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

# DETERMINANTS OF NEONATAL HEALTH OUTCOME AMONG PRETERM NEONATES WITH RESPIRATORY DISTRESS SYNDROME ADMITTED AT PUBLIC HOSPITALS ADDIS ABABA, ETHIOPIA, RETROSPECTIVE STUDY

**BY:**
**BEWKET ABERA (BSc)**

**A THESIS FOR THE DEGREE OF MASTERS OF SCIENCE IN NEONATAL NURSING (MSc)**
**ADDIS ABABA UNIVERSITY, ADDIS ABABA, ETHIOPIA**

**MAY, 2024**

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**INVESTIGATOR: BEWKET ABERA (BSc)**

**Advisors: Sr. Emebet Berhane, Asst. Professor**
**Sr. Fikirtemariam Abebe, Asst. Professor**

**A THESIS SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES OF ADDIS ABABA UNIVERSITY, COLLEGE OF HEALTH SCIENCES, SCHOOL OF NURSING AND MIDWIFERY, DEPARTMENT OF NURSING IN THE PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTERS OF SCIENCE IN NEONATAL NURSING.**

**MAY, 2024**

**ADDIS ABABA, ETHIOPIA**

## THESIS APPROVAL

The undersigned, certify that the thesis entitled "Determinants of Neonatal Health Outcome among Preterm Neonates with Respiratory Distress Syndrome admitted at public Hospitals Addis Ababa, Ethiopia, 2024", is approved by the Examining Board of the department after evaluating the fulfillment of the requirements.

**By:** Bewket Abera (BSc.)

**SCHOOL OF NURSING AND MIDWIFERY, ADDIS ABABA UNIVERSITY**

**APPROVED BY THE EXAMINING BOARD**

**Primary Advisor:**

Sr. Emebet Berhane (asst. Professor, Ph.D. fellow) Signature _____Date: _____

**Secondary Advisor**

Sr. Fikirtemariam Abebe (MSc., asst. Professor.) Signature: _____Date: _____

**Examiner:**

Name: Tadesse Bedada (asst. Professor.) Signature: _____ Date: _____

**Chair of the Department:**

Name _____ Signature _____Date: _____

## STATEMENT OF DECLARATION

I, the undersigned, declare and affirm that this thesis is my original work. I have followed all ethical principles of scholarship in the preparation, data collection, data analysis, and completion of this thesis. All scholarly matters that are included in the thesis have been given recognition through proper citation. Every effort has been made to avoid plagiarism in the preparation of this thesis.

I solemnly declare that this thesis has not been submitted to any other institution anywhere for the award of any academic degree, diploma, or certificate.

**STUDENT**

Name: Bewket Abera (BSc.) Signature: _____ Date: _____

This thesis has been submitted for examination with the endorsement of the supervisors whose signatures are provided below.

RESEARCH ADVISORS:

Sr. Emebet Berhane (asst. Professor, PhD fellow.) _____

_____

NAME RANK SIGNATURE DATE

Sr. Fikirtemariam Abebe (MSc., asst. Professor.) _____

_____

NAME RANK SIGNATURE DATE

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## ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ACS | Antenatal Corticosteroids |
| ANC | Antenatal Care |
| APGAR | Appearance, Pulse, Grimace, Activity, and Respiratory |
| APH | Antepartum Hemorrhage |
| BSC | Bachelor of Science |
| CI | Confidence Interval |
| COR | Crude Odds Ratio |
| AOR | Adjusted Odds Ratio |
| CPAP | Continuous Positive Airway Pressure |
| DM | Diabetes Mellitus |
| EDHS | Ethiopian Demographic Health Survey |
| EONS | Early Onset Neonatal Sepsis |
| ETB | Ethiopian Birr |
| GA | Gestational Age |
| GMH | Gandhi Memorial Hospital |
| HTN | Hypertension |
| MAS | Meconium Aspiration Syndrome |
| MSC | Masters of Science |
| NICU | Neonatal Intensive Care Unit |
| PROM | Premature Rupture of Membrane |
| RDS | Respiratory Distress Syndrome |
| SPHMMC | St. Pauli's Hospital Millennium Medical College |
| SPSS | Statistical Program for Social Sciences |
| TASH | Tikur Anbesa Specialized Hospital |
| WHO | World Health Organization |
| Y12MH | Yekatit 12 Memorial Hospital |

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## Abstract

**Background:** preterm neonates are at increased risk of morbidity and mortality related to different cases. Respiratory distress is one of the most common reasons for neonatal admission to the neonatal intensive care unit, 29% of late preterm neonates admitted to the neonatal intensive care unit develop respiratory morbidity. The preterm neonates with respiratory distress syndrome health outcome and its determinants are unknown in the study area.

**Objective:** This study aims to identify the determinants of neonatal health outcomes among preterm neonates with respiratory distress syndrome admitted at public Hospitals, in Addis Ababa, Ethiopia.

**Methods:** An institutional-based retrospective cross-sectional study design was utilized. A sample of 414 medical records of the neonates admitted at public hospitals from Jan 1/2019 to Dec 31/2023. The medical records were selected using a simple random sampling technique. The Data was using a data extraction checklist. Data was coded and entered into SPSS Version 27. A binary logistic regression analysis was run to identify significant determinant variables. The level of significance was declared at the *p*-value of <0.05 with 95% CI.

**Result:** In this study, records of 414 preterm neonates were included. Of this 249(60.1%) were males. The majority of preterm neonates with RDS 265(64%) were discharged with good outcomes and 149(36%) had poor outcomes. Gestational age, Birth weight, Parity, MAS and antenatal steroid administration were found significantly associated with RDS related preterm neonatal mortality, with the p value of 0.008, 0.047, 0.004, 0.017 and 0.037 respectively.

**Conclusion:** In this study findings showed that a significant number of preterm neonates with RDS had good health outcomes. The major determinants of poor health outcome were lower gestational age, low birth weight, born from primiparous, MAS and born from mother who didn't take antenatal steroid. Enhancing antenatal care to identify pregnant mothers at risk of preterm delivery early and initiating preventive interventions, such as administering corticosteroids during the antenatal period, may be recommended.



**Key word: Determinant, Preterm, Respiratory Distress Syndrome, Neonate, Addis Ababa**

# 1. INTRODUCTION

## 1.1. Background

According the world health organization (WHO), Preterm birth is defined as all births happened before completing 37 weeks of gestation (fewer than 259 days). It is sub-classified based on weeks of gestational age as: Moderate to late preterm (32 to <37 weeks), Very preterm (28 to <32 weeks), and extremely preterm (<28 weeks) (1). These preterm neonates are at increased risk of morbidity and mortality since they are highly vulnerable to jaundice, sepsis, respiratory distress syndrome(RDS), perinatal asphyxia, necrotizing enterocolitis, hypoglycemia, congenital anomalies and meconium aspiration syndrome and commonly associated with neonatal mortality (2).

Respiratory distress syndrome (RDS) is a disease that occurs in newborns due to a lack of or insufficient production of pulmonary surfactant. It is a common cause of neonatal respiratory distress, manifests mainly within hours of birth, most often soon after delivery. RDS primarily affects premature neonates and, on a rare occasion, term neonates. The incidence of RDS is inversely proportional to the neonate's gestational age, with smaller and premature neonates having more severe disease. Tachypnea, intercostal retractions, nasal flaring, audible grunting, cyanosis, and characteristic radiographic findings are common manifestations of the problem in newborns with RDS (3).

Respiratory distress syndrome is one of the commonest reasons for neonatal admission into the neonatal intensive care unit (NICU). A study report showed 29% of late preterm neonates were admitted to NICU due to specific respiratory morbidity, RDS case is higher among neonates born before 34 weeks' gestation (4). The incidence of respiratory distress syndrome in different parts of the world is high especially in Ethiopia it accounts up to 45.3% (5).

Globally, in 2018, 2.5 million death of neonates had been reported, by 2030, the neonatal death rate will approach 27.8 million if each country maintains the existing neonatal mortality rate (6). Sub-Saharan Africa had the highest record of neonatal mortality rate that is 28 deaths per 1000 live births, reported in 2018 (6, 7).

In Africa, half of the neonatal deaths are from preterm babies associated with preterm complications like RDS. Particularly the sub-Saharan African countries loss approximately 290,000 neonates in each year due to preterm complication. In Ethiopia neonatal deaths due to preterm birth complications reported as 37%. Even though respiratory distress alone is not a cause for preterm baby mortality, a study had shown that it is a significant predictor for preterm mortality (4).The factors: gestational age, birth weight, sex, APGAR score, hypothermia, Silverman Andersen score, place of delivery, Antenatal Corticosteroids (ACS), mode of delivery, Continuous positive airway pressure (CPAP), and surfactant were also found associated with mortality of preterm neonates with RDS (8).

In Ethiopia, 44% of the under-5 deaths accounts for preterm birth. According to the Federal Ministry of Health of Ethiopia and different studies report, preterm birth is the first cause of neonatal mortality and the fourth cause of under-5 mortality (9). Ethiopia is one of the Sub-Saharan African countries with a high prevalence of under-five year mortality (10). Even though the mortality rate trends show a decrease in a number of deaths, many children continue to pass away before reaching their first birthday.

Different studies were conducted about incidence and associated factors of respiratory distress syndrome in preterm neonates, but there are limited data or studies about determinants of neonatal health outcomes in preterm neonates with respiratory distress syndrome. Conducting such kinds of study will provide an important input to improve treatment practice and increase neonatal survival rate especially those neonates are highly vulnerable to death due to preterm complication like respiratory distress syndrome. Therefore, this study aimed to identify the determinants of neonatal health outcome among preterm neonates with respiratory distress syndrome admitted at public Hospitals, Addis Ababa, Ethiopia.

## 1.2. Statement of the problem

The neonatal period of life, particularly the day of birth, are the most challenging and vulnerable time for a child's survival and health. Every day, approximately 7,300 newborns die globally from complications of prematurity particularly related to infection and intrapartum related cases. Most of these causes are preventable and treatable (11). In 2019, there were approximately 2.4 million reported neonatal death worldwide, with the highest rates occurring in sub-Saharan Africa and South Asia. Among these, 99,000 were reported in Ethiopia, ranking it 4$^{th}$ globally after India, Nigeria, and Pakistan (12).

Globally, approximately 1.1 million deaths occur in preterm neonates due to birth complications. Preterm births range from 5 to 80% worldwide, and most of these babies survive with essential newborn care (13). However, the number of preterm birth is increasing and the associated complications are now recognized as a leading cause of death among children under 5 years of age (14).

The global report shows that neonatal mortality decreased from 36 deaths per 1,000 live births in 1990 to 19 deaths per 1,000 live births in 2015, resulting in an overall decline of 5.1 million to 2.7 million deaths, respectively (15).

Regarding preterm neonatal mortality, 75% of deaths occur within the first week of life among children under five years old (16), of these 42% occur within the first 24 hours (17). In India, sepsis was the major cause of death among NICU admitted preterm neonates (18). In this case the leading cause of death is prematurity itself which accounts 37% (19), of these 75% is commonly associated with respiratory complications such as Broncho pulmonary dysplasia (20). Neonatal mortality among preterm neonates due to RDS is common, for example, in Poland 12.8%, in Nigeria 46.9% and in Ethiopia 45% newborn deaths were reported (21). In Ethiopia, the early neonatal death occurred in 41.8 per 1,000 live births (95% CI 38.1 to 45.8). Furthermore, in urban and rural setting early neonatal death occur in the rate of 25.5 and 45.6 deaths per 1,000 live births, respectively (22).

Even though the survival of premature neonates has improved significantly with the advancement of highly specialized intensive care service, it maintains being a leading reason for hospitalization and permanent sequel for the survivors (23-25).

According to the 2019 Ethiopian Mini Demographic and Health Survey (EDHS), the neonatal mortality rate was 33 deaths per 1,000 live births(26). Studies had identified several factors contributing in preterm neonatal mortality. The factors such as male neonate, born from mother with diabetes mellitus (DM), neonatal sepsis, gestational age less than 28weeks, low APGAR score, home delivery, jaundice, hypoglycemia, born from preeclampsia /eclampsia mothers and being extremely very low birth weight were identified (27-30). In this case, different studies conducted about incidences and associated factors of respiratory distress syndrome in preterm neonates, but there is scarce data about neonatal RDS health outcome and its determinants.

Conducting such kinds of studies will provide an important input to identify the health outcome determinants to improve treatment practice and accordingly increase neonatal survival rate especially those highly vulnerable to preterm complication like respiratory distress syndrome. Therefore, this study is going to identify the determinants of neonatal health outcome among preterm neonates with respiratory distress syndrome admitted at public Hospitals, Addis Ababa, Ethiopia over the last five years.

## 1.3. Significance of the study

The purpose of this study is aimed to generate recent evidences on current determinants of neonatal health outcomes in Ethiopia, and the result of this study might be used as an input for health professionals working in the neonatal intensive care unit to improve neonatal health outcomes.

Generally, this study will have multiple benefit for different population. The study findings may help the healthcare providers to improve the quality of care and evidence-based practices, particularly to the determinants of neonatal health outcome. The finding helps the governmental and nongovernmental organizations working on preterm neonates' health improvement through resource allocation, providing up to date training for health professionals and developing guidelines for the management of RDS to design their service accordingly. The community might be also benefited by improved quality of care at hospitals for all preterm neonates with or without respiratory distress syndrome, and at the mean time reduces the morbidity and mortality associated with preterm birth and its complication. The finding may benefit the researchers as a base line information in further research.

In summary, studying the determinants of neonatal health outcomes in this context provides valuable insights for improving care, reducing mortality and promoting better health outcome for preterm neonates with RDS.

# 2. LITRATURE REVIEW

## Introduction

The aim of this literature review is to search information that already available in scientific world, in particular focusing on health outcome of RDS in preterm neonates those found both in developing and developed countries. We believe that the previous research findings will help to identify gaps in premature neonatal care that provided in the clinical setting. In this section we plan to review, literatures of health outcome determinants for RDS cases among preterm neonates and the review will be organized in form of socio-demographic factors, obstetric and maternal factors, neonatal factors and medical management factors. And proportion of health outcome of preterm neonates diagnosed with RDS.

## 2.1 Health outcome of preterm neonates

### 2.1.1 Proportion of preterm neonate mortality

Several studies in various countries have been conducted to estimate the incidence and proportion of death among neonates with RDS (27, 28, 31-35). According to a retrospective follow-up study conducted in Fiji, the death rate from RDS was 1.6 per 1,000 live births (33). A study conducted in Beijing, China, out of 207 neonates with RDS, found that RDS was responsible for 8(3.90%) of deaths (32). A study conducted in Jeddah, Saudi Arabia, found that 5.1% of neonates were died of RDS (34). Another study conducted in Bangladesh, documented that 36% neonates were died of RDS (27).

According to a Cameron study, neonatal mortality due to RDS was 24.5% (31). Another prospective descriptive study conducted in Kenya discovered that 68 (72.3%) of 94 neonates with RDS died, with 61% of deaths occurring within the first 10 days (35). A study on the general neonatal population in Eritrea found that neonatal death from RDS was 48.1% (36).

A retrospective follow-up study conducted in northern Ethiopia found that the incidence of RDS was high, with 49.5% of deaths (37). Another prospective cross-sectional study conducted in Ethiopia found that 52 (32%) of 162 neonates died from RDS (28).

While an institutional based prospective follow up study conducted in Addis Ababa public hospitals showed neonatal mortality due to RDS was 43.7%(4).

### 2.1.2 Survival status of preterm neonates

Survival status of preterm neonates is not the same in different studies across the world. According to comparative study done on preterm babies ≤30 weeks in a tertiary care hospital between India and U.K the overall survival rate was (83%) and (87.2%) respectively (38). A quality-improvement study conducted in Canada indicates that survival without major morbidity increased significantly from 56.6% to 70.9% across all gestational ages. Survival of preterm born at 23-25 weeks' gestation increased 70.8% to 74.5% (39).

A prospective study conducted on 246 preterm neonates with RDS revealed that 77/246 (31.3%) study participants had died while the majority of those alive 109/169 (64.5%) continued to need some respiratory support at age of 7 day(8). A prospective descriptive study in Kenya which was conducted among preterm neonates with respiratory distress syndrome showed that a survival rates about 40%, 30%, 28% and 25% on day 10, 20, 30 and 40 respectively. There were 68 (72.3%) deaths during the study period with 58 (61% (0.61, 95%CI: 0.51,0.71)) occurring within the first 10 days of life (35). An institutional based prospective follow up study conducted in Addis Ababa public hospitals showed a survival rate of 56.3% among 277 preterm neonates with respiratory distress syndrome(4).

A retrospective cohort study conducted on 568 randomly selected preterm neonates 199 (35%) died with an incidence rate of 62.15 (54.09-71.41) deaths per 1000-person day observation with median survival time of 15 days (40). A Hospital-based cross-sectional study conducted using 242 randomly selected medical records of preterm neonates with RDS, only 90 (37.2%) were discharged with a good outcome or after clinical improvement(21).

## 2.2 determinants of neonatal health outcome among preterm neonates

### 2.2.1 Socio-demographic determinants

Many study reports showed that significant association of RDS diagnosed neonates' death with socio-demographic determinates such as age at admission, birth weight, gestational age, newborn sex, and place of delivery (27, 29, 30, 33, 41-44). According to a retrospective cohort study conducted in Serbia among 371 newborn preterm neonates showed that low birth weight neonates with RDS have a higher risk of mortality (<1000g, OR: 2.57) (30).

A retrospective follow-up study in Fiji found that an increase in birth weight per 100 grams is associated with increased survival to discharge (33). A retrospective observational study conducted in Bangladesh found that a low-birth-weight of 1,500 gram is an independent predictor of neonatal mortality in preterm neonates with RDS (27). According to a study conducted in Bangladesh, the recovery rate for neonates treated for RDS was higher in females (83.33%) than in males (73.68%)(27).

A cross-sectional, descriptive study in Iran stated that extremely preterm gestational age is an independent predictor of mortality for neonates with RDS (29). A retrospective follow-up study in Fiji found that increased gestational age in weeks is positively associated with discharge with survival (33). The cross-sectional study, conducted in Ethiopia, showed that neonates with gestational ages greater than 34 weeks had a 90% lower risk of death than those with gestational ages less than 28 weeks(28).

According to a Serbian study, institutional delivery is a predictor of neonatal survival from RDS (30). While another cross-sectional study in Ethiopia found that neonates delivered in facilities outside of the study area had nearly four times the risk of death and mentioned place of birth as an independent predictor of RDS mortality (28). The same study found that neonatal admission age was a predictor of neonatal mortality from RDS (28).

### 2.2.2 Maternal medical and obstetrical related determinants

As investigated by different Studies, different maternal, obstetrical, and gynecological factors such as parity, PROM, pregnancy hypertension/preeclampsia,

abnormalities with the placenta, and mode of delivery have been linked to increased neonatal mortality from RDS (28, 32, 42, 44).

According to a study conducted in the Russian Federation, PROM is the predictor associated with the death of newborns from RDS(45). PROM was mentioned as a predictor of neonatal mortality in another case-control study in Beijing, China, and another study in India (32, 46). Studies in the Russian Federation and India mentioned Placental abruption and placental insufficiencies have been linked to neonatal mortality in the Russian Federation and India(45, 46).

Two studies in India found that mode of delivery is a predictor of mortality in neonates with respiratory distress syndrome (42, 46). A study in the Russian Federation, HTN of the pregnant mother/preeclampsia was identified as a predictor of neonatal mortality with RDS (45). An institutional based prospective follow up study conducted in Addis Ababa public hospitals also showed that pre/eclampsia is associated with neonatal mortality with RDS (AOR: 2.9 (1.32, 6.39)) (4).

A prospective cross-sectional study conducted in Ethiopia found that parity was a predictor of mortality from RDS, with neonates from primipara mothers having nearly three times the risk of mortality as neonates from multiparous mothers (AOR 2.49, 95% CI:1.05 - 5.87) (28).

### 2.2.3 Medical management- related determinants

Several studies showed that certain medical management methods are predictors of RDS mortality while others are protective (29, 30, 33, 42, 47-49). When compared to survivors, non-survivors were much less likely to be born to mothers who had received more than one dose of prenatal corticosteroids (33).

A cross-sectional, descriptive study conducted in Iran found that the interval between corticosteroid administration and birth was significantly longer in alive neonates than in neonates who died (29). Another prospective cohort study from India found that neonates born to mothers who used perinatal/antenatal corticosteroids were less likely to die (42).

### 2.2.4 Neonatal and Other Comorbidities related determinants

Different studies mentioned that perinatal asphyxia, low Apgar score, hypothermia, and neonatal sepsis were predictors of RDS mortality (27, 30, 32, 33, 50). According to a case-control study conducted in Beijing, China, asphyxia significantly increases mortality in neonate with RDS (32). In the same study, maternal-fetal infection/EONS was found to be significantly associated with neonatal death from RDS (32). Another study in India linked septic shock and a positive sepsis screen to a poor outcome/death (46).

A retrospective follow-up study conducted in Fiji and Serbia showed that Increased first-minute and fifth-minute Apgar scores were associated with survival to hospital discharge (30, 33). According to a Malawian study, none of the 23 neonates with a mean temperature below 35.8°C survived to discharge, regardless of treatment technique, and hypothermia is a highly significant predictor of neonatal mortality with RDS (49).

An institutional based prospective follow up study conducted in Addis Ababa public hospitals showed that feeding initiation time > 24 hours of admission (AOR: 5.4 (2.24, 12.86)), NEC (AOR: 4.4 (1.67, 11.59)) and hyperbilirubinemia (AOR: 0.19 (0.08, 0.46)) are associated with neonatal mortality with RDS (AOR: 2.9 (1.32, 6.39)) (4).

## 2.5 Conceptual framework

The Conceptual framework based on the reviewed literatures for determinants of neonatal health outcome among preterm neonates admitted with respiratory distress syndrome at selected Hospitals, Addis Ababa, Ethiopia.(27-29, 42, 43)

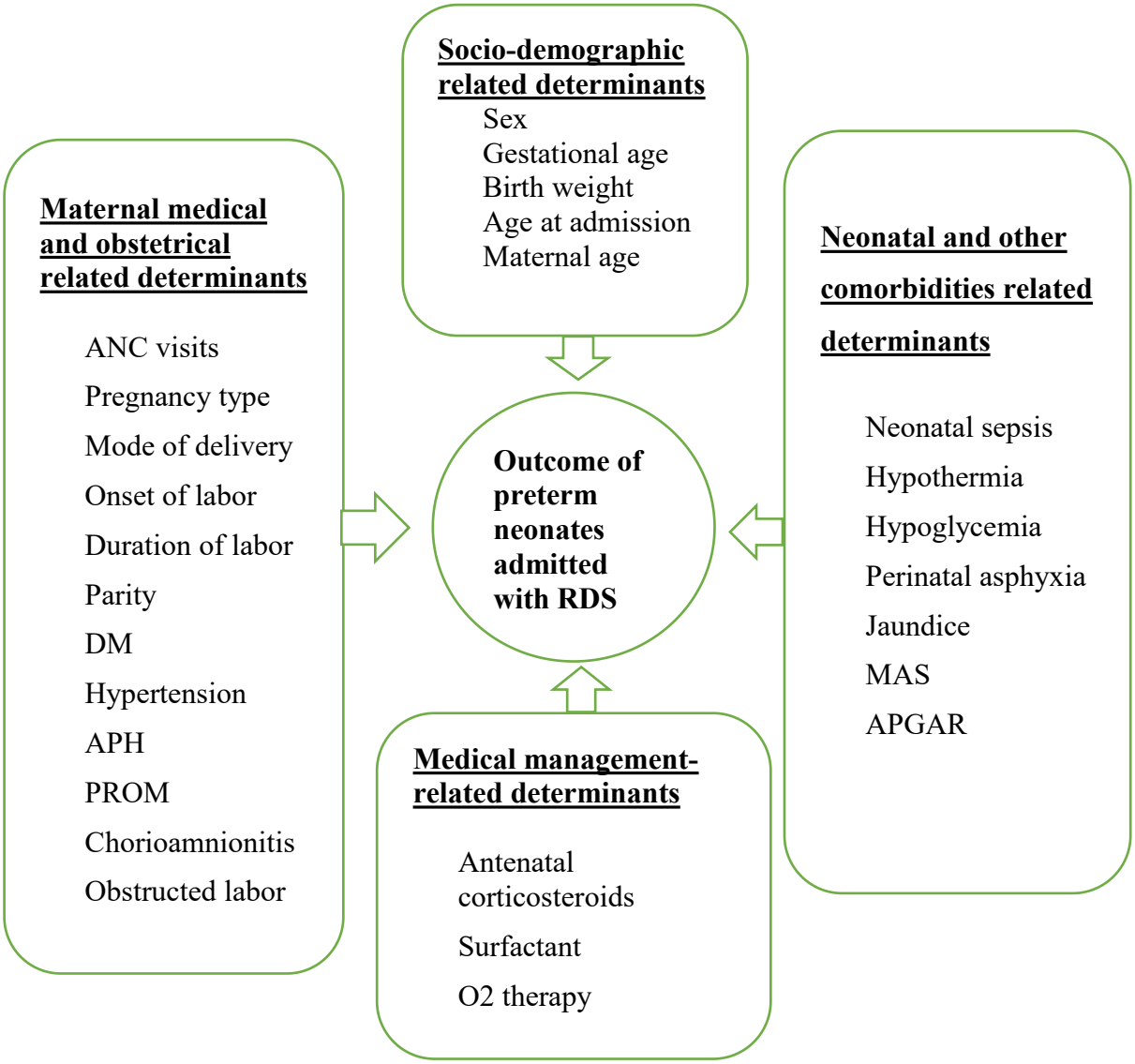


FIGURE 1: FIGURES OF CONCEPTUAL FRAMEWORK

The framework constructed based on the reviewed literatures for determinants of neonatal health outcome among preterm neonates admitted with respiratory distress syndrome.

# 3. OBJECTIVE OF THE STUDY

## 3.1. General objective

To assess the relationship between determinant factors and health outcomes among preterm neonates with respiratory distress syndrome admitted at public hospital, Addis Ababa from January 1/2019 to December 31/2023.

## 3.2. Specific objective

1. To identify the health outcome of preterm neonate with respiratory distress syndrome admitted at public hospital, Addis Ababa from January 1/2019 to December 31/2023.
2. To determine the determinant factors of health outcome of RDS diagnosed preterm neonates admitted at public hospital, Addis Ababa from January 1/2019 to December 31/2023.

# 4. METHODS

## 4.1 Study setting

The study was conducted in Addis Ababa public hospitals. Addis Ababa is the capital city of Ethiopia. Addis Ababa has eleven sub-cities at which the city lies at an altitude of 7,546 feet (2,300 meters). In the city, there are 13 governmental hospitals according to the Addis Ababa Health Bureau: six hospitals are owned by the Addis Ababa Health Bureau, four by Federal Ministry of Health (FMOH), one under Ministry of Education (Addis Ababa University), two by Defense Force. Of the 13 governmental hospitals four of them were selected using simple random sampling:

Tikur Anbesa Specialized Hospital (TASH), there is One neonatologist and 40 nurses working in the unit and there are 60 beds in the unit. The average annual admission rate was 3800, Gandhi Memorial Hospital (GMH), has 2 pediatrician 42 nurse and 38 beds with an average annual admission rate of 2300, St. Paul hospital millennium medical college (SPHMMC), there is a total of 3 neonatologists and 50 nurses working in the unit and there are 60 beds in the unit. The average annual admission rate was 3000 and Yekatit 12 Memorial Hospital (Y12MH), has 2 pediatrician and 35 nurses working in the unit and there are 45 beds in the unit. The average annual admission rate was 3800.These hospitals are providing the NICU service.

## 4.2 Study design and period

An institutional-based retrospective cross-sectional study design was conducted. The study was carried out within a month, from February 25/2024 to March 25/2024.

### 4.3 Source of Population and Study Population

#### 4.2.1 Source populations

Medical records of all preterm neonates with RDS diagnosis were admitted at Addis Ababa public hospitals.

#### 4.2.2 Study populations

The study populations included were all selected preterm neonates with RDS diagnosis admitted at selected hospitals of Addis Ababa from January 1/2019 to December 30/2023 and fulfilled eligibility.

### 4.4 Eligibility criteria

#### 4.3.1 Inclusion criteria

All medical records of preterm neonates with RDS diagnosis, admitted at selected hospitals in Addis Ababa within the past five years (January 2019 to December 2023), which has complete essential information of the mother.

#### 4.3.2 Exclusion criteria

Records of neonates with missed outcome, sex, GA, birth weight and Neonates with major congenital malformations like cardiac and/or respiratory malformation were excluded from the study.

### 4.5 Sample size determination and Sampling procedures

The sample size was determined by using a single population proportion formula with the following assumptions; mortality of preterm neonates admitted with respiratory distress (43.7 %)(4), margin of error between the sample and population =5%, standard normal distribution value at 95% CI, and Z α/2=1.96.

$$\frac{n = (Z\alpha/2)2 \times p\,(1 - P)}{d2}$$

$$\frac{n = 1.96 \times 1.96 \times 0.437 \times 0.563}{0.0025}$$

$$n = \mathbf{379}$$

With a contingency rate of 10%, the final sample size was determined to be **417.**

Whereas, n= the required sample size

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

Z=standard normal distribution value at 95% confidence level

Z α/2=1.96 for 95% confidence interval

p=Prevalence of preterm mortality due to RDS

**Sampling methods**

Neonates' medical records were selected by a simple random sampling technique. The number of medical record files for preterm neonates with respiratory distress syndrome were proportionally allotted to each selected hospital as follows:

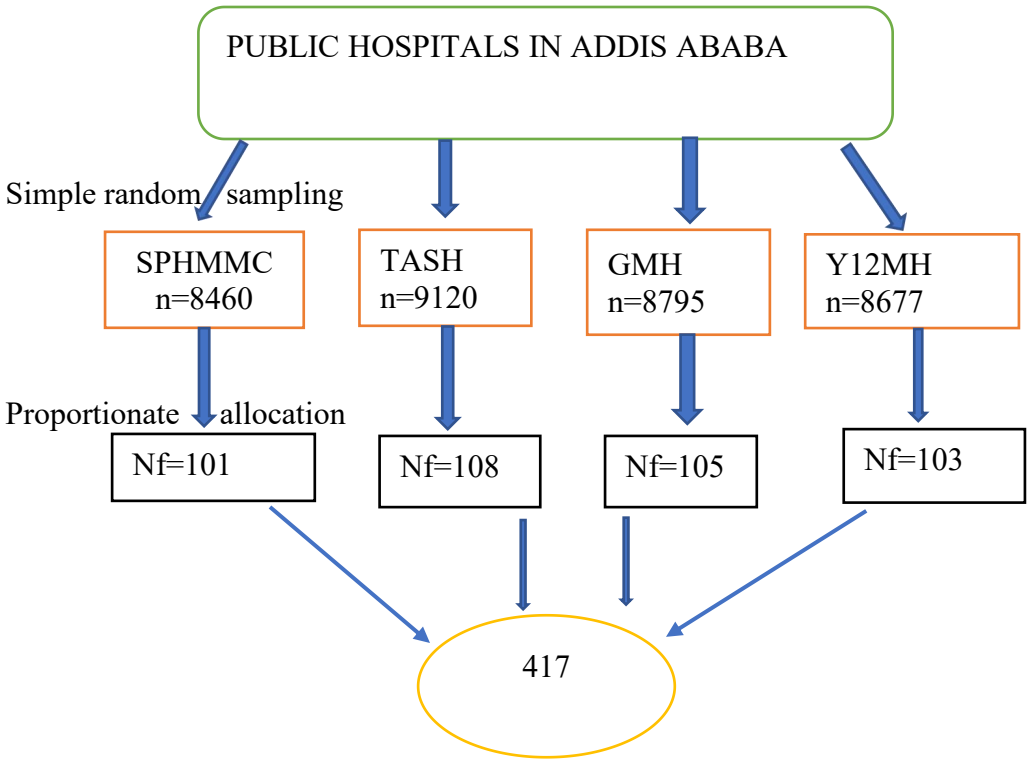


FIGURE 2: FIGURES OF SCHEMATIC SAMPLING PROCEDURE

### 4.6 Study Variable

#### 4.6.1 Dependent variable

Health outcome of the preterm neonates with respiratory distress syndrome

#### 4.6.2 Independent variable

**Socio demographic variable:** - Gestational age, birth weight, age at admission, Sex, maternal age

**Medical and obstetrical related factors:** ANC follow-up, parity, Maternal hypertension, diabetic mellitus, pre/eclampsia, and APH, Mode of delivery, onset of labor, duration of labor, types of pregnancy, PROM, Chorioamnionitis, and obstructed labor.

**Medical management related factors**: - Antenatal corticosteroid administration, O2 therapy, surfactant administration.

**Clinical characteristics of neonates**: neonatal sepsis, perinatal asphyxia, MAS, Hypoglycemia, Jaundice and Hypothermia

### 4.7 Operational definition

**Neonatal health outcome-** poor or good outcome of a newborn within the first 28 days of life.

**Poor outcome:** preterm Neonates with RDS diagnosis, who were admitted in the hospital and died during the neonatal period treatment course or left the hospital against medical advice and/or referred to other hospital.

**Good outcome:** preterm Neonates with RDS diagnosis who have been discharged from the hospital with better health.

### 4.8 Data collection methods

#### 4.8.1 Data collection tool and procedures

The Data was collected by chart review using a prepared checklist. The checklist is adopted from previous similar literature (21). The questionnaire consists of four parts: socio-demographic characteristics, maternal and obstetrical factors, medical-management factors, and neonatal and comorbidity factors.

Four nurses with a BSc degree and one supervisor with MSc degree who have experience in data collection were recruited and trained for data collection and supervision. The supervisor and data collectors were trained for one day on the aim of the study, the relevance of the study, the confidentiality of client information, and eligibility criteria.

### 4.9 Data Quality Control

To keep data quality, supervisor and data collectors were trained on how and what information they should collect from the targeted data sources. Data extraction forms were prepared and checked before data collection for its simplicity by conducting a pretest. The Pretest was conducted on 21(5%) of the sample at St. Peter Hospital, which is not included in the actual study and the result shows Cronbach's alpha of 0.723. Then after necessary amendments of the checklist data collection was made accordingly. During the data collection period, the completeness of the collected data was checked daily by the supervisor, and prompt feedback was given by the supervisor and principal investigator. The data were carefully entered and thoroughly cleaned before the beginning of the analysis.

### 4.10 Data management and analysis

The collected data was coded and entered into SPSS version 27 for analysis. Descriptive statistics was used to provide an overall and coherent presentation of the data. Bivariate and multivariate logistic regression analyses were employed to identify determinant variables. In bivariate analysis significant variables were identified and taken to multivariate Binary logistic regression analysis to see the relative effect of confounding variables. The result was present in Odds ratio with 95% CI, and P - value. The level of significance was declared at P -value less than 0.05.

### 4.11 Ethical Considerations

IRB approval was granted from Department of Nursing, SPHMMC, TASH, Addis Ababa health bureau (GMH and Y12MH (478/24)) which identified with the protocol number, CHS/NSG/76/2016/24, PM23/104, ሕፃ /ህ ት /310/16, A/A/H/13613/227 respectively. Permission requesting letter was written to selected hospitals to allow data collection. Confidentiality was maintained by keeping data anonymity with codes. All collected data were locked in a separate room before entered in to the computer. Data in the computer also secured by password. The data was not disclosed to third person other than principal investigator.

# 5. RESULT

## 5.1 Socio-demographic characteristics

In this study, medical records of 414 preterm neonates were reviewed with a coverage rate of 99.3%. Among these 249(60.1%) were males and 265(39.9%) females. Most of preterm neonates 363(87.7%) admitted at NICU before the age of 24hrs. Nearly half 187(45.2%) of their gestational age group were 34 – 37wks. More than half of preterm neonates 244(58.9%) birth weight were between 1500 - 2500gms and the mean weight of 1616 ± 427.32 SD grams.

**TABLE 1: BASELINE SOCIO-DEMOGRAPHIC CHARACTERISTICS OF PRETERM NEONATES AT ADDIS ABABA PUBLIC HOSPITALS IN ETHIOPIA, 2024.**

| Variable | Categories | Frequency | Percentage (%) (N=414) |
|---|---|---|---|
| **Sex of neonate** | Male | 249 | 60.1 |
| | Female | 165 | 39.9 |
| **Age at admission** | Birth-24 hr. | 363 | 87.7 |
| | >24 hr. | 51 | 12.3 |
| **Gestational age at birth(weeks)** | Late preterm (34 to <37) | 187 | 45.2 |
| | Moderate preterm (32 to <34 weeks) | 129 | 31.2 |
| | Very preterm (28 to <32 weeks) | 98 | 23.7 |
| **Birth weight** | LBW (1500 to <2500 g) | 244 | 58.9 |
| | VLBW (1000 to <1500 g) | 154 | 37.2 |
| | ELBW (<1000 g) | 16 | 3.9 |

## 5.2 Maternal medical and obstetrical related determinant characteristics

Among the total reviewed medical records, the majority 264 (63.8%) of mothers age were grouped between 25-35 years and the mean age of 26.87± 4.59 SD. 202(48.8%) had given birth through spontaneous vaginal delivery and 212(51.2%), through a cesarean section. Most of the mothers 402(97.1%) had ANC follow up. In this case premature rupture of membrane (PROM) accounts 85(20.5%), multiple gestation 113(27.3%), elective C/S 140(33.8%), prolonged labor 34(8.2%) preeclampsia/eclampsia 129(31.2%), DM 12(2.9%), APH 38 (9.2%), hypertension 17(4.1%) and 199(48.1%) of mothers has a parity of 2 or greater.

TABLE 3: MATERNAL MEDICAL AND OBSTETRICAL RELATED CHARACTERISTICS OF PRETERM NEONATE MOTHERS AT ADDIS ABABA PUBLIC HOSPITALS IN ETHIOPIA, 2024

| Variables | Categories | Frequency | Percentage (%) (N=414) |
|---|---|---|---|
| **Maternal age** | 18-24yr | 132 | 31.9 |
| | 25-35 | 264 | 63.8 |
| | >35 | 18 | 4.3 |
| **Parity** | Primipara | 215 | 51.9 |
| | Multipara | 199 | 48.1 |
| **Mode of delivery** | SVD | 202 | 48.8 |
| | C/S | 212 | 51.2 |
| **ANC** | Yes | 402 | 97.1 |
| | No | 12 | 2.9 |
| **Type of pregnancy** | Singleton | 301 | 72.7 |
| | Multiple | 113 | 27.3 |
| **Onset of labor** | Spontaneous | 244 | 58.9 |
| | Induced | 30 | 7.2 |
| | Elective C/S | 140 | 33.8 |
| **Duration of labor** | <12 | 311 | 75.1 |
| | 12-24 | 69 | 16.7 |
| | >24 | 34 | 8.2 |
| **HTN** | Yes | 17 | 4.1 |
| | No | 397 | 95.9 |
| **APH** | Yes | 38 | 9.2 |
| | No | 376 | 90.8 |
| **Preeclampsia/eclampsia** | Yes | 129 | 31.2 |
| | No | 285 | 68.8 |
| **DM** | Yes | 12 | 2.9 |
| | No | 402 | 97.1 |
| **PROM** | Yes | 85 | 20.5 |
| | No | 329 | 79.5 |
| **Chorioamnionitis** | Yes | 26 | 6.3 |
| | No | 388 | 93.7 |
| **Obstructed labor** | Yes | 45 | 10.9 |
| | No | 369 | 89.1 |

### 5.3 Medical management related determinants

In the treatment of respiratory distress and related problems 305(73.7%) of the neonates were supported by CPAP, 210 (50.7%) were born from mothers who took antenatal steroid and only 6(1.4%) got surfactant for the treatment of respiratory distress syndrome.

### 5.4. Neonatal and Other Comorbidities related determinants

The common medical problems identified among admitted preterm neonates were: Hypothermia 335(80.9%), Sepsis 212(51.2%), Neonatal jaundice 168 (40.6%), low Apgar score at 5$^{th}$ minute 55(13.3%), Perinatal asphyxia 45(10.9%), Hypoglycemia 37(8.9%) meconium aspiration syndrome 14(3.4%) and 384(94%) neonates didn't initiate feeding immediately after birth.

**TABLE 4: NEONATAL AND OTHER COMORBIDITY RELATED CHARACTERISTICS OF PRETERM NEONATES AT ADDIS ABABA PUBLIC HOSPITALS IN ETHIOPIA, 2024**

| Variables | Categories | Frequency | Percentage (%) |
|---|---|---|---|
| **Sepsis** | Yes | 212 | 51.2 |
| | No | 202 | 48.8 |
| **MAS** | Yes | 14 | 3.4 |
| | No | 400 | 96.6 |
| **Perinatal asphyxia** | Yes | 45 | 10.9 |
| | No | 369 | 89.1 |
| **Jaundice** | Yes | 168 | 40.6 |
| | No | 246 | 59.4 |
| **RBS** | ≤40mg/dl | 37 | 8.9 |
| | >40mg/dl | 377 | 91.1 |
| **Temperature** | ≥36.5°c | 79 | 19.1 |
| | <36.5°c | 335 | 80.9 |
| **APGAR score at fifth minute** | ≥7 | 359 | 86.7 |
| | <7 | 55 | 13.3 |
| **Feeding initiation time** | ≤1hr. | 25 | 6 |
| | >1hr. | 389 | 94 |

### 5.5 Overall outcome of preterm newborns admitted with RDS

Within this study 149 (36%) of preterm neonatal death with respiratory distress were recorded. From the total study participants 265 (64%) of the neonates had good health outcome. Of the survivor's male neonates account 166(62.6%) and 148 (55.8%) of them were from gestational age of 34-37 weeks.

Among the 149 preterm neonates who died of RDS, the highest number 86(57.7%) were born from primiparous mothers and 84 (56.4%) were delivered through a SVD, and 65 (43.6%) by cesarean section. Death incidence of 84(56.4%) were reported from Preterm neonate with VLBW (1000-1500GM) and 62(41.6%), from gestational age of 28-32 weeks.

In this study from the total preterm neonates born with extreme low birth weight 4 neonates were survived.

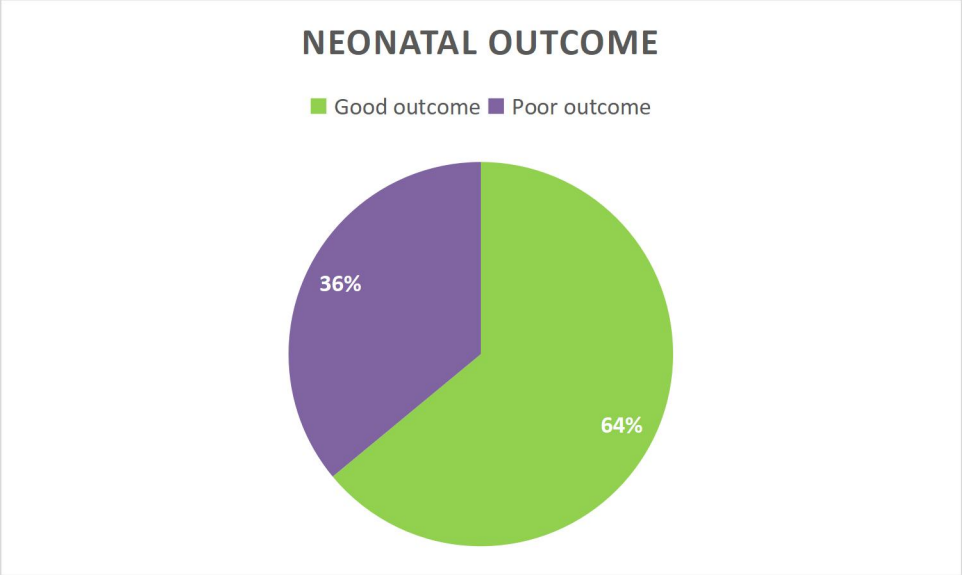


FIGURE 3: HEALTH OUTCOME OF PRETERM NEONATES WITH RDS ADMITTED TO NICU AT PUBLIC HOSPITALS IN ADDIS ABABA, ETHIOPIA, 2024

### 5.6 Determinant variables of preterm neonatal mortality with respiratory distress syndrome

After conducting bivariate logistic regression analysis, we used a p-value threshold of < 0.25 to select variables eligible for inclusion in the multiple logistic regression models. Only the significant variables identified in the bivariate analysis were introduced into the multiple logistic regression. In multi-variable logistic regression Gestational age, Birth weight, Parity, Meconium aspiration syndrome and Antenatal steroid administration were found statistically significantly associated with preterm neonatal mortality with RDS at p-value <0.05.

Based on this, preterm neonates being born with less than 34wk of gestation increased the risk of mortality by 2.6 times compared with those preterm neonates born greater than 34wk of gestation (AOR: 2.577, 95% CI 1.329-4.997, p=0.005) and being born with less than 32wk of gestation increased the risk of mortality by three times compared with those preterm neonates born greater than 34wk of gestation (AOR: 3.12, 95% CI 1.343-7.249, p=0.008).

Preterm neonates who had ELBW (<1000gm) and VLBW (1000-1500gm) was increased the risk of mortality by four times (AOR: 4.245, 95% CI 1.023-17.627, p=0.047) and 2.6 times (AOR: 2.578, 95% CI 1.35-4.922, p=0.004) compared with those preterm neonates who had LBW (1500-2500gm). Preterm neonates being born from primi-para mother increased the risk of mortality by two-fold compared with those preterm neonates born from multi-para mothers (AOR: 2.184, 95% CI 1.277-3.737, p=0.004). Preterm neonates admitted with respiratory distress syndrome who had meconium aspiration syndrome had 5.4 times more risk of death compared with those counterparts (AOR: 5.434, 95% CI 1.347-21.917, p=0.017).

Another significant determinant factor associated with preterm neonatal mortality was Antenatal steroid administration. Those preterm neonates got Antenatal steroid administration had 45% less likely to risk of death compared with their counterparts (AOR: 0.549, 95% CI 0.313-0.965, p=0.037).

TABLE 5: BINARY AND MULTIVARIABLE LOGISTIC REGRESSION ANALYSIS OF DETERMINANT VARIABLES OF PRETERM NEONATAL MORTALITY WITH RESPIRATORY DISTRESS SYNDROME

| Variable | Good Outcome (265) | Poor Outcome (149) | COA (95%CI) | AOR (95%CI) | P-value |
|---|---|---|---|---|---|
| | N (%) | N (%) | | | |
| **Gestational age** | | | | | |
| **34 to <37 wks.** | 148(55.8) | 39(26.2) | 1.00 | 1.00 | |
| **32 to <34 wks.** | 81(30.6) | 48(32.2) | 2.249(1.361,3.715) | **2.577(1.329,4.997)** | **0.005** |
| **28 to <32 wks.** | 36(13.6) | 62(41.6) | 6.536(3.8,11.231) | **3.12(1.343,7.249)** | **0.008** |
| **Birth weight** | | | | | |
| **1500 to <2500gm** | 191(72.1) | 53(35.6) | 1.00 | 1.00 | |
| **1000 to <1500gm** | 70(26.4) | 84(56.4) | 4.325(2.786,6.712) | **2.578(1.35,4.922)** | **0.004** |
| **Less than 1000gm** | 4(1.5) | 12(8.1) | 10.811(3.349,34.896) | **4.245(1.023,17.627)** | **0.047** |
| **Parity** | | | | | |
| **Multipara** | 136(51.3) | 63(42.3) | 1.00 | 1.00 | |
| **Primipara** | 129(48.7) | 86(57.7) | 1.439(0.96,2.157) | **2.184(1.277,3.737)** | **0.004** |
| **Meconium aspiration syndrome** | | | | | |
| **No** | 259(97.7) | 141(94.6) | 1.00 | 1.00 | |
| **Yes** | 6(2.3) | 8(5.4) | 2.449(0.833,7.199) | **5.434(1.347,21.917)** | **0.017** |
| **Antenatal steroid administration** | | | | | |
| **No** | 124(46.8) | 80(53.7) | 1.00 | 1.00 | |
| **Yes** | 141(53.2) | 69(46.3) | 0.759(0.507,1.134) | **0.549(0.313,0.965)** | **0.037** |

## 6. DISSCUSSION

In this retrospective study, we aimed to assess the relationship between determinant factors and health outcomes among preterm neonates with respiratory distress syndrome admitted at public hospital from 1 January 2019, to 31 December 2023. Preterm neonates born with lower Gestational age, lower Birth weight, Meconium aspiration syndrome, Duration of hospital stay and from primiparous mother and without Antenatal steroid administration were statistically associated with poor clinical outcomes. This study also shows that the majority of preterm neonates admitted with RDS 265(64%) were discharged with a good health outcome or after clinical improvement while undeniable number of poor health outcome being reported.

This finding was relatively higher than the studies reported from China, Saudi Arabia and Cameron (3.9%), (5.1%) and (24.5%) respectively (31, 32, 34) and relatively lower than the studies from Eritrea, Northern Ethiopia, Adama and Kenya (48.1%), (49.5%), (62.8%) and (72.3%) respectively (21, 35, 37). This variation might be due to different possible reasons like the sample size, treatment modality, setup of health facilities, and health professionals' experience.

However, the overall magnitude of mortality of this study was relatively comparable with the study reported from Addis Ababa and the same with the study reported from Bangladesh (43.7%) and (36%) respectively (4, 27). This may due to the similarity in NICU setup, policy accomplishment, study period, treatment modality, manpower, resources and facility distribution.

In this study, GA was identified as determinant factor of premature neonatal death. This is comparable with the study done in Adama hospital (21), in Northeastern Nigeria (51) and in University of Gondar comprehensive specialized hospital (52). This is in line with the clinical and physiological rationales: premature neonates with lower gestational age face greater challenges in maintaining lung function due to inadequate surfactant production. Timely interventions and specialized care are crucial to minimize the sequelae of RDS and improve outcomes.

Regarding to the birth weight our study findings were similar to study done (21) and in Northeast Nigeria that low birth weight was a determinant factor for preterm neonates death(51). Another study in Fiji also was in line to our study that was identified survival of the preterm neonates was positively associated with increasing birth weight per 100grams (33). This shows Adequate birth weight contributes to better lung function, thermoregulation, and overall well-being. This also may be due to immature immunity and high body mass index which exposes the neonates to hypothermic which is the major causes of comorbidity and mortality of the preterm neonates with RDS.

In this study antenatal steroid administration had shown positive effect on preterm neonates' survival. This is in support of a study done in Iran revealed that steroid administration significantly reduced mortality rate(29) and a study in Fiji revealed that Increasing doses of antenatal steroids were associated with survival (33). This might due to steroid stimulation of production of surfactant phospholipids by alveolar type II cells, enhance the expression of surfactant-associated proteins, reduce micro vascular permeability, and accelerate overall structural maturation of the lungs.

Another result that revealed Preterm neonates with meconium aspiration syndrome were more likely at increased risk of death. This is in support of respiratory tract physiology blocks of airway reduce lung function since they are at higher risk due to immature lungs and surfactant deficiency. Likewise, preterm neonates of primiparous mother were nearly two times more likely to die than those preterm neonates of multiparous mothers which was similar result with the study in Ethiopia (28). This may be due to Multiparous mothers may have more experience with childbirth and neonatal care, leading to better management of neonatal complications.

## 7. STRENGTHS AND LIMITATIONS

### Strength

The study used a five years of admission record of four hospitals, with proportional allocation; uses randomized sampling technique and larger sample size, which enhance the strength of the study.

### Limitation

Unlike prospective study, this retrospective study posed to miss important information such as socioeconomic factors like level of income, educational status, occupation of the mother and birth spacing which are considered significant predictors with preterm neonatal death. Even though this study includes four hospitals its generalizability to all hospitals of the city and Ethiopia could be another limitation. Selection bias is possibly introduced during secondary data collection because patients with incomplete records were excluded. So, the outcome may be under or over estimated.

# 8. CONCULUSION AND RECOMMENDATION

## CONCULUSION

In the current study, poor preterm neonatal outcome was found to be comparable with previous studies. the major determinants of poor health outcome of preterm neonates with RDS admitted to NICU: lower gestational age, lower birth weight, being primiparous, having meconium aspiration syndrome, born from mothers didn't take antenatal steroid were found significantly associated determinants of preterm neonatal death with RDS.

## RECOMMENDATION

**The recommendation was made based on our study finding**

The federal ministry of health works to reduce the neonatal mortality rate by including it in the second MDG IV, though the magnitude of death of preterm neonates in the study area is still high, so that the government should be able to strengthen services to reduce preterm neonatal death like strengthen HSDG by fostering partnerships between national, provincial, and local governments, as well as with private sector stakeholders.

The medical managements of the hospital should work on modernizing the recording system to facilitate research and help researchers to find out more precise determinants of preterm neonatal death related to RDS. . The result helps to health care manager to strengthen prevention aspect through implementing evidence-based practices

**To Hospitals and health Professionals**

A special emphasis and close follow up should be given to preterm neonates with low birth weight, since it is the greater number of mortalities in the current study. The health Professionals those working at ANC should advance their obstetric knowledge and skill to identify the risky mother for preterm delivery, intervene timely administration of antenatal corticosteroids and implement evidence-based practice for preterm neonatal care can help to reduce poor health outcomes and close monitoring of neonates with lower gestational age and birth weight. Individualized care plans should be developed based on the specific needs of each preterm neonate. Primiparous mothers should receive additional support and education regarding preterm neonatal care.

**To upcoming researchers**

A longitudinal prospective cohort study is strongly recommended to follow preterm neonates with RDS to identify the long-term outcomes of RDS on preterm neonates and the health needs of preterm neonates and to identify other determinants

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## ANNEXES

### Annex A: Information Sheet

Addis Ababa University College of Health Sciences, school of Nursing and Midwifery Graduate study program. Here, at Addis Ababa University College of Health Sciences, School of nursing and midwifery graduate Study Program, currently I will be undertaking research on a topic entitled Determinants of Neonatal Health Outcomes among Preterm Neonates with RDS admitted at public hospitals in Addis Ababa. The aim of this form is to make the concerned body clear about the purpose of the research, data collection procedure and get permission to conduct the research.

**Purpose of the study:** To assess the determinants of neonatal health outcome among preterm neonates with RDS admitted at public hospitals in Addis Ababa, Ethiopia.

**Benefits:** this research has no direct benefit for participants who include in the study but mostly has benefit for care planer, manager and for hospital community. If program planner preparing predicted plan there is indirect benefit for clients in the program of getting appropriate care and treatment service for newly admitted neonates.

**Confidentiality:** All information taken by the data collector is confidential and kept in safe place. Its confidentiality will be reassured by the data collected without the personal information of the client and all information collected from this questioner will be kept confidentially and will not be revealed to anyone except for investigator and kept in computer password.

Address of the principal investigator:

Name: Bewket Abera (BSc)

Phone number: +251934385527

E-mail: bewket375@gmail.com

**Annex-B: Data collection tool**

A data extraction tool prepared for the assessment of Determinants of Neonatal Health Outcomes among Preterm Neonates with RDS admitted at public hospitals in Addis Ababa from 2019 to 2023.

Data code ID: ---------- Signature of data collector: ----------

| | Section 1: Demographic Information | | REMARK |
|---|---|---|---|
| 101 | Gender: | 1. Male 2. Female | |
| 102 | Gestational Age at Birth (in weeks): | …… | |
| 103 | Birth Weight (in grams): | …….. | |
| 104 | Age at admission | …… | |
| 105 | Maternal Age: | …… | |
| | Section 2: Maternal medical and obstetrical characteristics | | |
| 201 | Parity | …….. | |
| 202 | place of delivery: | 1. Health center<br>2. Hospital<br>3. home | |
| 203 | Mode of Delivery: | 1. Vaginal<br>2. Cesarean section | |
| 204 | Does the mother have ANC follow up? | 1.yes 2. No | |
| 205 | Type of pregnancy? | 1. single 2. Multiple | |
| 206 | Onset of labor? | 1. Spontaneous<br>2. Induced<br>3. Elective C/S | |
| 207 | Duration of labor? | | |

| | | | |
|---|---|---|---|
| | | …… | |
| 208 | Mode of admission | 1. same facility<br>2. Referred<br>3. From home | |
| 209 | Chronic hypertension | 1.yes 2. No | |
| 210 | APH | 1.yes 2. No | |
| 211 | Preeclampsia/eclampsia | 1.yes 2. No | |
| 212 | Maternal Diabetes | 1.yes 2. No | |
| | Section 3: Neonatal Problem diagnosed during labor | | |
| 301 | PROM | 1.yes 2. No | |
| 302 | Chorioamnionitis | 1.yes 2. No | |
| 303 | Obstructed labor | 1.yes 2. No | |
| | Neonatal comorbidities and related determinants | | |
| 304 | Need for Respiratory Support: | 1.yes 2. No | If your answer is no go to Q303 |
| 305 | If yes, how oxygen support was delivered? | 1. CPAP 2. INO2 | |
| 306 | Oxygen Saturation at Admission: | 1. < 90% 2. ≥ 90% | |
| 307 | Use of Surfactant: | 1.yes 2. No | |
| 308 | Time of feeding initiation | ……. | |
| 309 | Sepsis | 1.yes 2. No | |
| 310 | Meconium Aspiration Syndrome | 1.yes 2. No | |
| 311 | Jaundice | 1.yes 2. No | |
| 312 | Body temperature during Admission | ……. | |
| 313 | Random Blood Sugar during Admission | …….. | |

| | | | |
|---|---|---|---|
| 314 | Apgar Score at 5 Minutes: | 1. < 7 2. ≥ 7 | |
| 315 | Perinatal Asphyxia: | 1.yes 2. No | |
| | Section 4: Medical management on ANC | | |
| 401 | Antenatal Steroid Administration: | 1.yes 2. No | |
| | Section 5: Neonatal Outcomes | | |
| 501 | Neonatal Outcome: | 1. Survived<br>2. Deceased | |

…… **THANK YOU** ……..