

**ADDIS ABABA UNIVERSITY
COLLEGE OF HEALTH SCIENCES
SCHOOL OF NURSING AND MIDWIFERY**

**Pattern of Disease, Outcome & Associated Factors Among
Neonates Admitted to Neonatal Intensive Care Unit at Jimma
University Medical Center, Jimma, Southwest Ethiopia, 2018.**

By: EbissaBayana (Bsc)

**A Thesis Submitted to Addis Ababa University, College of Health
Sciences, School of Nursing and Midwifery for Partial Fulfillment
of the requirements for Degree of Masters in Pediatric and Child
Health Nursing.**

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**PATTERN OF DISEASE, OUTCOME & ASSOCIATED FACTORS
AMONG NEONATES ADMITTED TO NEONATAL INTENSIVE CARE
UNIT AT JIMMA UNIVERSITY MEDICAL CENTER, JIMMA,
SOUTHWEST ETHIOPIA, 2018.**

BY EBISSA BAYANA (BSC)

Email:ebisabayana@ymail.com

ADVISORS: 1. DEBELA GELA (MSC)

2. TIGISTU GEBREYOHANNIS (MSC)

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ABSTRACT

Background: Neonatal period is a susceptible time in which the newborn has to adapt to a totally new environment and is vulnerable to many problems, which may even be life threatening. Neonatal disease pattern changes from time to time and place to place. Analyzing the neonatal admission pattern helps health care givers and policy makers to design better strategies.

Objective: This study aimed to assess the pattern of diseases, outcome and associated factors among neonates admitted to neonatal intensive care unit at Jimma university medical center, Jimma, Southwest Ethiopia, 2018.

Methods: Retrospective cross-sectional study design was conducted from March 15 to 30, 2018 among neonates admitted over a period of two years (January 1, 2016 to December 31, 2017) on 341 samples. Systematic random sampling technique was employed to get required samples from database. Data was collected using structured questionnaire by 4 trained diploma nurses. Data was entered to Epi-data 3.1 and exported to SPSS Version 23 for analysis. Bivariate and multivariate logistic regression was used to analyze the association between dependent and independent variables and P-value <0.05 at 95% CI was declared statistically significant association. Finally statement, tables, charts and graphs were used for data presentation.

Results: Of the total, 61.9 % were male, majority (66.9%) of them lives outside of Jimma town and 60.1% of them were inborn. The main disease patterns identified were neonatal sepsis (19.9%), prematurity (14.0%) and hyaline membrane disease (11.9%). More than half (55.56%) of neonates were admitted in the first 24 hours. Regarding their outcome, 81.52% of admitted neonates were improved and 18.48% were died. Prematurity and perinatal asphyxia were factors associated with increased risk of death [P<0.001, AOR= 0.26, 95%CI: (0.14, 0.46)] and [P<0.05, AOR=0.44, 95% CI: (0.21, 0.91)] consecutively.

Conclusion: Neonatal sepsis, prematurity, and hyaline membrane disease were the most frequently occurring diseases. Preterm, Primipara and out born were predictors of pattern of diseases whereas prematurity and perinatal asphyxia were predictors of death. The death rate was high which accounted 18.42 % which showed need of quality of care improvement. Therefore adequate resource should be put in place to improve neonatal outcomes.

Key words: Pattern of disease, outcome, neonate, association, neonatal intensive care unit.

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ACRONYMS AND ABBREVIATIONS

AGA	Appropriate for Gestational Age
AIDS	Acquired Immuno Deficiency Virus
AOR	Adjusted Odds Ratio
BPKIHS	Bratnagar Prasad Koirala Institute of Health Science
BSc	Bachelor of Science
C/S	Cesarean Section
CI	Confidence Interval
COR	Crude Odds Ratio
DM	Diabetes Mellitus
EDHS	Ethiopian Demographic & Health Survey
ETB	Ethiopian Birr
EVLBW	Extremely Very Low Birth Weight
FANC	Focused Antenatal Care
GA	Gestational Age
HIV	Human Immunodeficiency Virus
HMD	Hyaline Membrane Disease
hr	hour
JUMC	Jimma University Medical Center
KMC	Kangaroo Mother Care
LBW	Low Birth Weight
LGA	Large for Gestational Age
MAS	Meconium Aspiration Syndrome
MSc	Masters of Science
NBW	Normal Birth Weight
NEC	Necrotizing Enterocolitis
NGO	Non-Governmental Organization
NICU	Neonatal Intensive Care Unit
NMR	Neonatal Mortality Rate
PNA	Perinatal Asphyxia
RDS	Respiratory Distress Syndrome

SGA	Small for Gestational Age
SSA	Sub-Saharan Africa
SVD	Spontaneous Vaginal Delivery
UNAIDS	Joint United Nations Programme on HIV/ Acquired Immune Deficiency Syndrome
UNICEF	United Nation International Children Emergency Fund
UTI	Urinary Tract Infections
WHA	World Health Assembly
WHO	World Health Organization

1. INTRODUCTION

1.1. Background

Neonatal period is defined as the period from birth up to first 28 days of life and further divided into very early (birth to < 24 hour (hr)), early (24hr to <7 days), and late neonatal period (7 days to < 28 days) (1). The period is characterized by the transition to extra uterine life and rapid growth and development. Newborn health is the key to child health and survival and is the most hazardous period compared to any other time during the child's first year of life (2).

In low-income countries, important causes of Neonatal Mortality Rate (NMR) are prematurity, birth asphyxia, and sepsis, whereas prematurity and malformations are the leading causes in developed countries (3). The causes of neonatal admissions are not limited to infections but also non-infectious causes including metabolic, genetic, developmental defects and other factors like socio-cultural and behavioral effects such as illiteracy, socioeconomic deprivation, traditional beliefs, and fetal gender bias preferences of parents (4, 5). The pattern of diseases in neonatal period is a sensitive indicator of availability, utilization and effectiveness of mother and child health services in the community (6, 7).

Neonatal morbidity and mortality continue to be a large component of the burden of disease in Sub-Saharan Africa and its rates reflect a nation's socio-economic status, the efficiency and effectiveness of health care services (8). Management of common neonatal problems requires clinical expertise, training, access to suitable equipment, and well organized referral pathways (9) to ensure health care is of sufficient quality, which is important to monitor outcomes of care provided (10).

1.2. Problem statement

Neonatal morbidity and mortality is concerning health problem among low and middle income countries (11). Preterm birth (PTB) and very preterm birth (VPTB) are leading causes of mortality and morbidity in infants worldwide (12, 13). Of the estimated 8.7 million death in under five children worldwide, 41% occurred in neonates (14).

More than half of all deaths occurs within 24 hours of birth and 81% within first week of life in low and middle income where neonatal death contribute to 98%, of which more than three-quarters occurred in Sub-Saharan Africa and South Asia (15). Especially, in Sub-Saharan Africa (SSA), neonates confronted with a diversity of harmful clinical conditions, especially infectious diseases, which requires urgent interventions (16).

According to the report of United Nations of Children Fund (UNICEF) one of the main causes of neonatal death in Ethiopia is preterm birth which accounts for 23% of all other causes (17). Prior to 2000, neonatal deaths were rarely mentioned, but recently newborn health begun to emerge as a global and national public health priority (18). Despite the proven benefits of kangaroo mother care (KMC) in significantly reducing mortality among preterm babies, yet it's still underused in low income countries (11).

One of challenge in developing country is caring for the critically ill neonate, where health needs often surpass available resources like infrastructures, which are typically limited in low income countries (19), though health facility delivery is found to reduce the risk of neonatal mortality by 29% in low and middle income countries (20).

Neonatal morbidity and mortality contribute significantly to infant and under five mortality rate which are important indices for determining the level of development of any country (21). It also affects household income directly to cover costs for transport and health services (22). Spending on health care services by the government in turn affects the ability of a national proper financing on basic services (23) because morbidity and outcome of neonates are thought to be sensitive to changes in social, economic conditions and health care (24).

The development of neonatal intensive care unit (25) presence of programs like Integrated Management of Neonatal and Childhood Illnesses (IMNCI), Maternal, Child and Neonatal

Health (MCNH) and Focused Antenatal Care (FANC) has great contribution to ensure survival of neonates in most developing countries (26).

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 (27) and Sustainable Development Goals (SDGs) 3 ensures healthy lives and promotes well-being for all at all ages (28).

Appropriate feeding, maintaining temperature, cord and skin care, early detection and treatment of infection and its complications can substantially reduce mortality and morbidity of neonates(29). Timely access to simple interventions such as treating maternal infections during pregnancy, ensuring a clean safe birth and care of the umbilical cord can also decrease neonatal morbidity and mortality (30, 31). Even though highly cost-effective interventions exist to reduce neonatal mortality, there is no single intervention which fits all programmatic approaches (32).

Although knowing the disease pattern and disease-wise mortality in the neonatal intensive care unit (NICU) helps to use available resources and can make requisite efforts to reduce morbidity and mortality; little is known about the relative incidence of neonatal diseases and their outcomes and associated factors in Jimma university medical center (JUMC), Jimma, Southwest Ethiopia. Therefore this study is aimed to assess pattern of diseases, outcome and associated factors in Jimma university medical center (JUMC), Jimma, Southwest Ethiopia.

1.3. Significance of Study

Understanding the pattern and causes of neonatal morbidities is the key for identifying appropriate interventions for improvement of neonatal health.

So this study provides more evidence on the change of disease pattern among neonates for health care providers. The finding of this study gives an insight to policy makers on disease patterns among neonates and subsequent planning and implementation of newborn health programs in the Ethiopian communities. It creates awareness for the health institution, NGOs and as a whole the society to understand about the neonatal admission and outcome in NICU and action to be taken to prevent morbidity and mortality. It will be used as base line information for other researchers.

2. LITERATURE REVIEW

2.1. Introduction

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 resource-limited settings (33).

2.2. Patterns of diseases at admission in NICU

According to retrospective study conducted in tertiary care hospital of Southern Punjab, major neonatal diseases of neonates were birth asphyxia (36.6%), prematurity with complications (34%), sepsis (14.6%), congenital malformations (5.6%) (35). The common diseases in NICU at Bratnagar Prasad Koirala Institute of Health Science (BPKIHS) identified retrospectively were sepsis (32.6%), prematurity (86, 23.8%), and birth asphyxia (73, 20.2%) (36).

A retrospective study conducted at Tamale teaching hospital shown that the commonest neonatal disease was sepsis (29.2%), followed by prematurity(26.9%), birth asphyxia (16.2%) and congenital anomalies (7.1%) (37). A study conducted in neonatal intensive care unit of imperial college in England indicated that, respiratory disease was the most common; though jaundice was the most common reason for admission from home (22% home vs. 5% hospital). Risk factors for admission for jaundice include male, born at 37 weeks gestation, Asian ethnicity and multiple birth (38).

Retrospective study at tertiary care center hospital in Nepal shown that the commonest diseases were neonatal sepsis (34.5%) followed by prematurity (23.3%) and perinatal asphyxia (23.1%) (39). Birth asphyxia was found to be major of all case seen in Multan which accounts (34.5%) and among infections, sepsis was found in 1,009 (28.3%), pneumonia in 170 (4.7%) and meningitis in 30 (0.8%) (40).

According to retrospective study at secondary care in Pakistan, prematurity and infection were the main diseases of neonates (27.9% and 20.33%) respectively, followed by birth asphyxia (13%) and neonatal jaundice (11.3%) (41). According to a retrospective study done at rural tertiary care center in Tiruchirappalli, Tamil, Nadu morbidity profile shown 43% with birth asphyxia, 41% for prematurity and its complications, 34% with respiratory distress syndrome (RDS) (42).

Retrospective study at neonatal intensive care unit in Haryana indicated, neonatal jaundice, prematurity, infections and birth asphyxia were the major morbidity profiles (43). According observational study conducted at teaching hospital in Lalitpur, of 279 neonates studied commonest diseases among admitted neonates were infection (45.9%), followed by respiratory conditions (14.7%), neonatal jaundice (12.5%), perinatal asphyxia (9.3%) and prematurity/ small for gestational age (SGA) (6.5 %) (44).

A retrospective study conducted at tertiary care center of Mandaya shown that the major disease profiles were neonatal sepsis (28.8%), respiratory distress syndrome (RDS) (23.85%), birth asphyxia (17.72%), neonatal jaundice (7.02%), and meconium aspiration syndrome (5.47%) (45). According retrospective study conducted rural hospital in South Africa, birth asphyxia (38.2%), prematurity (23.5%), and infection were commonest causes of admission (21%) (46). A prospective study conducted at St. Paul's hospital shown that most common primary diagnoses at admission to the neonatal care unit were prematurity with respiratory problem (36.6%), neonatal sepsis (22.7%), and asphyxia (16.2%) (47).

2.3. Outcomes of Neonates in NICU

A Retrospective study done at Marburg university hospital, Germany the most prevalent etiologies of neonatal death were respiratory distress syndrome (73.8%), congenital abnormalities (13.8%) and sepsis (5.4%) respectively (48). According to a study done at tertiary care center of southern Punjab in Pakistan in 2014, of the total neonatal admissions, 67% were discharged in a satisfactory condition, 3.9% were discharged on request, 3.3% left against medical advice and 25.8% expired (male to female ratio was 2:1) (35).

Study conducted in Tamale teaching hospital indicated that, majority 82.7% of the neonates were successfully treated and discharged, 16.0% of them expired, 1.1% was transferred and 0.3% absconded (37). A retrospective study in government hospital in Amman, Jordan shown that the two most common reasons for admission and mortality were respiratory distress syndrome and prematurity (49).

A Meta-analysis done among LBW newborns, Kangaroo Mother Care (KMC) compared to conventional care was associated with 36% lower mortality (50). Study done at St. George, university hospital in Germany shown that overall neonatal death rate was 27.4%, which was significantly higher in 28 weeks gestational age(48).

Retrospective study at tertiary care center of neonatal intensive care unit in Chennai, India shown that birth weight of the baby, maturity of the baby and abnormal leukocyte count and platelet count were significantly associated with poor outcome (51).

According to observational study conducted at neonatal intensive care unit in Nashik, India, 48 deaths out of 106 cases were studied making the mortality rate of 45.28% and the survival rate of 54.72% (58/106) cases. Respiratory distress contributed maximum to mortality, followed by septicemia/sepsis (52). Retrospective study done in rural tertiary care center in Cameroon shown that early neonatal mortality rate was estimated at 12.6% which was due to prematurity (41.1%), neonatal infection (32.3%) and neonatal asphyxia (26.4%) (53).

According to Ethiopian Demographic and Health Survey of 2011, in Ethiopia, high rate of neonatal mortality (37 deaths per 1000 live births) and from EDHS 2016 (29 deaths per 1000 live births) were reported of which preterm birth is believed to be a major and direct cause of neonatal mortality (54).

2.4. Factors associated with pattern of disease at admission and outcome

2.4.1. Socio demographic Factors

According to retrospective study done in tertiary care hospital of Bangalore males account (54%) and death in males was higher (3.2%) than the females which were (2.7%), though it is statistically insignificant (55). Prospective study from a tertiary care centre in Odisha shown mortality was higher among males (20.43%) than females (12.9%) (56).

According to study done in a tertiary care teaching hospital of Mandya, the ratio of the males to female admitted was 1.45:1 (45). Of the total admissions at the neonatal unit of a tertiary health centre in Southern Nigeria male to female ratio was 1.1:1 and twenty six of the 47 patients who died were males while 21 females with a male to female ratio of 1.3:1(25).

Retrospective study conducted at a rural hospital in KwaZulu-Natal, South Africa, over half (56.6%) of the deaths took place within the first three days of life and being male sex was significant predictors of neonatal death (46). A retrospective study conducted in special care baby unit of university college hospital, Ibadan, Nigeria shown that mortality was significantly higher in the first 24 hours of admission and among neonates with LBW (8).

Retrospective study conducted at teaching hospital in Uttarkhand indicated that chief causes of mortality were prematurity (25.6%), sepsis (21.6%), perinatal asphyxia (19.5%) and RDS (17.3%) with a statistically higher rate in the out born in comparison with inborn and greater percentage of out born babies (19.95%) were admitted with sepsis/pneumonia/meningitis due to lack of practice of simple measures like hygiene at the time of delivery, transport, and handling the babies (57). According to retrospective study conducted at Cairo university hospital in Egypt of 1725 babies, (34.8%) were inborn and (65.2%) were out born and mortality was significantly higher among inborn (37.2%) than out born (17.2%) (58).

2.4.2. Neonatal factors

According to study conducted at tertiary care hospital in US low birth weight and preterm were significantly associated with neonatal morbidity (59). According to retrospective study conducted at neonatal intensive care unit in Brazil, death in very low birth weight infants was statistically associated with birth weight below 1000g (60). Significant association was observed between birth weight of the neonate's and outcome as well as a significant association existed between pattern of diseases and neonate's outcome according to study done in special care baby unit of university college hospital, Ibadan, Nigeria (8).

Study conducted in a tertiary care teaching hospital, Mandya on comparison of survival among different birth weight indicated that there was statistically significant difference between VLBW and normal birth weight group and between ELBW and normal birth weight group, but there was no statistically significant difference among LBW and normal birth weight group (45). A retrospective study done in Fuji foundation hospital, Rawalpindi showed that more expiries were observed with gestational age group less than 32 week and birth weight less than 1.5 kg. Necrotizing enterocolitis and hyaline membrane disease were strongly associated with low gestational age and low birth weights (61).

According retrospective study done in Orotta pediatric hospital, Eritrea, a total of 1502 infants were admitted to the NICU with an average preterm gestational age of 35.9 weeks and birth weight <2 kg, birth weight between 2.1 and 2.5 kg and small for gestational age were significantly associated with mortality (62).

A prospective study conducted in tertiary care hospital in Addis Ababa shown asphyxia and gestational age less than 37 were factors independently associated with neonatal mortality (47).

2.4.3. Maternal factors

A retrospective study conducted at Washington Hospital Center in Washington DC NICU admission was higher for African American, male newborns delivered by cesarean of primiparas with premature rupture of membranes and chorioamnionitis as well as preeclampsia, chronic hypertension and diabetes mellitus (63). Retrospective study conducted in New York indicated that of 422 mothers, 11.6% of them had a preterm birth which was significantly associated with presence of chronic illness, problem in current pregnancy and premature rupture of membrane (64).

According to study conducted in Erie, New York delivery by cesarean section was common among early-term births (38.4%) and increased the risk for NICU admission (12.2%) and morbidity (7.5%) compared with term births. Among vaginal deliveries, early-term neonates (6.8%) had a significantly higher rate of NICU admission compared with term neonates (4.4%) (65). A retrospective study at Richmond university medical center, Staten Island, prolonged rupture of membranes ≥ 120 min was significantly associated admission of neonates to NICU (66).

Study conducted in Caxias do Sul, southern Brazil public hospitals shown that late-preterm were statistically more likely to be subject to hypothermia/hyperthermia, hypoglycemia, respiratory pathologies, resuscitation in the delivery room, phototherapy, supplementary feeding, mechanical ventilation, venous infusions, antibiotics and admission to the neonatal intensive care unit, resulting in a nine times greater neonatal mortality rate when compared with full term newborns (67).

According to a retrospective study conducted in Bangkok, Thailand, premature rupture of membranes, antepartum hemorrhage, medical disorders during pregnancy, prenatal estimation of fetal weight, gestational age at delivery, and mode of delivery were significant factors for NICU admission (68).

Almost 50% of infant deaths in tertiary care center, Pakistan occur within first 28 days of life, with infections, birth asphyxia and pre-maturity as the commonest causes of death which was due to factors like poor care during pregnancy like poor nutrition, poor hygiene and unskilled management of complications, deliveries by unskilled personnel, inadequate newborn care and lack of access to emergency care (69). A case control study conducted in Gitwe district hospital in ruhango district Rwanda shown that factors highly associated with neonatal mortality were multipara, incomplete antenatal care visits, eclampsia, delivering at home and prolonged labor duration (70).

According to study done in a special care baby unit in Port Harcourt, Nigeria sixty percent of the Infants of diabetic mothers (IDMs) were born to mothers with gestational diabetes, while 40% were born to mothers with presentational DM. The commonest morbidities were hypoglycemia (significantly higher in IDMs than non-IDMs) and hyperbilirubinaemia in 30 (63.8%) and 26 (57.4%) respectively (71).

2.5. Conceptual Framework

This conceptual framework was adapted from Health Belief Model (HBM). HBM is a model that attempts to explain and predict health behaviors. It was first developed in the 1950s by social psychologists Hochbaum, Rosenstock and Kegels working in the U.S. Public Health Services. From the model I modified the variables for the purpose of my study. The following diagram shows the association of each independent variable with dependent variable.

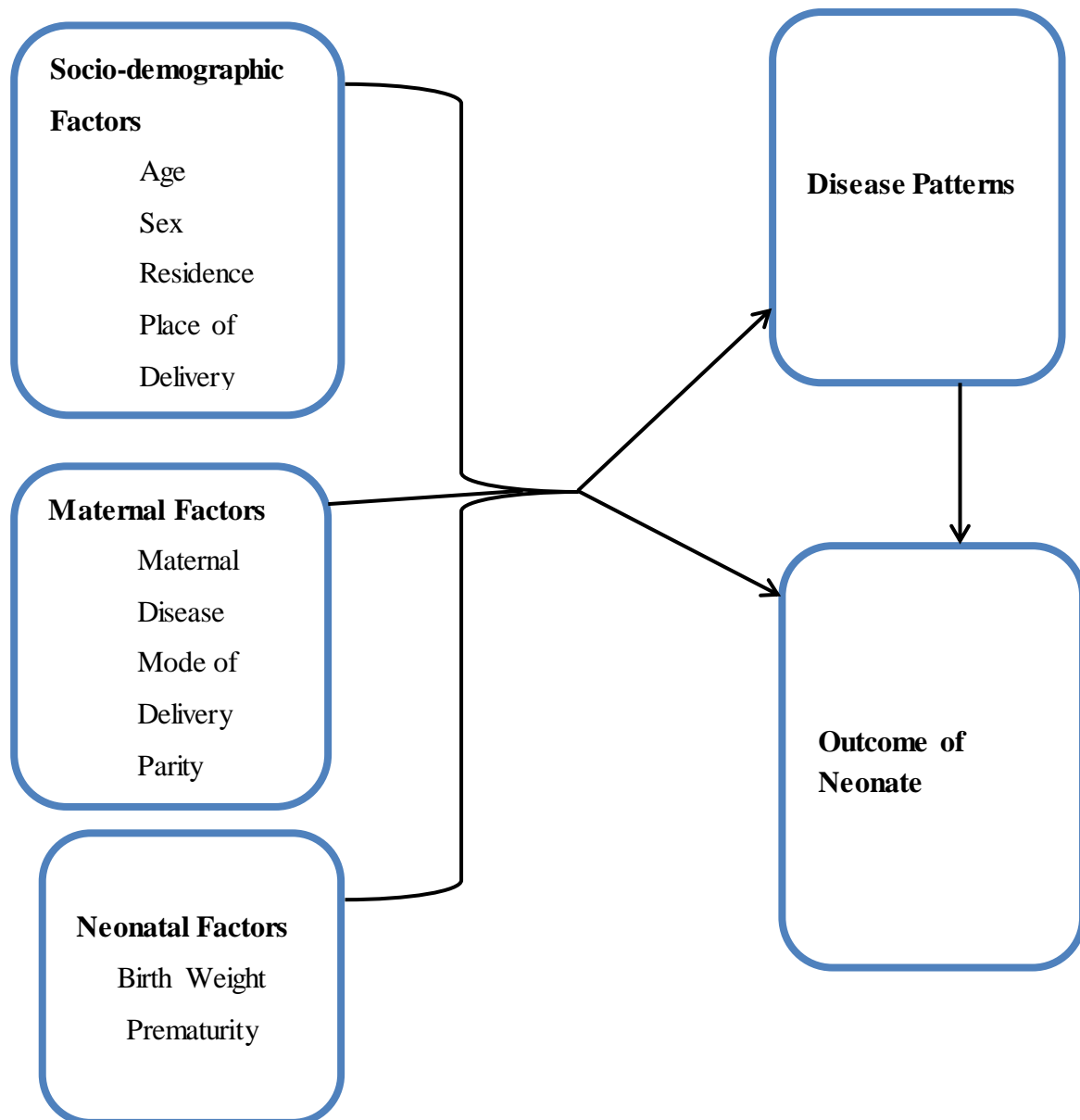


Figure 1: Conceptual framework

Source: Glanz et al, 2002

3. OBJECTIVES

3.1. General Objective

To assess the pattern of diseases, outcome and associated factors among neonates admitted to neonatal intensive care unit at Jimma university medical center, Jimma, Southwest Ethiopia, 2018.

3.2. Specific Objective

1. To describe patterns of diseases of neonates admitted in neonatal intensive care unit at Jimma university medical center, 2018.
2. To determine the outcome of neonates admitted in neonatal intensive care unit at Jimma university medical center, 2018.
3. To identify factors associated with pattern of diseases of neonates admitted in neonatal intensive care unit at Jimma university medical center, 2018.
4. To identify factors associated with outcome of neonates admitted in neonatal intensive care unit at Jimma university medical center, 2018

4. METHODS AND MATERIALS

4.1. Study Area and period

The study was conducted in Jimma university medical center which is located in Jimma town, 352 km south-west of Addis Ababa. It is also the only hospital having NICU unit in Jimma Zone. Jimma university medical center is one of the biggest and oldest university specialized hospital in the country established in 1922 and providing service for more than 15 million people in the catchment area. Currently, it is the only teaching and referral hospital in south western part of the country (72).

Jimma university medical center has major clinical departments like internal medicine, surgery, pediatrics, and gynecology/obstetrics and also has other clinical departments like, dentistry, ophthalmology, psychiatry, anesthesia, and dermatology. Annually around 1400 neonates are admitted to NICU of JUMC.

The study was conducted from March 15-30, 2018 G.C.

4.2. Study Design

Retrospective institutional based cross-sectional study over a period of two years (from January 1, 2016 to December 31, 2017) was conducted.

4.3. Population

4.3.1. Source Population

Records of all neonates admitted to the NICU at JUMC from January 1, 2016 to December 31, 2017.

4.3.2. Study Population

All sampled neonates records admitted to the NICU at JUMC over a period of two years (from January 1, 2016 to December 31, 2017) were included.

4.4. Eligibility Criteria

4.4.1. Inclusion Criteria

All neonates in age group of 0-28 days admitted in the NICU unit of the JUMC from January 1, 2016 to December 31, 2017.

4.4.2. Exclusions Criteria

Neonates admitted to NICU whose records incomplete were excluded.

4.5. Sample Size Determination and Sampling Procedure

4.5.1. Sample Size Determination

Since the prevalence of the problem in the study area is not known, by taking 0.5 and by using 95% confidence interval with 5% margin of error tolerated, the sample size was determined by using single population proportion formula.

$$n = \frac{(Z_{\alpha/2})^2 p (1-p)}{d^2}$$

Where,

n- Required Sample size

z- Standard normal value at 95% CI which is 1.96

p- Estimated population proportion which is 0.5

d- Possible margin of error tolerated which is 0.05

$$n = \frac{(1.96)^2 0.5(1-0.5)}{(0.05)^2} = 384$$

Since the source population is 2715, which is <10,000, population correction formula was used to determine adjusted minimum sample size.

$$n_f = \frac{n}{1+n/N}$$

Where

n= Initial sample size (384)

N=total number of neonates (2715)

n_f= minimum final sample size

$$\text{Thus } n_f = \frac{n}{1+n/N} = 384/1+384/2715 \approx \mathbf{336}$$

By adding 10% drop out, the final sample size was **370**

4.5.2. Sampling Procedure

List of the admitted neonates was taken from the database and K value was calculated as, $K=N/n_f \rightarrow 2715/370=7$ and systematic random sampling method was used to select the sample by every Kth interval according to the registration order and the first number (number 3) was selected by lottery method. So every 7 interval was selected until the completion of sample size. Incomplete sample was dropped out and no replacement was done for it rather the next selected sample was used.

4.6. Data Collection tool and procedure

Structured questionnaire adapted from research conducted in Kenya (73) in English version was used to collect the data. The tool contains three parts: socio-demographic factors, maternal/neonatal factors and disease distributions and neonatal outcome. Necessary data was extracted by reviewing patient's chart. Four diploma nurses and one BSc nurse were recruited for data collection and supervisor respectively.

4.7. Data Quality Control

Data collection tool was pretested on 5% samples of similar study subjects on records of neonates admitted in January, 2018. Based on the finding possible amendments were made. In addition data collectors were trained for one day on how to check the completeness of the data and supervision by supervisors and principal investigator was carried out on daily basis throughout the data collection period. After completion of the data collection, each questionnaire was checked for completeness and consistency.

4.8. Data Processing and Analysis

The data was checked for completeness, compiled, coded, cleaned and entered into Epi-data version 3.1 and exported to SPSS version 23 for analysis. Data analysis involved descriptive statistics, including frequency, percentage, mean and standard deviations. Crude and adjusted odds ratio (AOR) was analyzed with a 95% confidence interval (CI). Binary logistic regression was used to see association between dependent and independent variables. Those variables with p-value ≤ 0.05 on binary logistic regression were further considered for multivariate logistic regression to determine independent associations of each variable and control confounding variable. P-value < 0.05 was declared a statistically significant association. Finally, data was presented by texts/statements, graphs, tables and charts.

4.9. Variables

4.9.1. Dependent Variable

- Disease pattern
- Outcome of neonates (improved and death)

4.9.2. Independent Variables

- Socio-demographic
 - Age
 - Sex
 - Residence
 - Place of delivery
- Maternal factors/delivery factors
 - Parity
 - Mode of delivery
 - Maternal diseases
- Neonatal factors
 - Birth weight
 - Prematurity

4.10. Operational Definitions

Outcome: conditions of patients written on patients chart at discharge time (improved and death).

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.

Improved: Those neonates who were discharged after cured and Left against medical advice.

Definitions of Terms

✚ Gestational Age (74)

- ❖ 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 > 42 week of gestational age.

✚ Combination of Birth Weight and Gestational Age (74)

- ✓ Small for Gestational Age = Birth weight less than 10th percentile for that particular gestational age.
- ✓ 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.

4.11. Ethical Consideration

Ethical clearance and approval to conduct this research was obtained from Research and Ethical Review Committee of School of Nursing and Midwifery, College of Health Sciences, Addis Ababa University. Permission to conduct the study was also requested from JUMC Administrative office. 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.

4.12. Dissemination of Results

The result of this study will be presented and submitted to Department of Nursing and Midwifery, College of Health Sciences, Addis Ababa University. The study result will also be submitted to JUMC.

Effort will be made for publication on reputable Journals and will also be presented in scientific conferences.

5. RESULT

5.1. Socio-demographic Characteristics of neonates admitted to NICU

Out of 370 samples, 29 of the samples were excluded from the study. Three hundred forty one (341) were eligible for the study, out of which 211 (61.9%) were male neonates making the male to female ratio 1.6:1. Vast majority of them, 233 (68.3%) were admitted in less than 24 hours of their birth. Concerning their place of residence about two third, 228 (66.9%) of them lives outside of Jimma town. Regarding their birth place more than half, 205 (60.1%) of the neonates were inborn (Table 1).

Table 1 Socio-demographic Characteristics of neonates admitted in NICU of JUMC, Jimma town, Oromia, Southwest Ethiopia, 2018 (n=341)

Characteristics		Frequency	Percent
Sex	Male	211	61.9
	Female	130	38.1
Age	Less than 24 hr	233	68.3
	24hr-7 days	88	25.8
	Greater than 7 days and <28 days	20	5.9
Place of residence	Jimma Town	113	33.1
	Outside of Jimma Town	228	66.9
Place of delivery	In born	205	60.1
	Out born	136	39.9

5.2. Maternal Factors/delivery factors and neonatal factors

Regarding parity, 184 (54%) were multiparous mothers. Among 123 (36.07%) of mothers having maternal disease, 38 (30.9%) had infections followed by hypertensive disorder of pregnancy which accounted 32 (26.1%). Concerning their gestational age, more than two third (69.5%) of the neonates were term. Regarding their weight, more than half 207 (60.7%) of the neonates had weight 2500- 4000gm and with respect to anthropometry almost all, 317 (93%) of them were appropriate for their gestational age. Even though majority, 298 (87.4%) of neonates were singleton, 41 (12%) and 2 (0.6%) were twins and triplets, respectively. Regarding to mode of delivery, about half (51.6%) of neonates were delivered spontaneously (Table 2).

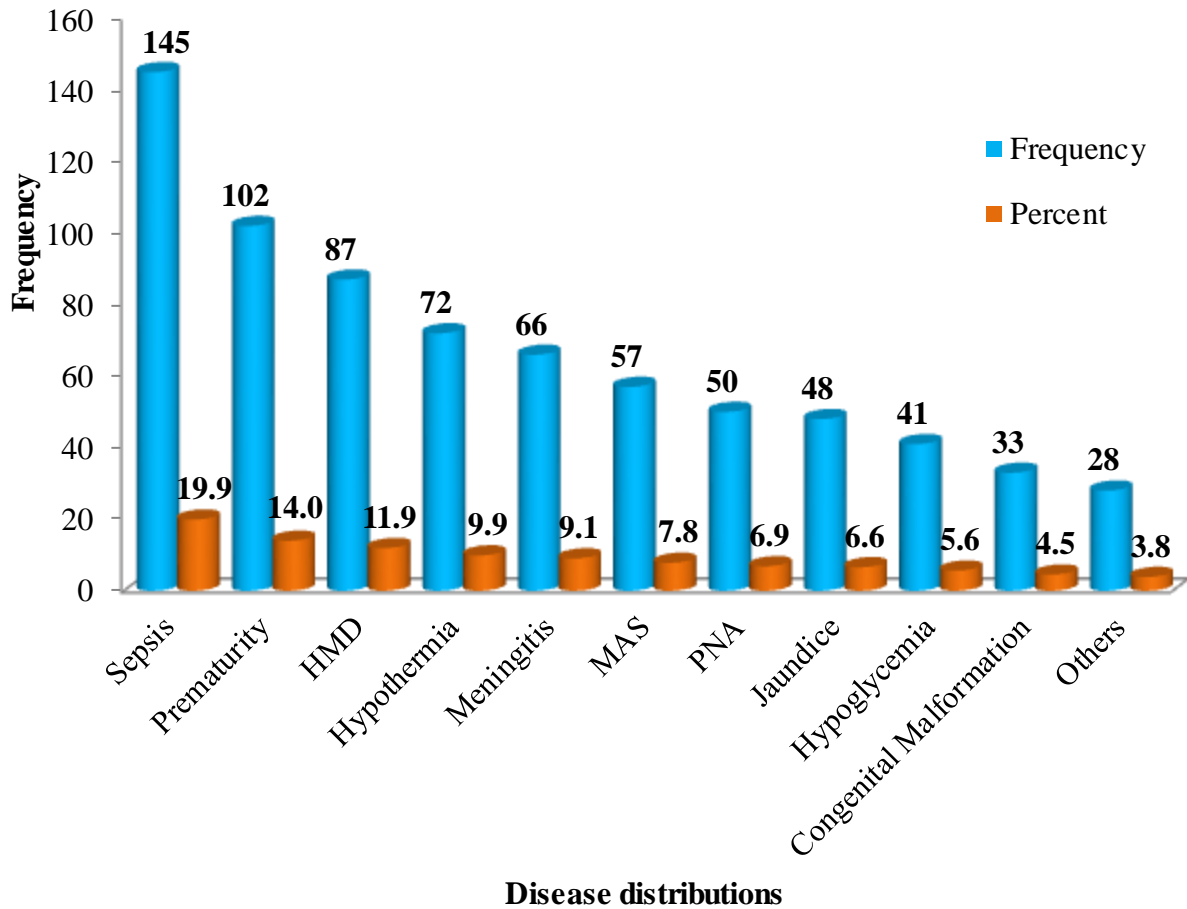
Table 2: Maternal/delivery and neonatal factors admitted in NICU of JUMC, Jimma town, Oromia, Southwest Ethiopia, 2018 (n=341)

Characteristics		Frequency	Percent
Parity	Primipara	157	46.0
	Multipara	184	54.0
Mode of delivery	SVD	176	51.6
	C/S	113	33.1
	Instrumental	52	15.2
Maternal diseases (n = 123)	Gestational diabetes	2	1.6
	Hypertensive disorder of pregnancy	32	26.0
	Infections	38	30.9
	HIV/AIDS	7	5.7
	Antepartum hemorrhage	13	10.6
	PROM	27	21.9
	Others	4	3.3
Gestational age	Preterm (37 < 37 weeks)	102	29.9
	Term (37-42 weeks)	237	69.5
	Post-term (> 42 weeks)	2	0.6
Birth weight	Low birth weight (<2500gm)	207	60.7
	Normal birth weight (2500-4000gm)	128	37.5
	Macrosomia (>4000gm)	6	1.8
Birth Size	Appropriate for Gestational Age (AGA)	317	93.0
	Small for Gestational Age (SGA)	18	5.3
	Large for Gestational Age (LGA)	6	1.8

NB: SVD = Spontaneous Vaginal Delivery, C/S = Cesarean Section, PROM =Premature Rapture of Membrane

5.3. Pattern of Disease

The major morbidity profile among all neonates was sepsis which accounted 145(19.9%) followed by prematurity 102 (14.0%) and hyaline membrane disease 87 (11.9%)(Figure2).



👉 More than two response is possible

NB:HMD = Hyaline Membrane Disease, MAS = Meconium Aspiration Syndrome, PNA = Perinatal Asphyxia

Figure 2: Distributions of diseases of neonates admitted in NICU of JUMC, Jimma town, Oromia, Southwest Ethiopia, 2018(n=341)

5.3.1. Factors associated with pattern of diseases

In multivariate analysis maternal infection, PROM, age of neonate greater than 7days, C/S and instrumental delivery were significantly associated to neonatal sepsis.

Those neonates born from mothers who had infection [P = 0.001, AOR=3.84 95% CI: (1.78,8.31)] and PROM (P = 0.050, AOR = 2.31, 95%CI (0.99,5.40) acquired sepsis 4 times and 2 times respectively compared to those who have no any maternal diseases. Those neonates greater than 7days of age [P= 0.003, AOR= 4.78, 95%CI= (1.68, 13.57)] were 5times more likely developed sepsis compared to those <24hr. Neonates delivered by C/S [P=0.017, AOR=1.93, 95%CI: (1.12, 3.33)] and instrumental delivery [P=0.026, AOR=2.16, 95%CI: (1.09, 4.26)] increased the risk of acquiring sepsis by two times compared to SVD..

Maternal infection and gestational was significantly associated to meningitis. Those neonates who were born from mothers who had infection [P= 0.002, AOR=3.29, 95%CI: (1.57, 6.92)] were 3 times more likely acquired meningitis compared to those who were born from mothers who had no any maternal disease..

Preterm birth and weight of neonates (< 2500gm and > 4000gm)were significantly associated to HMD. Preterm neonates[(P= 0.000, AOR = 5.66(2.86, 11.18)] were 6 times more likely acquired HMD compared to term neonates. Similarly weight <2500gm [P =0.000, AOR= 6.54, 95%CI: (3.18, 13.41)], and weight >4000gm [P= 0.032, AOR= 7.17, 95%CI (1.18, 43.43)] acquired HMD 7 times compared to normal birth weight neonates.

Only age was significantly associated to hypothermia. Neonates whose their age was 24hr to 7days [P= 0.004, AOR= 0.33, 95% CI: (0.15, 0.71)] were 67% less likely acquired hypothermia compared to those less than 24hr life of their age.

Primipara, instrumental deliveries and LGA were significantly associated to PNA. Neonates who born from primipara mothers [P= 0.039, AOR= 1.96, 95 %CI:(1.03, 3.73)] were 2 times more likely acquired PNA compared to neonates who born from multiparous mothers. Neonates delivered with assistance of instruments [P= 0.002, AOR = 3.61, 95%CI (1.62, 8.048)] were 4 times more likely acquired PNA compared to those neonates delivered by SVD. Large for gestational ages [P= 0.016, AOR= 8.03, (1.47, 43.64)] were 8 times more likely developed PNA compared to AGA neonates.

Instrumental deliveries were significantly associated to MAS. Neonates delivered with assistance of instruments [P=0.002, AOR=3.42, 95%CI:(1.59,7.37)] were 3 times more likely acquired MAS compared to those who were born by SVD.

Hypertensive disorder of pregnancy, APH and multiple births were significantly associated to prematurity. Neonates born from mothers who had hypertensive disorder of pregnancy [P= 0.000, AOR= 4.95, 95%CI: (2.01,12.17)] and APH [P= 0.001, AOR= 8.34, 95%CI:(2.31,30.11)] were 5 times and 8 times respectively more likely acquired prematurity compared to those neonates born from mothers who had no any disease. Similarly neonates who were multiple births [P= 0.000, AOR= 6.45, 95%CI: (3.00, 13.84)] were 6 times more likely acquired prematurity compared to singletons (Table 3).

Table 3: Multivariate analysis of factors associated with distributions diseases of neonates admitted in NICU of JUMC, Jimma town, Oromia, Southwest Ethiopia, 2018 (n=341)

Characteristics	Disease Patterns	COR(95% C.I)	AOR (95% C.I)	P-Value
Sepsis				
Maternal disease	Infection	3.84 (1.81,8.14)	3.84(1.78,8.31)	0.001*
	PROM	2.66 (1.16,6.08)	2.31(0.99,5.40)	0.05*
Age of neonate	No Disease		1	
	< 24hr		1	
Mode of delivery	> 7days	3.70 (1.37,9.99)	4.78(1.68,13.57)	0.003*
	C/S	1.50 (0.93,2.43)	1.93(1.12,3.33)	0.017*
Instrumental	SVD	1.84 (0.98,3.44)	2.16(1.09,4.26)	0.026*
			1	
Meningitis				
Maternal disease	Infection	3.29 (1.57,6.92)	3.29(1.57,6.92)	0.002*
	No Disease		1	
HMD				
Gestational age	Term		1	
	Preterm	13.14 (7.40,23.34)	5.66 (2.86,11.18)	0.000*
Wight of the neonate	2500-4000gm		1	
	< 2500gm	15.44 (8.22,29.01)	6.54 (3.18,13.41)	0.000*
	> 4000gm	6.40 (1.08,37.83)	7.17(1.18,43.43)	0.032*
Hypothermia				
Age	< 24hr		1	
	24hr-7days	0.33 (0.15,0.71)	0.33 (0.15,0.71)	0.004*
PNA				
Parity	Primipara	1.93 (1.05,3.57)	1.96 (1.03,3.73)	0.039*
	Multipara		1	
Mode of delivery	SVD		1	
	Instrumental	3.79 (1.73,8.28)	3.92(1.69,9.10)	0.001*
Birth size	AGA		1	
	LGA	5.89 (1.15,30.08)	8.03(1.47,43.64)	0.016*
MAS				
Mode of delivery	SVD		1	
	Instrumental	4.75 (2.27,9.95)	3.42 (1.59,7.37)	0.002*
Prematurity				
Maternal disease	Hypertensive disorder	2.49 (1.16,5.31)	4.95(2.01,12.17)	0.000*
	APH	4.51 (1.42,14.38)	8.34(2.31,30.11)	0.001*
Multiple birth	No maternal disease		1	
	Yes	5.37 (2.7,10.6)	6.45(3.00,13.84)	0.000*
	No		1	

*significant association, **1** = reference categories

NB:APH=Antepartum Hemorrhage, PROM= Premature Rapture of Membrane,C/S= cesareanSection,SVD=Spontaneous Vaginal Delivery, HMD= Hyaline Membrane Disease,PNA= Perinatal Asphyxia,LGA=Large for Gestational Age

5.4. Neonatal outcome in NICU

Of all admitted neonates, 278 (81.52%) were discharged after improvement. Of sixty three deaths, 35(55.56%) of them were died at age of 24hr to 7 days (fig 3 and table 4).

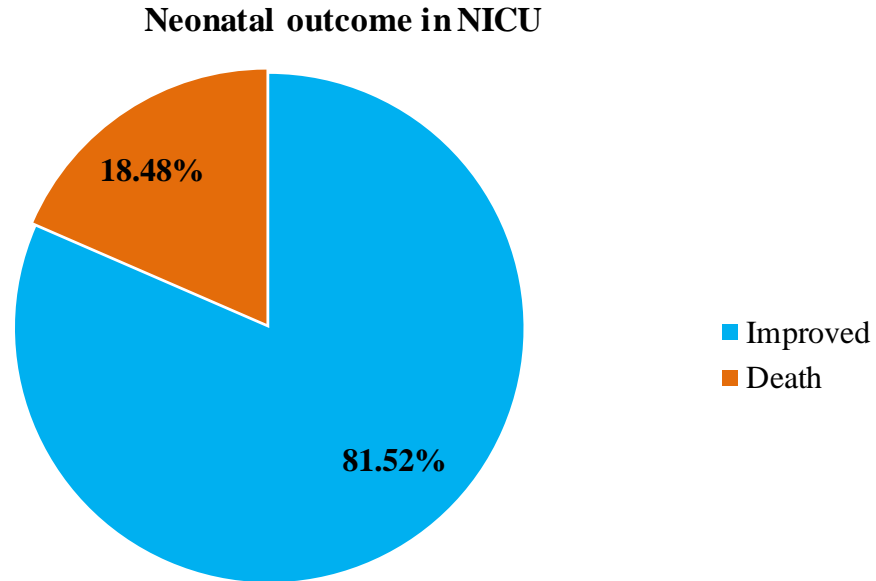


Figure 3:Outcome of neonates admitted in NICU of JUMC, Jimma town, Oromia, Southwest Ethiopia, 2018 (n = 341)

Table 4: Ages of neonates at death admitted in NICU of JUMC, Jimma town, Oromia, Southwest Ethiopia, 2018(n=63)

Characteristics		Frequency	Percent
Age of neonate at death	less than 24 hr	15	23.8
	24hr-7 days	35	55.56
	Greater than than7 days and <28 days	13	20.6

5.4.1. Factors associated with outcome of neonates

Prematurity and PNA were significantly associated to outcome of neonates. Those neonates who were diagnosed to have prematurity [P=0.000, AOR= 0.26, 95%CI: (0.14, 0.46)] were 74% less likely improved than those who were not diagnosed with prematurity. Similarly those newborns diagnosed to have perinatal asphyxia (PNA) [P=0.027, AOR=0.44, 95% CI: (0.21, 0.91)] were 56% less likely improved than those who were not diagnosed with it.

Table 5 Multivariate analysis of factors associated with outcome of neonates admitted in NICU of JUMC, Jimma town, Oromia, Southwest Ethiopia, 2018(n=341)

Characteristics	Outcome of Neonate in NICU		COR(95%CI)	AOR(95%CI)	P-Value	
	Improved	Death				
Prematurity	Yes	68	34	0.27 (0.15,0.48)	0.26 (0.14,0.46)	0.000*
	No	210	29		1	
HMD	Yes	61	26	0.27 (0.15,0.48)	0.88 (0.40,1.90)	0.750
	No	217	37		1	
Multiple birth	Yes	29	13	0.44 (0.21,0.92)	1.41 (0.62, 3.19)	0.410
	No	249	50		1	
PNA	Yes	36	14	0.52 (0.26,1.03)	0.44 (0.21,0.91)	0.027*
	No	242	49		1	
Sex	Male	178	33		1	0.199
	Female	100	30	0.61 (0.35,1.07)	0.67 (0.37,1.22)	
Hypoglycemia	Yes	5	36	1.72 (0.64, 4.59)	1.96 (0.70,5.45)	0.194
	No	242	58		1	
Parity	Primipara	133	24	1.42 (0.77,2.62)	1.49 (0.82,2.72)	0.187
	Multipara	145	39		1	

*significant association, **1**= reference categories

6. DISCUSSION

This study attempted to assess the pattern of diseases, outcome and associated factors among neonates admitted to neonatal intensive care unit

This study revealed sepsis was the frequently occurring disease among neonates admitted in NICU. This finding was similar with study conducted at Tamale, Nepal and BPKIHS (35, 37, 39). 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 study conducted in Punjab, Multan, Tamil and South Africa showed that the frequently occurring disease was asphyxia (36, 40, 42, 46). This difference might be explained due to the maternal and obstetric related problems.

In this study, maternal diseases like infection and PROM, age of the neonates >7days, mode of deliveries like C/S, and instrumental deliveries, were observed as significant predictors of sepsis. This finding is almost consistent with studies conducted in other countries like Thailand, Pakistan and Rwanda (69, 70, and 71). This might be explained due to unclean deliveries, lack of health education on danger signs of pregnancy, inadequate antenatal services and late referral of complicated labor. This implies that as we have to give attention to maternal infection to save the life newborn. Age of neonates > 7 days is also one predictor of neonatal sepsis which might be due to environmental sources or horizontal transmission from direct contacts of parents.

In this study, maternal infection was detected as significant predictors of meningitis. This finding is consistent with study conducted in Iran(75) in which prenatal risk factors associated with meningitis were, maternal vaginitis, asymptomatic bacteriuria, and prematurity. This similarity might be due to the chance of ascending microorganisms from the birth canal into uterus.

This study also revealed being preterm, weight of the neonates < 2500gm and > were detected as significant predictors of HMD. This finding is almost similar with study conducted in Cameroon and Turkey(76-77) which showed preterm and macrosomia were independent predictors of HMD. This might be due to structural and functional immaturity of the lungs (a deficiency in pulmonary surfactant) of preterm.

The role of macrosomia as a predictor of HMD might be to the increased incidence of intra-partum fetal distress, shoulder dystocia, instrumental vaginal deliveries with birth injuries, and neonatal hypoglycemia that is frequently associated with big baby.

In this study age of the neonates 24 hr to 7 days was significantly associated to hypothermia. Study conducted in Nigeria revealed the hypothermia was highly prevalent among babies aged < 6 h (78). This justifies neonates >24hr less likely acquire hypothermia compared to those < 24hr ages of their life. This might be due to neonatal adaptations to the environment and decreased loss of heat from a combination of different factors like evaporation of fluid from the skin, convective loss to relatively cold environment and conductive heat loss through contact with cold surfaces.

In this study, LGA, primipara and instrumental deliveries were significant predictors of PNA. Neonates who were LGA might acquire PNA due to with fetopelvic disproportion, which results in prolonged or obstructed labor as compared with AGA. Prim parity was also identified as a significant risk factor of perinatal asphyxia which is in line with study conducted in different places (Ahmedabad, Nigeria and Karachi) (79-81). This might be explained that, primiparous women are often ignorant of the demands of pregnancy there by neglecting early booking and regular attendance to antenatal care. This may result in complications of prolonged labor, which may subsequently end up with delivery of asphyxiated babies.

Instrumental delivery was found to be associated with asphyxia in this study, which is consistent to study conducted in Dire Dawa and Gusau (82-83). This may be explained by the fact that the hospital is a referral center where cases that could not be managed by other hospitals are referred to and also where women with pregnancy/labor complications attend without referral. It might be also due to the pelvic disproportions and prolonged labour which make deliveries more difficult. These could lead to fetal complications which result in fetal distress and ultimately perinatal asphyxia.

This study identified that those neonates delivered by instrument were 3 times more likely to acquire MAS. In contrast to this, a study conducted in a tertiary care center in Kerala showed that MAS was more common among neonates delivered by normal vaginal delivery (84). However, a study conducted in Narayana medical college hospital showed MAS occurred more commonly in babies born through caesarean section (85). This variation might be due to differences in sample size, management protocols of the centers and preferences of mothers.

According to this study, maternal hypertensive disorder was a significant predictor of prematurity. In line with this finding, in the USA, preeclampsia was one subsequent cause of prematurity (86). The risk of prematurity is increased in women with preexisting, chronic hypertension, pregnancy-induced hypertensive disorders; this was also identified in America (87). This might be due to the fact that hypertensive disorders prevent the placenta from receiving enough blood and make the placenta pull away from the wall of the uterus, causing maternal premature delivery.

Similarly, this study also identified that those neonates born from mothers who had APH were 8 times more likely to be premature. In line with this finding, a study conducted in the UK and Kenya at a national hospital also revealed that prematurity was high among neonates born from mothers having APH (88-89). This might be due to uteroplacental ischemia that results in preterm delivery, even though this may not be causal in nature.

Multiple births were also significantly associated with prematurity in this study. This is consistent with a study conducted in Kenya and Beijing (89-90). This might be due to uterine overdistension which results in spontaneous preterm. In this study, the overall neonatal mortality was 18.48%, which is higher than studies carried out in Nigeria (14.2%), South Africa (13.8%), Cameroon (12.6%) and Tamale (16.0%), but lower than St. Paul's hospital, Addis Ababa (23.2%) and Pakistan (25.8%) (8, 37, 41, 46, 47, 53). This difference in mortality pattern could be explained due to the related factors for each study in addition to the quality of care delivered by the centers.

From this finding prematurity increased the risk of death of neonates. This is similar with study conducted in different setups (study conducted at tertiary care center in Cameroon, St. George, university hospital in Germany, government hospital in Amman, Jordan),(48,49,53). The similarity might be due to immature organ of the preterm neonate and different complications related to prematurity that lead to death.

In this study, perinatal asphyxia was also one predictor of neonatal mortality which is in line with study conducted in Cameroon (53). This might be due to poor antenatal services, late referral of complicated pregnancies and poor neonatal resuscitation facilities both in terms of equipment and trained manpower.

More than half (55.7%) of death occurred 24 hours to 7 days after delivery in this study which was unlikely in another studies (study done in Nigeria (55%) and South Africa (56.7%) in which death occurred in 24hr of admission (8, 46). This variation might be explained by difference in sample size and poor infrastructures.

7. Conclusion and Recommendations

7.1. Conclusion

This study indicated that neonatal sepsis (19.9%), prematurity (14%) and hyaline membrane disease (11.9%) were the frequently occurring neonatal diseases. Maternal disease such as infection, hypertensive disorder of pregnancy, antepartum hemorrhage and premature rupture of membrane, age of neonate >24hour, mode of delivery such as cesarean section and instrumental delivery, presence of multiple births, gestational age less than 37 weeks (preterm), weight of the neonate < 2500gm and > 4000gm, place of delivery (out born), parity (primipara) and birth size like large for gestational age were found to independent predictors of pattern of diseases.

The neonatal death rate was high (18.48%) which showed the need of quality care improvements. Place of delivery (those neonates who were out born), neonates diagnosed to have prematurity and perinatal asphyxia were identified significant predictors of neonatal death.

7.2. Recommendations

Based on the finding the following recommendation will be forwarded to concerned bodies.

For health institutions

It is better to regularly screen out pregnant mothers for infection, hypertensive disorder and premature rupture of membrane so that they will be alarmed as this can put in risk of neonatal infection(sepsis and meningitis), HMD and prematuritywhich may lead to poor neonatal outcome even up to end with death.

For those health professionals who are working in NICU and obstetric unit;

Paying detail attention to identified factors to be associated outcome neonates and giving priority treatments for these factors will significantly decrease proportion of death.

For further researches;

It will be more valuable if studies will be conducted on this subject matter with alternative community based as well as institutional based prospective study design so as to find more factors associated with preventable factors of neonates.

8. Strength and Limitation of the study

Strength

This study assessed factors associated with pattern of diseases of neonates which is important in the context of this country. This study also identified factors associated with outcome of neonates in NICU of Jimma University Medical Center.

Limitation

The findings of this study should be interpreted in the light of a number of limitations.

Firstly, since it is a retrospective study institutional and health professional factors were not included. Secondly the study was cross-sectional it did not address the cause and effect of the factors. Thirdly the study reviewed data of two years only.

9. References

1. Waldemar A. Carlo. Overview of mortality and morbidity. 20th edition. Kliegman RM SB, SP Geme III JW, Schor NF, Behrman RE, editor. Philadelphia: Elsevier; 2016.
2. Baghel B, Sahu A, Vishwanadham K. Pattern of admission and outcome of neonates in a NICU of Tribal Region Bastar, India. 2016;2(6):147-50. DOI: 1021276/ijmrp201626029.
3. Registrar General. Annual family health survey: Sample, registration system, new Delhi. India: 2011.
4. Round, June L Mazmanian, Sarkis Kr. The gut microbiota shapes intestinal immune responses during health and disease. *Nature Reviews Immunology*. 2009;9(5):313-23.
5. Rajab, Anna Al Rashdi, Salmi IA. Genetic services and testing in the sultanate of Oman. Sultanate of Oman steps into modern genetics. *Journal of community genetics*. 2013;4(3):391-7.
6. Toma, Bose I, Olukemi A, Ibrahim O, Carol A, Rose D, et al. Pattern of neonatal admissions and outcome in a tertiary institution in north central Nigeria. *Journal of Medicine in the Tropics*. 2013;15(2):121.
7. Ugwu, McGill G. Pattern of morbidity and mortality in the newborn special care unit in a tertiary institution in the Niger delta region of Nigeria: A two year prospective study. *Global Advanced Research Journal of Medicine and Medical Sciences*. 2012;1(6):133-8.
8. Ike Elizabeth U, Modupe O, Oyetunde. Pattern of diseases and care outcomes of neonates admitted in special care baby unit of university college hospital, Ibadan, Nigeria *IOSR Journal of Nursing and Health Science*. Jun 2015;4(3).
9. Ganatra H, Zaidi K. Neonatal infections in the developing world. *Seminars in perinatology*. jsemperi. 2010;34(6):416.
10. Darmstadt, Gary L Kinney, Mary V Chopra, Mickey Cousens, Simon Kak, Lily Paul, et al. Who has been caring for the baby? *The Lancet*. 2014;384(9938):174-88.
11. Black, Robert E Cousens, Simon Johnson, Hope L Lawn, Joy E Rudan, Igor Bassani , Diego G Jha, Prabhat Campbell, et al. Global, regional, and national causes of child mortality in 2008: a systematic analysis. *The lancet*. 2010;375(9730):1969-87.
12. Beck, Stacy W, Daniel S, Lale B, Ana P Meriardi, Mario R, Jennifer H Rubens, et al. The worldwide incidence of preterm birth: a systematic review of maternal mortality and morbidity. *Bulletin of the World Health Organization*. 2010;88(1):31-8.

13. Lawn, Joy E Gravett, Michael G Nunes, Toni M Rubens, Craig E Stanton, Cynthia. Global report on preterm birth and stillbirth (1 of 7): definitions, description of the burden and opportunities to improve data. *BMC pregnancy and childbirth*. 2010;10(1)
14. Belizán JM, McClure EM, Goudar S et al. Neonatal death in Low-Middle income countries: a global network study. *Am J Perinatol*. Sep 2012 29(8):649–56.
15. Lawn, Joy E Blencowe, Hannah Oza, Shefali You, Danzhen Lee, Anne C Waiswa, et al. Every Newborn: progress, priorities, and potential beyond survival. *The Lancet*. 2014;384(9938):189-205.
16. Herbert HK, Lee AC, Chandran A, Rudan I, Baqui AH. Care seeking for neonatal illness in low-and middle-income countries: a systematic review. *PLoS medicine*. 2012;9(3).
17. UNICEF. Maternal, newborn and child survival, country profile. Ethiopia, Statistics and Monitoring Section/Policy and Practice. 2012.
18. WHO, UNICEF. Countdown to 2015: fulfilling the health agenda for women and children. The 2014 report. Geneva: World Health Organization, 2014.
19. Hoque M, Alam S, Ahmed A. Pattern of neonatal admissions and outcome in an intensive care unit (ICU) of a tertiary care paediatric hospital in Bangladesh—A One-Year Analysis. *Journal of Bangladesh College of Physicians and Surgeons*. 2014;31(3):134-9.
20. Tura G, Fantahun M, Worku A. The effect of health facility delivery on neonatal mortality: systematic review and meta-analysis. *BMC pregnancy and childbirth*. 2013;13(1):18.
21. Oluwayemi IO, Ogundare EO, Olatunya OS. Care of the newborn in developing countries. *neonatal biology*. 2014;3(5).<http://dxdoi.org/104172/2167-089710001>.
22. Ensor T, Cooper S, Davidson L, Fitzmaurice A, Graham WJ. The impact of economic recession on maternal and infant mortality: lessons from history. *BMC*. 2010;10(1):727.
23. United N. Millennium Development Goals Report 2009 (Includes the 2009 Progress Chart): United Nations Publications; 2009.
24. Odd, David E, David L, Glyn R, Finn. Long-term impact of poor birth condition on social and economic outcomes in early adulthood. *Pediatrics*. 2011;127(6):e1498-e504.
25. Kunle O, Onyaye E, Oliemen A. Prevalence and outcome of preterm admissions at the neonatal unit of a tertiary health centre in Southern Nigeria. *Open Journal of Pediatrics*. 2014;4(01):67.

26. Afolabi BM. sub-Sahara African Neonates – Ghosts to Statistics. *J Neonatal Biol* 2017;6:246. doi:104172/2167-08971000246.
27. Oza, Shefali Lawn, Joy E Hogan, Daniel R Mathers, Colin Cousens, Simon. Cause-of-death estimates for the early and late neonatal periods for 194 countries from 2000-2013. 2014. arXiv preprint arXiv:14114021.
28. Derek Osborn, Amy Cutter FU. Universal sustainable understanding the transformational challenge for developed countries report a study by stake holder forum up to 2030.
29. WHO. Care of the preterm and/or lbw newborn. Maternal, newborn, child and adolescent health. http://www.who.int/maternal_child_adolescent/topics/newborn/care_of_preterm/ en. WHO 2016.
30. Kananura, Rornald M Tetui, Moses Mutebi, Aloysius Bua, John N Waiswa, Peter Kiwanuka, et al. The neonatal mortality and its determinants in rural communities of Eastern Uganda. *Reproductive health*. 2016;13(1):13.
31. Gogia S, Sachdev HS. Home visits by community health workers to prevent neonatal deaths in developing countries: a systematic review. *Bulletin of the World Health Organization*. 2010;88(9):658-66.
32. Mahmud S, Shah SA, Ali S, Ghafoor T, Ahmed S, Lodhi MA. Pattern of neonatal admissions in a tertiary care hospital. *Editorial Advisory Board*. 2016;66:95.
33. Hoang T Trana LWD, Katherine J Leed, Stephen M Graham. A systematic review of the burden of neonatal mortality and morbidity in the Asean Region. *South-East Asia Journal of Public Health*. 2012;1(3):239-48
34. Unicef. Committing to child survival: a promise renewed. *SocialSciences*, 2015.
35. Muhammad S, Raghieb I, Shahzad B, Mubarak Ai, Khan Z. Pattern of neonatal admissions & its outcome in a tertiary care hospital of Southern Punjab. *P J M H S Oct – Dec 2014*; 8 (4).
36. Shah GS, Shah LR, Thapa A. Clinical profile and outcome of neonates admitted to the neonatal intensive care unit (NICU) at BPKIHS: A need for advanced neonatal care. *Qatar Medical Journal*. 2017;2017:74.
37. Walana W, Acquah Ekuban K, Abdul-Mumin A, Naafu B, Aruk E. Pattern, causes and treatment outcomes of neonatal admission in the Tamale teaching hospital. *Clinics mother child health*. 2016;13(252):2.

38. Battersby C, Michaelides S, Upton M, Rennie JM. Term admissions to neonatal units in England: a role for transitional care? A retrospective cohort study. *BMJ open*. 2017;7(5):e016050.
39. Kanodia P, Yadav SK, Bhatta NK, Singh RR. Disease profile and outcome of newborn admitted to neonatology unit of BPKIHS. *Journal of College of Medical Sciences-Nepal*. 2015;11(3):20-4.
40. Quddusi AI, Razzaq A, Hussain S, Hussain A. Pattern of neonatal admission at the children's hospital and the institute of child health, multan. *Journal of Ayub Medical College Abbottabad*. 2012;24(2):108-10.
41. Ali SR, Ahmed S, Lohana H. Disease patterns and outcomes of neonatal admissions at a secondary care hospital in Pakistan. *Sultan Qaboos University medical journal*. 2013;13(3):424.
42. Saminathan D, Mythili B, Ramesh E, Zacharias AM. Incidence, Mortality pattern, and outcome of low birth weight babies admitted in a rural tertiary care center: A Retrospective Study. 2015.
43. Narayan R. A study of the pattern of admissions and outcome in a neonatal intensive care unit at high altitude in Haryana. *Sri Lanka Journal of child health*.4(2):79-81.
44. Shakya A, Shrestha D, Shakya H, Shah SC, Dhakal AK. Clinical profile and outcome of neonates admitted to the neonatal care unit at a teaching hospital in Lalitpur, Nepal. *Journal of Kathmandu Medical College*. 2015;3(4):144-8.
45. Sridhar P, Thammanna P, Sandeep M. Morbidity pattern and hospital outcome of neonates admitted in a tertiary care teaching hospital, Mandya. *Int J Sci Stud*. 2015;3(6):126-9.
46. Hoque M, Haaq S, Islam R. Causes of neonatal admissions and deaths at a rural hospital in KwaZulu-Natal, South Africa. *Southern African Journal of Epidemiology and Infection*. 2011;26(1):26-9.
47. Tekleab AM, Amaru GM, Tefera YA. Reasons for admission and neonatal outcome in the neonatal care unit of a tertiary care hospital in Addis Ababa: a prospective study. *Research and reports in neonatology*. 2016;6:17-23.
48. Mihaylova, Anna Uchicova, Ekaterina Parahuleva, Nikoleta Parahuleva, Mariana. Prevention of Hyaline Membrane Disease (Hmd) In Preterm Infants. 2016.

49. Sivasubramaniam, Priya G Quinn, Cristin E Blevins, Meridith Al Hajajra AK-B, Najwa Faouri, Samir Halasa, et al. Neonatal outcomes of infants admitted to a large government hospital in Amman, Jordan. *Global journal of health science*. 2015;7(4):217.
50. Boundy, Ellen O Dastjerdi, Roya Spiegelman, Donna Fawzi, Wafaie W Missmer, Stacey A Lieberman, et al. Kangaroo mother care and neonatal outcomes: a meta-analysis. *Pediatrics*. 2015:peds. 2015-238.
51. Chinnusamy K, Devimeenakshi K. A retrospective study of analysis of various factors affecting the outcome of sepsis in neonates admitted to a tertiary care neonatal intensive care unit. *International Journal of Research in Medical Sciences*. 2016;4(4):1154-7.
52. Sonawane R, Patil S, Ahire N, Kulkarni N. Outcome of LBW Babies Admitted in the NICU- A Hospital based Study. *MVP Journal of Medical Sciences*. 2014;1(2):71-4.
53. Koum, Danielle Christiane Kedy Essomba, Noel Emmanuel Odile, Nguedjam Bianda Ngwe, Irma Ndanga, Malea Ndombo, et al. Factors associated with early neonatal morbidity and mortality in an urban district hospital. 2015.
54. Central Statistical Agency/CSA/Ethiopia and ICF. Ethiopia Demographic and Health Survey Addis Ababa, Ethiopia, and Rockville, Maryland, USA: CSA and ICF2016.
accessed from <https://dhsprogram.com/publications/publication-fr328-dhs-final-reports.cfm>
55. SB, Siva Saranappa Madhu, GN Singh, Ritesh. A study of disease pattern and outcome of newborns admitted to NICU in a tertiary care hospital. *Congenital anomalies*. 2014;29:0.92.
56. Naskar N, Swain A, Das K, Patnayak A. Maternal risk factors, complications and outcome of very low birth weight babies: prospective cohort study from a tertiary care centre in Odisha. *J Neonatal Biol*. 2014;3:2167-0897.1000142.
57. Rakholia R, Rawat V, Bano M, Singh G. Neonatal morbidity and mortality of sick newborns admitted in a teaching hospital of Uttarakhand. *Chrismed Journal of Health and Research*. 2014;1(4):228.
58. Fahmy N, Ramy N, El Houchi S, Khalek KA, Alsharany W, Tosson A. Outborns or inborns: Clinical audit of the two intensive care units of Cairo University Hospital. *Egyptian Pediatric Association Gazette*. 2017;65(1):10-4.
59. Nathan S. Fox MS, Samuel Bender, Chad K. Klauser, Daniel H. Saltzman, and Andrei Rebarber. Active second-stage management in twin pregnancies undergoing planned vaginal delivery in a US population. *Obstetrics and Gynecology*. 2010;115 (2):229–33.

60. Carneiro JA, Vieira MM, Reis TC, Caldeira AP. Risk factors for the mortality of very low birth weight newborns at a neonatal intensive care unit. *Revista Paulista de Pediatria*. 2012;30(3):369-76.
61. Khan HS, Khalil S, Akhtar P. Morbidity and mortality pattern of pre-terms. *Journal of Islamabad Medical & Dental College (JIMDC)*. 2016;5(1):77-80.
62. Shah S, Zemichael O, Meng HD. Factors associated with mortality and length of stay in hospitalised neonates in Eritrea, Africa: a cross-sectional study. *BMJ open*. 2012;2(5):e000792.
63. Chelliah AM, Vilchez G, Dai J, Bahado-Singh RO, Sokol RJ. Risk factors for neonatal intensive care unit admission after term twin deliveries. *Obstetrics & Gynecology*. 2014;123:141.
64. Mally PV, Hendricks-Muñoz KD, Bailey S. Incidence and etiology of late preterm admissions to the neonatal intensive care unit and its associated respiratory morbidities when compared to term infants. *American journal of perinatology*. 2013;30(05):425-32.
65. Sengupta S, Carrion V, Shelton J, Wynn RJ, Ryan RM, Singhal K, et al. Adverse neonatal outcomes associated with early-term birth. *JAMA pediatrics*. 2013;167(11):1053-9.
66. Burgess AP, Katz J, Pessolano J, Ponterio J, Moretti M, Lakhi NA. Determination of antepartum and intrapartum risk factors associated with neonatal intensive care unit admission. *Journal of perinatal medicine*. 2016;44(5):589-96.
67. Fauth de Araújo B, Zatti H, Madi JM, Brussius Coelho M, Bertoletti Olmi F, Travi Canabarro C. Análise da morbiletalidade neonatal em recém-nascidos pré-termo tardios. *Jornal de Pediatria*. 2012;88(3).
68. Phaloprakarn C, Manusirivithaya S, Boonyarittipong P. Risk score comprising maternal and obstetric factors to identify late preterm infants at risk for neonatal intensive care unit admission. *Journal of Obstetrics and Gynaecology Research*. 2015;41(5):680-8.
69. Rakhia A, Khan M, Memon AA, Dahar SA. Pattern and outcome of neonatal ailments in a tertiary care hospital. *Pakistan Journal of Medical Research*. 2014;53(1):14.
70. Ndayisenga T. Maternal and newborn risk factors associated with neonatal mortality in Gitwe district hospital in ruhango district, Rwanda. *IJMPH*. 2016;6(2):98-102.

71. Opara PI, Jaja T, Onubogu UC. Morbidity and mortality amongst infants of diabetic mothers admitted into a special care baby unit in port Harcourt, Nigeria. *Italian journal of pediatrics*. 2010;36(1):77.
72. Foundations of Jimma University specialized hospital
available on <http://www.bwstats.com/et/tag/jimma-university-specialized-hospital-ethiopia/>
73. Nkuranga JB. Pattern of admission, care and outcome of neonates managed in the neonatal intensive care unit (NICU) at kenyatta national hospital (KNH). July 2012.
74. FMOH. Neonatal intensive care unit (NICU) training manual, Addis Ababa Nov (2014)
75. Khalessi N, Afsharkhas L. Neonatal Meningitis: Risk factors, causes and neurologic complications. *Iran J Child Neurol*. 2014 Autumn;8(4): 46-50.
76. Joel N, Simeon, Regina N, Esther B, Paul K. Neonatal respiratory distress in a reference neonatal unit in Cameroon: an analysis of prevalence, predictors, etiologies and outcomes. *Pan African Medical Journal – ISSN: 1937- 8688*, 2016
77. Fedakar A, Aydogdu C. Clinical features of neonates treated in the intensive care unit for respiratory distress in Turkey. *Turk J Pediatr*. 2011;53(2):173-9
78. Tinuade A. Ogunlesi, Olusoga B, Mojisola M. Ogundeyi. Prevalence and risk factors for hypothermia on admission in Nigerian babies. *J. Perinat. Med*. 37 (2009) 180–184
79. Dalal CA, Bodar NL. A study on birth asphyxia at tertiary health centre. *Natl J Med Res* 2013;3:374-6.
80. Onyearugha CN, Ugboma HA. Severe birth asphyxia: Risk factors as seen in a tertiary institution in the Niger Delta area of Nigeria. *Control J Trop Med* 2010;4:11-9.
81. Aslam HM, Saleem S, Afzal R, Iqbal U, Saleem SM, Shaikh MW, Shahid N. Risk factors of birth asphyxia. *Italian journal of pediatrics*. 2014 Dec;40(1):94.
82. Ilah BG, Aminu MS, Musa A, Adelokun MB, Adeniji AO, Kolawole T. Prevalence and risk factors for perinatal asphyxia as seen at a specialist hospital in Gusau, Nigeria. *Sub-Saharan Afr J Med* 2015;2:64-9
83. Ibrahim NA, Muhye A, Abdulie S. Prevalence of birth asphyxia and associated factors among neonates delivered in Dilchora Referral Hospital, in Dire Dawa, Eastern Ethiopia. *Clinics Mother Child Health*. (2017). doi:10.4172/2090-7214.1000279
84. Jyoti R, Uma DN. Rajeshwary U, “Risk factors for meconium aspiration and MAS (meconium aspiration syndrome) in neonates born through meconium stained amniotic fluid (MSAF) in

- a tertiary care centre in Malabar (Kerala)". *Journal of Evolution of Medical and Dental Sciences* 2013; Vol. 2, Issue 49, December 09; Page: 9489-9495.
85. Nath GDR, Penchalaiah A. Study of clinical profile of meconium aspiration syndrome in relation to gestational age and birth weight and their immediate outcome at Narayana Medical College Hospital, Nellore, India. *Int J Contemp Pediatr* 2017;4:2142-50
86. Roberts JM, August PA, Bakris G, Barton JR, Bernstein IM, Druzin M, et al. Hypertension in Pregnancy report of the american college of obstetricians and gynecologists' task force on hypertension in pregnancy. *Obstetrics and Gynecology*. 2013; 122:1122–31. <https://doi.org/10.1097/01.AOG.0000437382.03963.88> PMID: 24150027
87. Madan J, Chen M, Goodman E, Davis J, Allan W, Dammann O. Maternal obesity, gestational hypertension, and preterm delivery. *The Journal of Maternal-Fetal & Neonatal Medicine*. 2010 Jan 1;23(1):82-8.
88. Bhandari S, Raja EA, Shetty A, Bhattacharya S. Maternal and perinatal consequences of antepartum haemorrhage of unknown origin. *BJOG* 2014;121:44–52
89. Ken P, Aggrey W , Dalton W ,Paul N .Prevalence and factors associated with preterm birth at kenyatta national hospital.*BMC pregnancy and childbirth* (2018) 18:107
90. Su RN, Zhu WW, Wei YM, Wang C, Feng H, Lin L, Yang HX. Maternal and neonatal outcomes in multiple pregnancy: A multicentre study in the Beijing population. *Chronic diseases and translational medicine*. 2015 Dec 1;1(4):197-202.

10. Annex

Annex1 - Data collection tool

Questionnaire prepared for collection of data on the patients chart to assess pattern of diseases, outcome and associated factors among neonates admitted to neonatal intensive care unit at Jimma University Medical Center, Jimma, Southwest Ethiopia, 2018.

Code No. _____

Part I. Socio-demographic Factors		
101	Date Admission	
102	Patient ID	
103	Study Number	
104	Age	A. Birth <24 hr B. 24 hr - <7days C. >7days
105	Sex	A. Male B. Female
106	Place of Residence	A. Jimma town B. Out of Jimma town
107	Place of delivery	A. In born B. Out born
Part II. Maternal/neonatal factors and disease distributions		
108	Parity	A. Primipara B. Multipara
109	Maternal diseases	A. Gestational Diabetes B. Hypertensive disorder of pregnancy C. Infections D. HIV/AIDS E. Antepartum Hemorrhage F. Other (specify) _____
110	Gestational age at birth	A. Preterm (32-37 weeks) B. Term (37-42 weeks) C. Post-term (> 42 weeks)
111	Weight(gm)	A. Low birth weight (< 2499gm) B. Normal Birth weight (2500-4000gm) C. Microsomia (> 4000gm)
112	Birth size	A. Appropriate for Gestational Age(AGA) B. Small for Gestational Age(SGA) C. Large for Gestational Age(LGA)
113	Mode of delivery	A. Spontaneous Vaginal delivery B. C/S C. Instrumental
114	Prolonged Labour	A. Yes

		B. No
115	Multiple Births	A. Yes B. No C. If yes, state the number _____
116	Patterns of Disease	A. Sepsis B. Meningitis C. Hyaline Membrane Disease(HMD) D. Perinatal Asphyxia(PNA) E. Hypothermia F. Jaundice G. Congenital Malformation H. Hospital Acquired Infection I. Other (specify) _____
PART III .NEONATAL OUTCOME		
117	Outcome of the neonate	A. Cured B. Discharged/Left Against Medical Advice C. Death
118	If death, age of the neonate was	A. < 24 hr B. 24hr-<7 days C. > 7 days and <28 days