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# The Proportion Of Perinatal Asphyxia And Its Associated Factors Among Neonates Visited To Neonatal Opd Of Tibebe-Gion Specialized Hospital, Bahirdar, Ethiopia: Retrospective Study

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**BAHIR DAR UNIVERSITY**  
**COLLEGE OF MEDICINE AND HEALTH SCIENCE**  
**SCHOOL OF MEDICINE**  
**DEPARTMENT OF PEDIATRICS AND CHILD HEALTH**  
**THE PROPORTION OF PERINATAL ASPHYXIA AND ITS**  
**ASSOCIATED FACTORS AMONG NEONATES VISITED TO**  
**NEONATAL OPD OF TIBEBE-GION SPECIALIZED HOSPITAL,**  
**BAHIRDAR, ETHIOPIA: RETROSPECTIVE STUDY**

**BY- DR. Meseret Abatneh (MD, YEAR THREE PEDIATRICS RESIDENT)**

**A THESIS SUBMITTED TO DEPARTMENT OF PEDIATRIC AND CHILD**  
**HEALTH, SCHOOL OF MEDICINE, COLLEGE OF MEDICINE AND**  
**HEALTH SCIENCES FOR PARTIAL FULFILLMENT OF SPECIALITY IN**  
**PEDIATRICS AND CHILD HEALTH**

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**BAHIRDAR, ETHIOPIA**

|                                       |                                                                                                                                                                  |
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| <b>Full title of research project</b> | Determine proportion of perinatal asphyxia and its associated factors among neonates visited neonatal OPD of Tibebe-Gion specialized hospital,Bahr Dar ,Ethiopia |
| <b>Study period</b>                   | From June 29, 2024 –June 28, 2025 G.C.                                                                                                                           |
| <b>Study area</b>                     | Tibebe-gion comprehensive specialized hospital                                                                                                                   |
| <b>Total cost of the project</b>      | 51,089.5 birr                                                                                                                                                    |
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## Declaration

By my signature below I declared and affirm that this thesis is my own work. This has not been previously submitted to this and any other institution for degree qualification and all source of material used for the thesis has been acknowledged.

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## **ABBREVIATION AND ACRONYM'S**

APGAR-----APPERANCE, PULSE, GRIMACE, ACTIVTIY, RESPIRATION

AOR -----ADJUSTED ODD RATIO

CI -----CONFIDENCE INTERVAL

C/S -----CESEREAN SECTION DELIVERY

DD-----DIRE-DAWA...

ICU-----INTENSIVE CARE UNIT

KG-----KILOGRAM

LMIC -----LOWER- MIDDLE INCOME COUNTRIES

NICU -----NEONATAL INTENSIVE CARE UNIT

OPD-----OUT PATIENT DEPARTMENT

OR-----ODD RATIO

PNA-----PERINATAL ASPHYXIA

PROM -----PREMATURE RUPTURE OF MEMEBRANE

TGSH-----TIBEREGION SPECIALIZED HOSPITAL

WHO-----WORLD HEALTH ORGANIZATION

## ABSTRACT

**Background:** Birth asphyxia is a global health crisis causing significant neonatal mortality and morbidity. Defined by the failure to initiate breathing at birth, it is clinically identified via low APGAR scores. While many maternal and fetal risk factors are preventable, localized research on its prevalence and causes remains insufficient within Ethiopia.

**Objective:** The objective of this study to determine the proportion of perinatal asphyxia and its associated factors among neonate visited to neonatal OPD of Tibebe-Gion specialized hospital.

**Method:** This institutional-based retrospective cross-sectional study was conducted at Tibebe-Ghion Specialized Hospital, Bahir Dar, from January 1, 2025 to February 21, 2026 G.C. The study included neonates admitted to the NICU between June 29, 2024 and June 28, 2025 G.C. The sample size was determined using a single population proportion formula ( $p = 23.07\%$ ), with finite population correction applied ( $N = 1,538$ ), yielding a final sample of 254. Systematic random sampling was employed. Data were collected using a standardized chart abstraction tool. Data were entered into EpiData and analyzed using SPSS version 26 with multivariable logistic regression at  $p < 0.05$  significance level.

**Result:** This study at Tibebe-Ghion Specialized Hospital found an 11.67% (95% CI: 8.3–15.1%) proportion of perinatal asphyxia among 240 neonates. The number of respondent was 240 (94.5%) Fetal malposition (AOR=0.11, 95%CI: 0.04–0.31), preeclampsia/eclampsia (AOR=0.15, 95%CI: 0.05–0.44), rupture of membranes (AOR=0.16, 95%CI: 0.056–0.476), and meconium-stained fluid (AOR=0.16, 95%CI: 0.06–0.48) were significant independent predictors.

**Conclusion and recommendations:** Perinatal asphyxia remains a significant neonatal problem at TGSHP, strongly associated with antepartum and intrapartum complications. Strengthening ANC follow up, labor monitoring, ensuring partograph use, improving neonatal resuscitation

readiness, and conducting larger prospective studies are essential to reduce its occurrence and improve neonatal outcomes.

# 1. INTRODUCTION

## 1.1 Background of Study

Birth asphyxia is a major global public health problem and a leading cause of neonatal morbidity and mortality(1). The World Health Organization (WHO) defines birth asphyxia as the failure to initiate and sustain breathing at birth. It is also described as impairment in placental or pulmonary gas exchange resulting in hypoxemia and hypercarbia, which prevents newborns from crying or breathing normally immediately after birth(1, 2).

Clinically, birth asphyxia is commonly identified using the Apgar score. An APGAR score of less than 3 for longer than five minutes, the presence of neurological manifestations, or evidence of multisystem organ dysfunction are key indicators of severe birth asphyxia(3). Furthermore, any APGAR score below 7 at the 1st, 5th, and/or 10th minute of life is considered a low APGAR score and is used to define birth asphyxia(4). However, APGAR scores may also be influenced by non-asphyxial factors such as maternal analgesia, prematurity, and neonatal infections(5).

Most of the risk factors of perinatal asphyxia are preventable include increase or decrease in maternal age, prolonged rupture of membranes, meconium-stained fluid, multiple births, antenatal care, low birth weight, mal-presentation, ante-partum hemorrhage, eclampsia, pre-eclampsia, and anemia(6).

Despite the high mortality and morbidity associated with perinatal asphyxia, the prevalence and associated factors of perinatal asphyxia are not well studied in Ethiopia and there is no report on the prevalence and associated factors of perinatal asphyxia in the study area so far.

## **1.2. Statement of the Problem**

Globally, neonatal mortality remains a persistent public health challenge despite progress in child survival(1). More than 2.5 million newborns die within the first month of life each year, and perinatal asphyxia is one of the leading causes of these deaths, contributing to an estimated 900,000 neonatal deaths annually worldwide due to failure to establish breathing at birth and associated complications (7, 8). This burden is disproportionately borne by low- and middle-income countries, particularly in Sub-Saharan Africa where perinatal asphyxia accounts for a substantial proportion of neonatal mortality and is among the top three causes of newborn deaths next to infections and prematurity(9).

Africa carries a high share of the global burden of birth asphyxia, with about 24% of neonatal deaths attributed to asphyxia, reflecting persistent gaps in intrapartum care, access to skilled birth attendants, and neonatal resuscitation services(10). In Ethiopia, neonatal mortality remains high with a national rate of approximately 30 deaths per 1,000 live births, and perinatal asphyxia is estimated to account for around 31.6% of these deaths, underscoring its significant contribution to neonatal loss in the country(11). Study conducted, a tertiary hospitals like the University of Gondar have reported perinatal asphyxia prevalence as high as 19.8% among NICU-admitted newborns, while other studies across different regions have documented rates ranging from 12.5% in Jimma to 32% in Harari Regional State, reflecting localized disparities in maternal and newborn care(12, 13, 14).

Reports from different studies that assess risk factors of perinatal asphyxia were inconsistent and contradicting. This emphasizes the need for further exploration to put the country figure. In addition, even though it is a significant cause of morbidity and mortality, the proportion of perinatal asphyxia and its associated factors among neonates admitted at Tibebe-gion hospital is not studied. Therefore, this study is aimed at assessing the proportion of perinatal asphyxia and associated factors among newborns visited to this hospital.

### **1.3 Significance of study**

This study is significant in addressing the persistent burden of perinatal asphyxia, which remains a leading cause of neonatal morbidity and mortality in Ethiopia. By determining the proportion of perinatal asphyxia and identifying its associated factors among neonates visited to the Neonatal OPD of Tibebe-Gion Specialized Hospital, the study generates context-specific evidence from a major referral hospital in northwest Ethiopia, where such data are currently limited. The findings were valuable for clinicians and other healthcare professionals by enhancing understanding of the key maternal, obstetric, and neonatal factors contributing to perinatal asphyxia. This evidence can support improved clinical decision-making, early identification of high-risk pregnancies and newborns, and the strengthening of intrapartum monitoring and immediate newborn care practices, including effective neonatal resuscitation.

At the institutional and health system levels, the results of this study will assist hospital administrators and health policymakers in planning targeted interventions, improving the quality of maternal and neonatal care services, and optimizing the allocation of resources. Moreover, the study will contribute to national efforts aimed at reducing neonatal mortality in alignment with Ethiopia's newborn and child survival strategies and the Sustainable Development Goals. Finally, the study will add to the existing body of scientific literature and serve as a reference for future research and program evaluations related to perinatal asphyxia and neonatal outcomes in similar settings.

## 2. LITERATURE REVIEW

### 2.1 prevalence of Perinatal asphyxia

Perinatal asphyxia remains a formidable challenge in neonatal medicine, consistently ranking as the third leading cause of neonatal mortality worldwide. Recent global estimates from 2023 to 2025 indicate that while overall under-five mortality has decreased, the share of neonatal deaths has risen to approximately 47–49% of all childhood deaths(15). Specifically, birth asphyxia is responsible for nearly 23% of the 2.3 million neonatal deaths occurring annually(16).

In high-income countries, the incidence is relatively low, typically ranging between 2 and 10 per 1,000 live births, owing to advanced intrapartum monitoring and immediate access to specialized neonatal resuscitation(17). However, in low-resource settings globally, the burden is significantly higher, often reaching up to 10-15% of all hospital-based deliveries depending on the facility's capacity(17, 18). In Colombia, a recent systematic review and meta-analysis estimated a cumulative prevalence of 5.92%, though with significant heterogeneity across studies.(19)

The African continent, particularly sub-Saharan Africa (SSA), bears the highest burden of perinatal asphyxia globally. As of 2024, the neonatal mortality rate in SSA remains the highest in the world at 26 deaths per 1,000 live births(20). Meta-analyses of studies conducted between 2021 and 2025 in East and Central Africa reveal a pooled prevalence of perinatal asphyxia at approximately 15.9% to 18.0%(21). Specifically, studies in Sudan (2024) reported a hospital-based prevalence of 11.3%,(22) while research in Nigeria and Tanzania has shown rates fluctuating between 11.5% and 12.8%(23, 24).

After excluding 2,815 duplicate records from 4,740 studies, the pooled incidence of perinatal asphyxia in Ethiopia was 15%, indicating a considerable national neonatal health burden(8). A meta-analysis of 38 studies involving 13,593 participants reported a pooled birth asphyxia prevalence of 23.07%, indicating a substantial neonatal public health burden(25).

In the Amhara Region, studies from tertiary hospitals report that the prevalence of perinatal asphyxia ranges from 19.8% to 23.6%, indicating a substantial burden even in relatively well-resourced facilities (26). In study conducted Dilla Referral Hospital high as 32.8% at, reflecting significant disparities within the region(27). The Sidama Region shows an even higher burden,

with 33% of neonates affected by perinatal asphyxia, highlighting critical gaps in obstetric and neonatal care services(28). In the Oromia Region, birth asphyxia accounts for approximately 30% of early neonatal deaths, demonstrating a persistent challenge in reducing neonatal mortality(14). Meanwhile, in the Tigray Region, facility-based studies report a prevalence of around 22.1%, indicating that perinatal asphyxia remains a major neonatal health concern across the region(29).

## **2.2 Factors Associated with Perinatal Asphyxia**

A major global meta-analysis involving over 16,000 patients highlighted that meconium-stained amniotic fluid (MSAF) remains one of the most potent global predictors, increasing the odds of asphyxia by 7.5 times (OR = 7.5; 95% CI: 1.4–39.6)(19). Furthermore, intrapartum fetal distress and the prolonged second stage of labor were identified as critical triggers worldwide, with fetal distress increasing the risk by more than 11 times in resource-limited settings(30).

A Sub-Saharan Africa meta-analysis showed low birth weight (AOR = 2.58, 95% CI: 1.36–4.88) and meconium-stained fluid (AOR  $\approx$  6.0, 95% CI: 3.69–9.74) as consistent predictors(31). In Tanzania, prolonged and obstructed labor and fetal distress were significantly associated ( $p < 0.01$ )(32). Studies from Uganda and Ghana indicated maternal age extremes, poor antenatal care, and intrapartum complications increased risk ( $p < 0.05$ )(32).

Across multiple facility-based studies in Ethiopia, systematic reviews and meta-analyses similarly identify broader determinants, including lack of antenatal care (AOR = 1.60), rural residence (AOR = 1.56), low birth weight (AOR = 2.33), antepartum hemorrhage (AOR = 2.09), and preterm birth (AOR = 2.21), reflecting that perinatal asphyxia risk is influenced not only by hospital-level obstetric challenges but also by socio-demographic and prenatal care factors at the population level(33). In Northwest Ethiopia, a study conducted at the University of Gondar Comprehensive Specialized Hospital reported a perinatal asphyxia prevalence of 19.8%, finding that absence of maternal formal education (AOR = 4.09), pregnancy-induced hypertension (AOR = 4.07), antepartum hemorrhage (AOR = 6.35), prolonged labor (AOR = 3.69), instrumental delivery (AOR = 3.17), and meconium-stained amniotic fluid (AOR = 4.50) were significantly associated with perinatal asphyxia, underscoring the influence of maternal and intrapartum complications on neonatal outcomes in this setting(12).

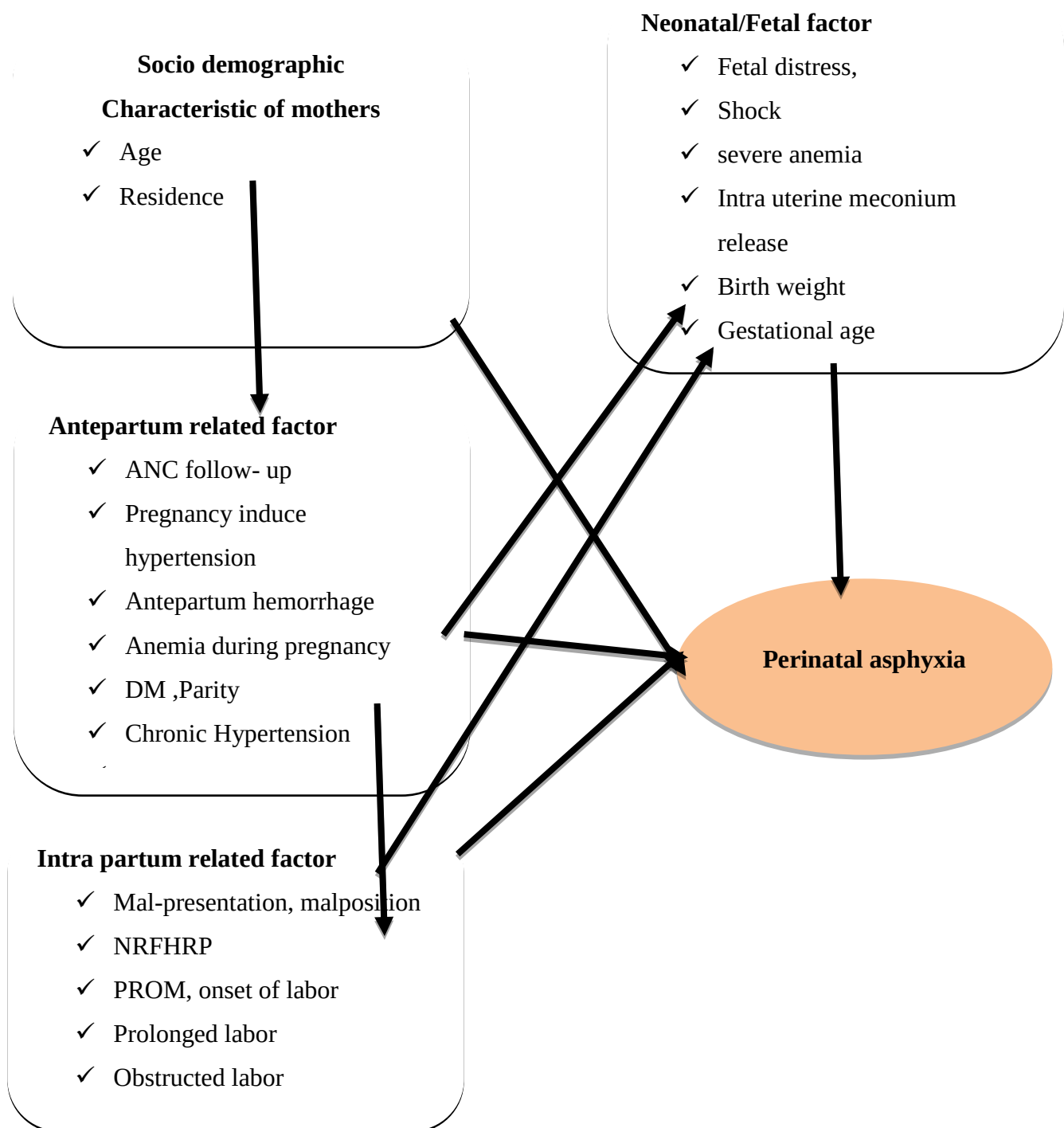
In Addis Ababa, a multicenter cross-sectional study involving public hospitals found a lower prevalence of 10.6%, but identified several significant predictors including antepartum hemorrhage (AOR = 7.17), low birth weight (AOR = 2.87), preterm birth (AOR = 3.4), caesarean section delivery (AOR = 2.75), instrumental delivery (AOR = 4.88), fetal distress (AOR = 4.77), and meconium-stained amniotic fluid (AOR = 9.02), demonstrating that both obstetric complications and fetal distress contribute to asphyxia in urban referral contexts(34).

In Southern Ethiopia at Dilla University Referral Hospital, the prevalence of perinatal asphyxia was 32.8%, and maternal anemia during pregnancy (AOR = 2.99), chronic hypertension (AOR = 4.89), meconium-stained amniotic fluid (AOR = 3.59), and low birth weight (AOR = 3.31) were identified as significant factors, emphasizing the role of maternal health status and neonatal vulnerability in this region (35). Evidence from general hospitals in the Tigray Region showed a prevalence of 22.1%, with cesarean section delivery (AOR = 6.97), meconium-stained amniotic fluid (AOR = 8.55), low birth weight (AOR = 12.75), and prolonged labor (AOR = 3.33) significantly associated with perinatal asphyxia, highlighting both obstetric procedures and neonatal characteristics as key determinants in northern Ethiopia(36).

A Northern Ethiopia study incorporating several hospitals also reported a birth asphyxia prevalence of 20.0%, identifying induction of labor (AOR = 3.59), prolonged labor (AOR = 3.59), meconium-stained amniotic fluid (AOR = 3.49), referral status (AOR = 3.68), instrumental delivery (AOR = 2.87), and primiparity (AOR = 2.05) as significant predictors, confirming the consistency of obstetric risk factors across different northern facilities(37).

At Hawassa University Specialized Hospital in the Sidama Region, neonatal asphyxia prevalence was reported at 17.9%, with prolonged labor (AOR = 2.91), presence of meconium (AOR = 2.14), premature rupture of membranes (AOR = 2.46), and labor complications (AOR = 3.35) as significant determinants, illustrating that obstetric complications continue to challenge neonatal outcomes in southern Ethiopian tertiary centers(38).

## 2.3. Conceptual framework



**Figure 1**conceptual frameworks for proportion of perinatal asphyxia and associated factors among neonate visited to neonatal OPD of TGSH, Bahir Dar, Ethiopia, 2026 G.C, retrospective

### **3. OBJECTIVES**

#### **3.1. General objectives**

To determine proportion of perinatal asphyxia and associated factors among neonates visited to neonatal OPD of Tibebe-Gion specialized hospital, Bahir Dar Ethiopia from June 29, 2024–June 28, 2025G.C.

#### **3.2. Specific objectives**

- ✓ To determine the proportion of perinatal asphyxia among neonates visited to neonatal OPD of Tibebe-Gion specialized hospital, Bahir Dar, Ethiopia from June 29, 2024–June 28, 2025 G.C
- ✓ To identify the associated risk factors of perinatal asphyxia among neonates visited to neonatal OPD of TGSH, Bahir Dar Ethiopia from June 29, 2024–June 28, 2025 G.C.

## **4. METHODS**

### **4.1. Study area and period**

This retrospective study was conducted in Tibebe-Gion specialized hospital. Tibebe-Gion specialized hospital is a newly established Tertiary care Teaching hospital in Bahir Dar City founded in January, 2019GC. It is located about 10 km south from center city on the high way to Addis Ababa. It has more than 450 bed capacity and gives for more than 94,000 clients as outpatient and inpatient services per year.

The pediatric and child health unit has about 112 beds divided into Emergency Triage Assessment and treatment (ETAT), Critical and stable Wards, Neonatal Intensive care unit (NICU) and Pediatric Intensive care Unit (PICU). The outpatient service has 3 OPD these are under 5 OPD, over 5 OPD and pediatric referral clinic (PRC). The neonatal care unit together with the maternal side & KMC has 55 beds (12 preterm, 12 term, 23 maternal, and 8 KMC). An average of around 1650 neonates were visited to NICU opd each year. The study was conducted from January 1, 2026-January 30, 2026 G.C

### **4.2 Study design.**

Institutional based retrospective cross-sectional study was employed.

### **4.3 Population**

#### **4.3.1 Source population**

All neonates who were visited to neonatal OPD of Tibebe-Gion specialized hospital from June 29, 2024 – June 28, 2025 G.C.

#### **4.3.2 Study population**

The study population composed of all neonates that were selected using systemic random sampling who was visited to neonatal OPD of Tibebe-Gion specialized Hospital, from June 29, 2024 to June 28, 2025 G.C and who fulfilled the inclusion criteria was included in the study.

### **4.4 Inclusion criteria and Exclusion criteria**

#### **4.4.1 Inclusion criteria**

- All Neonates visited to the neonatal OPD of Tibebe-Gion Specialized Hospital during the study period (June 29, 2024 – June 2025)

#### 4.4.2 Exclusion criteria

- ✓ Neonates with congenital anomalies making difficult to diagnose PNA clinically
- ✓ Neonates with incomplete or missing records necessary to confirm perinatal asphyxia.

### 4.5 Sample Size Determination and Sampling Procedure

#### 4.5.1. Sample size determination.

The sample size was calculated using a single population proportion formula to ensure sufficient statistical power. Based on a systematic review and meta-analysis of studies in Ethiopia, the overall pooled prevalence (P) of perinatal asphyxia is 23.07%(25).

$$\frac{Z \left( \frac{\alpha}{2} \right) \cdot p(1 - p)}{d^2}$$

Where.

**n<sub>i</sub>** = Initial sample size

**Z** = 1.96, the corresponding Z-score for the 95% confidence interval (CI)

**α** = Confidence interval (95%)

**d**: Marginal Error5% (0.05)

**P** = estimated prevalence (0.2307)(25).

$$\frac{(1.96)^2 \times 0.2307 \times (1 - 0.2307)}{0.0025}$$

$$n_o = 272$$

Since the source population (N = 1,538) were less than 10,000, the finite population correction formula was applied:

$$n_f = \frac{n_o}{1 + n_i/N}$$

$$n_f = \frac{272}{1 + 272/1538}$$

$$n_f = 231$$

After adding a 10% non-response rate the final sample size for the study was 254 participants.

#### 4.5.2 Sampling Technique and Procedure

A systematic random sampling technique was employed to select 254 neonatal medical charts from the total Neonatal OPD visits at Tibebe-Ghion Specialized Hospital (TGSH). The sampling

frame consisted of the NICU admission registry covering a 12-month period from June 29, 2024 to June 28, 2025 G.C., during which 1,538 neonates were admitted. The sampling interval (K) was determined by dividing the total number of admissions (1,538) by the final sample size (254), yielding a sampling interval of approximately six.

The first medical chart was selected by choosing a random number between one and six using a lottery method. Following this, every sixth neonatal medical chart listed in the registry was systematically selected and retrieved from the medical records archive until the required sample size was reached. When a selected chart was incomplete, missing, or excluded due to major congenital anomalies or substantial missing clinical information, the next consecutive eligible chart was included. This procedure ensured representativeness of the study population, maintained the adequacy of the sample size, and minimized potential selection bias.

## **4.6 study variables**

### **4.6.1 Dependent variable**

Perinatal asphyxia (yes/no)

### **4.6.2 Independent variables**

Socio demographicCharacteristic of mothers: Age, Residence

Neonatal/Fetal factor: Fetal distress, Shock, severe anemia, Intra uterine meconium release, Birth weight and Gestational age

Intra partum related factor: Mal-presentation, malposition, prolonged PROM, onset of labor, prolonged labor, obstructed labor

Antepartum related factor: ANC follow- up, Pregnancy induce hypertension, Antepartum hemorrhage, Anemia during pregnancy, DM and Parity, Chronic Hypertension

#### 4.6 Operational and term definition

**Perinatal Asphyxia:** For the purpose of this study, a neonate is defined as having perinatal asphyxia if the medical record documents an APGAR score < 7 at the 5th minute and/or the neonate required active resuscitation (e.g., bag-mask ventilation, chest compressions, or drugs) at birth(2, 16).

**Prolonged Labor:** Documented labor lasting more than 12 hours for primigravida or more than 8 hours for multipara mothers after the latent phase of the first stage of labor.

**Fetal malposition:** is a situation where the fetal head is in a position other than occiput anterior position

**Fetal malpresentation:** the presentation of the fetus where the presenting part is not vertex

**Obstructed labor:** the presenting part of the fetus cannot progress through birth canal despite adequate uterine contraction due to mechanical or anatomic obstruction

**Prolonged Premature Rupture of Membranes (PROM):** rupture of amniotic membrane for >18hrs(39).

**Good Antenatal Care (ANC) Follow-up:** A mother who had at least four documented ANC visits during the indexed pregnancy, as per the previous Ethiopian national guidelines commonly recorded in the 2024 charts(33).

**Low Birth Weight:** A neonate whose birth weight is recorded as less than 2,500 grams(34).

#### 4.7 Data Collection Procedures

Data for this study was collected through retrospective review of medical records of neonates visited to neonatal OPD of Tibebe-Gion Specialized Hospital during the study period. A standardized chart abstraction form was used to capture relevant maternal and neonatal variables, including demographic information, obstetric history, delivery characteristics, neonatal outcomes, APGAR scores, and interventions at birth. Two trained BSc-level nurses were serve as data abstractors and was supervised by one MSc nurse. The data collectors were retrieve selected medical records from the hospital archive according to the sampling frame and extract all relevant information directly from the charts using kobo collector.

#### **4.8 Data Quality Control**

Data quality was maintained through training of data abstractors on the standardized chart abstraction form and definitions of key variables. Data were entered into EpiData and exported to SPSS version 25 for analysis, with double-entry verification to reduce errors. Supervisors performed random checks on 10% of the charts to ensure accuracy, completeness, and consistency. Standard operational definitions were strictly followed when extracting variables such as PROM, duration of labor and birth weight and clinical signs of perinatal asphyxia. Any discrepancies or unclear entries were resolved by cross-checking the original medical records.

#### **4.9 Data Processing and Analysis**

The collected data was cleaned, coded, and entered into EpiData version 4.6 software. Then, the data was exported to SPSS version 26 for analysis. Binary logistic regression analysis was used primarily to check which variables have association with the dependent variable individually. All variables with  $P \leq 0.25$  in the bivariate analysis were included in the final model of multivariable analysis in order to control all possible confounders. Multivariable logistic regression was used for the analysis of the data. An adjusted odd Ratio with 95% confidence intervals (CI) was computed to identify the presence and strength of associations, and statistical significance was declared at  $p < 0.05$ . The goodness of fit was tested by Hosmer-Lemeshow. Multi co-linearity test was carried out to see the correlation between independent variables by using standard error and Co linearity statistics ( $VIF > 10$  and standard error  $> 2$  was considered as suggestive of existence of multi co-linearity).

Finally, the result was presented in the form of text, table, and graph.

#### **4.10 Ethical Consideration**

Ethical clearance for this study was obtained from the Bahir Dar University Institutional Review Board (IRB). Following approval, a formal letter of cooperation was submitted to the administration of Tibebe-Ghion Specialized Hospital to obtain permission to access neonatal medical records. As this study involves a retrospective chart review with no direct contact with patients or families and poses minimal risk, a waiver of informed consent was formally requested in accordance with national ethical guidelines and Bahir Dar University IRB policies.

To ensure participant privacy and confidentiality, no personal identifiers, such as names or medical record numbers, were recorded on the data abstraction form. Each record was assigned a

unique identification code. All electronic data was stored on a password-protected computer and all hard copies of abstraction forms was kept in a locked cabinet accessible only to the research team. Upon completion of the study, data was securely archived and eventually destroyed according to institutional policies to prevent unauthorized access or re-identification.

Although the study involves minimal risk, there is a potential for rare incidental findings, such as previously unreported neonatal conditions. The study teams were handling such findings following standard clinical reporting procedures. The benefits of this research, including improving understanding of perinatal asphyxia and informing interventions to reduce neonatal morbidity and mortality, outweigh the minimal risks associated with the study.

#### **4.11 Plan for dissemination of results**

The findings of the study will be presented on the research defense day and a formal report will be submitted to the Department of Pediatrics and Child Health with both soft and hard copies. The research output will also be published in local or international scientific journals.

## 5. RESULT

### 5.1 Socio-Demographic Characteristics

A total of 240 mothers and their neonates were included in the study, giving a respondent rate of 94.5% out of the 254 target sample size. Among the participants, about half of the mothers (50.0%) were in the 25–35 years age group. Most mothers resided in urban areas (64.2%), (Table 1)

**Table 1 Socio-Demographic Characteristics of Mothers of Neonates among Neonates visited to neonatal OPD of Tibebe-Ghion Specialized Hospital (n = 240)**

| Variable           | Category | Frequency | Percent (%) |
|--------------------|----------|-----------|-------------|
| Age of mother      | <25      | 94        | 39.2        |
|                    | 25–35    | 120       | 50.0        |
|                    | >35      | 26        | 10.8        |
| Maternal residence | Rural    | 86        | 35.8        |
|                    | Urban    | 154       | 64.2        |

### 5.2 Antepartum characteristics

Regarding pregnancy history, Antenatal care (ANC) follow-up was high at 95.4%. Major maternal complications reported included preeclampsia/eclampsia (12.1%), multiple gestations (12.9%) and gestational diabetes (8.8%)

**Table 2 Antepartum characteristics of neonates visited to neonatal OPD of Tibebe-Ghion Specialized Hospital (n = 240)**

| Variable           | Category | Frequency | Percent (%) |
|--------------------|----------|-----------|-------------|
| Multiple gestation | No       | 209       | 87.1        |

|                                      |     |     |      |
|--------------------------------------|-----|-----|------|
|                                      | Yes | 31  | 12.9 |
| <b>ANC follow-up</b>                 | Yes | 229 | 95.4 |
|                                      | No  | 11  | 4.6  |
| <b>Preeclampsia/Eclampsia</b>        | Yes | 29  | 12.1 |
|                                      | No  | 211 | 87.9 |
| <b>Prolonged PROM</b>                | No  | 210 | 87.5 |
|                                      | Yes | 30  | 12.5 |
| <b>APH</b>                           | No  | 228 | 95.0 |
|                                      | Yes | 12  | 5.0  |
| <b>Gestational diabetes mellitus</b> | No  | 219 | 91.3 |
|                                      | Yes | 21  | 8.8  |

### 5.3 Intrapartum characteristics

Most labors (77.5%) started spontaneously. The majority of deliveries were spontaneous vaginal deliveries (66.3%). 11.7% had meconium-stained amniotic fluid. Fetal malposition was observed in 13.3% of deliveries. Neonatal resuscitation with bag and mask was performed in 10.0% of newborns.

**Table 3 Intrapartum characteristics of neonates visited to neonatal OPD of Tibebe-Ghion Specialized Hospital (n = 240)**

| <b>Variable</b>                                | <b>Category</b>  | <b>Frequency</b> | <b>Percent (%)</b> |
|------------------------------------------------|------------------|------------------|--------------------|
| <b>Onset of labor</b>                          | Spontaneous      | 186              | 77.5               |
|                                                | Induced          | 29               | 12.1               |
|                                                | Elective C/S     | 25               | 10.4               |
| <b>Duration of labor (n=215)</b>               | <12hrs           | 148              | 68.8               |
|                                                | >12hrs           | 67               | 31.2               |
| <b>Mal-presentation</b>                        | Yes              | 7                | 2.9                |
|                                                | No               | 233              | 97.1               |
| <b>Place of delivery</b>                       | In TGSH          | 142              | 59.2               |
|                                                | Out of TGSH      | 98               | 40.8               |
| <b>Mode of delivery</b>                        | SVD              | 159              | 66.3               |
|                                                | C/S              | 77               | 32.1               |
|                                                | Assisted vaginal | 4                | 1.7                |
| <b>Cord prolapse</b>                           | Yes              | 28               | 11.7               |
|                                                | No               | 212              | 88.3               |
| <b>Neonatal resuscitation (bag &amp; mask)</b> | Yes              | 24               | 10.0               |
|                                                | No               | 216              | 90.0               |
| <b>Meconium-stained fluid</b>                  | Yes              | 28               | 11.7               |
|                                                | No               | 212              | 88.3               |
| <b>Fetal malposition</b>                       | Yes              | 32               | 13.3               |

|                                          |          |     |      |
|------------------------------------------|----------|-----|------|
|                                          | No       | 208 | 86.7 |
| <b>5<sup>th</sup> minute APGAR score</b> | $\geq 7$ | 196 | 81.7 |
|                                          | <7       | 44  | 18.3 |

#### 5.4 Neonatal characteristics

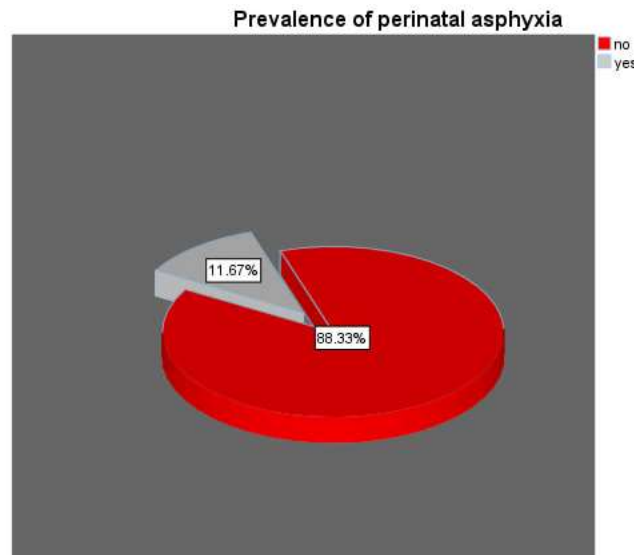
The majority of neonates were male (59.2%) and about 55.4% of the neonates were born between 37 and 42 weeks of gestation, though a significant portion (42.1%) were preterm (<37 weeks). Approximately half of the newborns (50.4%) had a normal birth weight (2500–4000 g), while 48.8% were classified as low birth weight (<2500 g). Severe neonatal anemia and congenital anomalies were both identified in 2.1% of the admitted neonates.

**Table 4 Neonatal Characteristics of Neonates visited to neonatal OPD of Tibebe-Ghion Specialized Hospital (n = 240)**

| Variable                      | Category    | Frequency | Percent (%) |
|-------------------------------|-------------|-----------|-------------|
| <b>Gestational age</b>        | <37 weeks   | 101       | 42.1        |
|                               | 37-42 weeks | 133       | 55.4        |
|                               | >42 weeks   | 6         | 2.5         |
| <b>Birth weight</b>           | <2500gm     | 117       | 48.8        |
|                               | 2500-4000gm | 121       | 50.4        |
|                               | >4000gm     | 2         | 0.8         |
| <b>Neonatal sex</b>           | male        | 142       | 59.2        |
|                               | female      | 98        | 40.8        |
| <b>Severe neonatal anemia</b> | Yes         | 5         | 2.1         |
|                               | No          | 235       | 97.9        |
| <b>Congenital anomalies</b>   | yes         | 5         | 2.1         |
|                               | No          | 235       | 97.9        |
| <b>Neonatal shock</b>         | yes         | 2         | 0.8         |
|                               | No          | 238       | 99.2        |

#### 5.4 Proportion of Perinatal Asphyxia

The proportion of perinatal asphyxia among neonates admitted to the NICU of Tibebe-Ghion Specialized Hospital was found to be 11.67%(95% CI: 8.3–15.1%).



**Figure 2 proportion of perinatal asphyxia among neonates admitted to the NICU of Tibebe-Ghion Specialized Hospital.**

### 5.5 Factors associated with the occurrence of perinatal asphyxia

Bivariable and multivariable binary logistic regression analysis was conducted to identify associated factors of perinatal asphyxia. Accordingly on bivariable analysis prolonged PROM ,preeclampsia/eclampsia,duration of labor,MSAF,ANC follow up, and fetal malposition showed p- value less than 0.25 and entered in multivariable analysis.In the multivariable logistic regression analysis, rupture of membranes, preeclampsia or eclampsia, fetal malposition, and meconium-stained amniotic fluid were significantly associated with perinatal asphyxia. Neonates born to mothers withprolonged premature rupture of membranes had 6.73 times more likely to develop perinatal asphyxia compared to those withoutprolonged PROM (AOR = 6.73; 95% CI:2.12-21.37; p = 0.001). Similarly, neonates born to mothers with preeclampsia or eclampsia had 6.98 timesmore likely to develop perinatal asphyxia compared to those without the condition (AOR = 6.98; 95% CI:2.21- 22.01;p = 0.001). The presence of fetal malposition was associated with higher odds of perinatal asphyxia (AOR = 9.38; 95% CI:3.05–28.81; p < 0.001). Additionally, neonates with meconium-stained amniotic fluid 4.39 times higher odds of developing perinatal asphyxia compared to those without meconium-stained fluid (AOR = 4.39; 95% CI: 1.3–14.78; p = 0.001).

**Table 5Multivariables Logistic Regression Analysis of Factors Associated with Perinatal Asphyxia among Neonates visited to neonatal OPD of Tibebe-Ghion Specialized Hospital, Bahir Dar, Ethiopia.**

| Variable | Category | Perinatal asphyxia | COR (95% CI) | AOR (95% CI) | P-Value |
|----------|----------|--------------------|--------------|--------------|---------|
|----------|----------|--------------------|--------------|--------------|---------|

|                                        |         | Yes | no  |                  |                   |         |
|----------------------------------------|---------|-----|-----|------------------|-------------------|---------|
| <b>Prolonged PROM</b>                  | yes     | 9   | 21  | 4.31(1.73-10.70) | 6.73(2.12-21.37)  | 0.001   |
|                                        | no      | 19  | 191 | 1                | 1                 |         |
| <b>Preeclampsia or Eclampsia</b>       | yes     | 10  | 19  | 5.64(2.24-14.03) | 6.98 (2.21-22.01) | 0.001   |
|                                        | no      | 18  | 193 | 1                | 1                 |         |
| <b>Fetal Malposition</b>               | yes     | 12  | 21  | 6.82(2.8-16.61)  | 9.38(3.05-28.81)  | < 0.001 |
|                                        | no      | 16  | 191 | 1                | 1                 |         |
| <b>Meconium-stained Amniotic Fluid</b> | yes     | 9   | 21  | 4.31(1.73-10.70) | 4.39(1.3-14.78)   | 0.001   |
|                                        | no      | 19  | 191 | 1                | 1                 |         |
| <b>ANC follow up</b>                   | no      | 3   | 8   | 3.06(0.74-12.69) | 0.34(0.04-2.55)   | 0.292   |
|                                        | yes     | 25  | 204 | 1                | 1                 |         |
| <b>Duration of labor</b>               | =>12hrs | 14  | 53  | 2.74(1.22-6.17)  | 2.52(0.88-7.24)   | 0.086   |
|                                        | <12hrs  | 13  | 135 | 1                | 1                 |         |

**Note:** COR = Crude Odds Ratio; AOR = Adjusted Odds Ratio; CI = Confidence Interval; PROM = Premature Rupture of Membranes. Reference categories are indicated with “1”. \*Statistically significant at  $p < 0.05$ .

## 6. DISCUSSION

This study identified the proportion and factors associated with perinatal asphyxia among neonates visited to the neonatal OPD of Tibebe-Ghion Specialized Hospital. The proportion of

perinatal asphyxia was found to be 11.67% (95% CI: 8.3–15.1%). This finding is comparable to studies conducted in Sudan (11.3%) (22) and Nigeria (11.5%) (23). However, it is lower than the pooled national prevalence in Ethiopia of 23.07% (25) and findings from the Sidama Region (33% ) (28), Dilla (32.8% ) (27), and other Ethiopian settings. The relatively lower prevalence in this study might be attributed to the high rate of ANC follow-up (94.5% ) among participants, which facilitates early identification and management of high-risk pregnancies, though variations in facility capacity and referral systems remain important contextual factors.

In the multivariable logistic regression analysis, fetal malposition emerged as the strongest predictor of perinatal asphyxia. Neonates with fetal malposition had significantly higher odds of developing asphyxia compared to those without fetal malposition (AOR = 9.38; 95% CI: 3.05–28.81;  $p < 0.001$ ). This finding is consistent with studies from Addis Ababa (34) and the Amhara Region (12, 26), which identified malposition as a major contributor to obstructed labor and fetal distress. The pathophysiological mechanism involves prolonged and dysfunctional labor patterns associated with malposition, leading to uterine contractions that compromise utero-placental blood flow and increase the risk of hypoxic-ischemic insults to the fetus (19).

Preeclampsia or eclampsia was another significant predictor, with neonates born to mothers with hypertensive disorders having 6.98 times higher odds of perinatal asphyxia (AOR = 6.98; 95% CI: 2.21–22.01;  $p = 0.001$ ). This finding aligns with evidence from Hawassa (38) and other Sub-Saharan African contexts (31), reinforcing the well-established link between maternal hypertension and placental insufficiency. Chronic vasospasm in preeclampsia reduces the placental surface area for gas exchange, causing chronic fetal hypoxia that culminates in birth asphyxia during the peak of labor (17, 35).

Similarly, prolonged premature rupture of membranes and meconium-stained amniotic fluid were both associated with significantly higher odds of perinatal asphyxia (AOR = 6.73; 95% CI: 2.12–21.37;  $p = 0.001$ , AOR = 4.39; 95% CI: 1.3–14.78;  $p = 0.001$ ). Prolonged PROM increases the risk of ascending chorioamnionitis and umbilical cord compression due to oligohydramnios, compromising fetal oxygenation during labor (30, 38). Regarding MSAF, the presence of meconium often indicates intrauterine hypoxia, which triggers fetal bowel peristalsis and

sphincter relaxation. Additionally, meconium aspiration syndrome (MAS) can obstruct airways and inhibit surfactant function, leading to severe postnatal respiratory failure (19).

The clinical implications of these findings are profound. All four factors—fetal malposition, preeclampsia/eclampsia, PROM, maternal rural residence and meconium-stained amniotic fluid—demonstrated strong and statistically significant associations with perinatal asphyxia. These results underscore the urgent need for heightened intrapartum surveillance and the mandatory presence of skilled neonatal resuscitation teams during deliveries involving these specific complications. Strengthening the use of the partograph to early detect labor abnormalities, ensuring regular blood pressure monitoring during antenatal care, and maintaining emergency obstetric care readiness could significantly reduce the burden of perinatal asphyxia in this hospital.

## **7. STRENGTHS AND LIMITATIONS OF THE STUDY**

### **7.1 Strengths**

- Use of standardized medical records and operational definitions to identify perinatal asphyxia.
- Inclusion of key maternal, intrapartum, and neonatal variables to assess associated factors.

### **7.2 Limitations**

- Retrospective chart review may lead to incomplete or missing data.
- Single hospital-based study limits generalizability to other settings.

## **8. CONCLUSION AND RECOMMENDATIONS**

### **8.1 Conclusion**

This study identified perinatal asphyxia as an important neonatal health problem among neonates visited to neonatal OPD of Tibebe-Ghion Specialized Hospital. The occurrence of perinatal asphyxia was significantly associated with key intrapartum and maternal conditions, particularly premature rupture of membranes, hypertensive disorders of pregnancy, fetal malposition, and meconium-stained amniotic fluid. These factors were found to independently increase the likelihood of neonatal asphyxia, highlighting the critical role of timely obstetric management and close intrapartum monitoring. The findings emphasize that perinatal asphyxia in this setting is largely linked to manageable obstetric complications, underscoring the importance of improved surveillance and skilled care during labor and delivery.

### **8.2 Recommendations**

#### **For Tibebe Ghion Specialized Hospital (TGSH)**

- Strengthening intrapartum monitoring and early detection of complications.
- Promoting ANC follow up and timely decision of high risk pregnancy like PROM and pregnancy induced hypertension
- Maintain equipped neonatal resuscitation units and emergency obstetric readiness.

#### **For Clinical Staff**

- Conduct thorough risk assessments and maintain close intrapartum monitoring for early detection of fetal distress.

#### **For Future Researchers**

- Conduct larger, multi-center studies.
- Use prospective designs for stronger evidence.
- Investigate additional maternal and health system factors.

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## 10. APPENDIX

### Questionnaire for the Study

**Title:** The Proportion of Perinatal Asphyxia and Its Associated Factors among Neonates visited to neonatal OPD of Tibebe-Gion Specialized Hospital, Bahir Dar, Ethiopia (June 29, 2024 – June 28, 2025 G.C.)

**Instructions:** Please review the neonatal medical charts carefully and record the information accurately. Confidentiality of patient information must be maintained.

#### Part I: Socio-Demographic Data

| No  | Variable      | Options           |
|-----|---------------|-------------------|
| 1.1 | Age of mother | _____             |
| 1.2 | Residence     | A. Rural B. Town  |
| 1.3 | Neonatal sex  | A. Male B. Female |

#### Part II: Antepartum Questions

| No  | Variable                | Options                   |
|-----|-------------------------|---------------------------|
| 2.1 | Parity                  | A. Primipara B. Multipara |
| 2.2 | Gestational age (weeks) | _____                     |
| 2.3 | Multiple gestations     | A. Yes B. No              |

|     |                                 |                                                                               |
|-----|---------------------------------|-------------------------------------------------------------------------------|
| 2.4 | Maternal anemia                 | A. Yes B. No                                                                  |
| 2.5 | ANC follow-up                   | A. Yes B. No                                                                  |
| 2.6 | Comorbid illness                | A. Yes B. No                                                                  |
| 2.7 | If Yes, specify comorbidity     | A. Renal B. Pulmonary C. Cardiac D. Chronic hypertension E. Presentational DM |
| 2.8 | Pregnancy-related complications | A. Yes B. No C. Not documented                                                |
| 2.9 | If Yes, specify complication    | A. Preeclampsia/eclampsia B. APH C. Hyperemesis gravidarum D. Gestational DM  |

### Part III: Intrapartum Questions

| No   | Variable                                        | Options                                                                        |
|------|-------------------------------------------------|--------------------------------------------------------------------------------|
| 3.1  | Onset of labor                                  | A. Spontaneous B. Induced C. Elective C/S                                      |
| 3.2  | Duration of labor                               | _____                                                                          |
| 3.3  | Rupture of membranes                            | A. PROM B. Not PROM C. Not documented                                          |
| 3.4  | Amniotic fluid meconium-stained                 | A. Yes B. No C. Not documented                                                 |
| 3.5  | Malposition                                     | A yes B no C not documented                                                    |
| 3.6  | Malpresentation                                 | A. Yes B. No C. Not documented                                                 |
| 3.7  | Mode of delivery                                | A. SVD B. C/S C. Assisted vaginal                                              |
| 3.8  | NRFHRP present                                  | A. Yes B. No C. Not documented                                                 |
| 3.9  | Obstructed labor                                | A. Yes B. No C. Not documented                                                 |
| 3.10 | Place of delivery                               | A. Health center B. Government hospital C. Private institution D. Home E. TGSH |
| 3.11 | Cord prolapse                                   | A. Yes B. No C. Not documented                                                 |
| 3.12 | APGAR score documented                          | A. Yes B. No                                                                   |
| 3.13 | If yes, 5th minute APGAR score                  | _____                                                                          |
| 3.14 | If no APGAR score, did the baby cry immediately | A. Yes B. No                                                                   |

|      |                                      |                                |
|------|--------------------------------------|--------------------------------|
| 3.15 | Neonatal resuscitation with bag-mask | A. Yes B. No C. Not documented |
| 3.16 | Perinatal asphyxia diagnosis         | A. Yes B. No                   |

#### Part IV: Postpartum Questions

| No  | Variable                      | Options                                                          |
|-----|-------------------------------|------------------------------------------------------------------|
| 4.1 | Birth weight of newborn       | _____                                                            |
| 4.2 | Neonatal shock                | A. Yes B. No C. Not documented                                   |
| 4.3 | Severe neonatal anemia        | A. Yes B. No C. Not documented                                   |
| 4.4 | Congenital anomaly identified | A. Yes B. No                                                     |
| 4.5 | If yes, specify type          | A. Congenital lung disease B. Congenital heart disease C. Others |