

Pattern of Admission and Outcome of Neonates Admitted to Neonatal Intensive Care Unit at Jimma Medical Center, South West Ethiopia



BY: Betre Shimeles (MD, Pediatrics resident)

A Thesis to be Submitted to the Department Of Pediatrics and Child Health, Faculty of Medical Sciences, Jimma University for the Partial Fulfilment of the Requirement of Specialty Certificate in Pediatrics and Child Health

**November 2021
Jimma, Oromia, Ethiopia**

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Declaration

Assurance of principal investigator

I, agree to accept responsibility for the scientific, ethical and technical Conduct of the research project & for provision of required progress report as per terms and condition of the college of health sciences in effect at the time of grant is forwarded as the result of this application.

Name of principal investigator

Signature

Date

Dr. Betre Shemelis

Approval of the advisor

This thesis proposal has been submitted with my approval as university advisor

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Abstract

Background: Neonatal period is the most susceptible period of life, the newborn has adapt to a totally new environment and is vulnerable to many problems. Children face the highest risk of dying in their first month of life for example there were 17 deaths per 1,000 live births in 2019. Globally, most of the neonatal deaths (around 99%) occur in developing countries particularly in sub-Saharan African and south central Asian countries. For many years, the neonatal mortality rate in Ethiopia remains greater than 30 per 1,000 live births. Hence, identifying the pattern for neonatal admission and outcome in a hospital setting is crucial to improve the quality of existing practices.

Methods: Institution based prospective longitudinal study was conducted in a neonatology unit, at Jimma medical center from February 1, 2021 to August 1, 2021. Structured questionnaire used to capture the relevant data and Epi Data version 4 and SPSS version 25 used for data entry and analysis respectively. Descriptive statistics carried out to see the pattern of admission and outcome whereas bivariate and multivariate logistic regression analysis performed to determine factors associated with mortality at P value of less than 0.05 at a CI of 95% considered as significant.

Results: Out of the total 380 neonates enrolled, 222 (58.4%) were male, 61.6% of mothers came from the surrounding district. The main causes of admissions were neonatal sepsis (55.5%), prematurity with respiratory problem (28.9%), hyperbilirubinemia (18.9%), and asphyxia (13.9%). Regarding the outcome, 75.8% of admitted neonates were discharged alive and the hospital neonatal mortality rate was 24.2%. The average length of hospital stay was 8.7 days (SD 7.5 days). Neonates who were diagnosed to have Respiratory distress syndrome have increased risk of death [AOR=1.92, (95% C.I :)] (1.06-3.38), birth weight, maternal education and Respiratory distress syndrome have significant association with mortality (p- value <0.05).

Conclusion and recommendation Most of the neonates were diagnosed with neonatal infection, prematurity, and hyperbilirubinemia. The hospital neonatal death rate seen in this study is high; which indicates the need for improving the quality of neonatal care. Therefore adequate resource should be put in place to improve neonatal outcomes.

Key words: Pattern, Neonatal, Mortality, Morbidity

Acknowledgement

First, I would like to express my deepest gratitude and appreciation to my advisors Dr. Netsanet Workineh, Dr. Workineh Tesfaye and Mrs. Bekele Teka for their unreserved encouragement and provision of constructive comments and guidance to complete this work.

Furthermore, Jimma University, Faculty of Medical Sciences, Department of Pediatrics and child Health is appropriately acknowledged for giving me this golden and educative opportunity.

I would like to thank you to mothers and care takers of the neonates, without whose willingness, this study would not have been done.

Last, but not least, I would like to thank my fellow residents, for their continuous support and inputs to this study.

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ACRONYMS AND ABBREVIATIONS

ANC=Antenatal Care

CM= congenital malformation

GA=Gestational Age

IUGR =Intrauterine Growth Restriction

IDM =Infant of Diabetic Mother

IRB= Institutional Review Board

JMC= Jimma Medical Center

MDG-=Millennium Development Goal Number 5

MAS =Meconium Aspiration Syndrome

NICU=Neonatal Intensive Care Unit

PI=Principal Investigator

RDS =Respiratory Distress Syndrome

SDG3 =Third Sustainable Development Goals

TTN =Transient Tachypnea of Newborn

CHAPTER 1: INTRODUCTION

1.1 Background

The neonatal period (birth to the first 28 days of life) is a transition time to independent extra-uterine life. During this time, rapid adaptations in immune, physiological and biochemical functioning occur. Exposed to multiple environmental influences, the neonates face various diseases and that increase the risk of dying (1) Children face the highest risk of dying in their first month of life at an average global rate of 17 deaths per 1,000 live births in 2019(2). Even though Globally, the number of neonatal deaths declined from 5.0 million in 1990 to 2.4 million in 2019. Recent data show that neonatal mortality has declined at a slower rate than overall childhood mortality and contributing around 47% of all child deaths under the age of 5-years(3)

Most of the neonatal deaths (99%) occur in developing countries particularly in Sub-Saharan African and south central Asian countries. Sub-Saharan Africa had the highest neonatal mortality rate in 2019 ,27 deaths per 1,000 live births and had shown the slowest progress in reducing newborn deaths(3). Each year, at least 1.16 million African babies die in the first 28 days of life – and 850,000 of these babies die in the first week of life. The main causes of neonatal morbidity and mortality are intrapartum complications (including birth asphyxia), prematurity, sepsis, congenital anomalies and pneumonia(4).

Although Ethiopia had achieved Millennium Development Goal number 5 (MDG-5), the rates of disaggregated by age showed that neonatal mortality continues to be suspended high with little or no sign of reduction over years(5,6). According to the Ethiopian Mini Demographic and Health Survey (EDHS) 2019, the under-5, infant and neonatal mortality rate is 55, 43 and 30 deaths per 1,000 live births respectively. The Neonatal mortality declined from 39 deaths per 1,000 live births in 2005 to 30 deaths per 1,000 births in 2019, a reduction of 23 % over the past 15 years(7).

Reducing neonatal mortality is an essential part of the third Sustainable Development Goal (SDG) by 2030 and the aim of this goal to end preventable deaths of newborns and reduce neonatal mortality to at least as low as 12 per 1000 live births in all countries. To meet this health goal by 2030, progress must be accelerated, in particular regions with the highest burden of disease (8). Consistent to the SDG goals, Ethiopia has also developed a health sector strategic plan to direct its

health intervention through 2035. In this plan, the country aspires to decreasing preventable neonatal mortality(9)

It is possible to improve survival and wellbeing of newborns and end preventable stillbirths by reaching high coverage of quality antenatal care, skilled care at birth, postnatal care for mother and baby, and care of small and sick newborns. This study helps to improve neonatal intensive care and to know the causes of neonatal admission and outcomes in JMC, NICU

1.2 Statement of the problem

Worldwide, Neonatal morbidity and mortality is concerning health problem among low and middle income countries. Preterm birth (PTB). and Low birth weight are leading causes of mortality and morbidity in neonates (10). Currently, Preterm birth with complication is the leading cause of death among children under five around the world, and a leading cause of disability and ill health later in life. Of the fifteen million babies born too early each year, more than one million die due to complications related to preterm birth. Low birth weight (newborns weighing less than 2,500 grams at birth), due to prematurity and/or restricted growth in utero, is also a major contributor of newborn and child deaths, as well as disability globally. (11) The World health organization (WHO) estimates that birth weight below 2500 g indirectly contributes to about 15% of the neonatal mortality, ranging from 6% in high income countries to 30% in low income countries, with preterm birth and its complications.(12)

In developed countries, most infant illness and deaths fall into preterm birth and congenital malformations. However, in developing world, where infections and asphyxia predominate (1). A child born in developing world is 10 times more likely to die in the first month than a child born in a high-income countries (3). In the developing world ,the majority of all neonatal deaths (75%) occurs during the first week of life, and about 1 million newborns die within the first 24 hours(12).From the pattern of diseases, Asphyxia is the most common cause of death during the first day, and the other majorities of preterm death occurs during the first week(3,5).Thirty-eight percent of babies in sub-Saharan Africa die of infections, mainly of them are after the first week of life and the majority of these are low birth weight (LBW) and preterm babies (3,5).

In Africa, studies done in Nigeria and Tanzania the most common of neonatal admission were birth asphyxia, prematurity and neonatal infection. Prematurity was the most common cause of

neonatal death followed by birth asphyxia and neonatal infections(12,13).This trend is also similar in Ethiopia, 320,000 babies are born too soon each year and 24,400 children under five die due to direct preterm complications(11).

In Ethiopia, Studies done in University of Gondar referral hospital, Mizan Tepi University Teaching Hospital, Ayder Comprehensive Specialized Hospital and St Paul's Hospital Millennium Medical College showed the main causes of neonatal morbidities included hypothermia, sepsis, prematurity, meconium aspiration syndrome and perinatal asphyxia and Leading causes of neonatal mortality were birth asphyxia, neonatal infections and prematurity (13–16).

The Every Newborn Action Plan, launched in June 2014 by World Health Assembly (WHA), provides a stimulus to accelerate progress by implementing effective cause-specific interventions that can rapidly reduce neonatal mortality (17) and the Sustainable Development Goals' health targets by 2030, planned to end preventable deaths of newborns and reduce neonatal mortality in particular regions with the highest burden of disease.(9)

Hence, knowing the causes of neonatal morbidity and mortality at is an essential step toward improving the quality of existing practices. Based on the review of the related literature, despite a few information available on the setting. This prospective study will help to find out cause of admission, factors associated with neonatal morbidity and mortality, duration of hospital stays and overall outcomes of neonatal admissions in Jimma medical center.

1.3 Significance of the study

This study is necessary for evidence based interventions concerning improvement of neonatal intensive care, to reduce in hospital mortality, prevent acute or long lasting complications and help planners for better resource allocation and optimize the local resources for better care. In this process; this study will also help the department to improve documentation, patient follow up and helps for investigators to get involved in further research activities in addition to clinical work.

CHAPTER 2: LITERATURE REVIEW

Neonatal morbidity and mortality are major global public health challenges representing an increasing proportion of overall under-5 child mortality, with the vast majority of neonatal deaths occurring in Sub-Saharan Africa and its rates reflect a nation's socio-economic status, efficiency and effectiveness of health care services (11). There are some literatures about pattern of admission and outcomes of neonates in different countries.

2.1 Patterns of Diseases at Admission in Neonatal Intensive Care Unit

In hospital based prospective study conducted in Pakistan from Sep 2011 to Feb 2013 in neonatal unit of Military Hospital in Karina, out of 2000 admitted sick neonates, morbidity pattern showed share of prematurity (32.30%), sepsis (28.91%), birth asphyxia (11%), meconium aspiration syndrome (MAS) 5%, congenital malformations 5%, Transient tachypnea of newborn (TTN) 5%, neonatal jaundice 5% and bleeding diathesis 0.50% (18)

A retrospective cross sectional study done in Jordan, at Princess Rahm Pediatric Hospital from 1st of March, 2018 to 28th of February, 2019. Overall, the medical records of 1247 neonates included in this study and common causes of admission were sepsis (27.3%), followed by respiratory distress syndrome (RDS) (24.9%) and asphyxia (13.1%)(19).

This hospital-based retrospective study was conducted in Sudan, at the NICU of Saad Abu Elella Teaching Hospital in Khartoum 01 January 2018 to 31 October 2018. Overall the medical records of 207 neonates including in this study and the most common morbidities among them were sepsis, (28.6%) respiratory distress syndrome (23.3%), neonatal jaundice (13.6%) and asphyxia (8%)(20)

A retrospective cross-sectional study conducted in south west Ethiopia, Jimma University Specialized Hospital in neonatal unit from Jan 2012 to Dec 2012. A total of 225 neonates admitted during the study period, the main causes of admissions were neonatal infections (40%), low birth weight (32.4 %) and prematurity (30.7%) (21).

A retrospective cross-sectional study conducted in North Ethiopia, University of Gondar referral hospital in neonatal unit from December 1, 2015 to August 31, 2016. A total of 769 neonates included in the study. Neonatal morbidity included sepsis (67.9%), prematurity (34.9%), polycythemia (31.5%), hypoglycemia (18.5%), meconium aspiration syndrome (14.7%), and perinatal asphyxia (12.5%) (14).

A prospective cohort study was conducted in Ethiopia, at St Paul's Hospital Millennium Medical College neonatal care unit from March 1, 2015, to May 31, 2015. From total of 216 neonates who admitted, the most common primary diagnoses were prematurity with respiratory problem (36.6%), neonatal sepsis (22.7%), and asphyxia (16.2%) (13).

2.2 Outcomes of Neonates in Neonatal Intensive Care Unit

In hospital based prospective study conducted in Pakistan from Sep 2011 to Feb 2013 in neonatal unit of Combined Military Hospital Karina, Out of 2000 admitted sick neonates, Case fatality for prematurity was 26.78%, Birth asphyxia 21.81%, Low birth weight 21.18%, congenital malformations 19%, sepsis 15.22%, MAS 13% and seizure disorder 5.55% (18).

A retrospective study cross sectional study done in Jordan, at Princess Rahm Pediatric Hospital from 1st of March, 2018 to 28th of February, 2019. The majority of the admitted neonates survived (91.9%), and the overall mortality rate was 8.1%. the common causes of mortality in this center were RDS was the most common cause of death rate (35.6%) and followed by sepsis (27.7%). The gestational age, weight of the baby at birth, and the quick clinical assessment (Apgar) within the first five minutes were the strongest predictors of neonatal mortality (19).

A retrospective study cross sectional study done in Nigeria, Jos University Teaching Hospital situated in the North Central part of from 1 March 2010 to 28 February 2011 Of the 572 neonates, (19.4%) died. Prematurity was the most common cause of mortality (43.2%), followed by birth asphyxia (18.0%), neonatal infections (17.1%), and congenital anomalies (13.5%). About three quarters (76.5%) of the mortalities occurred in the first week of life with 46.4% of these occurring in the first 24 hours (22).

In a retrospective cohort study done in Tanzania, Kilimanjaro Christian Medical Centre (KCMC) in neonatal unit from 2000 to 2010, Overall mortality was 10.7%. Leading single causes of death were birth asphyxia (45.7%), prematurity (35.1%), congenital malformations (9.1%), and infections (8.6%). Babies with birth weight below 2500 g constituted 29% of all admissions and 52.1% of all deaths. Birth asphyxia was the most frequent cause of death in normal birth weight babies (73.1%) and prematurity in low birth weight babies (94.7%). The majority of deaths (56.7%) occurred within 24 hours, and 490 (91.4%) within the first week (23).

This hospital-based retrospective study was conducted in Sudan, at the NICU of Saad Abu Elella Teaching Hospital in Khartoum 01 January 2018 to 31 October 2018. overall the medical records

of 207 neonates including in this study and the overall mortality rate 15%. Prematurity, sepsis and asphyxia were the most frequent cause of death(17)

Institution-based descriptive cross-sectional study conducted on neonates admitted to the neonatal intensive care unit of Ayder Comprehensive Specialized Hospital from June 2018 to May 2019. Of total 1785 neonates admitted during the study period and 1388 (77.8%), 99 (5.5%), and 298 (16.6%) of them treated and discharged, discharged against medical advice, and died, respectively. The causes of 139 (46.6%), 72 (24.2%), 63 (21.1%), and 22 (7.4%) neonatal deaths in the hospital were prematurity- related complications, neonatal sepsis, perinatal asphyxia, and congenital anomalies, respectively (16)

Institution based cross sectional study conducted in South-West Ethiopia, in neonatal intensive care unit of Mizan Tepi University Teaching Hospital from June25 to July 20, 2018. A total of 1316 neonates admitted, of these 300 died due to different reasons. Overall mortality was 22.7%,from all deaths 93 (31%) of them delivered prematurely, 89 (29.7%) of them admitted for sepsis and 46 (15.3%) of them admitted due to low birth weight (24).

A prospective cohort study conducted in Ethiopia, at St Paul's Hospital Millennium Medical College neonatal care unit from March 1, 2015, to May 31, 2015 Out of the 216 neonates studied, 50 (23.2%) died. High case fatality observed among neonates with the diagnosis of prematurity with respiratory problem (40.5%) and asphyxia (40.0%). Diagnosis of asphyxia was an independent predictor of mortality (13).

CHAPTER 3: OBJECTIVE OF THE STUDY

3.1 General objective:

- ✓ To assess the pattern of admission, outcome of neonate admitted to neonatal intensive care unit at Jimma medical center, from February-august 2021.

3.2 Specific objectives:

- ✓ To identify pattern of disease of the neonates admitted into to neonatal intensive care unit at Jimma medical center
- ✓ To assess the discharge outcome of neonates admitted into to neonatal intensive care unit at Jimma medical center
- ✓ To identify factors associated with discharge outcome of neonates admitted into to neonatal intensive care unit at Jimma medical center
- ✓ To assess the length of stay of neonate admitted into to neonatal intensive care unit at Jimma medical center

CHAPTER 4: MATERIALS AND METHODS

4.1 Study area and period

4.1.1 Study area

The study was conducted at JMC, which is a referral hospital found in Jimma town, southwest Ethiopia, around 350km from the capital city of +Ethiopia (Addis-Ababa). It started service in 1983 and currently utilized by 15 million populations in its catchment areas of south western Oromia, Gambelia and Southwest Ethiopian regional state. It provides a broad range of medical services to both in and out patient of all age groups. Department of pediatrics and child health is one of the major specialties which has 12 specialists two of whom is subspecialist, two major wards, 5 bedded intensive care unit (ICU), 30 – 40 bed capacity neonatal intensive care unit (NICU) and five subspecialty outpatient clinics and an emergency room with average of 12 bed. One of the units in this department is neonatal intensive care unit (NICU). It offers inpatient care on 20 ICU and 22 maternal side beds, for neonates admitted for different cause's .It has radiant warmers to keep the room warm and two continuous positive airway pressure (CPAP). The unit does not have a mechanical ventilator or incubators for premature neonates. It is staffed with 28 nurses, two senior, 1 senior resident and 4 junior residents, which rotate each month.

4.1.2 Study period

The study was conducted from February 1, 2021 to August 1, 2021.

4.2 Study design

Institution based longitudinal study design was used.

4.3 Source population

All neonates admitted to JMC neonatal intensive care unit.

4.4 Study population:

All neonates admitted to JMC neonatal intensive care unit during the study period who fulfill the inclusion criteria

4.5 Inclusion and exclusion criteria

4.5.1 Inclusion criteria:

Neonates admitted to JMC neonatal intensive care unit during the study period.

4.5.2 Exclusion criteria:

Those neonates who admitted for observation and discharged well in 24 hours and who died on arrival (<30 min) and parents refused to give consent were excluded from the study

4.6 Sampling and Sample size determination

All neonates who admitted in JMC, NICU in the study period were included consecutively.

4.7 Study variables

4.7.1 Dependent variable

✓ Discharge outcomes of neonate

4.7.2 Independent variables

✓ Age at Admission, Maternal Age, Sex ,Gestational Age ,Birth Weight ,Multiple Birth, Clinical Diagnosis ,Length of Stay ,Mode of Delivery ,Place of Birth ,ANC Visit status, Parity, Apgar Score, Maternal medical illness, Maternal educational status, Maternal occupation ,Address

4.8 Data collection method and procedures

4.8.1 Data collection method

Interviewer administered structured questionnaire used to collect data which prepare for purpose of this research. Maternal and demographic data obtained by interviewing at the time of admission and clinical data were collected from charts after the diagnosis settled by treating physician.

Trained Residents collected the data. The principal investigator checked for completeness of the questionnaire on daily basis.

4.8.2 Data quality assurance

To assure the quality of data, the following measure was undertaken. Structured questionnaire was used. The questionnaire was pretested and clarity of language was checked. Threading physicians were oriented at beginning of each month for the team joining neonatal ward. The principal investigator closely supervised the activity on a daily base. At the end of each data collection days, the principal investigator was checking the completeness of the filled questionnaires to ensure the quality of the data collected. There was meeting held whenever necessary with the data collectors so that any ambiguity was cleared by discussion.

4.8.3 Data processing and analysis

Data coding, cleaning and verification were done before entering into EpiData manager version 4.0 and exported to the Statistical Package for Social Sciences (SPSS) version 25 for analysis. P-value of less than 0.25 at a CI of 95% on bivariate analysis was considered as a candidate variable for multivariate logistics regression. P value of less than 0.05 at a CI of 95% was considered as significant. Descriptive statistics carried out to see the pattern of admission and outcomes, whereas Bivariate and multivariate logistic regression analysis were performed to determine factors associated with mortality at P value of less than 0.05 at a CI of 95% will be considered as significant.

4.9 Operational definitions

- **Neonates** - all babies under the age of 28 days.
- **Early neonatal death** – is the neonatal death occurring within the first seven days of life
- **Gestational age:** Estimated by using last normal menstrual period (LNMP) or by Ballard score. (27)
- **Preterm:** Gestational age < 37 completed weeks
- **Term** - Gestational age above 37 completed weeks
- **Preterm:** babies born from less than 37 week of gestational age.
- **Term:** babies born from 37 to 42 week of gestational age.

- **Post term** :babies born above 42 week of gestational age
- **Normal birth weight**: Birth weight above 2500gm.
- **Low birth weight**: Birth weight<2500gm.
- **Length of hospital stay**: the day neonates stay in hospital until death or discharge alive
- **Bad obstetric history**: a mother who have previous history of either abortion, still birth or early neonatal death
- **Hypothermia** will define as body temperature 36.5°C measure in the armpit during admission.
- **Antenatal care follow up**: pregnant women who had at least one follow up at health institution.
- **A small for gestational age** :infant was define as baby having a birth weight below the tenth percentile for its gestational age and sex
- **Appropriate for Gestational Age** :Birth weight b/n the 10th and 90th percentile for that particular gestational age.
- **Large for Gestational Age** :Birth weight greater than 90th percentile for that particular gestational age.
- **Respiratory distress syndrome** -diagnosed based on the clinical signs and radiologic findings
- **Sepsis** - diagnosed based on the clinical findings
- **Meconium Aspiration Syndrome (MAS)** – the aspiration of stained amniotic fluid, which can occur before, during or immediate after birth.
- **Disease Pattern**: Frequency and Distribution of disease at admission.
- **Inborn**: Neonate who was born at maternity ward of JUMC and admitted to NICU of JUMC.
- **Out born**: Those neonates born out of JUMC, but admitted to NICU of JUMC.
- **Discharged alive** : Those neonates who were improved, referred and leave against medical advice
- **Death** – the cessation of all biological function in the hospital

4.10. Ethical considerations

Ethical clearance was obtained from the Institutional Review Board (IRB) of Jimma University Institute of Health. Additionally, permission letter was obtained from JMC clinical director office and the department of pediatrics and child health before the commencement of the study. Verbal consent was obtained from the attendant or parent of each baby. To keep the confidentiality all collected data was coded and locked in a separate place and it was used only for the research purpose. The ethical consideration was taken in to account throughout the study and they had right not to participate and withdraw from the study at any time. In addition safety precautions were taken by both data collector and parents during face to face interview by using all the COVID 19 prevention strategies by providing face mask, sanitizer and keeping distance between them.

4.11. Plan for dissemination of results

The finding of this study will be submitted to Jimma University Faculty of Medical Sciences, Department of Pediatrics and Child Health, and other relevant stake holders. Attempts will also be made to publish it on peer reviewed scientific journal.

CHAPTER 5: RESULTS

5.1 Characteristics of neonates admitted to NICU, JMC, 2021

In this study, 410 neonates admitted were approached during the study period, 380 neonates were included in the analysis and 30 neonates were excluded based on inclusion criteria. Of the 380 neonates included in the analysis, 271 (71.4%) were improved, 17(4.4%) went against medical advice and 92 (24.2%) died. Of the 380 neonates, 222 (58.4%) were male and 146 (38.4%) were inborn. Sixty nine (18.2%) were admitted within the first hour of age. 184 (48.4%) were born preterm (at gestational age less than 37 weeks) gestation. Three hundred forty eight (93.7%) were appropriate for gestational age and seven (1.8%) were small for gestational age (**Table 1**)

Table 1 Characteristics of Neonates admitted to NICU, JMC, 2021 (N=380)

Variables	Category	Frequency	Percent
Sex	Male	222	58.4%
	Female	158	41.6%
Age at presentation	<24hr	199	52.4%
	24-7day	146	38.4%
	≥7day	35	9.2%
GA at birth (N-359)	<37wk	184	48.4%
	≥42wk	4	1.1%%
Birth weight(N-362)	<2500g	150	41.4%
	2500g-4000g	203	56.2%
	≥4000g	9	2.5%
Type of gestation	Singleton	316	83.2%
	Multiple gestation*	64	16.8%
Place of birth	Home	19	5%
	Institutional delivery	361	95%
Mode of delivery	SVD	269	70.8%
	Assisted	15	3.9%

	C/S	96	25.3%
Length of stay	<3days	92	24.2%
	4-7days	137	36.1%
	>7days	151	39.7%

SVD-Spontaneous Vaginal Delivery and C/S-Caesarian Section

*all were twin

5.2 Sociodemographic Characteristics of mothers of neonates admitted to the NICU, JMC, 2021

Most of the mothers (349, 91.8%) of the neonates were in the age range of 19-35 years. Regarding the educational status of the mothers, about a third (149, 39.2%) of them attended primary school whereas half of them (199, 52.4%) live in rural area. (Table 2)

Table 2 Socio-demographic Characteristics of mothers of neonates admitted to NICU, JMC, 2021 (N=380)

Variables	Categories	Frequency
Maternal Age	<19	8 (2.1%)
	19-35	349 (91.8%)
	36 and above	23 (6.1%)
Residency	Urban	181 (47.6%)
	Rural	199 (52.4%)
The mother support the pregnancy?	Yes	377 (99.2%)
	No	3 (0.8%)
Maternal Education	No formal education	146 (38.4%)
	Primary school attended	149 (39.2%)
	Secondary school attended	55 (14.5%)
	Higher Education	30 (7.9%)
Maternal Occupation	Employed	112(29.5%)
	Un-employed	268(70.5%)

5.3. Obstetric Characteristics of mothers of neonates admitted to NICU, JMC, 2020(N=380)

Over half of the mothers 231 (60.8%) were multiparous and (18.7%) mothers had obstetrical complication during pregnancy. Almost all the mothers (372, 97.7%) had ANC visit, half of them (175, 47%) having ≥ 4 antenatal visits. (**Table 3**)

Table 3 : Obstetric Characteristics of mothers of neonates admitted to NICU, JMC, 2020 (N=380)

Variables	Categories	Frequency
Parity	Primipara	149 (39.2%)
	Multiparty	231 (60.8%)
ANC follow-up	Yes	372 (97.7%)
	No	8 (2.1%)
Number of ANC visit (N-372)	< 4	197 (53%)
	≥ 4	175 (47%)
Any obstetric problem diagnosed	Yes	71 (18.7%)
	No	309 (81.3%)
Diagnosed obstetric cases(N-71)	Preeclampsia	36 (50.7%)
	Malpresentation	11 (15.4%),
	Eclampsia	7 (10%)
	Supper imposed chronic HTN	2 (1.4%)
	PROM	5 (7.1%)
	Others	10 (13.1%)
APGAR Score	Known	133 (35%)
	Unknown	247 (65%)
APGAR Score for Inborn(N-146)	Known	102(69.9%)
	Unknown	44(30.1%)
1st Min Apgar score (N-133)	Less than 3	2 (1.5%)
	4 up to 6	76 (57.1%)
	7 up to 10	55 (41.4%)

5th Min Apgar Score (N-133)	Less than 3	2 (1.5%)
	4 up to 6	21 (15.7%)
	7 up to 10	110 (82.7%)

5.4 Patterns of Diseases at Admission in NICU, JMC, 2020(N=380)

The most common primary diagnoses during admission to the neonatal care unit were neonatal sepsis (55.5%), prematurity with respiratory problem (28.9%), hyperbilirubinemia (18.9%), and asphyxia (13.9%). Hypothermia was diagnosed as comorbid illness in 8.6% of the neonates during admission and the most common diagnosis after admission was hospital acquired infection 7.4%.(Table4)

Table 4 common diagnosis of neonates admitted to NICU, JMC, 2020 (N=380)

Cause of admission	Frequency
Neonatal Sepsis	197 (55.5%)
Respiratory Distress Syndrome	109 (28.9%)
Pathologic Jaundice	72 (18.9%)
Perinatal Asphyxia	53 (13.9%)
Congenital Malformation	50 (13.2%)
Meconium Aspiration	27 (7.1%)
Traumatic Birth Injury	25 (6.6%)
HIV-Exposed	6(1.6%)
Other Conditions*	40 (10.5%)

* These are hypothermia, hypoglycemia, kernicterus, neonatal tetanus, anemia and polycythemia

**the percentage adds up more than 100% because of multiple diagnosis at admission.

5.5 Outcome of neonates

5.5.1 Neonatal characteristics by mortality, in NICU, JMC, 2020(N=380)

Of the 380 neonates, 92 (24.2%) died in the neonatal unit, and the remaining 288 (75.8 %) were discharged from hospital. When broke down to specific diagnosis of mortality were prematurity with respiratory problem (47.8%), sepsis (44.6%), and perinatal asphyxia (17.4 %) had associated. Fifty nine (64.9%) of the 92 neonates who died had admission weight <2,500 g. all neonates, 4 (100%) weighing <1,000 g and 27 (69.2%) of the 39 neonates weighing between 1,000 g and 1,499 g were died. Three (42.9%) of the seven small for gestational age neonates and 76 (21.8%) of the 348 appropriate for gestational age neonates died. One neonate whose gestational age was 28 weeks died. Of the 17 neonates whose gestational age was between 28 weeks and 31 weeks, 12 (70.6%) died. 95.6% of mothers who received ANC follow up, their neonates died and 85(92.3%) of neonates died in the first week of life. In relation to place of birth, inborn neonates accounted 28% of the deaths

5.5.2 Table 5 Bivariate and Multivariate logistic regression model to identify factors associated with mortality among neonates admitted to NICU, JMC, South West Ethiopia, 2021.

To get the predictor of the outcome variable, multivariable logistic regression analysis was performed after selecting the candidate variable through bivariate logistic regression. Birth weight, residency, maternal education level , ANC follow up ,mode of delivery, APGAR score, sepsis ,pathological jaundice and RDS had shown association during the binary logistic regression at P-value <0.25.Out of these birth weight, maternal education and RDS were found to be a significant association with mortality by multivariate logistic regression at P-<0.05 with 95% CI AOR.

This study revealed neonates with birth weight <2500g neonates were 2 times high likely to die than normal birth weight and >4000g neonates (AOR: 2.19; 95%CI 1.24-3.89). Neonates born from mothers who did not attend any formal education had 5 times high odd of dying than their counters from mothers who attend any formal education (AOR: 5.07; 95%CI 1.12-22.88). Similarly, neonates with respiratory distress syndrome had 2 times high likely to die than those admitted with no RDS (AOR: 1.92; 95% CI 1.06-3.38). (**Table 5**)

Table 5 Bivariate and Multivariate logistic regression model to identify factors associated with mortality among neonates admitted to NICU, JMC, South West Ethiopia, 2021.

Variables	Categories	Death	P-value	COR (95% CI)	AOR (95% CI)
Sex	Female	54 (58.7%)	0.95	1.01(0.63-1.63)	
	Male	38 (41.3%)		1	
Place of birth	Health facility	88 (95.7%)		1	
	No health facility	4 (4.3%)	0.74	0.82 (0.26-2.55)	
Maternal age	<18 years	2 (2.2%)	0.47	1.41 (0.59-3.52)	
	19-35 years	83 (90.2%)		1	
	≥36 years	7 (7.6%)	0.93	1.06 (0.21-5.39)	
Birth weight	<2500g	58(66.6%)	0.00	3.26(1.99-5.78)	2.19(1.24-3.89)
	25000-4000g	28(32.1%)		1	1
	≥4000g	1(1.1%)	0.74	0.69(0.08-5.78)	0.91 (0.11-7.87)
Residency	Urban	37 (40.2%)		1	1
	Rural	55 (59.8%)	0.10	0.67 (0.41-1.08)	0.83(0.45-1.52)
Maternal education	No formal Education	45 (48.9%)	0.017	6.05(1.38-26.5)	5.07 (1.12-22.88)
	Primary school attended	40 (43.5%)	0.025	5.28(1.20-23.2)	4.37 (0.96-19.7)
	Secondary school attended	5 (5.4%)	0.69	1.39 (0.25-7.69)	1.39(0.25-7.88)
	Higher education	2 (2.2%)		1	1
Maternal Occupation	Employed	28 (30.4%)		1	
	Unemployed	64 (69.6%)	0.86	1.04 (0.62-1.72)	
Parity	Primipara	34 (37%)	0.61	1.13 (0.69-1.84)	
	Multipara	58 (63%)		1	
ANC follow-up	Yes	88 (95.7%)		1	1
	No	4 (4.3%)	0.10	3,22 (0.79-13.17)	2.35(0.54-20.19)

Any obstetric problem	Yes	18 (19.6%)	0.80	1.07 (0.59-1.95)	
	No	74 (80.4%)		1	
Mode of delivery	SVD	72 (78.3%)		1	1
	AVS	1 (1.1%)	0.11	0.19 (0.02-1.51)	0.42 (0.05-3.68)
	CS	19 (20.7%)	0.17	0.67(0.38-1.18)	0.86(0.42-1.65)
Type of Pregnancy	Multiple	21 (22.8%)	0.08	0.59 (0.33-1.06)	1.58 (0.77-3.28)
	Singleton	71 (77.2%)		1	
Time of delivery	working hour	44(47.8%)		1	
	Off working hour	48(52.2%)	0.33	0.79(0.49-1.26)	
APGAR score	Known	26 (28.3%)		1	1
	Unknown	66 (71.7%)	0.12	0.66 (0.39-1.11)	1.49(0.86-2.62)
<hr/>					
Sepsis	Yes	41(44.6%)	0.10	0.67 (0.42-1.08)	0.81 (0.46-1.38)
	No	51 (55.4%)		1	1
Meningitis	Yes	21 (22.8%)	0.81	1.07 (0.61-1.86)	
	No	71 (77.2%)		1	
Pathologic jaundice	Yes	13 (14.1%)	0.18	0.63 (0.33-1.23)	0.71 (0.34-1.44)
	No	79 (85.9%)		1	1
Asphyxia	Yes	16 (17.4%)	0.27	0.70 (0.36-1.32)	
	No	76 (82.6%)		1	
Meconium aspiration	Yes	8(8.6%)	0.49	0.74(0.31-1.75)	
	No	84((91.3%)		1	
Congenital malformation	Yes	15 (16.3%)	0.30	0.71 (0.36-1.36)	
	No	77 (83.7%)		1	
RDS	Yes	44 (47.8%)	0.00	3.08 (1.88-5.04)	1.91 (1.06-3.38) *
	No	48 (52.2%)		1	1
Other medical conditions	Yes	15 (16.3%)	0.04	2.04 (1.02-4.08)	1.65 (0.77-3.53)
	No	77 (83.7%)		1	1

*Statistically significant at $P\text{-value} \leq 0.05$

CHAPTER 6: DISCUSSION

This is a hospital based prospective study aimed to demonstrate the pattern of admission and outcomes of neonates managed in the NICU at Jimma university medical center . Our finding reported that sepsis (55.5%), prematurity (28.9%), hyperbilirubinemia (18.9%) and asphyxia (13.9%) were the most common causes of neonatal admission. The proportions of these causes of admission vary across different centers(19,21,25,26). Similar to our study, which Sepsis, prematurity, and asphyxia were frequent cause of admission in Jordan, Sudan and university of Gondar (14,17,19), however hyperbilirubinemia contributed a higher proportion as a cause of admission in our hospital when compared to them. This may be explained by the fact that the our hospital is a referral center where cases that could not be managed by other hospitals are referred to us.

In Pakistan, Jordan and St Paul's Hospital, where sepsis accounted 28.9%,27.2% and 22.7%,respectively, which contributed a lesser proportion as a cause of admission when compared to ours (13, 19,21)). However, which is comparable to previous study conducted at this hospital which accounted (40%) (18). The similarity in finding might be due to overcrowding, high patient to few staff ratio, inadequate availability of disposable materials and poor compliance to infection control measures but high prevalence of neonatal sepsis in our centers could be explained by most of the mothers were referred to the hospital from surrounding districts and majority of the babies were out born, which occur that poor compliance to infection control measures in the antenatal, intrapartum, and postpartum neonatal care .The other explanation of discrepancy in different centers could be variation of diagnostic criteria used for sepsis.

The overall incidence of prematurity with RDS in our hospital was comparable to that of reported from tertiary hospitals in Jordan (24.9%) but lower than the study from St Paul's Hospital in Ethiopia (36.6%)(13,19) .Asphyxia also, the common cause of admission in many studies done in developing countries and has important consequences for subsequent morbidity and mortality in infancy and childhood. The proportion in our hospital (13.9%) comparable to study done in university of Gonder (12.5%) and Pakistan (11%)(14). The fact that prematurity, sepsis,

and asphyxia are being common causes of neonatal Morbidity in neonatal care centers of developing countries including ours could imply the lack of appropriate interventions in the antenatal, intrapartum, and postpartum neonatal care.

The overall mortality in our neonatal care unit was 92/380 (24.2%). This magnitude was higher than the reports from some other centers. A lower mortality rate was reported in Tanzania (10.7%) Jordan (8.1%), Sudan (8.3%) and Ayider Hospital (11.4%), but a comparable magnitude of mortality with that of our finding was reported in Nigeria and Mizan tepi hospital(13,14,16,22,23). The first week of mortality in our study (92.1%) comparable to the center in Tanzania (91.4%) but higher than compare to Nigeria (76.5%). This difference in the magnitude of neonatal mortality across different neonatal care centers in the developing countries could be related factors for each study and may reflect variation in the quality of service provided in the centers. But the higher magnitude of mortality in our center when compared to some of the centers mentioned earlier needs attention to improve the quality of care in the unit. In fact that our hospital is a tertiary care center may attract more neonates and pregnant mothers with obstetric complication for their delivery. However, in our study, we included both inborn and out born babies, which could reflect the representativeness of our finding.

The leading clinical diagnosis associated to mortality in our neonatal care unit were prematurity with respiratory problem 47.8%, sepsis 44.6%, and perinatal asphyxia 17.4 %. Similar to our finding Studies conducted in Pakistan, Nigeria, Sudan and Jordan were reported prematurity, sepsis, and asphyxia as major causes of mortality in a neonatal care unit (17–19,22). The high rate of mortality because of that prematurity in our finding may be related to the lack of appropriate treatment modalities, such as mechanical ventilation, CPAP, incubator, surfactant administration, and parenteral nutrition.

Neonatal infection in our finding is a preventable cause of neonatal death and prevented by appropriate treatment of maternal infection and by proper infection prevention strategies during labor and delivery or after delivery. The other most common cause of death in our hospital was Asphyxia. This neonatal problem can be prevented and should be prevented, but once it occurs reversing the damage to body organs may not be possible. Proper training of the health care provider on how to detect fetal jeopardy during labor and delivery and also on how to identify risk

factors for asphyxia can help prevent asphyxia. Providing training on neonatal resuscitation to health care providers who attend labor and delivery is also very important in preventing asphyxia.

Our finding in the present study also indicated that low birth weight the compare proportion of death which compare to study done in Tanzania (23).This similarity due to the fact that underweight and preterm newborn had immaturity of immune systems and other body defense mechanisms which control newborn disease susceptibility. This implies that anticipating high risk newborn babies and early treatment would reduce the deaths of such physiologically and anatomically vulnerable neonates. Other possible explanations for this might also be due to delay in receiving adequate health care due to poor facilities and lack of medical supplies in low income countries.

Strength of the study

The strength of the current study included its being prospective in design, which allowed for better control over data acquisition and used as a representative data for our neonatal intensive care unit. The findings would specifically be of interest for similar settings in resource-limited countries.

Limitation of the study

The limitations include Firstly, the neonatal unit data recording system needs also improvement as some of the patients' records were incomplete. Secondly, the neonatal unit should have access to important laboratory investigations including blood culture so that unnecessary prescription of antibiotics, prolonged duration of hospital stay and misdiagnosis is reduced.

CHAPTER 7: CONCLUSION AND RECOMMENDATION

7.1 Conclusion

A Based on this prospective study the following conclusions can be drawn: prematurity, Neonatal infections and asphyxia were the major causes of morbidity and mortality in Jimma University medical center neonatal unit during study period. This study found Prematurity with RDS, low birth weights and maternal education had a significant association with neonatal mortality

The hospital neonatal death rate seen in this study is high (24.2%). This mortality is high (72%) in < 1500gm and out born neonates , which indicates the need to improve the quality of neonatal care and appropriate interventions in the antenatal, intrapartum, and postpartum neonatal care are very important.

7.2 Recommendations

Based on the finding the following recommendation will be forwarded to concerned bodies. For our hospital; as the burden of neonatal death among neonates admitted at JMC is found to be high, it is recommended that early detection and anticipating high risk pregnancies and high-risk newborns and provision of timely and appropriate intervention could reduce neonatal mortalities

For health institutions; In our finding , as more deaths are from those out born interventions should be done to increase prereferral care, avoid delay and awareness creation on care seeking behavior

Facility as well as community based researches should be done more representative research by including more teaching hospitals in different regions of the country to understand the real burden of the problem and possible associated risk factors. This will enable policy makers to design the necessary preventive, curative as well as rehabilitative strategies in order to reduce the burden of the problem and improve the quality of care.

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ANNEX I: Participant's information sheet and consent form

Hello, my name is Dr Betre Shemelis and I am pediatrics and child health postgraduate student in Jimma University, College of Health Science, and School of Medicine. I am conducting survey on the pattern of morbidity and mortality in neonates within this hospital. The result that will come out of this study will be used by the institutions and the government to solve some problems related with neonatal diseases. The research is intended to benefit the society including the people that will be participating in this research and will introduce no harm to the participant. The questionnaire requires the maximum of 20 minutes to complete. Your participation is entirely voluntarily, and you can quit from the study any time you want. Your name and other personal identity will not be used, and hence the information we will collect from you will completely be kept confidential and will not be disclosed to any third person other than the people participating in this study.

May I now begin the interview?

If yes, continue interviewing

If no, thank and stop interviewing

Name of the interviewer _____ Sign. _____ Date _____

Name of the supervisor. _____ Sign. _____ Date _____

Annex II Amharic Information Sheet

የፈቃደኝነት መጠየቂያና የመረጃ ገጽ

የመረጃ ገጽ

ሰላም ዶክተር በትረ ይባላል፤ በጅም ዩኒቨርሲቲ የህፃናት ህክምና እና ጤና የሁለተኛ ድግሪ (ስፔሻሊቲ) ተማሪ ነኝ ። እኔ በዚህ ሆስፒታል ውስጥ በአራስ ሕፃናት ውስጥ በሚከሰት የሕመምናውጤቶች ንድፍ ላይ ጥናት እያካሄደሁ ነው

የዚህ ጥናት ውጤት የበሽታውን መጠን ለማወቅ ያስችላል ። መጠይቁ 20 ደቂቃ በላይ አይወስድም ። የአንቺ በጥናቱ ላይ ተሳትፎ በፈቃደኝነት ላይ የተመሰረተ ነው። መሳተፍ ካልፈለግሽ መተው ይቻላል። የአንቺ ስምና ግለሰባዊ መርጃ ሚስጥራዊነቱ የተጠበቀ ነው። ስላንቺ መረጃ ጥናቱን ከሚያካሂደው ሰው ውጭ ሌላ ሰው አያውቅም፤ መጠይቁም የሚሞላው ብቻሽን ሆነሽ ነው።

ጥያቄ አለሁት?

የፈቃደኝነት ቅጽ

በጥናቱ ለመሳተፍ ተስማምተዋል?

አዎ ተስማምቻለሁ

አይ አልተስማማሁም

በመጥይቁ ሞዴል የሚፈረም፡ ከላይ በመረጃ ገጽ ላይ ያለውን ለጥናቱ ተሳታፊ በተገቢ ሁኔታ አንብቤ ማስረዳቴን በፊርማዬ አረጋግጣለሁ።

የተጠያቂው ፊርማ _____ ቀን _____.

የጤያቂው ስም _____ ፊርማ _____ ቀን _____.

የተቆጣጣሪው ስም _____ ፊርማ _____ ቀን _____.

Annex III Afan Oromo Information Sheet

Fullaa oddefannoo fi fedhii Haadholii

Fullaa oddefannoo

Akkam, Maqaan koo Dr. batra shimelis jedhama. Ani Yuunivarsiitii Jimmaatti rizidentii pedaatiriksii fi fayyaa da'immaaniiti. Ammaa ani haala bal'ina fi bu'aa daimman kichu kutaa yaal ijjolle kichu cisanii yalmni , irratti qorannoo gochaan jira. Bu'aan qorannoo kanarraa argannu bal'ina rakkoo kanaa bekuuf nuu gargaara. Gaffiilee armaan gadii debisuuf daqiiqaa 20 fudhata. Hirmaannaan keessan fedhii keessan irratti kan hundaaye dha. Yoo hirmaachuu hin barbaanne dhaabuu dandessa. Maqaafi enyummaan kee qorannoo kana kessattii hin eeramu. Odeefannoon ati nuuf kennitu, nama qorannoo kana hojjetuun ala kan beeku hin jiraatu, gaffiis kan gafatamtu qobaake taateti.

Gaaffii qabduu?

Irraati hirmaachuuf walii galtanii?

Eeyyee_____.

Lakkii_____.

Anii wanta armaan oliiti katabame irraati hirmaachuuf waliigaleera.

Mallattoo_____.

Maqaa nama gaffii gafatuu_____mallattoo_____guyyaa _____.

Maqaa nama to'atuu_____mallattoo_____guyyaa_____.

ANNEX IV: Questionnaire

Questionnaire

NICU Questionnaire

IDENTIFICATION

Code	Question	Response	
1	Study ID number:	_ _ _ _ _ _ _	
2	Card Number	_ _ _ _ _ _ _	
3	Date of admission for the neonate	_ _ _ _ _ _ _ _ _	
4	Infant Sex	1 <input type="checkbox"/> . Female 2 <input type="checkbox"/> . Male	
5	Postnatal age at admission in hour (if less than 72hrs)	Minute _ _ Hours: _ _ Days: _ _	
6	Best gestational age in weeks and days:	weeks: _ _ days: _ _	
7	Birth weight	_ _ _ _ _ _	
8	Admission weight if birth weight not known	_ _ _ _ _ _	
9	Birth weight for gestational age:	1 <input type="checkbox"/> . AGA 2 <input type="checkbox"/> . SGA 3 <input type="checkbox"/> . LGA	
10	Birth place:	1 <input type="checkbox"/> . J MC 2 <input type="checkbox"/> . <i>general hospital</i> 3 <input type="checkbox"/> Primary hospitals 3 <input type="checkbox"/> . Health Center 4 <input type="checkbox"/> . Home 5 <input type="checkbox"/> . Other; specify: _____	
11	How far is your home from nearest hospital in your district?	: _____ kilometers	
Maternal Background			
12	Maternal age in years:	_ _	
13	Dwelling Place?	1 <input type="checkbox"/> . Urban 2 <input type="checkbox"/> . Rural	
14	Is mother supported?	1 <input type="checkbox"/> . Yes 2 <input type="checkbox"/> . No	

15	Maternal education:	1 <input type="checkbox"/> .No Formal education 2 <input type="checkbox"/> . Primary education 3 <input type="checkbox"/> . Secondary education 4 <input type="checkbox"/> . Higher institution	
16	Occupation of mother:	1 <input type="checkbox"/> . House wife 2 <input type="checkbox"/> . Private business 3 <input type="checkbox"/> . Employee (GO/NGO) 4 <input type="checkbox"/> .farmer 5 <input type="checkbox"/> .daily laborer 6 <input type="checkbox"/> . Other _____	
17	Parity:	_____	
18	Any bad Obstetric problem during previous pregnancy	1 Yes <input type="checkbox"/> . 2 no <input type="checkbox"/> . (if no skip to q20)	
19	If yes to Q 18select the applicable	1 Spontaneous <input type="checkbox"/> . 2 APH <input type="checkbox"/> . 3 pregnancy induced HTN <input type="checkbox"/> . 4 GDM <input type="checkbox"/> . 5 Still birth <input type="checkbox"/> . 6 other _____	
20	Did you attend Antenatal care during this pregnancy?	1 <input type="checkbox"/> . Yes 2 <input type="checkbox"/> . No (if no skip to q22)	
21	If yes to Q20 number of visits	_ _	
22	Any known medical disorder you have before the pregnancy?	1 <input type="checkbox"/> . Yes 2 <input type="checkbox"/> . No (if no skip to q24)	
23	if yes to q no. 22 what is the medical problem	1 cardiac disease 2 diabetes mellitus 3 chronic hypertension 4 asthma or other pulmonary problem 5 other _____	
24	Any Obstetric problem diagnosed during this pregnancy (from the time you notice pregnancy till delivery)?	1 <input type="checkbox"/> . Yes 2 <input type="checkbox"/> . No _ No (if no skip to q26)	
25	If yes to Q24 what is the obstetric disorder?	1 <input type="checkbox"/> .preeclamsia 2 <input type="checkbox"/> .eclamsia 3 <input type="checkbox"/> .superimposed chronic HTN 4 <input type="checkbox"/> .GDM 5 <input type="checkbox"/> .APH 6 OTHER _____	
26	Mode of delivery:	1 <input type="checkbox"/> . Spontaneous vaginal delivery 2 <input type="checkbox"/> . Assisted vaginal delivery 3 <input type="checkbox"/> . C/S	
27	Is the pregnancy multiple?	1 <input type="checkbox"/> . Yes 2 <input type="checkbox"/> . No	
28	Delivery time	Time _ _ 1 <input type="checkbox"/> . Working hours 2 <input type="checkbox"/> . Off working hours	

Infant background		
29	Is this the first admission to this hospital?	1 <input type="checkbox"/> . Yes 2 <input type="checkbox"/> . No
30	Was the baby referred?	1 <input type="checkbox"/> . Yes 2 <input type="checkbox"/> . No
31	APGAR score:	1 <input type="checkbox"/> . Known 2 <input type="checkbox"/> . Unknown
32	1 st minute Apgar score:	_ _
33	5 th minute Apgar score:	_ _
34	Was the baby needed resuscitation immediately after birth?	1 <input type="checkbox"/> . Yes. 2 <input type="checkbox"/> . No 3 <input type="checkbox"/> . unknown
Infant clinical profile		
35	Presenting complaints:	1 <input type="checkbox"/> . Small baby 2 <input type="checkbox"/> . Cold to touch 3 <input type="checkbox"/> . Failure to suck 4 <input type="checkbox"/> . Vomiting 5 <input type="checkbox"/> . Seizure 6 <input type="checkbox"/> . Referred 7 <input type="checkbox"/> . Jaundice 8 <input type="checkbox"/> . Fever 9 <input type="checkbox"/> . Breathing problem 10 <input type="checkbox"/> . other, specify: _____
36	Which of the following were the admission diagnoses of the infant	1 <input type="checkbox"/> . Early onset neonatal sepsis (< 7 days) 2 <input type="checkbox"/> . Neonatal Seizure 3 <input type="checkbox"/> . Late onset neonatal sepsis (>=7 days) 4 <input type="checkbox"/> . Anemia 5 <input type="checkbox"/> . Meningitis 6 <input type="checkbox"/> . Pathologic jaundice 7 <input type="checkbox"/> . HIV-exposed 8 <input type="checkbox"/> . Shock 9 <input type="checkbox"/> . Perinatal asphyxia with multiple organ involvement 10 <input type="checkbox"/> . Congenital malformation/ Chromosomal anomalies 11 <input type="checkbox"/> . Acute bilirubin encephalopathy (ABE) 12 <input type="checkbox"/> . Traumatic birth injury 13 <input type="checkbox"/> . Respiratory Distress Syndrome 14 <input type="checkbox"/> . Necrotizing enterocolitis (NEC) 15 <input type="checkbox"/> . Meconium aspiration syndrome 16 <input type="checkbox"/> . Hypoglycemia 17 <input type="checkbox"/> . Apnea 18 <input type="checkbox"/> . Electrolyte disorders 19 <input type="checkbox"/> other
37	Additional diagnosis after admission (Complications):	1 <input type="checkbox"/> . Yes. 2 <input type="checkbox"/> . No
38	If yes to Q no 37, what complications	1 <input type="checkbox"/> hospital acquired infection 2 <input type="checkbox"/> iv site infection 3 <input type="checkbox"/> surgical wound infection 4 <input type="checkbox"/> jaundice 5 <input type="checkbox"/> hypoglycemia 6 <input type="checkbox"/> hypothermia 7 <input type="checkbox"/> intolerance 8 other

39	What was the treatment offered?	1 <input type="checkbox"/> .Antibiotics 2 <input type="checkbox"/> . Analgesics 3 <input type="checkbox"/> .surgical procedures 4 <input type="checkbox"/> . Oxygen 5 <input type="checkbox"/> . Nutritional treatment 6 <input type="checkbox"/> .iv fluid support 7 <input type="checkbox"/> phototherapy 8 <input type="checkbox"/> kangaroo mother care 9 <input type="checkbox"/> Other, specify: _____	
40	Duration of ward stay in days:	_ _ _	
41	Outcome of current admission:	1 <input type="checkbox"/> . Discharged improved 2 <input type="checkbox"/> . Died in the hospital 3 <input type="checkbox"/> . Referred out to another facility to complete treatment 4 <input type="checkbox"/> . Referred for better management 5 <input type="checkbox"/> . Leave against medical advice/disappearance	
FORM COMPLETION Name of person completing this form: _____ Signature _____ Date of form completion _ _ _ - _ _ - _ _ _ _ _ (DD-MM-YYYY)			

Thank you very much for your willingness to participate in my research!