 95% and if they born above 34 weeks almost as likely as a full-term(11).

Despite this all information and recommendations, the issue of preterm survival is still the burden of the world especially for developing countries including Ethiopia.

1.2. Statement of the problem

Globally, 2.4 million neonatal deaths were recorded in 2019 (6,700 neonatal deaths per day). One third of all neonatal deaths occur within the first day of life and close to three-quarters occurring within the first week of life (12). Among the total newborn deaths, three-quarters of it are resulted from complications due to prematurity, intra partum related deaths (including birth asphyxia) and neonatal infections which can be prevented or treated(13). Preterm related complications are the single largest direct cause of neonatal deaths throughout the world, responsible for 35% of the world's neonatal death (1.1 million deaths per year)(14).

Risk of a neonatal death following complications of preterm birth is at least 12 times higher among African baby than European. Almost all (99%) babies who die during the first 4 weeks of life are in the poorest parts of the world, especially in sub-Saharan Africa and South Asia in which most of neonatal deaths are from preterm birth complication(15). There is a dramatic survival gap for preterm depending on place of birth. For example, over 90% of extremely preterm babies (<28 weeks) born in low-income countries die within the first few days of life but less than 10% of babies of the same gestational age die in high-income countries with a ratio of 10:90 survival gap (14). So far, more than three-quarters of preterm could be saved with feasible, cost-effective care and further reductions up to 75% are possible through intensive neonatal care(14).

In Africa half of the neonatal deaths are from preterm babies caused by only preterm complications and sub-Saharan African countries loses approximately 290,000 neonates in each year due to preterm complication(16).The highest rates of preterm mortality are in West Africa. nearly 16 per 1000 live births, mainly in Sierra Leone and Liberia(17).

According to the conclusion of an individual participant level meta-analysis study done in east Africa, 52% of newborn deaths are secondary to preterm or neonates who are small for gestational age (18). In Kenya preterm complication(28%) is the second leading causes of neonatal mortality next to intra partum related complications(29%)(15).

Ethiopia is the 4th ranked country in the world which has highest neonatal mortality next to India, Nigeria and Pakistan (19). Almost 90% of neonatal deaths in the country are due to preterm birth complications (37%), intra partum related complication (28%) and infection (24%)(20).

According to Ethiopian Demography Health Survey (EDHS), neonatal mortality has decreased from 39 to 29 between 2005 and 2016, but has increased to 30 in 2019 (21). Studies in Ethiopia have identified several predictors of preterm mortality such as male neonate, being born from diabetes mellitus (DM) mother, respiratory distress syndrome, neonatal sepsis, gestational age less than 28weeks, low APGAR score, home delivery, jaundice, hypoglycemia, born from preeclampsia/eclampsia mothers and being extremely very low birth weight (22–24). However, the studies were conducted in single institution with a retrospective in design. Additionally, CPAP types, dehydration, COVID-19, apnea and nurse to patient (neonate) ratio were newly added variables in this study unlike other studies conducted previously.

Furthermore, Ethiopia as a country accepts initiatives to decrease preterm mortality and much is already being done but neonatal death related to preterm complication is still the leading cause of neonatal mortality (25). Knowing the particular time which is risk for preterm death is vital for policy makers and other stakeholders to intervene accordingly. In addition, predictors of mortality should be identified with regard to time for prevention and management of preterm problems. To do so, further studies should be conducted. Therefore, the purpose of this study was to estimate time to death and predictors of mortality among preterm neonates admitted to selected public hospitals of Addis Ababa.

2. LITERATURE REVIEW

1.1. Mortality, time to death and Survival of preterm neonate

2.1.1 Proportion of preterm mortality

Different studies across the world found results differently on preterm mortality. A national vital statistics reports of United States of America indicates (34%) of infant deaths were due to preterm complications(26). In China and Iran the overall mortality among preterm neonates were 1.9 % (27) and 9.1% (28) respectively.

Study on sick preterm illness conducted in Ethiopia find that preterm neonatal mortality was 29% (29). This study was almost similar with the result done in five hospitals of Ethiopia 29.31% (30). Another studies in Jimma university specialized hospital and Bahr Dar showed that the overall preterm mortality was 34.9% (31) and 36.1% (32)respectively. Preterm mortality according to the study conducted in university of Gondor was 28.8%(24) where as in Debre Tabor it was 31.2% (22). Among studies conducted in Ethiopia, preterm mortality was low in Axum university hospital which was 22.2% (33). Another two studies in Addis Ababa found nearby figures 29.7% (23) and 30.7%(34).

2.1.2 Time to preterm Mortality

Time to death of preterm according to different studies is not the same. Study in china revealed that most of the deaths (68.1%) at 24–27 weeks of gestation were within 12 hours and 47.4% deaths at 28–36 weeks of gestation were within 12–72 hours after birth(27). A result from South Brazil showed that 21% ,45% and 33% extremely preterm deaths were at the age of birthday, up to 6 days of age and 7-27 days respectively(35). According to a retrospective cohort hospital based study in Iran 39% and 63.7% preterm were died during the first 24 hours and 48 hours of age respectively. The rest 84.3% were died at the age of early neonatal age and 12.24% died during their late neonatal period (7-28 days)(28). Based on the result of a prospective hospital based cohort study done in Kenya 15.9% of preterm deaths were within the first 24 hours of age and 81.1% of the preterm neonates were died at the end of their first week(36). According to a retrospective cross-sectional study conducted in Bair Dar 85% of the preterm mortality were within the first seven days of life. From these 16.6% and 43% of deaths were within the first 24 hours and 72 hours of life respectively(32). Another institution-based cognitive research study in Axum

found that 23.4% of the preterm neonates died within the first 48 hours and 76.6% died within the first 7 days of life(33). Based on the result of another institution-based retrospective follow-up study conducted in university of Gondor 11.4% of preterm neonates were died within the first 24 hours and 85.23% of deaths were occurring in the first 7days(24). Retrospective cohort study conducted in Black lion hospital showed that 52.5% deaths occurs within the first 2 days and two third (67.1%) of the deaths occur within the first 3 days(34).

2.1.3 Survival status of preterm neonate

Survival status of preterm neonates is not the same in different studies across the world. Retrospective cohort study conducted in China said that there was no preterm survived at 24 weeks gestation with rates of survival to discharge increased when the increase of gestational age from 68.2% at 24–27 weeks, to 99.4% at 34–36 weeks(27). According to comparative study done on preterm babies ≤30 weeks in a tertiary care hospital between India and U.K the overall survival rate was (83%) and (87.2%) in India and U.K respectively(37). Retrospective cohort study in Australia which was conducted among neonates less than 32 weeks of gestation showed that hospital survival rates based on gestational age alone were 27%, 59%, 76%, 85%, 91% and over 95% at 23, 24, 25, 26, 27 and 28–31 weeks, respectively(38). Based on the result of a retrospective cohort hospital-based study conducted in Iran, the survival rate was 11.11% for extremely low birth weights and 45.12% to very early preterm birth. The smallest surviving infant in this study was a 750 gram female with gestational age of 30 weeks and the youngest infant was a 970 gram female with GA of 25weeks plus two days of gestational(28). A quality-improvement study conducted in Canada indicates that survival without major morbidity increased significantly from 56.6% to 70.9% across all gestational ages. Survival of preterm born at 23–25 weeks' gestation increased 70.8% to 74.5% (39).

In Africa survival studies conclude findings differently. Retrospective descriptive study in Ghana puts that the overall survival rate at discharge was 60.73% with lowest survival rate in extremely low birth weight 14.3% and extremely preterm babies 20% (40). Prospective hospital cohort study conducted in Kenya found that the overall proportion who survived at discharge was 60.6% with survival rate of 29.6% for infants born less than 28 weeks' gestation, 50% for those born at 28-31 weeks and 75.5% for those born at or above 32 weeks(36).

Studies in Ethiopia found different figures on the survival of preterm neonates. Based on the result of a retrospective cohort study done in Jimma the overall survival at discharge was (65.1%)(31). According to retrospective a cross sectional survival analysis study conducted in Bair Dar the survival rate of extremely very low birth weight, very low birth weight, low birth weight and normal birth weight were 0%, 19.9%, 66.1% and 87.5%, respectively. By gestational age the survival rate was 0%, 19.4%, 40%, 46.7% and 75% for gestational age < 28 weeks, 28–31 + 6 weeks, 32–33 + 6 weeks and 34– 36 + 6 weeks, respectively(32). Based on the result of a cross sectional observational study conducted in five hospitals of Ethiopia,70.69% of the preterm neonates were survivors(30) and in Debre Tabor survivors were 60.9% (22). Study conducted in Black Lion hospital showed that the overall survival was 69.3% with 40% of survival rate below 28 weeks of gestation, 54.5% of 28-31wks of gestation, 74.6% 32-34wks of gestation and the survival rate for late preterm infants was 100%(41).Another prospective descriptive study done in three teaching hospitals of Addis Ababa revealed that the survival rate of preterm neonates was zero %, 9.1%, 31.8%, 55.2%, 57.6%, 77.4%, 90.4%, 98.6% and 98.8% at gestational age of 28, 29, 30, 31, 32, 33, 34, 35, and 36 weeks respectively(34).

2.2. Predictors of mortality among preterm neonates

2.2.1. Socio-demographic Predictors of preterm mortality

Different studies agreed that maternal age, gestational age, sex of the neonate ,birth Wight , place of delivery are major socio-demographic predictors of preterm mortality (22,28,32,41). A study conducted in rural area of Tanzania conclude that neonatal mortality was higher among neonates born from teenage(13–19 years) than those born from older mothers (20 to 34 years) and(35 to 49 years) in which ,46,28 and 31 per 1,000 live births were died respectively)(42) . Another study in Western Uganda found that maternal age ≥35 years was predictor of preterm mortality (43) where as a study conducted in South Brazil said that maternal age and educational status were statistical insignificance to extremely preterm death(35). A prospective cross sectional descriptive study done in three teaching hospitals of Addis Ababa identified that being born from married mother (AOR 3.9) has better chance of neonatal survival (34).

In reference to different studies, neonatal demography such as birth weight, gestational age and sex were predictors of preterm mortality. A retrospective cohort hospital based study in Iran

showed that early preterm births and very early preterm births(28) which is partially in line with the study conducted in Western Uganda <28 weeks' gestation were predictors of preterm mortality (43). A retrospective case-control study conducted in Nigeria conclude that neonatal survival was independently associated with gestational age at >32 weeks of gestation(44) which is almost similar with a prospective cohort hospital based study conducted in Kenya GA of ≥ 32 weeks (HR 0.39), birth weight >1000g (HR 0.27) (36).Regarding about both gestational age and birth weight, a study done in western Uganda found that small for gestational age was significant factors of preterm mortality(43).

A retrospective study done in Brazil on preterm neonates <32 weeks of gestation identified that being male was greater risk of death than female neonates with (HR 1.39)(35). This finding was in line with the study done in western Uganda (43) whereas a study conducted in Iran didn't found a significant difference among male and female sex for mortality(28). Case control study conducted in Lusaka, Zambia found that male preterm neonates had more risk of mortality than females (45). According to the conclusion of a study done in Jimma 45.3% were female having death proportion of 15.5% lower than males 19.4% (31). One study in Ethiopia generalized that being female and higher educational level of the mother were predictors of preterm mortality(30) but another studies conducted in Debre Tabor(22) and Addis Ababa(23) found that being male was a significant predictors of preterm mortality.

According to the study conducted in Iran, low birth weight, very low birth weight and extremely low birth weight were risk factors for mortality in preterm neonates(28). Based on the result of a study conducted in Aksum University age and birth weight were predictor for the occurrence of preterm death (33). Another study conducted in five hospitals of Ethiopia conclude that birth weight 1500 gram and above was protective predictor to preterm mortality(34).In reference to another study conducted at Debre Tabor gestational age less than 32 weeks and being extremely very low birth weight were predictors of preterm death(22).This result was similar with a study conducted in Gondor by the variable gestational age (24) and in Addis Ababa by the variable extremely prematurity(23).

2.2.2. Maternal medical, pregnancy and obstetrics predictors of preterm mortality

According to prospective cohort study conducted in tertiary hospital in Western Uganda no antenatal care, greater than four anti natal follow up visits, singleton pregnancy were predictors of preterm mortality(43) which is similar with a study conducted in Brazil which said that attending less than four prenatal care visits was considered as a risk for extremely preterm deaths compared to four or more visits (HR 1.21)(35). Another prospective cohort study in Kenya stated that maternal antenatal care attendance (HR 0.52) was predictors of preterm survival(36). Another study conducted in South Brazil which concluded that cesarean delivery was a protective factor for extremely preterm death (35). In reference to the result of a prospective, cross-sectional, and observational study conducted in Ethiopia, no antenatal care visit was predictors of preterm mortality(30).

A retrospective case study in Trinidad conclude that obstetric complications has significantly related to preterm neonatal death (46). Another study conducted in South Brazil concluded that cesarean delivery was a protective factor for extremely preterm death (35). Prospective cohort study in Kenya revealed that caesarian section delivery was associated with increased risk of preterm death (HR 4.26) (36) where as another study conducted in Ethiopia found that vaginal delivery was predictor of preterm mortality(30).

A prospective cohort study in Tanzania found that antepartum hemorrhage was predictor of preterm mortality (HR:3.32)(47). Based on the result of a retrospective case-control study in Nigeria maternal febrile illness and polyhydramnios adversely affect neonatal survival(44). According to this study antenatal dexamethasone, pre-labor premature rupture of membranes and delivery after at least 24 hour of commencement of dexamethasone were positive predictors for preterm survival(44). Another retrospective cohort study conducted in Debre Tabor conclude that ,preterm neonates born from preeclampsia/eclampsia mother were 1.95 times more hazard of death than preterm neonate born from non-preeclampsia/eclampsia mothers(22).

Retrospective cohort study conducted in Black Lion Hospital found that maternal diabetic mellitus (AHR:2.29) was predictor of preterm mortality(23). In reference to a prospective cohort study done in Uganda preterm neonates born from HIV-positive mothers have increased mortality hazard compared with babies born from (HIV)-negative mothers (HR: 49)(48).

2.2.3. Clinical related predictors of preterm mortality

Preterm babies are at risk for numerous medical problems affecting different organ systems. Studies in different part of the world search out different results. Based on retrospective descriptive study conducted in Ghana, hypothermic preterm neonates at presentation were 7.2 times more likely to die than normo-thermic preterm neonates (40). This finding was similar with a prospective cohort study done in western Uganda (43). Another retrospective cohort study conducted in Bahr Dar conclude that abnormal admission temperature was statistically significant variables to preterm death (32) which agreed to a study conducted in Jimma (31).

Respiratory distress is predictors of preterm mortality in many studies. According to a study conducted in Ghana preterm neonates having respiratory distress syndrome were 10.2 more likely to die (40) which was in lined with a study done in Western Uganda (43) and Tanzania (HR:8.14) (47). In reference to retrospective cohort studies conducted in Bahir Dar (32) and Addis Ababa(AHR:1.54)(23) respiratory distress syndrome was predictor of preterm mortality.

Hypoglycemia is among the commonest fatal causes of preterm mortality. Different studies agreed with this fact. Institution-based cognitive study conducted in Axum(33) and retrospective cohort study done in Gondar university (AHR=1.75) (24) identified that hypoglycemia was the predictors of preterm mortality.

Based on the result of retrospective descriptive study conducted in Ghana, preterm babies having jaundice at admission were 2.9 times more likely to die compared to neonates who did not have this comorbidities(40). Another retrospective cohort study conducted in Bair Dar said that hyper bilirubinemia was statistically significant variable to preterm death (32). This was similar to the result of a study conducted in Jimma (31) and Gondar university (AHR=1.62) (24).

Low APGAR score is other predictors of preterm mortality supported by different studies. A retrospective study conducted in Nigeria revealed that low APGAR score at 5 minutes was predictors of preterm mortality(49). Another study conducted in Tanzania described that low APGAR score <7 at 1st minute (HR: 14.03) was predictors of preterm death (47). A retrospective cohort study conducted in Bahir Dar (32) and in Jimma(31) found that PNA was predictor of preterm mortality.

In reference to another study conducted in Axum university hospital, low first and fifth APGAR score(<6) were predictors of preterm mortality(33). This study was in lined to the finding of a retrospective cohort study conducted in Addis Ababa Black lion hospital which disclosed that low first and fifth minute APGAR score(AHR:3.11) and (AHR:0.51) respectively were identified as predictors of preterm mortality respectively(23).

According to a study conducted in Jimma University (31) sepsis was predictors of preterm death which is similar with a study conducted in Black Lion hospital (AHR:1.62) (23).

Based on the result of the study conducted in Bahir Dar NEC and HAI were statistically significant variables for mortality of premature neonates(32).

2.2.4. Treatment and Health service-related predictors of preterm mortality

A prospective cohort study done in Uganda noted that preterm neonates who hadn't received KMC had six-fold increase mortality hazard compared with those who did (AHR 6.4). This study revealed that preterm neonates who were not exclusively breastfed had a four-fold increase of mortality hazard compared to those exclusively breastfed(HR=4.4) (48). Similarly another study conducted in Axum University hospital said that lack of kangaroo mother care and breastfeeding initiated were the predictor factors for preterm death (33). According to the study conducted in university of Gondor, the risk of death among pre-term neonates received kangaroo mother care was lowered by 73% (AHR=0.25) (24) and another study conducted in Addis Ababa Black lion hospital breast feed initiating was protective factors of preterm mortality(23).

High nursing patient provision ratio (>1) were associated with a lower risk of the composite outcome relative to low ones (<1) and high nursing provision ratio during NICU hospitalization is associated with a lower risk of a composite adverse outcome in very preterm infants (50). Another study suggests that decreases in the provision of one to one nursing in tertiary level neonatal intensive care units increase in-hospital mortality rate (51).

2.3. Conceptual Frameworks

Different predictor variables are responsible for preterm mortality. These predictors are presented by the following conceptual frame work which was adapted from different literatures (23,24,32).

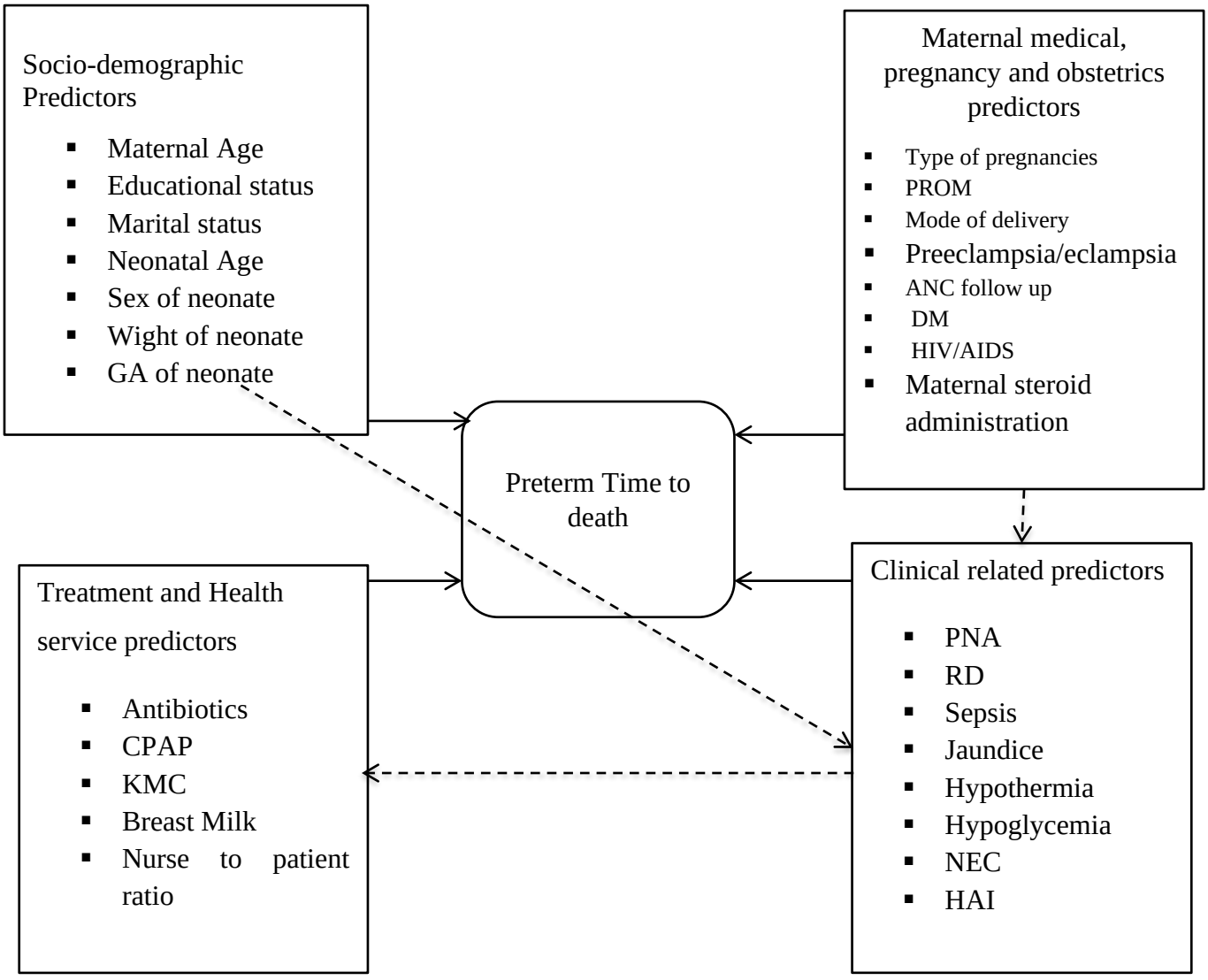

Figure 1: Conceptual frame work on the assessment of survival status and predictor of mortality among preterm neonate admitted to neonatal intensive care unit of Addis Ababa public hospitals, Ethiopia, 2021.

2.4. Justification of the study

Preterm mortality is the leading cause of neonatal mortality yet unresolved especially in developing countries like Ethiopia. Preterm mortality is not only a burden on the image of the country but also it has devastating social, psychological, and economic factors in the quality of the family and the community life. Therefore, preterm mortality should be decreased, to do so identifying the hazard time and predictors of preterm mortality in relation to time to death was an important information source to intervene accordingly. To the best of our awareness, there is a dearth of reliable information done in the study area at multicenter level on time to death and predictors of time to death. So, it is wise to produce data about time to death and predictors of time to death to guide policy and decision-makers in the process of decreasing preterm mortality. Generally, the predisposing factors of this study were the burden of preterm mortality and inadequate information regarding about time to death and predictors of mortality in relation to time.

2.5. Significance of the study

The finding from this study will be used by different policy makers, international and local organizations as a recent input or evidence for planning and investing to improve preterm health. Studies about time to death and predicators of mortality especially those conducted prospectively are limited not only in our country but also in Africa. So, this study will fill this gap. Since science and technologies are growing quickly, updated data will be mandatory for evidence-based intervention and this study will be useful to plan different interventional programs. Furthermore, the finding will also be helpful for the government of Ethiopia in revising different protocols and guidelines. The main objective of this study is to determine time to death; which will be so advantageous for professionals working in neonatal intensive care unit to intervene timely and to follow critically wit in the hazard time to death. The result of this study will also be useful for professionals working in antenatal care unit, labor and delivery wards to plan on the prevention of preterm delivery. Generally, this study will have multiple use for health care professionals, community, policy makers, researchers, governmental and nongovernmental organizations and technologists that are working in reducing death related preterm birth.

3. OBJECTIVES

3.1. General Objective

- To assess survival status and predictors of mortality among preterm neonates admitted to neonatal intensive care unit of Addis Ababa public hospitals, Ethiopia, 2021.

3.2. Specific Objectives

1. To assess incidence density proportion of death among preterm neonates admitted to Addis Ababa public hospitals from Feb 12-May 12, 2021, Ethiopia,
2. To determine time to death among preterm neonates admitted to neonatal intensive care unit of Addis Ababa public hospitals from Feb 12-May 12, 2021, Ethiopia.
3. To identify predictors of time to death among preterm neonates admitted to neonatal intensive care unit of Addis Ababa public hospitals from Feb 12-May 12, 2021, Ethiopia.

4. MATERIALS AND METHODS

4.1. Study Area

The study was conducted in Addis Ababa, the capital and largest city of Ethiopia. It is located on a well-watered plateau surrounded by hills and mountains, in the geographic center of the country with a total population of 4.8 million people. It is the political capital of Africa, where the African Union is headquartered and based. It is also the a sit for the United Nations Economic Commission of Africa (52,53).

The city has twelve public Hospitals among these, six hospitals (Gandhi memorial hospital , Yekatit 12 hospital medical college, Zewditu memorial hospital, Ras-Desta Damtew memorial hospital, Menelik II referral hospital, Tirunesh Beijing general hospital) are governed by Addis Ababa health bureau and the rest five (St' peter Specialized hospital, St' Paul's Hospital millennium medical college hospital, Amanuel hospital, Alert hospital and Eka Kotebe hospital are governed by federal ministry of health and one university hospital (Tikur Anbessa Specialized Hospital).

All of these hospitals except Amanuel hospital have their own neonatal intensive care unit. So, the study was conducted in five randomly selected public hospitals of Addis Ababa. These are Black Lion, Gandhi memorial, Ras-Desta Damtew memorial, Yekatit 12 Hospital Medical College and St. Peter Specialized Hospitals.

4.2. Study Design and Period

An institutional based prospective cohort study was conducted from February 12-May 12, 2021.

4.3. Population

4.3.1. Source of Population

All preterm neonates admitted to NICU in selected public hospitals of Addis Ababa

4.3.2. Study Population

All preterm neonates admitted to NICU of selected public hospitals in Addis Ababa from Feb 12 to May 12, 2021

4.4. Inclusion and Exclusion Criteria

4.4.1. Inclusion Criteria

All alive neonates admitted to NICU by the diagnosis of preterm in selected public hospital with in the study period were included.

4.4.2. Exclusion Criteria

Preterm neonates diagnosed with major congenital anomaly (neural tube defect, congenital cardiac disease, GI or abdominal wall defect and syndrome) were excluded.

Preterm neonates born from mothers whose data becomes difficult to access by any means were excluded.

4.5. Sample Size Determination and Sampling Procedure

4.5.1 Sample size calculation

Sample size was determined by using Z α/2 and Zβ as 1.96& 80% at 95% confidence level respectively. Taking 29.7% proportion of death of preterm neonates(23). For the proportion of preterm mortality, the first sample size was calculated using the formula;

n=$\frac{(Za/2)2\ x\ p(1-p)}{d^2}$, n= $\frac{(1.96)^2\ X\ 0.297(1-0.297)}{(0.05)^2}$=320.836≈321, by adding 10%, it will be 353.

Sample size calculation for different factors associated with sunlight exposure:

To determine the required sample size for the second specific objective, different factors which were significantly associated with preterm mortality was considered with the following assumption; 95% confidence level, Margin of error=5%=0.05 and 10% of non-respondent rate /with drawl/. The calculated sample size for selected variables and maximum sample size was taken for the required sample size.

Different variables that have high contribution for preterm mortality were selected based on the hazard ratio by considering two previous studies in Black lion(29.7%)(23) and Debre Tabor hospital(31.2)(22) respectively. Three variables were selected from each study having the maximum hazard ratio from the predictors. The formula used to calculate is N=E/P (E), and by using STATA the following table is found to be the result (Table1).

Table 1: Sample size calculation for predictors of preterm mortality among preterm neonates admitted to neonatal intensive care unit of Addis Ababa public hospitals, Ethiopia, 2021.

Predictors	Hazard Ratio	Adjusting for censoring	Calculated from STATA	Total sample size after 10% non-response rate
Eclampsia/pre-eclampsia(22)	1.95		251	251
Extremely very low birth weight(22)	**2.94**		**97**	**97**
Gestational age less than 32 weeks(22)	**1.74**	0.312	**365**	**365**
DM(23)	2.29		172	172
Extremely preterm(23)	2.87		106	106
Low first minute APGAR score (23)	3.11	0.297	92	92

From this calculation the maximum sample size was 365.

4.5.2 Sampling Procedure

Three-month average base line preterm admission data was taken from HMIS from each selected hospital. Based on the data Gandhi memorial hospital had 180, Yekatit 12 hospitals medical college had 118, Black Lion Hospital had 130, Ras-Desta Damtewu hospital had 87, and St. Peters specialized hospital had 45 average preterm admissions per three months. The total population was less than twice of the sample size, and the k value was 1.53. Therefore, by using systematic sampling technique, from each three consecutive preterm admissions that full fulfill the inclusion criteria, two participants were selected randomly by lottery method until the required sample size

was achieved in each hospital. If the recruited sample index mother refuses to participate the next admission was recruited.

By using proportional allocation formula 117, 85, 77, 57 and 29 preterm neonates were recruited from Black Lion Hospital, Gandhi Memoral Hospital, Yekatit 12 hospitals medical college, Ras-Desta Damtewu Memrial Hospital and St. Peter Specialized Hospital respectively (Fig.2).

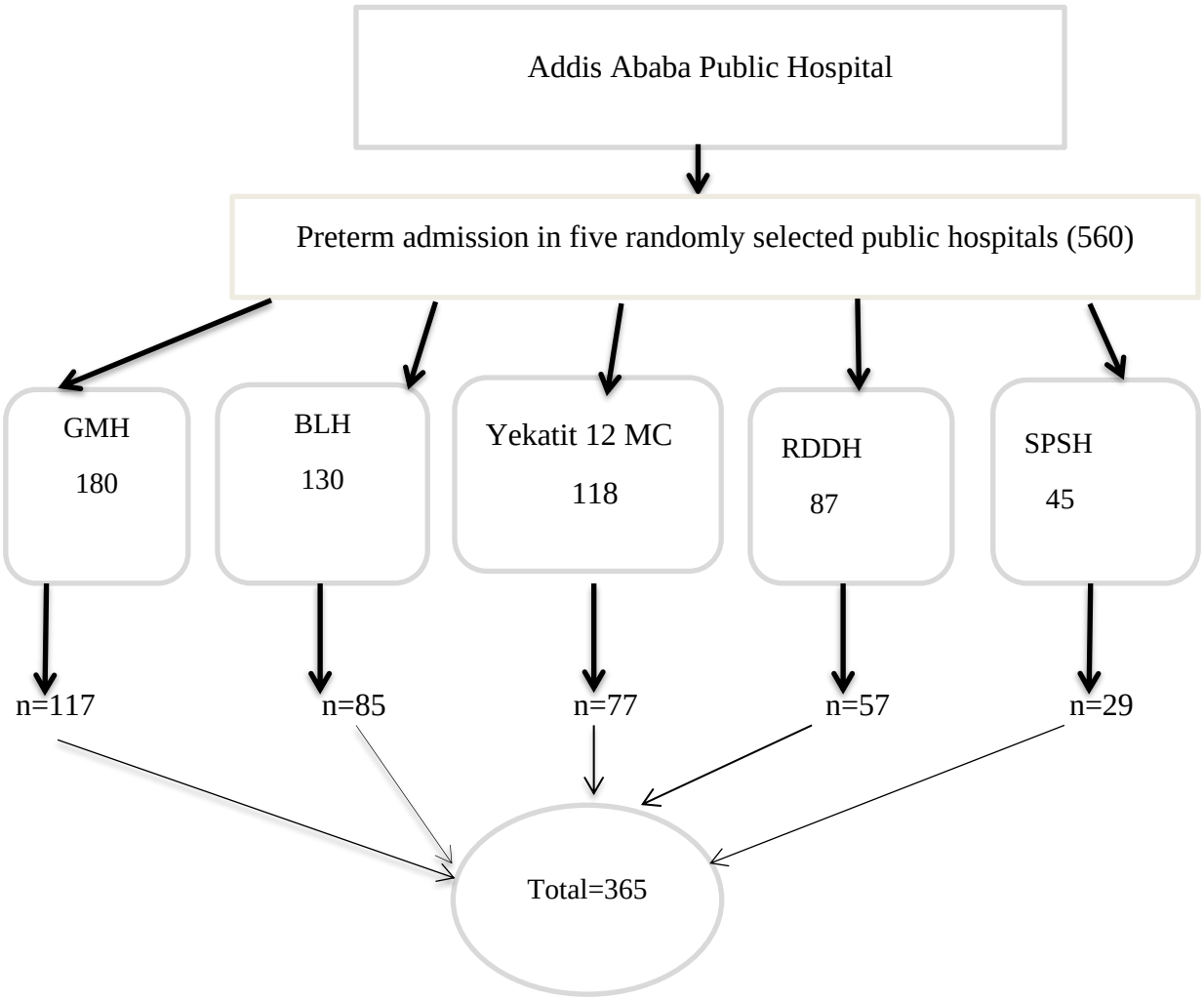

Figure 2: Schematic presentation of proportional allocation of to assess survival status and predictors of mortality among preterm neonates admitted to neonatal intensive care unit of Addis Ababa public hospitals, Ethiopia, 2021.

4.6. Study Variables

4.6.1. Dependent Variable

Time to death

4.6.2. Independent Variables

Socio-demographic variables; sex, residence, maternal age, educational status, income of mother, weight of neonate, age of neonate, date of admission and discharge.

Maternal obstetrical and medical predictors; multiple pregnancies, PROM, mode of delivery, preeclampsia, abruption placenta, ANC follow up, steroid administration, hypertension, DM, HIV/AIDS and sepsis

Neonatal medical/clinical variables; PNA, RD, sepsis, jaundice, hypothermia, hypoglycemia, NEC

Treatment and health service variables; antibiotics, CPAP, KMC, Nurse to patient ratio and trophic feeding.

4.7. Operational Definitions/ Definition of Terms

Appropriate for gestational age (AGA): The percentile of birth weight to gestational age is 10% and 90%) (5)

Died: preterm neonate who died during the follow-up within 28 days after birth and had death summery

Censored: preterm neonates who left the follow up without event (transferred to another institution, left against medical advice, discharged and preterm stays more than 28 days)

Event: preterm neonate who died during the follow-up

Extremely low birth weight: neonates born with less than 1000 gram of birth weight (5)

Extremely preterm: neonates born less than 28 weeks of gestation (4)

Feeding: feeding stands for either trophic or full feeding

Follow up time period: Time from recruiting up to either the study subjects died or censored

KMC: In this study KMC include both intermittent or continuous

Large for gestational age (LGA): The percentile of birth weight to gestational age > 90%) (5)

Late preterm: neonates born at 34 to 36 weeks and 6days of gestation (4)

Low birth weight: neonates born with 1500-2499 gram of birth weight (5).

Moderate preterm: neonates born at 32 to 33 weeks and 6days of gestation (4)

Normal birth weight: neonates with 2500-3999 gram of birth weight (5)

Under extreme Poverty: (≤1500ETB) (54)

Under poverty: (1501-2400ETB) (54)

Above Poverty: (>2400ETB) (54)

Preterm: neonates who are diagnosed as preterm either by last normal mensuration period, by Ballard score or using early ultrasound (20weeks)

Small for gestational age (SGA): the percentile of birth weight to gestational age is less than10% (5)

Time to death: time at which the neonates died during the follow up.

Very low birth weight: neonates born with (1000-1499 gram) of birth weight (5)

Very preterm: neonates born from 28 to 32 weeks of gestation (4)

4.8. Data Collection Tools and Procedures

Data collection tool was adapted from different studies with some modification (23,24,32). Study participants were recruited at admission by the principal investigator and followed during their stay in the facility, taking note of all significant clinical events until either they become censored or dead. Readmitted neonates were managed according to their previous participation status in the study. In each study site trained nurses collected the data and those data collectors were followed by the supervisors. The principal investigator followed the data collection process. Maternal data were collected by using direct interview and medical chart review. Neonatal data were collected

from medical record prospectively until the study participant was died or censored. The maximum time of follow up in the ward was 28 days from birth.

4.9. Data Quality Control and Management

Before starting data collection, tool was checked by neonatologists and research experts. The tool was pretested on 20 preterm neonates at Menelik II Memorial hospital for its applicability and appropriateness. Place of delivery and censor type were added to the tool after pretest. Strict efforts were made to assure the data quality starting from data collection up to data analysis. Two days training was given for data collectors and supervisors about research protocols. The supervisors inspected all the activities of the data collectors and assessed data quality daily. Before the data entry, it was checked for completeness and consistency by the principal investigator. Data entry was made by the principal investigator. Data was cleaned and sorted using Epi Data software version 4.6. The tool was checked by expert neonatologist

4.10. Data Analysis

Preterm death was the event of interest coded as "1" and "0" for censored. Time to death was calculated in days using the time interval between the time of admission and the time of death. Information about the number of deaths was collected starting from admission up to time of death based on the tool. Data was entered and cleaned by using EPi Data version 4.6 and transported to SPSS version 25 for recoding and then transported to STATA version 14 for analysis. Multicollinearity test was done and the variable chorioamnionitis was omitted by the software (STATA) due to multicollinearity with the variable oligo/polyhydramnios. Model fitness was tested by using Schoenfeld residuals test for proportionality assumption of each covariate and overall model of the stratified Cox Proportional Hazard. So based on this test, the model was fitted with p-value of >0.05 and global test result of 0.146.

Descriptive statistics was used to describe the frequencies, percentages, rates and to calculate the median and standard deviation after checking the distribution of the data. Kaplan Meier failure curve was used to show the pattern of death, estimate probability time to death and to compare the failure curves. Log rank test was used to look statistical differences among or between the categories of variables to be included in the Cox-proportional hazard model.

Bivariate Cox regression was first fitted and those independent variables having p-value ≤ 0.25 level of significance were included in the multivariable analysis. Cox proportional-hazard regression was fitted at 5% level of significance to determine the net effect of each explanatory variable on outcome variable (HR with its 95% confidence interval and p-values were used to measure strength of association and identify statistically significance). P-value < 0.05 was considered as statistically significant association. Finally, the results of the study were presented with text, graph and table

4.11. Ethical Consideration

Ethical approval was obtained from Institutional Review Board of AAU, college of health science. Permission was sought from each hospital. Study participants were asked for their willingness to participate in the study after explaining the purpose of the study. Written informed consent was obtained from each participant. The privacy of the study participants and confidentiality of information was strictly maintained by omitting any personal identifier during the data collection.

4.12. Dissemination Plan

The result of this study will be disseminated to, Addis Ababa University College of health science, to the selected health facilities, Addis Ababa health bureau, Federal Ministry of Health. Lastly, it will be submitted for publication in peer reviewed and reputable journal.

5. RESULT

5.1. Socio-demographic characteristics of the study participants

During the study period, there were a total of 593 preterm admission, of those 43 were excluded due to congenital anomaly. A total of 365 neonates with their index mothers were involved initially but 7 preterm neonates were diagnosed with the exclusion criteria after they had been recruited to the study. Response was obtained from 358(98.1%) participants out of these preterm neonates, male were 190 (53.07 %) and females were 168 (46.9%). The mean age of the mother was 27.4 ±4.7SD years. The maximum and minimum maternal ages found in this study were 18 and 40 respectively. In this study 89(24.8%) mothers had no formal learning, 90(25.1%) primary education, 31(8.7%) secondary education 79(22.1%) technical/vocational and 69(19.3%) higher educational level. Most 313(87.4) mothers are living in urban. More than half 221 (61.73 %) of the neonates were admitted at the age of less than 24 hours and the rest 137 (38.27%) were admitted at the age of 24 and above. The smallest weight and the youngest gestational age recorded in this study were 600gram and 27 weeks respectively (Table 2).

Table 2: Socio-demographic characteristics of preterm neonate and their index mothers among those admitted to neonatal intensive care unit of Addis Ababa public hospitals, Ethiopia, 2021.

Variables	Categories	Total	Status	
		Number (%)	Died (%)	Censored (%)
Marital Status	Single	23(6.4)	10(8)	13(5.5)
	Married	330(92.2)	112(89.6)	218 (93.5)
	Divorced	5(1.4)	3(2.4)	2(0.8)
	Governmental	92(25.6)	27(21.6)	65(27.9)
	Private	87(24.3)	33(26.4)	54(23.2)
Occupation	Merchant	32(8.9)	12(9.6)	20(8.5)
	Farmer	4(1.1)	1(0.8)	3(1.3)
	House wife	113(31.6)	42(33.6)	71(30.5)
	Other	30(8.4)	10(8)	20(8.6)
	Under extreme Poverty	31(8.7)	15(12)	16(6.8)

Average household monthly income	Under poverty	51(14.2)	15(12)	36(15.5)
	Above Poverty	276(77.1)	95((76)	181(77.7)
Birth Weight	EVBW	15(41.8)	13(10.4)	2(0.9)
	VLBW	99(27.7)	69(55.2)	30(12.8)
	LBW	211(58.9)	41(32.2)	170(73)
	NBW	33(9.2)	2(1.6)	31 (13.3)
Gestational age	Extreme Preterm	7(1.9)	7(5.6)	0(0)
	Very Preterm	109(30.5)	79(63.2)	30(12.9)
	Moderate Preterm	59(16.5)	19(15.2)	40(17.2)
	Late preterm	183(51.1)	20(16)	163(69.9)

***Other: student, labor work**

5.2. Maternal medical, pregnancy and obstetrics related characteristics

Almost all 349 (97.5%) index mothers of this study had ANC follow up, of whom around three quarter 238(66.5%) of them had four or more antenatal visit whereas only 39(10.9%) of the mothers have less than four antenatal visits. Around quarters 100 (27.9%) of the mothers had multiple pregnancies the rest 258(72.1%) had single pregnancy type. Almost all 349(97.5%) of the mother had delivered in health institution and only 9(2.5%) gave birth at home. Nearly half of 188(52.5%) the neonates were born via SVD and 161(45%) of them were via C/S, the rest 9(2.5%) were born instrumentally. Significant majority 316(88.3%) of the mothers had risk for preterm delivery. Around one-third 109(30.4%) of the mothers were preeclamptic and /or eclamptic and only 22(6.2%) of the mothers had oligo/polyhydramnios (Table 3).

Table 3: Maternal medical, pregnancy and obstetrics related characteristics of index mothers among preterm neonates admitted to neonatal intensive care unit of Addis Ababa public hospitals, Ethiopia, 2021**.**

Variables	Total (%)	Status	
		Died (%)	Censored (%)
VDRL test Result			
Non-reactive	346(96.7)	119(95.2)	227(97.4)
Reactive	9(2.5)	5(4)	4(1.7)
Unknown	3(0.8)	1(0.8)	2(0.9)
Steroid administration			
Yes	144(40.2)	53(42.4)	91(39.1)
No	214(59.8)	72(57.6)	142(60.9)
Dose of Steroid			
One dose	20(13.9)	9(16.9)	11()12.1)
Two Dose	27(18.8)	17(32.1)	10(10.9)
Three Dose	23(15.9)	7(12.3)	16(17.7)
Four(full dose)	74(51.4)	20(37.7)	54(59.3)
PPROM			
Yes	124(34.6)	53(44.6)	71(36.4)
No	234(65.4)	66(55.4))	124(63.6)
APH			
Yes	32 (8.9)	18(14.4)	14(6)
No	326(91.1)	107(85.6)	219(94)
Present of Chronic illness			
Yes	42(11.7)	19(15.2)	23((9.8)
No	316(88.3)	106(84.8)	210(90.2)

5.3. Neonatal admission diagnosis related predictors

Most 313(87.4%) neonates were appropriate for gestational age, only 42 (11.7%) and 3(0.8) of preterm neonates were SGA and LGA respectively. In this study EONS was found in significant majority of the neonates 309(86.8%) followed by RD 275 (76.8%). More than half 192(53.6%) of the neonates were hypothermic at admission (Table 4).

Table 4: Neonatal admission diagnosis related predictors among neonates admitted to neonatal intensive care unit of Addis Ababa public hospitals, Ethiopia, 2021.

Variables	Total (%)	Status	
		Died (%)	Censored (%)
1st minute APGAR score			
<3	20(5.6)	13(10.6)	7(3.1)
3-6	142(40.2)	59(47.9)	83(35.9)
>=7	192(54.2)	51(41.5)	141(61)
5th minute APGAR score			
<3	3(0.8)	3(2.4)	0(0)
3-6	59(16.7)	29(23.6)	30(12.9)
>=7	292(82.5)	91(73.9)	201(87.1)
EONS			
Yes	309(86.3)	116(95.1)	190(81.5)
No	49(13.7)	6(4.9)	43(18.5)
NHB			
Yes	38(10.6)	2(1.6)	10(4.3)
No	320(89.4)	123(98.4)	223(95.7)
PNA			
Yes	80(22.3)	52(41.6)	28(12)
No	278(77.7)	73(58.4)	205(88)

5.4 New medical problem identified during the follow up

Majority 277(77.4%) of the neonate's had developed new medical problem during the follow up. Of those new medical problems observed during the follow up, nearly half 170(47.5%) of the neonates developed hyperbilirubinemia (Table5).

Table 5: New medical problem during the follow-up period among preterm neonates admitted to neonatal intensive care unit of Addis Ababa public hospitals, Ethiopia, 2021.

	Total (%)	Status	
		Died (%)	Censored (%)
HAI			
Yes	98(27.3)	61(48.8)	37(15.9)
No	260(72.7)	64(51.2)	196(84.1)
NEC			
Yes	87(24.3)	65(52)	22(9.4)
No	271(75.7)	60(48)	211(90.6)
NHB			
Yes	170(47.5)	74(59.2)	96(41.2)
No	188(52.5)	51(40.8)	137(58.8)
Apnea			
Yes	120(33.5)	96(76.8)	24(10.3)
No	238(66.5)	26(23.8)	209(89.7)
Thrombocytopenia			
Yes	136(38)	71(56.8)	65(28.9)
No	222(62)	54(43.2)	168(72.1)
Dehydration			
Yes	84(23.5)	65(52)	19(7.7)
No	274(76.5)	60(48)	225(92.3)

5.5. Treatment related predictors of preterm neonates

More than half of neonates 233(65.1%) were cared by greater than 1 to 2 patient nurse ratio in their hospital stay. Among those preterm babies 232(64.8%) had received CPAP for respiratory support the rest 126(35.2) didn't get CPAP. Initiation of CPAPA in nearly half of the neonates 123(53%) was after admission and only 2(0.8%) of neonates had started CPAPA in delivery room before transportation to NICU. The most widely used CPAPA type in this study was homemade (homegrown) CPAP. Significant majority 337(94.1%) of preterm neonates had received antibiotics. Among neonates who didn't start feeding within the first 24 hours of admission, 50 (87.7%) were died and only 7(12.3%) survived (Table 6).

Table 6: Treatment related predictors among preterm neonates admitted to neonatal intensive care unit of Addis Ababa public hospitals, Ethiopia, 2021.

Variables	Total (%)	Status	
		Died (%)	Censored (%)
Time of CPAP initiation			
Since delivery	2(0.8)	0(0)	2(1.8)
At admission	107(46.2)	31(25.8)	76(67.8)
After admission	123(53)	89(74.2)	34(30.4)
Types of CPAP			
Diamedica	110(47.4)	48(40)	62(55.4)
Homegrown(homemade)	122(52.6)	72(60)	50(44.6)
KMC			
Yes	58(16.2)	15(12)	43(18.5)
No	300(83.8)	110(88)	190(81.5)
Nurse to patient ratio			
1:1	6(1.7)	2(1.6)	4(1.7)
1:2	119(33.2)	12(9.6)	107(45.9)
>1:2	233(65.1)	111(88.8)	122(52.4)

5.6. Overall survival and mortality of preterm neonates

In this study a total of 358 preterm neonates were followed for up to 28 days of age starting from admission up to the occurrence of outcome. Among those preterm neonates 125(34.9) of the neonates died with the incidence rate of 36.4/1000 neonates-day (Fig.3).

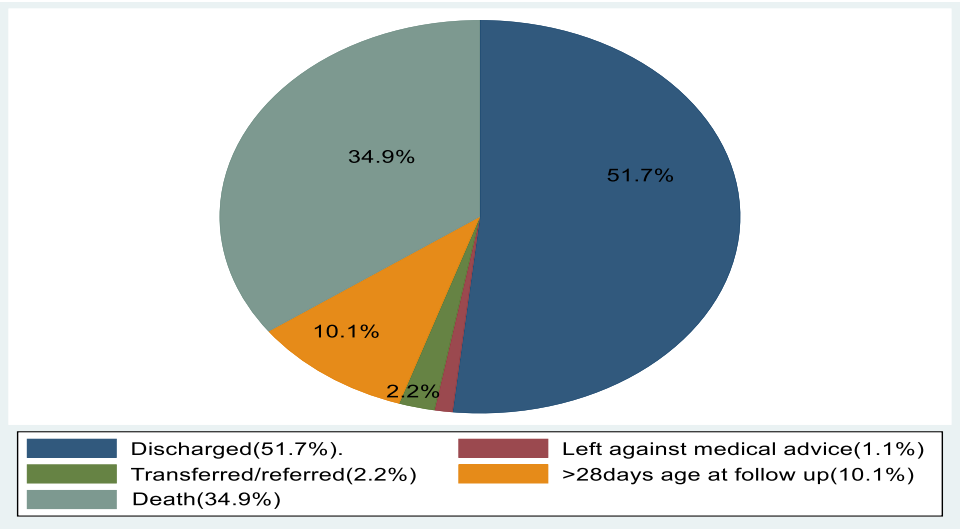

Figure 3: over all outcomes of preterm neonates admitted to neonatal intensive care unit of Addis Ababa public hospitals, Ethiopia, 2021.

Most neonates 105 (84%) died in the first seven days after admission, 8 (6.4%) died before one days after admission, 48(38.4%) between one and three days from admission, above three days up to 7 days of admission 49 (39.2%) and the rest 20(16%) of the neonates died between 7 and 28 days of life (above seven days of admission). The total incidence rate was 36.4/1000 (CI: 0.031 - 0.044) neonate - days observation.

The mean, median and standard deviation of time to death of the entire cohort was 9.6, 6 and 8.7days respectively. The minimum follows up times observed in this cohort was 0.08days and the maximum was 28 days. There were no survivors observed in the cohort of less than 28weeks of gestational age and the survivors of those preterm neonates having less than 1000gram were only two from a total of 15 preterm neonates.

The cumulative failure of preterm neonates was low in the first day after admission, which increases as follow up time increases up to 28 days of age. At the end of first day of hospital stay the failure was 3.6%, at the end of 3rd day 15.88% which increase to 33.9% at the end of seven

days and 45.5% on 28 day of follow up. As length of hospital stay increases the hazard of time to death will increase (Fig 4).

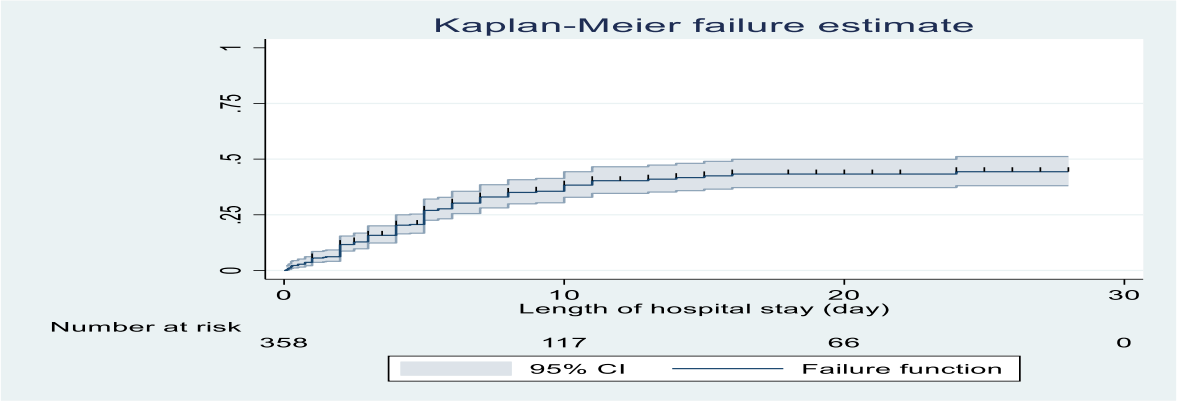

Figure 4: Kaplan-Meier failure estimate of time to death among preterm neonates admitted to neonatal intensive care unit of Addis Ababa public hospitals, Ethiopia, 2021.

5.7. Mortality and Comparison of time to death for different categorical variables

In this study neonates having extremely very low birth weight, very low birth weight and low birth weight had higher risk of death than those born with normal birth weight. According to this study, 86.7% of neonates born with birth weight less than 1000gram and 69.7% of the neonates with birth weight of 1000-1499gram were died. The median hazard time to death of extremely very low birth weight and very low were 3 and 5days respectively which was shorter than time to death of neonates having normal birth weight which was 7days (Fig.5).

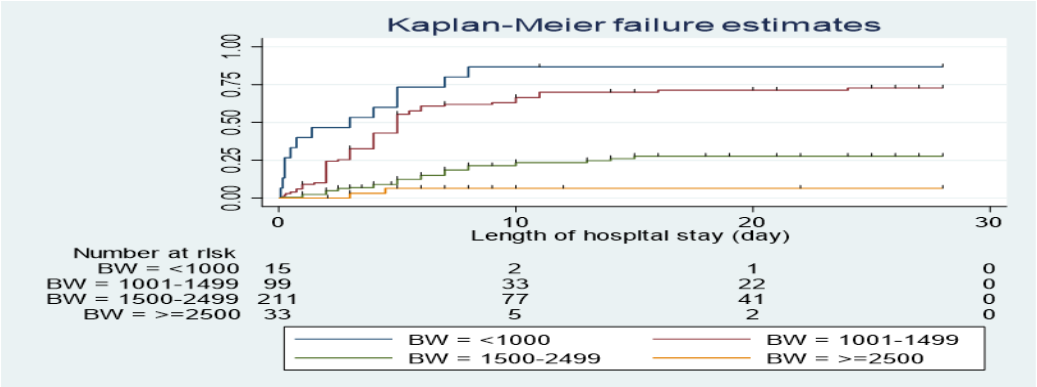

Figure 5: The Kaplan-Meier failure estimates compare time to death of neonate with categories of birth weight among preterm neonates admitted to neonatal intensive care unit of Addis Ababa public hospitals, Ethiopia, 2021.

This study also showed that neonates who developed dehydration during the follow up time had increased risk of death than preterm those didn't develop dehydration in their stay. The median hazard time to death was 5 days which was shorter than those neonates with no dehydration (7days) (95%CI: 1.3-4.7) (Fig.6).

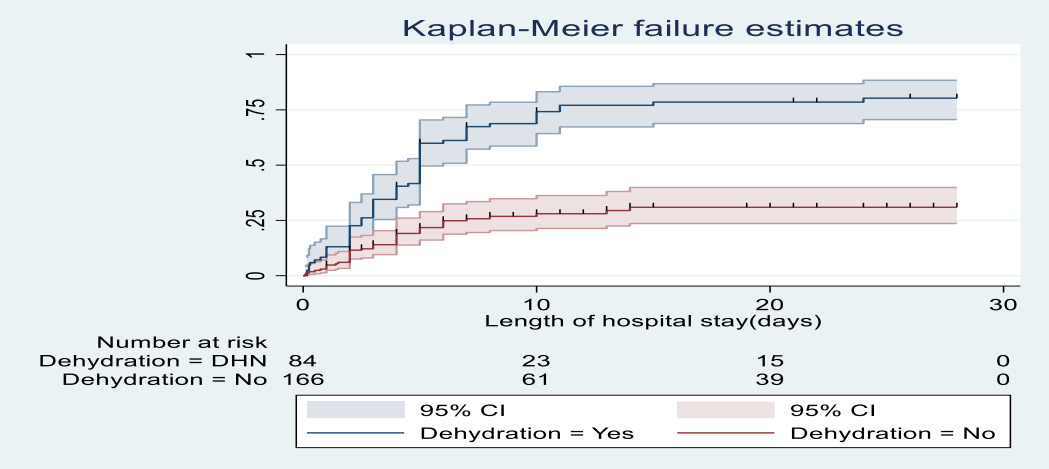

Figure 6: The Kaplan-Meier failure estimates compare time to death of premature neonate with categories of dehydration among those admitted to neonatal intensive care unit of Addis Ababa public hospitals, Ethiopia, 2021.

Preterm neonate born to APH mothers had increased risk of death compared to preterm neonate born from mothers who had no APH with the median hazard time to death of 4.5 days and 6 days respectively (95%CI:1.4-6.6)(Fig.7).

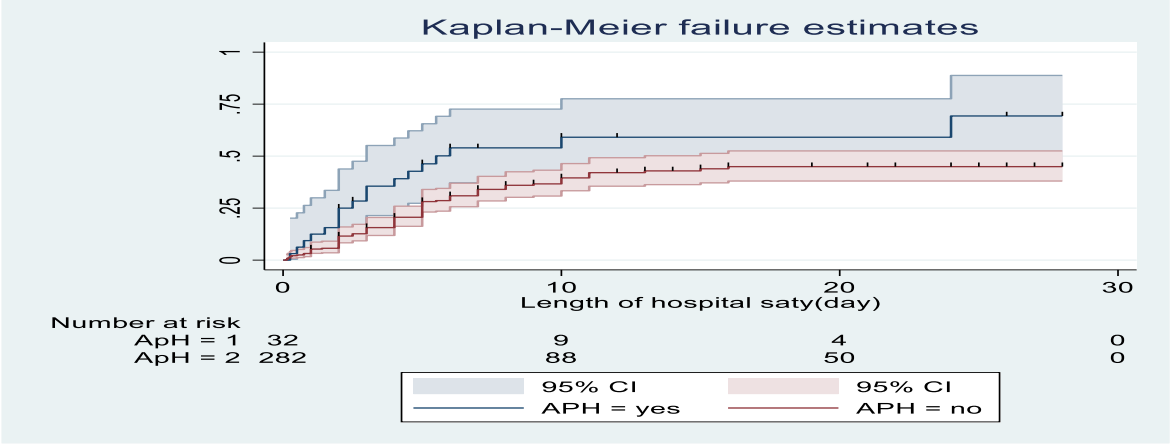

Figure 7: The Kaplan-Meier failure estimates compare time to death of premature neonate with categories of APH among those admitted to neonatal intensive care unit of Addis Ababa public hospitals, Ethiopia, 2021.

This study also shows that preterm neonates who had developed apnea during the follow-up period were at risk to die with in short period of time than those who didn't have apnea with the median hospital stay of 4 and 7 days respectively(95%CI:1.3-4.7). The incidence rate was 10.6/100 and the difference was statistically significant with p-value of 0.004 (Fig 8).

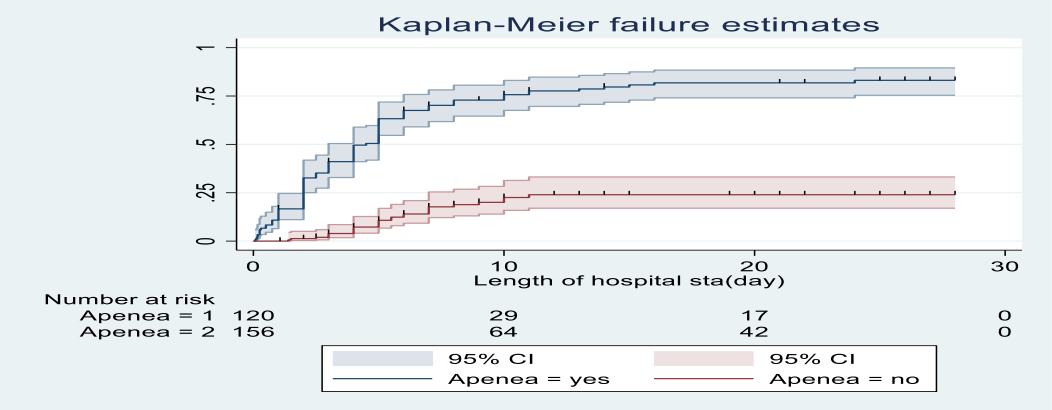

Figure 8: The Kaplan-Meier failure estimates compare time to death of premature neonate with categories of Apnea among those admitted to neonatal intensive care unit of Addis Ababa public hospitals, Ethiopia, 2021.

Preterm neonates started feeding with in 24hours of admission has favorable survival probability than neonates who had not fed. The median time to death for those hadn't start feeding and those who had fed was 2days and 7days respectively (95%CI: 3.3-12.3). This was statistically significant with p-value 0.000 (Fig.9).

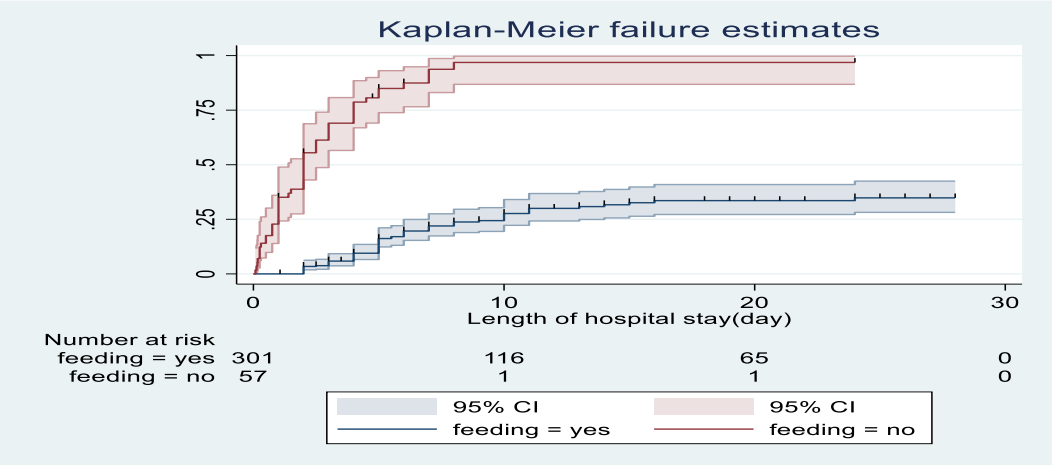

Figure 9: The Kaplan-Meier failure estimates compare time to death of premature neonate with categories of feeding with in 24hour among those admitted to neonatal intensive care unit of Addis Ababa public hospitals, Ethiopia, 2021.

In this cohort study preterm neonates who had got KMC had better survival probability than those who hadn't. The median hazard time to death for neonates without KMC was 5days which was shorter than those neonates cared with KMC (28days) with (95%CI: 2.4-14.4). The incidence rate was 11.5/100 to neonates with KMC and 51.3/100 neonates without KMC. This was statistically significant with p-value of 0.000(Fig.10).

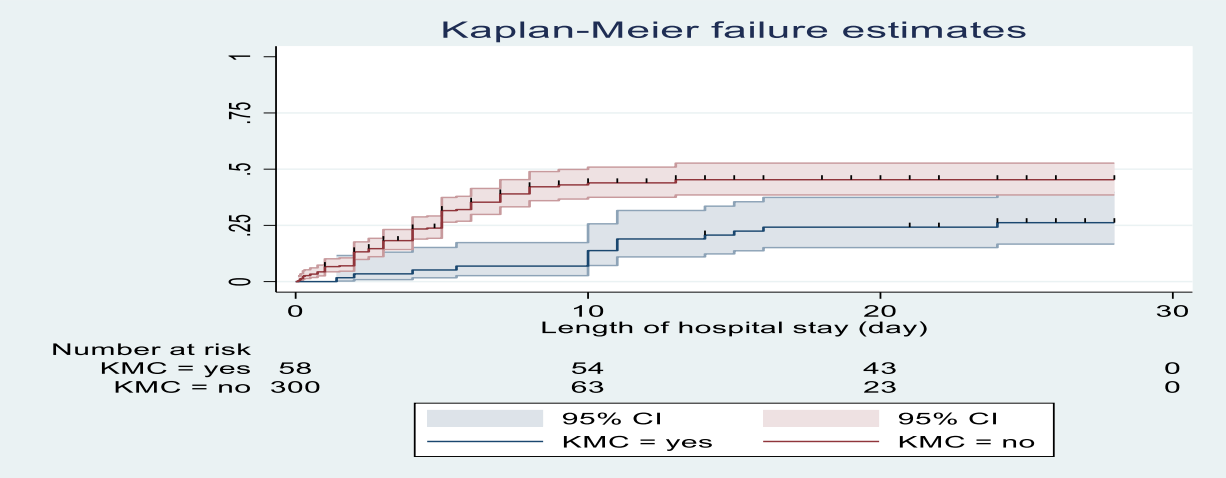

Figure 10: The Kaplan-Meier failure estimates compare time to death of premature neonate with categories of KMC among those admitted to neonatal intensive care unit of Addis Ababa public hospitals, Ethiopia, 2021.

Log rank test was done to check the existence of significant difference in the survival status among different covariates. Based on log rank test result marital status and educational status were statistically insignificant (P-Value>0.05). This means that, the KM failure curve was not statistically different with respect to categories of significant covariates or we have no enough evidence to say that there has difference on failure curve. On the other hand, variables like, birth weight, Gestational age,1st and 5th minute APGAR scores, nurse to patient ratio, apnea, dehydration, NEC, HAI and preeclampsia/eclampsia has statistically significant result of log-rank test with (P-Value <0.05). This means at 95% confidence, there had difference in hazard time to death of preterm mortality among the categories (Table 7).

Table 7: Median time to death and log-rank test for equality of survivor functions among preterm neonate among neonates admitted to neonatal intensive care unit of Addis Ababa public hospitals, Ethiopia, 2021.

Variables	Categories	P-value	Median Time to death(day)	Log-rank test (x2)
Oliguria/polyhydramnios	Yes	0.0006	6	5.13
	No		-	
APH	Yes	0.0067	5	6.93
	No		-	
PPROM	Yes	0.0023	10	1.99
	No		-	
Feeding within 24 hours	Yes		-	
	No	0.000	3	241.63
CPAP	Yes	0.000	-	
	No		4	56.01
Hypothermia	Yes	0.000	14	18.03
	No		-	
RD	Yes	0.000	16	31.20
	No			
EONS	Yes	0.0069	-	6.80
	No		-	
PNA	Yes	0.000	5	39.46
	No			
KMC	Yes		-	12.44
	No	0.0005	-	
Types of CPAPA	Home made	0.000	7	61.12
	Diamedica		-	
Marital Status	Single			
	Divorced	0.152	4	3.78
	Married			

5.8 Proportional hazard assumption test by Schoenfeld's residuals

Model fitness was tested by using Schoenfeld residuals test for proportionality assumption of each covariate and overall model of the stratified Cox Proportional Hazard. Based on this test, the model was fitted with p-value of >0.05 and global test result of 0.146 (Table 8).

Table 8: Schoenfeld's residuals test result among preterm neonates admitted to neonatal intensive care unit of Addis Ababa public hospitals, Ethiopia, 2021.

Variables	Rho	X2	Prob>chi2
Marital status	0.16633	2.68	0.1015
Educational Status	0.00683	0.01	0.9410
ANC follow up	0.04135	0.18	0.6726
GA	0.14963	3.25	0.0715
Weight	0.00583	0.00	0.9496
Hypothermia	0.01712	0.04	0.8329
RD	0.00289	0.00	0.9783
EONS	0.09502	0.72	0.3971
PNA	0.08626	0.95	0.3304
CPAP	0.11366	1.63	0.2012
types of CPAPA	0.11329	1.62	0.2030
feeding within 24hr	0.02348	0.06	0.8039
KMC	0.10094	1.18	0.2779
Nurse to neonate Ratio	0.03679	0.18	0.6718
PPROM	0.12807	1.99	0.1582
APH	0.10273	1.37	0.2412
Pre/eclampsia	0.04183	0.25	0.6198
Oliguria	0.01309	0.02	0.8821
1st minute APGAR	0.02534	0.07	0.7855
5th minute APGAR	0.02331	0.07	0.7897
HAI	0.17155	3.46	0.0630
NEC	0.15180	2.92	0.0873
Apnea	0.09022	1.08	0.2978
Dehydration	0.12301	1.86	0.1728
Global test			**0.1461**

After bivariate cox regression, variables having p-value less than 0.25 were transported to multivariate cox regression which yields table 10. Based on this, apnea (AHR: 2.4), dehydration (AHR: 2.33), antepartum hemorrhage (AHR: 3.1), KMC (AHR: 5.8) and feeding initiation over 24hour (AHR: 6.4) were statistically significant predictors with p value<0.05. This indicates that preterm neonates who developed apnea had 2.4times (CI: 1.3-4.7) more risk of time to death compared to those preterm with no apnea during the follow-up. Similarly preterm neonates who developed dehydration during the follow up had 2.33time (CI: 1.3-4.3) higher risk of time to death than those who didn't develop dehydration. Preterm neonates born to APH mother had 3.1times (CI: 1.4-6.6) more risk of time to death compared to their counter parts. Preterm neonates who hadn't got care of KMC had 5.8times (CI: 2.37-14.33) more risk of time to death than those neonates who had got KMC during the follow up period. Preterm neonates who didn't start feeding with in 24hours of admission had 6.4times increased risk of time to death than their counter parts.

Variables like marital status, educational status, nurse to patient ratio, gestational age,1st and 5th minute APGAR scores, oligo/polyhydramnios and CPAPA type were among the variables which becomes statistically insignificant in multivariate analysis with p-value >0.005(Table 9).

Table 9: Multivariate cox proportional hazard regression result for preterm neonates admitted to neonatal intensive care unit of Addis Ababa public hospitals, Ethiopia, 2021.

Variables	Categories	P- value	CHR (95% CI)	AHR (95% CI)	Remark
Apnea	Yes	0.009	6.4(4.2,9.66)	2.4 (1.3,4.7)	***
	No		1		
Dehydration	Yes	0.006	3.5(2.36,5.0)	2.33(1.3, 4.3)	***
	No		1		
NEC	Yes	0.163	2.2(1.6, 3.2)	.64 (.35, 1.2)	
	No		1		
HAI	Yes	0.219	1.6(.92, 1.85)	1.4(0.8, 2.5)	
	No		1		
Preeclampsia/eclampsia	Yes	0.329	2.26(1.56, 3.25)	1.3(.75 2.29)	
	No		1		
APH	Yes	0.004	1.9(1.2, 3.15)	3.1(1.4, 6.6)	***
	No		1		
PPROM	Yes	0.297	1.3(.89, 1.85)	1.3(.78, 2.27)	
	No		1		
Feeding with in 24hours	No	0.000	11.4(7.7,16.8)	6.4(3.33, 12.28)	***
	Yes		1		
CPAP	No	0.142	.07(.03, .2)	.39(.11,1.37)	
	Yes		1		
Hypothermia	Yes	0.933	2.2(1.5, 3.2)	1.1(.59, 1.76)	
	No		1		
RD	Yes	0.395	9.6(3.5, 25.9)	1.7(.45, 7.76)	
	No		1		
EONS	Yes	0.984	2.8(1.2, 6.3)	1.(.36, 2.85)	
	No		1		
PNA	Yes	0.804	2.9(2.1, 4.)	1.1(.55, 2.18)	
	No		1		
Birth Weight	<1000	0.105	23.5(5.3,104)	5.13(0.7, 37.)	
	1001-1499	0.19	13(3.2, 3.3)	9.5(1.45, 61.6)	
	1500-2499	0.22	3.1(.75, 12.8)	8.42(1.4, 52)	
	>=2500		1		
KMC	No	0.000	2.6(1.5, 4.5)	5.8(2.37, 14.33)	***
	Yes		1		

***= statistically significant predictors

6. DISCUSSION

This prospective cohort study was aimed to assess the survival and predictors of preterm mortality among preterm neonates admitted to public hospitals of Addis Ababa. Being born to APH mother, apnea and dehydration during the follow-up time, lack of Kangaroo Mother Care, and inability to started feeding with in 24hours of admission were predictors to time to death.

According to this study the overall mortality of preterm neonates admitted to public hospitals of Addis Ababa during the study period was 125(34.9%). This result was similar with the finding of studies done in Jimma university specialized hospital and Bahr Dar university Hospital 34.9% (31) and 36.1% (32). The possible explanation of these similarities could be the study areas were referral hospitals in which different complicated mother can be referred from different parts of the country leads to high flow of preterm and complicated intra-partum complication may leads to preterm death. It can be also explained similarity of NICU setups which haven't different sophisticated materials that used to save preterm neonates.

However, the finding of this study was higher than the study conducted in china and Iran the 1.9 % (27) and 9.1% (28). The possible explanation for this difference might be due to the difference in neonatal intensive care unit set-ups. Developed countries unlike our NICU set-ups has mechanical ventilators, modern CPAP, parenteral nutrition and infusion pumps which may help to save preterm(55). The finding of this study was higher than the result done in university of Gondor 28.8%(24), Debre Tabor it was 31.2% (22), Axum university hospital 22.2% (33) and two studies conducted in Addis Ababa 29.7% (23) and 30.7%(34). The possible explanation for this difference might be due to study design difference. The design of this study was prospective cohort unlike other studies conducted retrospectively. In prospective study missed data due to chart incompleteness is avoided which display all events accordingly. But in retrospective studies death may be masked due to incomplete charts. Another possible reason could be due to study area in which most studies conducted previously done in single institution but this study incorporates many institutions. This may inflate the proportion of death. The difference in exclusion criteria in which different studies excludes preterm neonates born before 28weeks of gestation might be another possible explanation. In this study preterm neonates born less than 28weeks of gestation were included unlike other studies in which the proportion of death may be inflated.

The incidence density rate of death in this study was 36.4/1000 neonate-day observation. This finding was lower than the result found in a study conducted in TASH (39.1/1000)neonate-day observation(23). This difference might be due to the difference in sample size. The study conducted in TASH was conducted in large sample than this study.

This study showed that the highest hazard time was the first seven days of admission in which majority of the deaths (84%) were encountered. This finding was almost similar with study done in Iran 84.3% (28), Kenya 81.1% (36), in Bair Dar University Hospital 85% (32), in university of Gondor Hospital 85.23% (24). This might be due to different complication of preterm neonates are happened during pregnancy, at birth and transitional period of neonates from intrauterine to extra uterine or direct complication of pregnancy and abnormal intra-partum process leads to make the neonates to die shortly after birth. Lack of mechanical ventilators may also have contribution to die shortly after birth.

In this study the survival of preterm neonates born at the gestational age of bellow 28,28-32, 32+1-33+6 ,34-36+6 weeks was 0%,38%,68% and 89% respectively. This finding was almost similar with the study conducted in Bahir Dar university hospital (32). This similarity might be due to the similar neonatal intensive care unit service. However, this result is different from a study conducted in Kenya which found that the survival was 29.6% for infants born less than 28 weeks' gestation, 50% for those born at 28-31 weeks and 75.5% for those born at or above 32 weeks survived(36). This might be due to neonatal intensive care unit service difference between Kenya and Ethiopia. In Kenya neonatal intensive care unit, surfactant administration and mechanical ventilations which can save preterm neonates from death are available unlike our study areas(56).

In this study, being born from mother having APH was predictors of time to death of preterm mortality which fasten time to death by 3.1days (AHR: 3.1) compared to their counter parts. This was similar with the study conducted in Tanzania(47).This is supported by the fat that preterm neonates born from APH mother suffer of anemia leads to fetal hypoxia which can increase risk time to death of preterm mortality(57).

Apnea was one of the significant predictors identified in this study which shorten the time to death by 2.4days (AHR: 2.4). This is supported by the scientific evidence that preterm neonates are vulnerable for IVH, sepsis and anemia causing for apnea (or it could be apnea of prematurity a

diagnosis common in premature babies)(58). In fact, apnea was diagnosis when babies become critical which may lift out the count in this study.

Preterm neonates developing dehydration during the follow up period were died 2.3days shorter than (AHR: 2.33) those neonates who didn't develop dehydration. The possible practical explanation for this reason could be the fact that preterm neonates are vulnerable for excessive water loss due to thin skin and high coverage of water to body mass index. In addition to this, preterm neonates are vulnerable for different medical problems like sepsis and neonatal jaundice which causes dehydration during pathological process and at the time of treatment cascades(59). Similarly, it could be, due to clinical management gaps such as need for daily weigh, measuring urine output and being able to measure fluid intake -IV pumps, proper documentation of IVF and PO feeding intake which are not being done in almost all facilities. From the above points dehydration would leads to preterm mortality by affecting multi-organ system of the baby.

Unable to start feeding with in the first 24 hours of admission shorten by 6.4days than (AHR: 6.4) their counter parts. This finding was relatively similar with studies conducting in Uganda(48), Axum University (33) and TASH(23). The finding is supported by the fact that early initiation of feeding can stimulate gut maturation and breast milk has its own immunoglobulin which can increase the immunity level of preterm neonates, it also stimulate gastro intestinal flora which can used for vitamin-K production(60,61). This prevents from the possible bleeding disorder which is common in preterm neonates' leads to possibly decrease death in relation to time.

Preterm neonates without KMC had 5.8 days shorter time to death compared with those neonates who had got KMC. This finding was similar with the study conducted in Uganda Hospital(48), Axum University Hospital(33), and University of Gondor Hospital(24).The possible expiation might be as preterm neonates are vulnerable for apnea and hypothermia, which can be prevented by KMC. this is supported by the scientific evidence that KMC is a simple intervention to care for preterm newborns by tying the baby to the mother's front, providing thermal care through continuous skin to skin contact, increased breastfeeding, reduced infections and early recognition of illness(62). Therefore, lack of KMC leads to this problem which can increase the hazard of death.

6. STRENGTH AND LIMITATION

6.1. Strength of the Study

This study has the following strengths. The study was conducted prospectively which can increase quality of data. Data were not missed due to chart incompleteness unlike other retrospective studies. The study was conducted in different hospitals of the town which can increases representative and generalizability. Additionally, in this study major congenital anomalies were excluded which can give relatively real predictors of time to death preterm mortality.

6.2. Limitations of the Study

Even though the study has several strengths; since the study period was only three months, it may mask seasonal variability. In this study all preterm neonates were considered as they have equal chance of mortality and survival regardless of their gestational age.

8. CONCULSION AND RECOMMENDATION

8.1. Conclusion

The incidence proportion of mortality as a result of preterm complications was high compared to retrospective cohort study conducted in TASH. The identified hazard time to death in this study was the first seven days after admission. Being born to APH mother, lack of KMC, apnea and dehydration during the follow up period, inability to start feeding within 24hours of admission were the identified predictors of time to death.

8.2. Recommendation

Based on the finding of this study, the following recommendations are forwarded;

Federal ministry of health

Federal ministry of health better to; give strong emphasis to decrease preterm mortality, add dehydration as one chapter to be discussed in the national NICU guideline, work to equipped NICU with infusion pump to prevent dehydration and regulate strong rule/revise regulation/ about utilization of KMC and early feeding initiation.

To health care providers

Especial attention and follow-up better to be given for every preterm neonate admitted to NICU especially in the first seven days after admission**.** The health care team of NICU better to prevent and manage dehydration and apnea as fatal cases. NICU health care providers better to follow strictly fluid intake and output to every neonate and hydration status better to be assessed frequently as a vital sign. Professionals working at ANC, labor and delivery unit better to give especial attention in the possible prevention and management of APH.

Researchers

Further research better to be conducted; by taking long follow up time and in each gestational age category.

For each study area

Hospitals better to; have their own protocols to prevent apnea and dehydration, and emphasis on KMC and feeding initiation practice at a facility level.

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APPENDIX I: DATA COLLOCTION TOOL

Hospital Name _____

Subject's Code No._____

Part I: Maternal Socio,conomical and demographic related characteristics

No	Maternal socio demographic Characteristics	Response	Skip to
101	Age of the mothers	_____Year	
102	Marital status	1. Single 2. Married 3. Divorced 4. Widowed	
103	Educational status	1. No formal learning 2. Primary 3. Secondary 4. Technical/vocational 5. Higher	
104	Occupation	1. Governmental employee 2. Private 3. Merchant 4. Farmer 5. House wife 6. Other (specify)……	
105	Residency	1. Urban 2. Rural	
106	Average household monthly income	_____ETB	

Part II: Maternal medical, pregnancy and obstetrics related characteristics

No	**Maternal medical and obstetrics characteristics**	**Response**	**Skip to**
201	ANC follow Up	1. Yes 2. No →	**203**
202	If yes, how many times?	_____	
203	VDRL test	1. Reactive 2. Non-reactive 3. Unknown	
204	Parity	1. Primi 2. Multi	

205	Type of pregnancy	1. Singleton 2. Multiple	**207**
206	If the pregnancy is multiple	1. First baby 2. Second baby 3. Third baby 4. Fourth and above	
207	Steroid administration	1. Yes 2. No	**209**
208	If yes how many times	_____dose	
209	Mode of Delivery/delivery method/	1. SVD 2. Instrumental delivery 3. C/S	
210	Place of delivery	1. Institutional 2. Home	
211	Risk of preterm birth	1. Yes 2. No	**213**
212	If yes, risk of preterm birth (multiple response)	1. PPROM 2. APH 3. Preeclampsia/Eclampsia 4. Oligo/polyhydramnios 5. Other specify…..	
213	Does the mother diagnosed with chronic disease	1. Yes 2. No	**301**
214	If yes which one of the medical problem (multiple response)	1. Diabetes 2. Hypertension 3. Anemia 4. Tuberculosis 5. HIV/AIDS 6. COVID-19 7. Others specify ……..	

Part III: Preterm demographic related characteristics

	Preterm demographic characteristics	Response	Skip to
301	Sex	1. Male 2. Female	
302	Age at admission	_____hr/day	
303	Gestational age	_____Week	

304	Weight	_____ gram.	
305	Weight for gestational age	1. AGA 2. LGA 3. SGA	

Part IV: preterm medical problem and treatment related characteristics

No.	Neonatal Medical problem and treatment characteristics	Response	Skip to
401	APGAR score at birth	1. 1st minute _____ 2. 5th minute _____	
402	Diagnosis at admission (multiple response)	1. Hypothermia 2. RD 3. EONS 4. PNA 5. NHB(Jaundice) 6. Meningitis 7. Other specify ……..	
403	Does the neonate develop new medical problem between the follow up	1. Yes 2. No →	405
404	New medical problems between the follow up(multiple response)	1. HAI 2. NEC 3. NHB(Jaundice) 4. Apnea of prematurity 5. Hypothermia 6. Hypoglycemia 7. Thrombocytopenia 8. Other specifies….	
405	Does the neonate eligible to CPAP	1. Yes 2. No →	408
406	Time of initiation of CPAP	1. Since delivery 2. At admission 3. After admission	
407	Type of CPAP the neonates put on	1. Dimedica 2. Home made	
408	Does the neonate receive antibiotics	1. Yes 2. No →	410
409	If yes time of antibiotics initiation in reference to admission	_____hr/day	

410	Does the neonate start feeding	1. Yes 2. No →	412
411	If yes, feeding initiation at the age of	_____hr/day	
412	Does the neonate receive KMC	1. Yes 2. No →	413
413	Length of stay in the hospital	_____hr/day	
414	Nurse to patient ratio	1. 1:1 2. 1:2 3. > 1:2	
415	Was there antibiotics revision to more potent(meropenem and vancomycin or cefepime and vancomycin)	1. Yes 2. No →	417
416	If the answer to question number 415 is yes, after how many days of admission?	_____days	
417	Outcome of the neonate	1. Died 2. Censored →	420
418	If died immediate cause of death(multiple response)	_____	
419	Died at the age of	_____hr./days	
420	If the answer to question number 417 is censored, reason of being censored	1. Discharge 2. Left against medical advice 3. Transferred/referred 4. >28days age at follow up	

End of the questioner!

APPENDIX II: ENGLISH VERSION INFORMATION AND CONSENT FORM SHEET

Good Morning/ Afternoon?

How are you? My name is _____. I am a data collector for the study which is conducting in Addis Ababa five public hospitals. This hospital is one of the study area in which data is collected on survival and predictors of mortality among preterm neonates admitted to public hospitals in Addis Ababa, Ethiopia, 2021by Dires Birhanu who is studying for his Master's degree at Addis Ababa University, Collage of Health Science, school of Nursing and Midwifery, Department of nursing. The main purpose of the research is for the partial fulfillment of graduation on the title of preterm survival and predictors of mortality in Addis Ababa public hospitals. You are kindly being asked as your baby (babies) will be participants of this study. Before you decide, it is important for you to understand why the research is being done and what it will involve. Read the following information carefully and ask if there is anything that is not clear or if you would like more information. Please take time to decide whether you want as your baby to take part in this study. The purpose of this study is to determine time to death and predictors of preterm mortality. This study is for research purposes but we hope that the information obtained will be used to inform the hospital and other policy formulators which will result in improved healthcare service delivery.

1. The study title: SURVIVAL AND PREDICTORS OF MORTALITY AMONG PRETERM NEONATES ADMITTED TO PUBLIC HOSPITALS IN ADDIS ABABA, ETHIOPIA, 2021

2. **Procedure and duration**: The study involves different procedures started from admission up to discharge or death. Your baby/babies will be followed until this event up to the age of 28 days. Every data regarding about your baby will be kept with a full of confidential.

3. Risks and benefits:

There are no risks involved in this study. This study will be anonymous. The baby will receive treatment as per the diagnosis made based on the hospital protocol. There are no direct medical benefits to your child for participating in this study. A potential benefit of the study will be improved healthcare service delivery based on the recommendations of this study.

5. Confidentiality: This research will be conducted in accordance with all the Ethiopian laws and regulations that protect rights of human research subjects. All records and other information obtained will be kept strictly confidential and your baby's protected health information will not be used without permission. All data collection tools will be identified by number or otherwise coded to protect any information that could be used to identify your baby. Results of this study may be published, but no names or other identifying information will be released

6. Rights: The investigator can withdraw your baby form the research without your approval.

7. Voluntary Participation

It is up to you to decide whether your baby takes part in this study. Refusal to participate or the decision to withdraw from this research will involve no penalty or loss of benefits to which your child is otherwise entitled. This will not affect your relationship with the investigators and the treating team.

8. Costs and Compensation to participants

There is no cost to you, and there is no compensation to subjects for participation in this

9. Institutional Review Board

This study has been approved by the institutional research and ethics Committee of Addis Ababa University College of health science school of nursing and midwifery and it has got permission from this hospital.

10. Contact address: If there are any questions or enquires any time about the study or procedures, please contact by the following address.

- Principal investigator: **Dires Birhanu**
- E -mail: dires2007@gmail.com
- Mobile phone: +251-921-28-71-18

Are you willing to participate?

If the answer is, **YES**, Please continue

NO _____ Thanks her and end!

Consent Form

By signing this consent form, I confirm I have read/ heard the information in this consent form and have had the opportunity to ask questions. I will be given a signed copy of this consent form. I voluntarily agree for my baby to take part in this study.

Name of mother/father/care giver _____Signature_____

APPENDIX III: AMHARIC VERSION MATERNAL RELATED DATA COLLECTION TOOL

የሆስፒታሉ ስም _____

መለያ ቁጥር._____

በአዲሰ አበባ ከተማ ስር ባሉ ሆስፒታሎች ያለማዜአቸው ለተወለዱ ጨቅላ ህፃናት ሞት እና የሞት ጊዜ ለማጥናት ለእናቶች የተዘጋጀ መጠይቅ

ክፍል አንድ፡ የሥነ- ህዝብ ፤ ማህበራዊ እና ኢኮኖሚያዊ ጉዳዮችን በተመለከተ የተዘጋጁ ጥያቄዎች፡ አዲስ አበባ ፡ ኢትዮጲያ፤ 2013 ዓ.ም.

ተ.ቁ	ጥያቂ	መልስ	ማለፍ
101	የእናት እድሜ	----------ዓመት	
102	የጋብቻ ሁኔታ	1. ያላገባች 2. ያገባች 3. የፈታች 4. ባሏ የሞተባት	
103	የእናት የትምህርት ሁኔታ	1. ማንበብና መፃፍ የማትችል 2. ከ1-8ኛ ክፍል 3. ከ9-12ኛክፍል 4. ዲኘሎማ 5. ድግሪ እና ከዚያ በላይ	
104	ሥራ	1. ተማሪ 2. የቤት እመቤት 3. የመንግስት ሠራተኛ 4. የቀን ሠራተኛ	

		5. የግል ተቀጣሪ 6. ነጋዴ 7. ሌላ_____	
105	መኖሪያ ቦታ	1.ከተማ 2.ገጠር	
106	ወራዊ የቤተሰብ ገቢ	----------ብር	

ክፍል ሁለት፡-: የእናቶች የእርግዝና ክትትል፤ የጤና ሁኔታ እና የወሊድ በተመለከተ በተመረጡ የአዲስ አበባ ሆስፒታሎች ላይ የተዘጋጀ ጥናት፡ አዲስ አበባ፡ ኢትዮጲያ፤ 2012 ዓ.ም.

ተ.ቁ	ጥያቄ	መልስ	ይለፍ
201	የእርግዝና ክትትል ነበረዎት	1. አዎ 2. የለም	203
202	ለጥያቄ ቁጥር 201 መልስዎ አዎ ከሆነ ምን ያክል ጊዜ ተከታትለዋል	----------	
203	የአባላዘር ምርመራ	1. ፖዘቲቭ 2. ነጋቲቭ 3. አይታወቅም	
204	ስንተኛ እርግዝና ነው	1. የመጀመሪያ 2. ከአንድ በላይ	
205	የእርግዝና አይነት	1. አንድ 2. ሁለት እና ከዚያ በላይ	207
206	ሁለት እና ከዚያ በላይ ከሆነ ይህ ህፃን	1. መጀመሪያ የተወለደ ነው 2. ሁለተኛ የተወለደ 3. ሶስተኛ	

		4. አራተኛ	
207	በምጥ ጊዜ ለህፃኑ/ኗ ሳንባ ማደበሪያ የተሰጠ መዲሃኒት ነበረ	1. አዎ 2. የለም	209
208	ለጥያቄ ተራቁጥር 207 መለስዎ አዎ ከሆነ ስንት ጊዜ ተሰጠ	----------	
209	ህፃኑ/ኗ የት ተወለደ/ች	1. እዚሁ ሆስፒታል 2. ሌላ ሆስፒታል	
210	በምን ወለዱ	1. በማህፀን 2. በመሳሪያ የታገዘ 3. በቀዶ ጥገና	
211	ያለጊዜ ለመውለድ የሚያበቃ የታወቀ ሁአጋላጭ ሁኔታ ነበር	1. አዎ 2. የለም	213
212	ለጥያቄ ተራ ቁጥር 211 መልስዎ አዎ ከሆነ፣የነበረው አጋላጭ ሁኔታ ምን ምን ነበር	1. የእንሽርት ውሃ ቀድሞ መፍሰስ 2. ከምጥ በፊት የደም መፍሰስ 3. ከፍተኛ የሆነ የደም ግፊት 4. የእሸርትውሃ መቀነስ/መጨመር 5. ኢንፌክሽን 6. ሌላ…..	
213	የታወቀ የቆየ በሽታ አለበወት ተበለው ያውቃሉ	1. አወ 2. የለም	ጨርሻለሁ አመሰግናለሁ!
214	ለተራቁጥር 213 መለስዎ አዎ ከሆነ ምን አይነት በሽታ	1. የስኳር 2. የደም ግፊት	

		3. የደም ማነስ 4. የቲቢ 5. ኤች አይቪ አዲስ 6. ኮቪድ-19 7. ሌላ ……..	

APPENDIX IV: AMHARIC VERSION INFORMATION AND CONSENT FORM SHEET

ደህና አደሩ/ዋሉ/አመሹ/አረፈዱ

እንዴት ነዎት? ስሜ_____እባላለሁ።እኔ በተመረጡ የአዲስ ኣባባ ሆስፒታሎች የአዲስ ኣባባ ዩኒቨርሲቲ ጤና ሳይንስ ፋካሊቲ በነርሲንግ እና አዋላጅ ነርሲንግ ትምህርት ቤት ውስጥ ድረስ ብርሃኑ በተባለ የጨቅላ ሕፃናት መነርሲንግ ማስተርስ ድግሪ ተማሪ ቸማካኝነት እየተጠና ባለው ጥናት መረጃ ሰብሳቢ ነኝ።የጥናቱ ርዕስ ያለጊዜአቸው የተወለዱ ጨቅላ ሕፃናት የመሞቻ ጊዜን እና ለሞታቸው ምክንያት የሚሆኑ ችግሮችን መለየት ይሰኛል።የጥናቱ ዋና አላማ ለመመረቂያነት ቢሆንም ያለጊዜቸው ለሚወለዱ ጨቅላ ህፃናት የጤና ሁኔታ መሻሻል ጥቅም ይኖረዋል ።ይህም የሚሆነው እነዚህ ጨቅላ ህፃናት መቼ እንደሚሞቱ እና ለሞታቸው አጋላጭ ምክንያቶችን በመለየት ለሚመለከተው አካል ስለሚያሳውቅ ያለጊዜኣቸው የተወለዱ ጨቅላ ሕፃናት ሞትን ይቀንሳል ተብሎ ይታመናል።ይህ ሆስፒታል ጥናቱ ከሚካሄድባቸው ሆስፒታሎች መካካል አንዱ ነው።ስለሆነም የእርስዎ ልጅ/አች በዚህ ጥናት እንድሳተፍ/ትሳተፍ/ፉ በአክብሮት እንጠይቀዎታለን።ስለመሳተፍ አለመሳተፍ ከመወሰንዎ በፊት ጥናቱ ለምን እንደሚሰራ፣እንዴት እንደሚሰራ፣ስለጥቅምና ጉዳቱ፣መቼ እንደሚሰራ፣እንዲሁም ስለሀጋዊነቱ ከዚህ በታች የተቀመጠውን ሃሳብ በሚገባ ያንብቡት/ያዳምጡት እና ይወስኑ፤

1ኛ. የጥናቱ ርዕስ፡ የመዳን ሁኔታ እና የመሞታቸው ምክንያቶችን በተመረጡ የአድስ አባባ ሆስፒታሎች ፅኑ ህሙማን ጨቅላ ህፃናት ክፍል ውስጥ ከሚተኙ ያለጊዜአቸው የተወለዱ ጨቅላ ሕፃናት መካከል መለየት ይሆናል፤2013 ዓ.ም

2ኛ. የጥናቱ ሒደት እና ጊዜ፡ ይህ ጥናት ጨቅላ ህፃናቱ ወደ ፅኑ ህሙማን ጨቅላ ሕፃናት ክፍል ሲገቡ ጀመሮ የመዳን ሁኔታቸው እስከሚታወቅ ድረስ ሆኖ ከፍተኛ የመከታተያ ጊዜው 28 ቀን ብቻ ይሆናል።

3ኛ. ከጥናቱ የሚገኝ ጥቅምና ጉዳት

ልጅዎ በዚህ ጥናት በመሳተፉ/ፏ/ፋቸው ምክንያት ሊመጣ የሚችል ጉዳት የለም።ጉዳት ተብሎ የሚታሰበው ከመታከሚያ ካርድ ላይ ለማይገኙ እናትን በሚመለከት መረጃ ለመጠየቅ እናት የምታጠፈው ጥቂት ጊዜ ብቻ ይናል።

ልጅዎ በዚህ ጥናት በመሳተፉ/ፏ/ፋቸው ምክንያት ምንም አይነት ጥቅም አይገኝም።ጥቅም ተብሎ የሚታሰበው ይህ ጥናት በሚገኝው ግኝት መሰረት ለሌላ ጊዜ ተመሳሳይ ሕፃናትን መታደግ ይሆናል።

4ኛ. የጥናቱን ሚስጥር ጠባቂነት በተመልከተ

ይህ ጥናት የሚካሄደው ኢትዮጵያ ለጥናት እና ምርምር የምትከተለውን ህግ መሰረት አድርጎ ስለሆነ ማንኛውንም ህፃናትንም ሆነ እናቶችን የሚመለከት መረጃ ሚስጢሩ የሚጠበቅ ይሆናል።

5ኛ. የጥናቱ ባለቤት መብት

የዚህ ጥናት ባለቤት ልጄዎን ከጥናቱ ያለማንም ፈቃድ የማስወጣት መብቱ የተጠበቀ ነው

6ኛ. ጥናቱ ፍላጎትን መሰረት ያደረገ ስልመሆኑ

በዚህ ጥናት የእርስዎ ልጅ እንድሳተፍ ማድረግ ወይም አለማድረግ የእርስዎ ሙሉ መብት ነው። ጥናቱ ከተጀመረ በኋላም ማስወጣት ወይም ማስገባት ይችላሉ።የእርስዎ ልጅ በዚህ ጥናት ባለመሳተፉ/ፏ/ቸው ምክንያት የሚቀርበት ጥቅም ወይም ህክምና የለም።ከጥናቱ ባለቤት ጋር ያላችሁ ግንኙነትም አይሻክርም

7ኛ. ክፍያ እና የማካካሻ ገንዘብን በተመለከተ

በዚህ ጥናት የእርስዎ ልጅ ስለተሳተፈ/ፉ/ች ምንም አይነት ክፍያም ሆነ ማካካሻ አይሰጠጥም

8ኛ.ስለ ጥናቱ ህጋዊነት

ይህ ጥናት ቢካሄድ ምንም አይነት ጉዳት እንደማይኖረው ተረጋግጦ ከአዲስ አባባ ዩኒቨርሲቲ ጤና ሳይንስ ፋኩሊቲ ጥናት እና ምርምር የሰነ ምግባር ኮሚቴ እንድሁም ከዚህ ሆስፒታል ፈቃድ አግኝቷል።

9ኛ. የጥናቱ ባለቤት አድራሻ

ይህን ጥናት በተመለከተ ስለጥናቱ ሂደት እና ሁኔታ መጠየቅ ቢፈልጉ ከዚህ በታች በተገለፀው አድራሻ ማግኘት ይችላሉ።

የጥናቱ ባለቤት ስም፡ ድረስ ብርሃኑ ምህረቴ

ስልክ ቁጥር፡ 0921287118

ኢሜል ፡dires2007@gmail.com

ልጅዎ በጥናቱ እንድሳተፍ/ፉ/ ፈቃደኛ ነዎት?

ፈቃደኛ አይደለሁም----------አመሰግናለሁ እዚህ ላይ ጨረሰናል

ፈቃደኛ ነኝ----------እባክዎ ስምና ፊርማዋን በስምምነት ፎርሙ ላይ ያስቀምጡልኝ

የስምምነት ፎርም

ስለዚህ ጥናት ዓለማ፣የጥናት ሂደት፣ጥቅምና ጉዳት፣እንድሁም ህጋዊነት በሚገባ ካነበብኩ/ካዳመጥኩ/ በኋላ ያልገባኝን እንድጠይቅ እድል ተሰጥቶኝ ሁሉን ነገር አገናዝቤ ልጄ/ልጆቼ በዚህ ጥናት እንድሳተፉ መስማማቴን በስምና ፊርማዬ አረጋግጣለሁ።

ስም_____

ፊርማ _____

ስለትብርዎ በጣም እናመሰግናለን!

APPENDIX V: PROSPECTIVE COHORT FOLLOW UP CHART

Parameters	Time frame of the follow up									
	At admission	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	WK 2	WK 3	WK4
Vital Sign										
Hydration status										
GA(general appearance)										
Status of the neonate										
New medical problems										
Lab investigation result										
Mediation										
Other										

***WK=week**

***Status of the neonate=critical, subcritical, stable**