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# Fetal Heart Rate Abnormalities and Associated Factors Among Mothers Who Gave Birth at Tertiary Hospitals, Bahir Dar, North-West Ethiopia.

Minalbat, Abebe

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**BAHIR DAR UNIVERSITY  
COLLEGE OF MEDICINE AND HEALTH SCIENCES  
DEPARTMENT OF OBSTETRICS AND GYNECOLOGY**

**FETAL HEART RATE ABNORMALITIES AND  
ASSOCIATED FACTORS AMONG MOTHERS  
WHO GAVE BIRTH AT TERTIARY HOSPITALS,  
BAHIR DAR, NORTH-WEST ETHIOPIA.**

**BY**

**MINALBAT ABEBE (MD, OBGYN RESIDENT)**

**JULY, 2022**

**BAHIR DAR**

# **BAHIR DAR UNIVERSITY**

**COLLEGE OF MEDICINE AND HEALTH SCIENCES**

**DEPARTMENT OF OBSTETRICS AND GYNECOLOGY**

**Proportion and Factors Associated With Fetal Heart Rate Abnormalities Among Mothers Who Gave Birth at Tertiary Hospitals, Bahir Dar, North-West Ethiopia. Cross Sectional Study.**

**By: Minalbat Abebe (MD, OBGYN Resident)**

**A Thesis Submitted to Department of Obstetrics and Gynecology, School of Medicine, College of Medicine and Health sciences, Bahir Dar University in Partial Fulfillment of the Requirements for Speciality Certificate in Obstetrics and Gynecology.**

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**July, 2022**

**Bahir Dar**

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## DECLARATION

This is to certify that the thesis entitled proportion and factors associated with fetal heart rate abnormalities among mothers who gave birth at tertiary hospitals in Bahir Dar, North West Ethiopia: cross-sectional study, submitted in partial fulfillment of the requirements for specialty certificate in Obstetrics and Gynecology Bahir Dar University, is a record of original work carried out by me and has never been submitted to this or any other institution to get any other degree or certificates. The assistance and help I received during the course of this investigation have been duly acknowledged.

Dr Minalbat Abebe

28/11/2014E.C

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I hereby certify that I have supervised, read and evaluated this thesis titled “Proportion and factors associated with fetal heart rate abnormalities among mothers who gave birth at tertiary hospitals in Bahir Dar, North West Ethiopia: cross-sectional study” by Dr. Minalbat Abebe Amsalu prepared under my guidance. I recommend the thesis be submitted for oral defense.

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**APPROVAL OF THESIS FOR DEFENSE RESULT**

As members of the board of examiners, we examined this thesis entitled "Proportion and factors associated with fetal heart rate abnormalities among mothers who gave birth at tertiary hospitals in Bahir Dar, North West Ethiopia: cross-sectional study" by Minalbat Abebe. We hereby certify that the thesis is accepted for partial fulfillment of the requirements for "specialty certificate in obstetrics and gynecology".

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**Internal examiner name Signature Date**

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**Chair person's name Signature Date**



## **DEDICATION**

This thesis is dedicated to my family for their contribution on my personality and need of continuous education. Especially those family members, my father Abebe Amsalu, my big brother Abebaw Abebe and my little sister Gojjam Abebaw, who sadly passed away with in the last three consecutive years before looking this day. I always remember all of you for your contribution for my success.

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I would like to thank Bahir Dar University, school of Medicine department of Obstetrics and Gynecology for giving me this opportunity to do this thesis.

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## ABSTRACT

**BACKGROUND:** Fetal heart rate abnormalities are used to forecast fetal compromise or fetal distress which results in fetal acidemia due to poor fetal oxygenation. Globally, approximately one-quarter of all newborn deaths are caused by birth asphyxia; survivors can suffer permanent brain damage and irreversible damage of other organs. Non reassuring fetal heart rate is one of the common indications for caesarean and operative vaginal deliveries. There is paucity of researches done in the country in general and no research done in the study area in particular.

**OBJECTIVE:** To assess the proportion and factors associated with fetal heart rate abnormalities among mothers who gave birth at tertiary hospitals of Bahir Dar, North-west Ethiopia, January to June 2022.

**METHODS:** An institutional based cross-sectional study was conducted on 598 mothers who gave birth from January to June 2022 in two tertiary hospitals at Bahir Dar. Study subjects were selected using systematic random sampling method. Data was collected using interviewer administered pretested semistructured questionnaire. Data was entered, cleaned and coded using Epi data version 3.1 and transported to SPSS version 23.00 statistical software for analysis. Results were presented using descriptive statistics by using texts, frequency tables and graphs. Bivariate and Multivariable logistic regression analysis was used to identify factors associated with fetal heart rate abnormalities. Model fitness assessed using Hosmer and Lemeshow Test.

**RESULTS:** The proportion of fetal heart rate abnormalities was 19.4% (95% CI= 16.22-22.58%). Primiparous [AOR=1.950 (95% CI 1.085, 3.506)], meconium stained amniotic fluid [AOR=6.412 (95% CI 3.787, 10.855)], induced labor [AOR=3.513 (95% CI 2.023, 6.099)] and augmented labor [AOR=5.677 (95% CI 2.498, 12.901)] were significantly associated with fetal heart rate abnormalities.

**CONCLUSIONS:** The overall proportion of fetal heart rate abnormalities was higher. Primiparous, meconium stained amniotic fluid, induced and augmented labor had significant statistical association with fetal heart rate abnormalities. Close intrapartum fetal heart rate monitoring is crucial during followup of mothers having these factors.

Key words: Fetal heart rate, tertiary hospitals, Bahir Dar, Felege Hiwot Hospital, Tibebe Ghion Hospital, Ethiopia

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## **LIST OF ABBREVIATIONS AND ACRONYMS**

- ANRS Amhara National Regional state
- APH Antepartam hemorrhage
- BDU Bahir Dar University
- BPM Beats Per Minutes
- FHCSH Felege Hiwot Comprehensive Specialized Hospital
- FHR Fetal Heart Rate
- FMoH Federal Ministry of Health
- NRFHRP Non Reassurance Fetal Heart Rate Pattern
- PIH Pregnancy Induced Hypertention
- TGSH Tibebe Ghion Specialized Hospital
- WHO World Health Organization

# 1. INTRODUCTION

## 1.1 Background

One of the main challenge for Obstetricians are to estimate fetal well-being adequately and timely intervention for suspected fetal hypoxia (1). Fetal heart rate (FHR) is one of the important parameter to follow fetal well-being during intrapartum labor follow up. There are different methods of intrapartum fetal heart rate monitoring; which includes structured intermittent auscultation (by using Pinnard stethoscope or Doppler assessment) and continuous electronic fetal monitoring (EFM) (2).

Structured intermittent auscultation is equivalent to continuous electrical fetal monitoring (EFM) in screening for fetal compromise in low-risk patients. Continuous EFM should be used when there are abnormalities in intermittent auscultation or for high-risk mothers (2, 3). Structured intermittent auscultation was done every 30 minutes for low risk mothers and every 15 minutes for high risk mothers during first stage of labor but during second stage of labor auscultation done every 15 minutes and every 5 minutes for low risk and high risk mothers respectively (2). Continuous EFM has no difference in neonatal death rate and occurrence of cerebral palsy as compared to intermittent auscultation, but reduces neonatal seizures. Continuous EFM increased cesarean delivery rates and instrumental vaginal births (3).

Fetal heart rate decreases as gestational age increased due to maturation of parasympathetic (vagal) heart control. Baseline FHR declined an average of 24 bpm between 16 weeks gestation and term. The baseline FHR at term ranges from 110 to 160 bpm, less than 110 bpm is bradycardia and greater than 160 bpm is tachycardia (4). According to Ethiopia, bradycardia is FHR less than 100 and tachycardia while FHR is 180 bpm and above (2).

According to National Institute of child Health and Human Development (NICHD), fetal heart rate patterns are classified in to three categories. These are; category1(normal) which includes baseline rate 110-160bpm, moderate variability, with/out acceleration and early deceleration and absence of late/variable deceleration, category 3 (abnormal) FHR patterns are sinusoidal pattern and absence of variability with one of the following; recurrent late deceleration, recurrent variable deceleration or bradycardia, category 2 (indeterminate) includes patterns other than category 1 or 3 (5).

According to American College of Obstetrics and Gynecology (ACOG) (2019), management of category I FHR patterns may be managed in a routine manner with either continuous or intermittent monitoring. Category II tracings require evaluation, continued surveillance, initiation of appropriate corrective measures when indicated, and reevaluation. Once identified, these tracings may require more frequent evaluation, documentation, and continued surveillance, unless they revert to Category I. Category III FHR tracings most often require prompt delivery. While intrauterine resuscitation measures are used, preparations for delivery should be considered (6).

In the setting where continuous Cardiotomography (CTG) is not available; if FHR value less than 110 bpm lasting more than five minutes is detected (in the absence of maternal hypothermia, known fetal heart block, or beta-blocker therapy) consideration should be given to immediate delivery by cesarean or instrumental vaginal delivery. If FHR value exceeding 160 BPM during at least three contractions should motivate an evaluation of maternal temperature and signs of intrauterine infection. Beta-agonist drugs and parasympathetic blockers are other possible causes. With isolated fetal tachycardia, increased frequency of intermittent auscultation and treatment of pyrexia and/or infection need to be considered (7).



## 1.2 Statement of the problem

Fetal heart rate is one of the important parameter followed to assess fetal wellbeing during intrapartal follow up (2). FHR abnormalities show fetal hypoxia and/or acidosis which results birth asphyxia.

Fetal heart rate abnormalities are common intrapartal finding during labor follow up and have different prevalence around the globe. These prevalence includes 30.7 % at Thailand (8), 21.2% at Israel (9), 18.6% at Addis Ababa (10) and 15.1% at Finote Selam hospital (11).

Fetal heart rate abnormality was affected by multiple antepartum and intrapartum factors; which includes nulliparity, MSAF, augmentation of labor, IUGR and referral from other health institution (8, 11, 12) .

Globally more than 5 million perinatal deaths occurring each year, ending preventable stillbirths and neonatal deaths will continue to form a significant part of the international public health agenda beyond 2015 (13). The Perinatal Mortality Rate (PMR) of Ethiopia was among the highest in Sub Saharan Africa and the trend has been stable between 90 and 40 per 1000 total births (14). Globally, approximately one-quarter of all newborn deaths are caused by birth asphyxia; survivors can suffer permanent brain damage and irreversible damage of other organs (15). Fetal asphyxia, which is early manifested with abnormal fetal heart rate, is the common cause of neonatal death; accounts 22.45% in study done in Eastern Ethiopia public hospitals (16).

Abnormal fetal heart rate is the common indication for Caesarean delivery. In study done at Addis Abeba teaching hospital NRFHR accounts 26.3% and 17.8% of indications for cesarean delivery in government and private hospitals respectively (17). In a study done at Adigrat hospital 2015, on determinants of caesarean deliveries and its major indications, Northern Ethiopia 21.1% of caesarean deliveries is due to Nonreassuring fetal heart rate (18). In another study at FHRH it accounts 15.9% (19). NRFHR also one of the common indication for operative vaginal delivery, a study at Jimma university medical center shows 56.2% of operative vaginal deliveries are due to NRFHR (20).

Even though the problem is common finding there is only one research done in Amhara region at Finote Selam primary hospital. This study was a retrospective by using patient chart which may not include important variables which affects FHR and the study was done at one primary hospital which may not represent the true degree of the problem.

### **1.3 Significance of the study**

The significance of this study is to assess the prevalence and associated factors of FHR abnormalities at two tertiary hospitals in Bahir Dar which are one of the indicator for fetal hypoxia, acidemia or birth asphyxia and common indication for caesarean and operative vaginal deliveries. Anticipation, early detection and appropriate measures will improve perinatal outcomes.

Even though it is a common indication for caesarean and operative vaginal deliveries there is no research in the study area. There is only one study in the region to assess proportion of NRFHR pattern and associated factor which is a retrospective study using patient charts which may miss important variables that affect fetal heart rates. This study was done prospectively by collecting information both from the laboring mother and chart.

As a teaching hospital Bahir Dar University College of medicine and health science department of obstetrics and gynecology can use the result of the study as scientific evidence with more specific and local data for better patient care. This thesis will provide baseline information for further study on this topic. The thesis will use at national level as an input to know the prevalence of the problem; to improve quality of care; to work on modifiable risk factors to improve perinatal outcomes.

## **2. LITRATURE REVIEW**

### **2.1 Prevalence of Fetal heart rate abnormalities**

A retrospective cohort study done at Thailand, Siriraj hospital 2018, the incidence of abnormal fetal heart rate is 30.7% (8). In a study done at Israel on 2018, the prevalence of NRFHR pattern was 21.2% (9). A cross sectional study done at three teaching hospitals at Addis Abeba on clinical profile and outcome of pregnancies with NRFHR in Labor at Three Teaching Hospitals, Addis Ababa, 2018, the prevalence of FHR abnormality is 18.6% (10). A retrospective study done at Finote Selam hospital on proportion and associated factors of NRFHR pattern, 2020, the prevalence of NRFHR Pattern is 15.1% (11).

The type and prevalence of abnormal fetal heart rates; on a across sectional study at three teaching hospital at Addis Abeba on 2018 includes; bradycardia 65%, tachycardia 25.3% and mixed 9.7% of cases (10). A retrospective study at Finote Selam primary hospital bradycardia accounts for 80% and tachycardia for 20% of cases (11).

### **2.2 Determinants of fetal heart rate abnormality**

#### **2.2.1 Antepartum factors**

A retrospective cohort study done on incidence, associated factors of FHR abnormality and pregnancy outcomes in Thailand Siriraj hospital nulliparity increases FHR abnormality by 1.35 [AOR 1.35 (1.01, 1.82) 95% CI] (8), a prospective observational study done at China on prediction of non-reassuring fetal status on 2020 shows that nulliparity has association with NRFHR pattern [3.746 (1.572–8.929)] (12), a retrospective study(on 2020) done at Finote Selam hospital on proportion of NRFHR pattern nulliparity increases FHR abnormality by 2.72 [1.377, 5.381) 95% CI] (11). A case control study done at Israel, nulliparity decreases the rate of fetal heart rate abnormality (9). Primigravida is a high risk pregnancy and has different antepartum and intrapartum complication. These include hypertensive disorders, prolonged labor, fetal distress, operative delivery, emergency cesarean delivery, need of oxytocin augmentation and obstructed labor (21).

A retrospective study done at Finote Selam primary hospital show that referral from other health institutions increase FHR abnormality by three fold [AOR 2.83 (1.457, 5.503), 95% CI] (11).

A retrospective cohort study done on Risk factors for non-reassuring fetal heart tracing among growth restricted fetuses undergoing labor induction has association with abnormal fetal heart rate. The possibility of FHR abnormality depends on degree of IUGR (fetal weight <5<sup>th</sup> centile and abnormal umbilical artery Doppler study) and gestational age at delivery (22).

### **2.2.2 Intrapartum factors**

In a study done on continued versus discontinued oxytocin stimulation in the active phase of labor: double blind randomized controlled trial in Denmark 2021, continuing of augmentation increases the risk of fetal heart rate abnormalities (27.9% Vs 40.8%) (23). A retrospective study done at Finote Selam primary hospital, augmentation of labor increased FHR abnormality [AOR 3.66 (1.782, 7.534), 95% CI] (11).

A retrospective study done at Finote Selam primary hospital MSAF increased FHR abnormality [AOR 6.49 (3.198, 13.173), 95% CI] (11). A prospective study done on abnormal FHR tracing patterns during the first stage of labor shows the presence of MSAF increases FHR abnormality by 1.91 (95% CI 1.03, 3.3%) (24). A retrospective cohort study done on incidence, associated factors of FHR abnormality and pregnancy outcomes in Thailand Siriraj hospital MSAF didn't increase fetal heart rate abnormality (8). A prospective case control study done at India on Fetal heart rate patterns in patients with thick meconium staining of amniotic fluid, there is no association between MSAF and abnormal fetal heart rate pattern (25). A retrospective study done on evaluation of clinical diagnosis of fetal distress and perinatal outcome in a low resource Nigerian setting on 2016, MSAF has no association with abnormal fetal heart rate (26).

## Conceptual framework

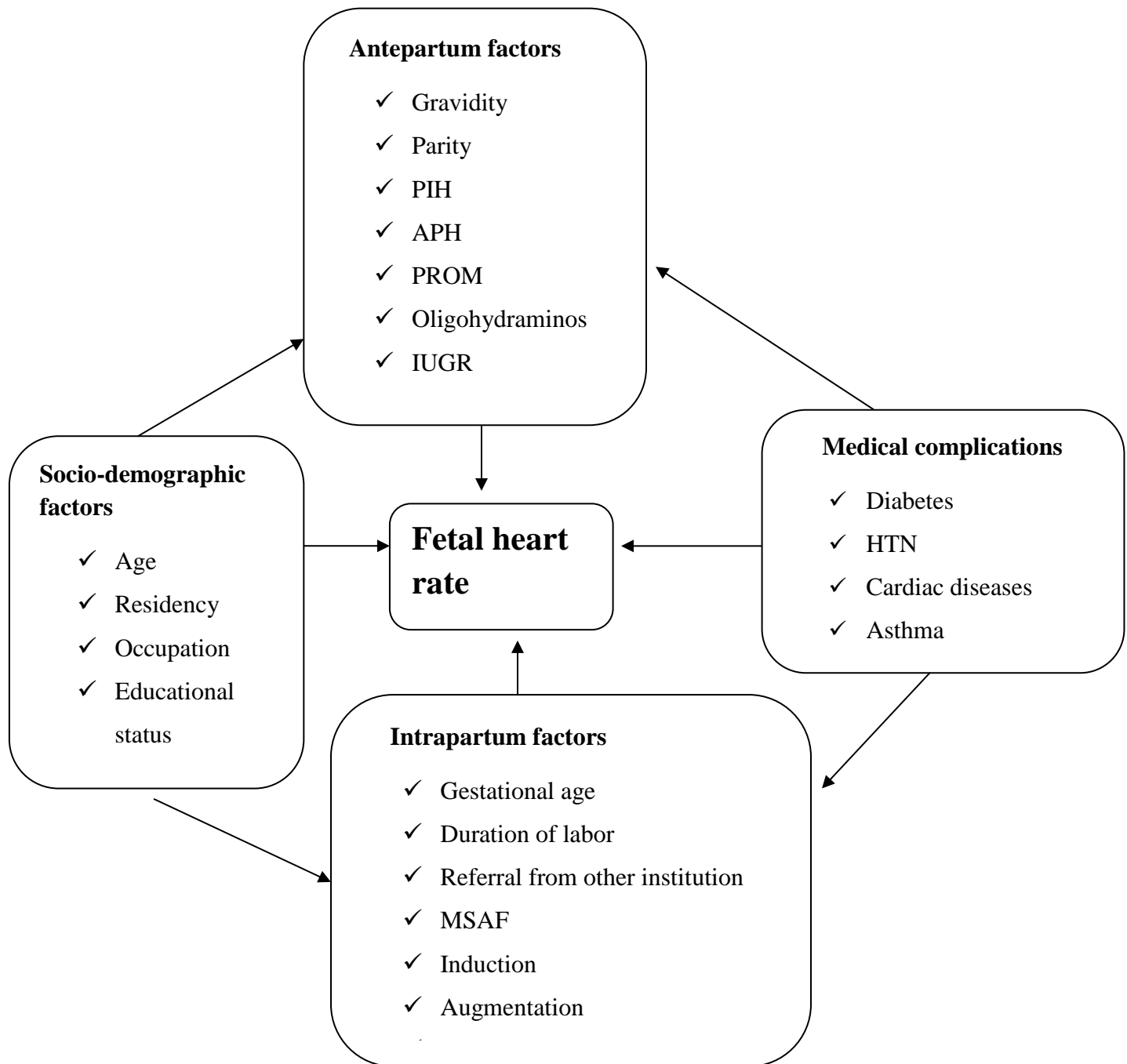


Figure 1: Conceptual frame work adapted from literatures for the study on proportion and factors associated with fetal heart rate abnormalities among mothers who gave birth at two tertiary hospitals, Bahir Dar, Ethiopia, 2022 (8, 11).

## **3. OBJECTIVES**

### **3.1 General objective**

- ✓ To assess proportion and factors associated with fetal heart rate abnormalities among mothers who gave birth at tertiary hospitals of Bahir Dar, North-west Ethiopia, from January to June, 2022.

### **3.2 Specific objectives**

- ✓ To determine proportion of fetal heart rate abnormalities among mothers who gave birth at tertiary hospitals of Bahir Dar, North-west Ethiopia, from January to June, 2022.
- ✓ To identify factors associated with fetal heart rate abnormalities among mothers who gave birth at tertiary hospitals of Bahir Dar, North-west Ethiopia, from January to June, 2022.

## 4. METHODS AND MATERIALS

### 4.1 Study Area and period

The study was conducted in two tertiary hospitals found in Bahir Dar city from January to June, 2022. Bahir Dar is the capital city of Amhara National Regional State, located 565 km Northwest of Addis Ababa with estimated population of 168,899 as per 2021 world population review. TGSB and FHCSB are the two tertiary governmental hospitals in the city with estimated catchment population of seven million. FHCSB has one labor ward with two rooms containing 5 beds each. There are 5 general gynecologists currently working in the department of gynecology and 5 to 10 residents by monthly rotation from TGSB. TGSB is a teaching hospital of Bahir Dar University located in “Sebatamit” 7 km to the south of Bahir Dar city. The hospital started its activity in November 2018 G.C and giving delivery service since that. These two hospitals gave delivery service for a total of 8360 mothers which was 4894 deliveries at FHCSB and 3466 deliveries at TGSB by the last one year.

### 4.2 Study Design

An institutional based cross-sectional study was conducted

### 4.3 Source Population

All mothers who gave birth at two tertiary hospitals in Bahir Dar were the source population

### 4.4 Study population

All mothers who gave birth at tertiary hospitals in Bahir Dar during the study period were the study population

### 4.5 Sample population

All selected mothers who gave birth at tertiary hospitals in Bahir Dar in the study time period

### 4.6 Inclusion and Exclusion criteria

**Inclusion criteria:** All mothers who gave birth at TGSB and FHCSB

**Exclusion criteria:** Those unable to give information/seriously sick/mentally disabled

- Maternal fever and/or maternal tachycardia, fetal congenital anomaly
- Fetal death at admission, fetal arrhythmia, Breech presentation and scheduled cesarean delivery

#### 4.7 Sampling unit: Individuals

#### 4.8 Sample size determination

Sample size determined using Epi info for single population proportion using a prevalence value (P) of 15%, marginal error (d) 3% and 95% confidence interval (CI).Where;

$N_0$ - Initial sample size

Z- Z value (e.g. 1.96 for 95% confidence interval)

p- Percentage picking a choice (expressed as decimal 0.15 taking from study done at Finote Selam primary hospital) (11).

d- Margin of error (expressed in decimal, 0.03)

$$N_0 = 544$$

Sample size for the second objective was calculated using double population proportion formula by using significant variables from a cross sectional study done at Finote Selam primary hospital, North West Ethiopia (11).

Table 1: Sample size calculation for objective two for the study on proportion and factors associated with fetal heart rate abnormalities among mothers who gave birth at FHCSH and TGSH, Bahir Dar, Ethiopia, 2022 (11).

| Factors                         | Assumptions           | Proportion         | AOR  | Sample size |
|---------------------------------|-----------------------|--------------------|------|-------------|
| Primigravida                    | CI- 95%<br>Power- 80% | P1-8.1<br>P2- 24.7 | 2.72 | 177         |
| MSAF                            | ”                     | P1-5.6<br>P2-32.1  | 6.49 | 82          |
| Augmentation of labor           | ”                     | P1-10.7<br>P2-34.8 | 3.66 | 109         |
| Referral from other institution | ”                     | P1-10.4<br>P2-23.1 | 2.83 | 47          |

Where P1= % outcome in unexposed group, P2= % outcome in exposed group

The largest sample size calculated was 544. Adding nonresponse rate of 10% (54 mothers) makes the final sample size 598.



## 4.9 Sampling procedure

The sample was collected from two tertiary hospitals at Bahir Dar city with proportional sampling from each hospital using a baseline data of delivery in the last one year which is 4894 at FHCSH and 3466 at TGSH. From a total of 598 samples; 350 samples was taken from FHCSH and 248 samples from TGSH using systematic random sampling technique using a calculated K value of 7. The sample was coded as 1-598.

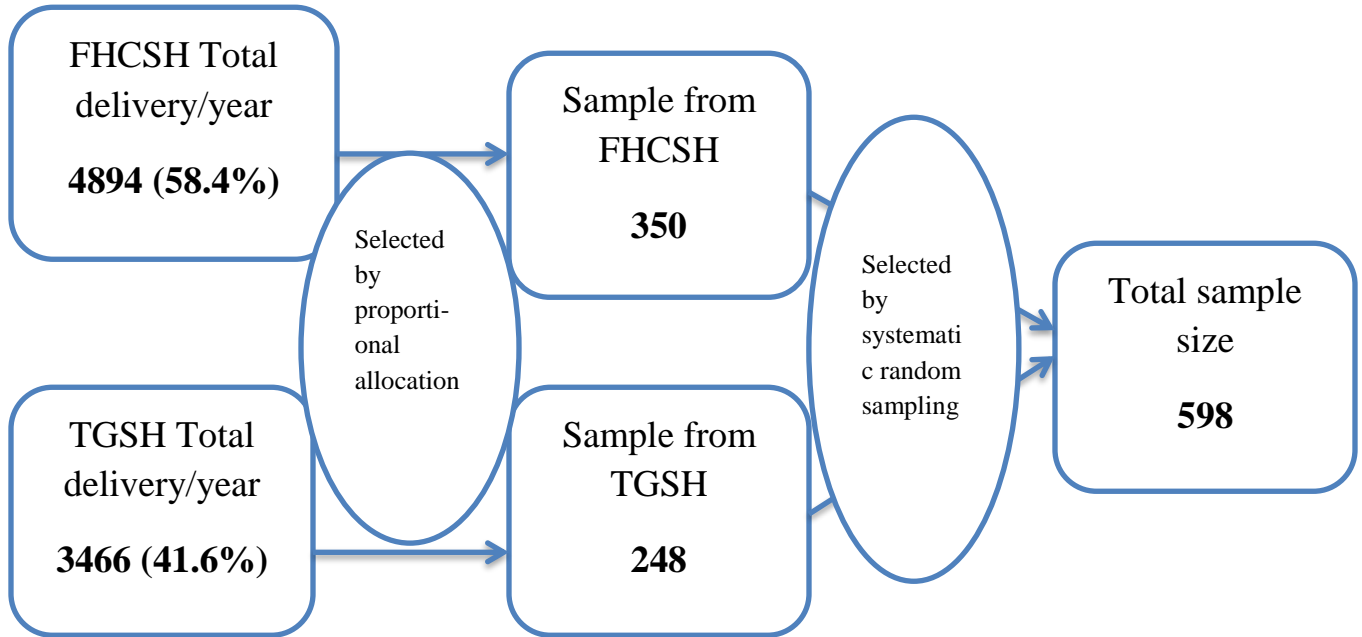


Figure 2: The sampling procedure for the study on proportion and factors associated with fetal heart rate abnormalities among mothers who gave birth at FHCSH and TGSH, Bahir Dar, Ethiopia, 2022.

## 4.10 Variables of the study

### 4.10.1. Dependent variable

Fetal heart rate abnormality

## 4.10.2. Independent variables

### **Sociodemographic factors**

Age

Address

Educational status

Occupation

Religion

### **Antepartal factors**

Gravidity

Parity

PIH

APH

PROM

Oligohydraminos

IUGR

### **Intrapartal factors**

Gestational age

Duration of labor

Referral from other institution

MSAF

Induction/Augmentation

Duration of labor

## **Medical illness**

Diabetes

HTN

Asthma

Cardiac diseases

### **4.11 Data collection and measurement**

The data collection was done by six second year residents with close supervision by two fourth year residents and the principal investigator. The diagnosis was confirmed by third year resident. Training on methods of data collection was given for one day for the data collectors and for the supervisors. The data was collected from clients and charts using semistructured pretested questionnaire. The pretest was done at Debre Markose referral hospital on 10% of the sample size population. The questionnaire was prepared in English. The questionnaire was adapted and developed with modification from related study of validated questionnaire and considered valid and reliable through the favorable comments of experts. The questionnaire includes the socio-demographic variables, antepartum factors, intrapartal factors and medical illness.

### **4.12 Data quality Assurance**

From the very beginning, data collectors and supervisor were given a full course of training regarding the basic principles of data collection procedure. The principal investigator and supervisors were made day to day onsite supervision during the whole period of data collection. At the end of each day, each questionnaire was reviewed and checked for completeness, accuracy and consistency by the supervisor and principal investigator and corrective measure was taken together with the data collectors. Following the discussion corrective directions was given on how to minimize errors.

### 4.13 Data processing and analysis

After all the necessary data collected, the data was coded on pre-arranged coding sheet by the principal investigator. Data entry was done using Epi data version 3.1 and analysis was done using SPSS 23.00 version statistical software. Descriptive statistics was computed and presented in the form of texts, tables and figures. A binary outcome variable indicating no fetal heart rate abnormality “0” and having fetal heart rate abnormality coded as “1” was used as the dependent variable. Binary logistic regression, initially with bi-variate analysis was used to determine the association between different factors and the outcome variable. Multivariable logistic regression was used to identify the relative importance of each predictor to the dependent variable by controlling for the effects of other variables. Those variables which was significant on bivariate analysis (P-value <0.2) was entered to multivariable logistic regression analysis. The association between dependent and independent variables was determined using odds ratio (OR) with 95% confidence interval (CI). The level of significance was taken at  $\alpha \leq 0.05$ . Model fitness was done using Hosmer and Lemeshow Test.

### 4.14 Operational definitions

**Normal fetal heart rate:** Baseline Fetal heart rate between 110bpm and 160bpm.

**Abnormal fetal heart rate:** Baseline Fetal heart rate 160bpm and above or less than 110bpm with two measurements five minutes apart.

### 4.15 Ethical Considerations and Confidentiality

Letter of ethical clearance was written from Bahir Dar University school of medicine to TGSH and FHCRH and the respondents were informed about purpose of the study and informed written consent was obtained. All information during data collection was confidential; there was not be any personal identification which is left on the questionnaire.

## 5. RESULTS

### 5.1 Socio-demographic characteristics of study participants

This study was done on 598 study participants with 100% response rate. From all study participants 85% of participants were in the age group of 20 to 34 with mean age of  $27.12 \pm 5.24$  years. The minimum and maximum age was 16 and 45 years respectively. Of all study participants; 369 (61.7%) were from urban and 566 (94.6%) of the participants were married (Table 2).

Table 2: Sociodemographic characteristics of mothers who gave birth at Bahir Dar tertiary hospitals, Bahir Dar, North-West Ethiopia, 2022 (N=598)

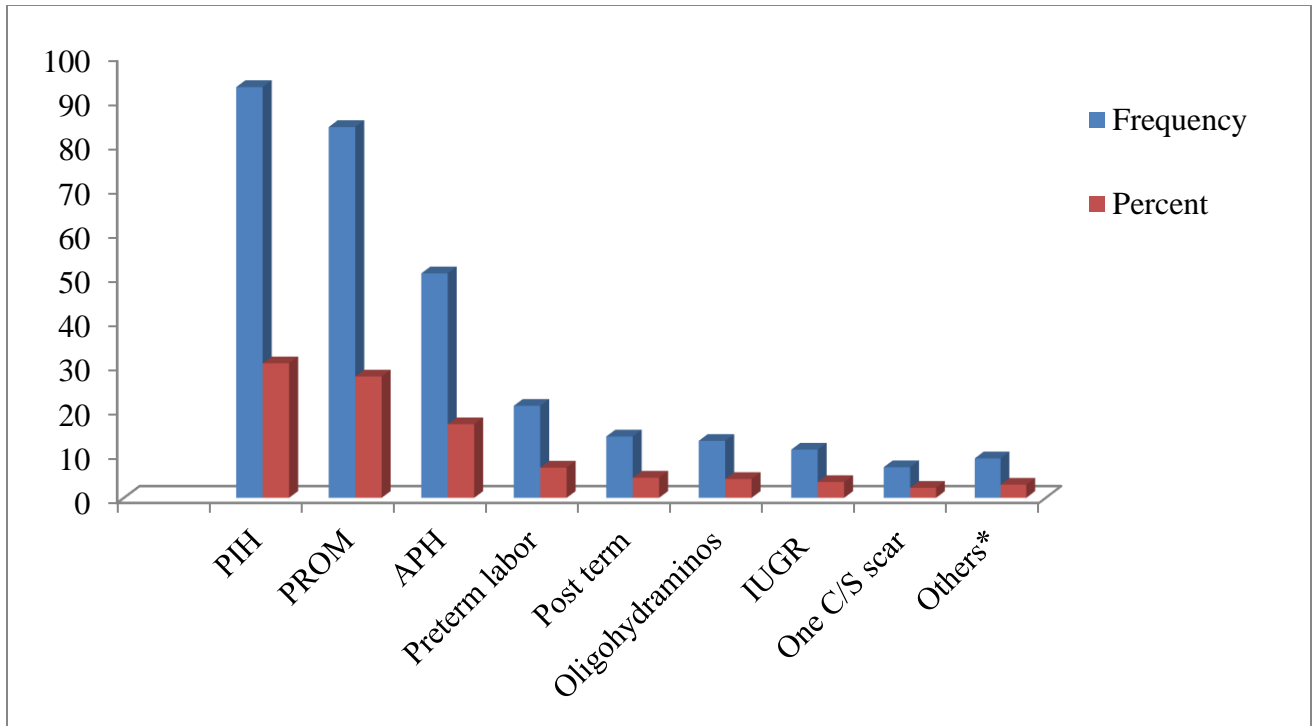
| Variables          |                     | Frequency (n) | Percentage (%) |
|--------------------|---------------------|---------------|----------------|
| Maternal age       | less than 20        | 24            | 4.0            |
|                    | 20 – 34             | 507           | 84.8           |
|                    | 35 and above        | 67            | 11.2           |
| Place of residence | Urban               | 369           | 61.7           |
|                    | Rural               | 229           | 38.3           |
| Religion           | Orthodox            | 527           | 88.1           |
|                    | Muslim              | 66            | 11.0           |
|                    | Protestant          | 5             | .9             |
| Marital status     | Single              | 12            | 2.0            |
|                    | Married             | 566           | 94.7           |
|                    | Divorced            | 17            | 2.8            |
|                    | Widowed             | 3             | .5             |
| Educational status | No education        | 200           | 33.4           |
|                    | Primary school      | 120           | 20.1           |
|                    | Secondary school    | 122           | 20.4           |
|                    | More than secondary | 156           | 26.1           |
| Occupation         | Government employee | 105           | 17.6           |
|                    | Merchant            | 96            | 16.0           |
|                    | Farmer              | 162           | 27.1           |
|                    | Private employee    | 59            | 9.9            |
|                    | House wife          | 149           | 24.9           |
|                    | Others              | 27            | 4.5            |

## 5.2 Antepartum factors

Out of all study participants, 586 (98%) had at least one ANC visit and most of the participants their ANC follow up was at health centers 366 (61.2%). Among all study participants 264 (44.1%) mothers had at least one obstetrics complications and 70 (11.7%) mothers had medical complications (Table 3).

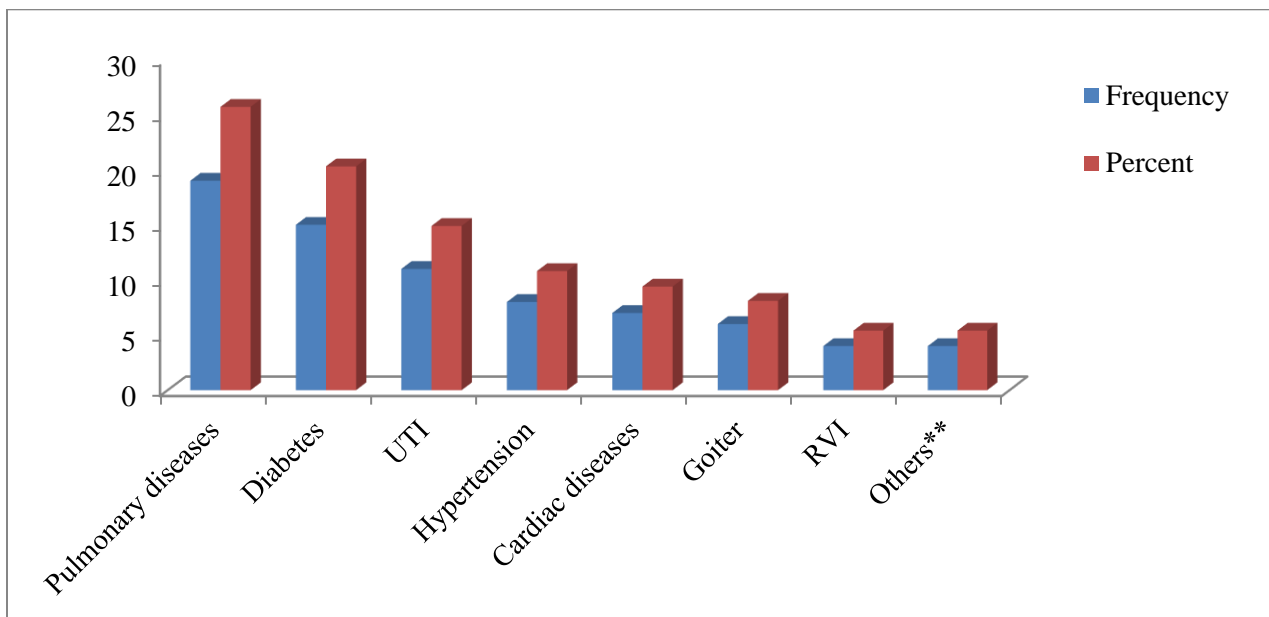
Table 3: Antepartum factors of mothers who gave birth at tertiary hospitals, Bahir Dar, North-West Ethiopia, 2022 (N = 598).

| Variables                         |                      | Frequency (n) | Percentage (%) |
|-----------------------------------|----------------------|---------------|----------------|
| Parity                            | Multipara            | 402           | 67.2           |
|                                   | Primiparous          | 196           | 32.8           |
| ANC Visit                         | Yes                  | 586           | 98.0           |
|                                   | No                   | 12            | 2.0            |
| Location of ANC follow up (n=586) | health center        | 366           | 61.2           |
|                                   | government hospital  | 199           | 33.3           |
|                                   | private institutions | 21            | 3.5            |
| Obstetrics complication (n=598)   | No                   | 334           | 55.9           |
|                                   | Yes                  | 264           | 44.1           |
| Medical complication (n=598)      | No                   | 528           | 88.3           |
|                                   | Yes                  | 70            | 11.7           |



\* GDM, Polyhydraminos, macrosomia, teenager pregnancy and thrombocytopenia

Figure 3: Obstetrics complications among mothers who gave birth at tertiary hospitals, Bahir Dar, North-West Ethiopia, 2022.



\*\* HBsAg positive, ITP

Figure 4: Medical complications among mothers who gave birth at tertiary hospitals, Bahir Dar, North-West Ethiopia, 2022.

### 5.3 Intrapartum factors

The mean gestational age for the study participant was  $38.77 \pm 2$  week. Among the total of 598 delivering mothers, the onset of labor was spontaneous in 430 (71.9%) and 210 (35.1%) mothers were referred from other health facilities. From mothers who had initially spontaneous labor 35(7.5%) of the cases required augmentation. The cesarean delivery rate from the study participants were 225 (37.6%) (Table 4).

Table 4: Intraparum factors of mothers who gave birth at tertiary hospitals, Bahir Dar, North-West Ethiopia, 2022 (N = 598).

| Variables                   | Frequency (n)                 | Percentage (%) |      |
|-----------------------------|-------------------------------|----------------|------|
| Gestational age             | Early preterm                 | 11             | 1.8  |
|                             | Late preterm                  | 59             | 9.9  |
|                             | Early term                    | 210            | 35.1 |
|                             | Full term                     | 234            | 39.1 |
|                             | Late term                     | 66             | 11.0 |
|                             | Post term                     | 18             | 3.0  |
| Type of labor               | Spontaneous                   | 430            | 71.9 |
|                             | Induced                       | 133            | 22.2 |
|                             | Augmented                     | 35             | 5.9  |
| Place of labor              | Referral                      | 210            | 35.1 |
|                             | At this hospital              | 388            | 64.9 |
| Liquor status               | No MSAF                       | 500            | 83.6 |
|                             | MSAF                          | 98             | 16.4 |
| Ways of rupture of membrane | Spontaneous before labor      | 96             | 16.1 |
|                             | Spontaneous during labor      | 386            | 64.5 |
|                             | ARM                           | 116            | 19.4 |
| Mode of delivery            | SVD                           | 338            | 56.5 |
|                             | Instrumental vaginal delivery | 35             | 5.9  |
|                             | Cesarean delivery             | 225            | 37.6 |



## 5.4 Fetal heart rate abnormalities

From the total of 598 mothers who had deliveries at two tertiary hospitals in Bahir Dar 116 (19.4 %) (95% CI= 16.22-22.58%) had fetal heart rate abnormalities. Detected FHR abnormalities were bradycardia and tachycardia which accounts for 71 (61.2%) and 45 (38.8%) respectively (Figure 2). Half of the FHR abnormalities were detected at active phase of labor 59 (50.9%) (Table 5).

Table 5: Types of fetal heart rate abnormalities among mothers who gave birth at tertiary hospitals, Bahir Dar, North-West Ethiopia, 2022 (n = 116).

| Variables   |  | Frequency (n) | Percentage (%) |
|---|--|---------------|----------------|
| Type of FHR abnormality                           | Bradycardia                            | 71            | 61.2           |
|   | Tachycardia                            | 45            | 38.8           |
| Cervical dilation at detection of FHR abnormality | 1-3 cm                                 | 41            | 35.3           |
|   | 4-9 cm                                 | 59            | 50.9           |
|   | 10cm                                   | 16            | 13.8           |
| Measures taken for FHR abnormality                | Respond for intrauterine resuscitation | 5             | 4.3            |
|   | Instrumental delivery                  | 10            | 8.6            |
|   | Cesarean delivery                      | 101           | 87.1           |

## 5.5 Associated factors of fetal heart rate abnormality

Bivariable analysis was done for 14 variables; those variables with P value of  $\leq 0.2$  were the candidates for multivariable logistic regression analysis. Maternal age, educational status, occupation, parity, gestational age, induced and augmented labor, being referral and having MSAF were variables fitted for multivariable logistic regression analysis. During multivariable logistic regression analysis parity, induced and augmented labor and having MSAF were significantly associated with FHR abnormalities with p-value of  $\leq 0.05$ .

In this study the FHR abnormality was increased 2 times among nulliparous mothers as compared to multipara mothers [AOR=1.950 (1.085, 3.506)], 3.5 times and 5.7 times greater among mothers with induction and augmentation of labor as compared to normal spontaneous labor [AOR=3.513 (CI 95% (2.023, 6.099) and AOR= 5.677 (CI 95%: (2.498, 12.901)]. The FHR abnormality was 6 times greater among mothers who had meconium stained amniotic fluid as compared with not having MSAF [AOR = 6.412 (95% CI: (3.787, 10.855)] (Table 6).

Table 6: Factors associated with the proportion of mothers who gave birth at tertiary hospitals in Bahir Dar, North-West Ethiopia, 2022.

| Variables               |                        | FHR abnormality |            | COR<br>(95 %<br>CI) | AOR(95%CI)          | P-value |
|-------------------------|------------------------|-----------------|------------|---------------------|---------------------|---------|
|                         |                        | Yes (%)         | No (%)     |                     |                     |         |
| Maternal<br>age (years) | 15-25                  | 60 (10)         | 177 (29.6) |                     | 1                   |         |
|                         | 26-35                  | 49 (8.2)        | 273 (45.7) | .529                | .751 (.420, 1.342)  | .751    |
|                         | 36-45                  | 7 (1.2)         | 32(5.4)    | .645                | 1.396 (.456, 4.274) | 1.396   |
| Educational<br>status   | No education           | 22 (4.7)        | 172(28.8)  |                     | 1                   |         |
|                         | Primary school         | 26 (4.3)        | 94 (15.7)  | 1.699               | 1.717 (.807, 3.651) | .161    |
|                         | Secondary school       | 27 (4.5)        | 95 (15.9)  | 1.746               | 1.398 (.594, 3.290) | .442    |
|                         | More than<br>secondary | 35 (5.9)        | 121 (20.2) | 1.777               | 1.215 (.426, 3.465) | .715    |
| Occupation              | Government<br>employee | 27 (4.5)        | 78 (13.2)  |                     | 1                   |         |
|                         | Merchant               | 17 (2.8)        | 79 (13.2)  | .622                | .636 (.233, 1.739)  | .378    |
|                         | Farmer                 | 31 (5.2)        | 131 (21.9) | .684                | .589 (.193, 1.798)  | .353    |
|                         | Private employee       | 10 (1.7)        | 49 (8.2)   | .590                | .503 (.188, 1.346)  | .171    |
|                         | House wife             | 25 (4.2)        | 124 (20.7) | .582                | .428 (.158, 1.155 ) | .094    |
|                         | Others                 | 6 (1.0)         | 21 (3.5)   | .825                | .334 (.093, 1.198)  | .092    |

|                 |                          |            |            |       |                        |               |
|-----------------|--------------------------|------------|------------|-------|------------------------|---------------|
| Parity          | Multipara                | 61 (10.2)  | 341 (57.0) |       | 1                      |               |
|                 | Primiparous              | 55 (9.2)   | 141 (23.6) | 2.181 | 1.950(1.085, 3.506)    | .026*         |
| Gestational age | <37 week                 | 6 (1.0)    | 64 (10.7)  |       | 1                      |               |
|                 | 37-41+6 week             | 107 (17.9) | 403 (67.4) | 2.832 | 1.707 (.676, 4.306)    | .258          |
|                 | 42 and above             | 3 (0.5)    | 15 (2.5)   | 2.133 | 1.128 (.225, 5.661)    | .884          |
| Type of labor   | Normal spontaneous labor | 58 (9.7)   | 372 (62.2) |       | 1                      |               |
|                 | Induced labor            | 89 (14.9)  | 44 (7.4)   | 3.171 | 3.513 (2.023, 6.099)   | $\leq 0.0^*$  |
|                 | Augmented labor          | 14 (3.5)   | 21 (2.3)   | 4.276 | 5.677 (2.498, 12.901)  | $\leq 0.0^*$  |
| Referral        | No                       | 83 (13.9)  | 305 (51.0) |       | 1                      |               |
|                 | Yes                      | 33 (5.5)   | 177 (29.6) | .685  | .964 (.555, 1.677)     | .898          |
| Liquor status   | No MSAF                  | 69 (11.5)  | 431 (72.1) |       | 1                      |               |
|                 | MSAF                     | 47 (7.9)   | 51 (8.5)   | 5.756 | 6.412 (3.787, 10.855 ) | $\leq 0.01^*$ |

## 6. DISCUSSION AND IMPLICATIONS

Fetal heart rate abnormalities are used to forecast fetal compromise or fetal distress which results in fetal acidemia due to poor fetal oxygenation. The objective of this study was to assess proportion and factors associated with fetal heart rate abnormalities among mothers who gave birth at tertiary hospitals of Bahir Dar, North-west Ethiopia, from January to June, 2022.

The finding of this study revealed that the proportion of fetal heart rate abnormality was 19.4% (95% CI= 16.22-22.58%). The finding was comparable with the study conducted at Addis Abeba (18.6%) (27), a study done at Israel on 2018 (21.2%) (9). However, the finding of this study is higher than the study done at Finote Selam hospital 15.1% (11), Tanzania (9.9%) (28) and Zimbabwe (11.2%) (29). The difference for this finding might be difference in study population, level of health institution, study methodology, inclusion and exclusion criteria. The study at Finote Selam was retrospective and performed at primary hospital in which low risk mothers will deliver. The study at Tanzania didn't include mothers with abruption, cervical dilation above 7cm and preterm pregnancies. The study at Zimbabwe includes only term pregnancy, cephalic presentation and normal fetal heart rate at admission.

The proportion of FHR abnormality in this study is lower than the study done in Thailand, Siriraj hospital where the proportion of FHR abnormality was (30.7%) (8). The possible explanation for this discrepancy might be due to use of more than half (55.7%) of nulliparous mothers as study participant as compared to 32.8% in this study. Primigravida increases risks of pregnancy induced hypertensive disorders, prolonged labor, prolonged pregnancy, need of oxytocin augmentation and obstructed labor (21).

In this study the proportion of FHR abnormalities was associated with primiparity, the presence of MSAF, induced and augmented labor. According to this finding being primiparous the FHR abnormality was increased by two fold as compared to multipara. This finding is consistent with a cross sectional study done at Finote Selam hospital (11), retrospective cohort study done at Thailand (8), prospective observational study done at China (12). This may be due to being primigravida is a high risk pregnancy and has different antepartum and intrapartum

complication. These include hypertensive disorders, prolonged labor, prolonged pregnancy, need of oxytocin augmentation and obstructed labor (21). This finding was against the result of a case control study done at Israel (9). This difference might be due to the study did not include preterm and post term pregnancies.

The FHR abnormalities were six times greater among mothers who gave birth after augmented labor and 3.4 times greater among mothers who gave birth after induced labor as compared with spontaneous labor. This finding is consistent with the study done in Israel (9) and Finote Selam (11). Administration of oxytocin increases uterine contraction which decreases blood flow to the fetus. This decrease in blood flow results fetal hypoxia and fetal heart rate abnormality. The indication for induction might be due to conditions which cause placental insufficiency or decrease in amniotic fluid which increases fetal heart rate abnormality.

The FHR abnormalities were increased by 6.8 times in those fetuses having MSAF as compared with clear liquor. This finding is consistent with the study done at Finote Selam (11) and with the study done on abnormal fetal heart rate tracing patterns during the first stage of labor (24). Passage of meconium is a sign of fetal asphyxia which results due to relaxation of anal sphincter and increased peristalsis during fetal asphyxia. FHR abnormality is an early sign of asphyxia. The result of this study was against the result of other studies done at Thailand Nigeria and India (8, 26, 29). The study in Thailand and India didn't include post term pregnancies, the study in Nigeria was didn't include post term pregnancies and half of the study participants were Primiparous which increases fetal heart rate abnormalities.

## **7. CONCLUSION, FUTURE DIRECTION AND IMPLICATIONS**

### **Conclusion**

This study found that proportion of fetal heart rate abnormality was higher. Primigravida, meconium stained amniotic fluid, induced and augmented labors were significantly associated with the FHR abnormality.

### **Limitations of the study**

- This study is unable to assess cause and effect relationships since the study design is cross-sectional
- This study done only at tertiary hospitals and the population might not be representative

## Recommendations

- **To Health care providers**

- ✓ To closely follow those mothers having induced and augmented labor, having MSAF and primigravida in order to detect and intervene early FHR abnormalities.
- ✓ To conduct further study on proportion of FHR abnormality and associated factors by including other health institutions
- ✓ To conduct further study on fetal outcome in delivering mothers with abnormal fetal heart rate

- **To Hospital**

- ✓ To conduct further study on proportion and associated factors by including other health institutions
- ✓ To conduct further study on fetal outcome in delivering mothers with abnormal fetal heart rate

## REFERENCES

1. Bullens L. Management of fetal distress during term labor. 2018.
2. Health FMO. Management protocol on selected obstetrics topics. Federal Democratic Republic of Ethiopia; 2020.
3. Bailey RE. Intrapartum fetal monitoring. *American family physician*. 2009;80(12):1388-96.
4. Cunningham F, Leveno K, Bloom S, Spong CY, Dashe J. *Williams obstetrics*, 25ed: Mcgraw-hill New York, NY, USA; 2018.
5. Macones GA, Hankins GD, Spong CY, Hauth J, Moore T. The 2008 National Institute of Child Health and Human Development workshop report on electronic fetal monitoring: update on definitions, interpretation, and research guidelines. *Journal of Obstetric, Gynecologic, & Neonatal Nursing*. 2008;37(5):510-5.
6. Miller DA. Intrapartum fetal heart rate monitoring: Overview. Hentet fra <https://www.uptodate.com/contents/intrapartum-fetal-heart-rate-monitoringoverview>. 2019.
7. Lewis D, Downe S, Panel FIFMEC. FIGO consensus guidelines on intrapartum fetal monitoring: Intermittent auscultation. *International Journal of Gynecology & Obstetrics*. 2015;131(1):9-12.
8. Boonchuan K, Wattananirun K, Boriboonhirunsarn D. Incidence of Intrapartum abnormal fetal heart rate pattern in Siriraj hospital. *Thai Journal of Obstetrics and Gynaecology*. 2018:18-26.
9. Ganer Herman H, Tamayev L, Houli R, Miremberg H, Bar J, Kovo M. Risk factors for nonreassuring fetal heart rate tracings after artificial rupture of membranes in spontaneous labor. *Birth*. 2018;45(4):393-8.
10. Dwivedi EMaAD. Clinical Profile and Out Come of Pregnancies with NRFHR in Labor at Three Teaching Hospitals, Addis Ababa, Ethiopia. 2018;<https://www.researchgate.net/publication/327635313:1-19>.
11. Kassahun EA, Aweke AM, Getu AA, Gela GB, Limenih SK, Mekonnen ME, et al. Proportion and Associated Factors of Nonreassuring Fetal Heart Rate Patterns in Finote Selam Primary Hospital, North West Ethiopia. *BioMed Research International*. 2020;2020.
12. Lu J, Jiang J, Zhou Y, Chen Q. Prediction of non-reassuring fetal status and umbilical artery acidosis by the maternal characteristic and ultrasound prior to induction of labor. *BMC Pregnancy and Childbirth*. 2021;21(1):1-7.
13. Organization WH. The WHO application of ICD-10 to deaths during the perinatal period: ICD-PM. 2016.
14. Berhan Y, Berhan A. Perinatal mortality trends in Ethiopia. *Ethiopian journal of health sciences*. 2014;24:29-40.
15. WHO. Basic Newborn Resuscitation Highlights from the World Health Organization 2012 Guidelines. 2017.
16. Desalew A, Sintayehu Y, Teferi N, Amare F, Geda B, Worku T, et al. Cause and predictors of neonatal mortality among neonates admitted to neonatal intensive care units of public hospitals in eastern Ethiopia: a facility-based prospective follow-up study. *BMC pediatrics*. 2020;20(1):1-11.
17. Aman H, Negash S, Yusuf L. Cesarean delivery practices in teaching public and non-government/private MCH hospitals, Addis Ababa. *Ethiopian Journal of Health Development*. 2014;28(1):22-8.
18. Samson K, Gebretsadik B, Alem G, Betel B. Determinants of caesarean deliveries and its major indications in Adigrat hospital, northern Ethiopia: a case control study. *Epidemiology: Open Access*. 2015;5(3).
19. Eyowas Abebe F, Worku Gebeyehu A, Negasi Kidane A, Aynalem Eyassu G. Factors leading to cesarean section delivery at Felegehiwot referral hospital, Northwest Ethiopia: a retrospective record review. *Reproductive Health*. 2016.
20. Hubena Z, Workneh A, Siraneh Y. Prevalence and outcome of operative vaginal delivery among mothers who gave birth at Jimma University Medical Center, Southwest Ethiopia. *Journal of pregnancy*. 2018;2018.



21. Hashim N, Naqvi S, Khanam M, Jafry HF. Primiparity as an intrapartum obstetric risk factor. JPMA-Journal of the Pakistan Medical Association. 2012;62(7):694.
22. Nwabuobi C, Bagiardi L, Wood N, Odibo L, Sinkey R, Odibo A. Risk factors for non-reassuring fetal heart tracing among growth restricted fetuses undergoing labor induction. American Journal of Obstetrics & Gynecology. 2019;220(1):S448.
23. Boie S, Glavind J, Uldbjerg N, Steer PJ, Bor P. Continued versus discontinued oxytocin stimulation in the active phase of labour (CONDISOX): double blind randomised controlled trial. *bmj*. 2021;373.
24. Hadar A, Sheiner E, Hallak M, Katz M, Mazor M, Shoham-Vardi I. Abnormal fetal heart rate tracing patterns during the first stage of labor: effect on perinatal outcome. American journal of obstetrics and gynecology. 2001;185(4):863-8.
25. al DDe. Fetal heart rate patterns in patients with thick meconium staining of amniotic fluid and its association with perinatal outcome. International Journal of Reproduction, Contraception, Obstetrics and Gynecology. 2017;6(3):1030-5.
26. Ajah LO, Ibekwe PC, Onu FA, Onwe OE, Ezeonu TC, Omeje I. Evaluation of clinical diagnosis of fetal distress and perinatal outcome in a low resource Nigerian setting. Journal of clinical and diagnostic research: JCDR. 2016;10(4):QC08.
27. Kassa EM. Clinical Profile and Out Come of Pregnancies with NRFHR in Labor at Three Teaching Hospitals, Addis Ababa, Ethiopia. 2018.
28. Mdoe PF, Ersdal HL, Mduma ER, Perlman JM, Moshiro R, Wangwe PT, et al. Intermittent fetal heart rate monitoring using a fetoscope or hand held Doppler in rural Tanzania: a randomized controlled trial. BMC pregnancy and childbirth. 2018;18(1):1-8.
29. Desai DS, Maitra N, Patel P. Fetal heart rate patterns in patients with thick meconium staining of amniotic fluid and its association with perinatal outcome. International Journal of Reproduction, Contraception, Obstetrics and Gynecology. 2017;6(3):1030-6.

## ANNEXES

### Annex I: Information and consent Sheet

**Date** \_\_\_\_\_

**Code** \_\_\_\_\_

**Health facility** \_\_\_\_\_

My name is ..... I am here on behalf of Dr Minalbat Abebe (Final year Obstetrics and Gynecology Resident), he is working on this research project by with the objective to assess magnitude and associated factors of fetal heart rate abnormalities in tertiary hospitals, Bahir Dar, North West Ethiopia as partial fulfillment of specialty in Obstetrics and Gynecology. I am interviewing laboring mothers and you are selected for the interview. So your cooperation has great role for fruitfulness of this study. You do not have to answer any questions that you do not want to answer, and you may end this interview at any time as you want. Any care or service provision never be discontinued related to your refusal to participate in this study. The care & support will continue even you did not accept this study. You can change your idea at any time even if you accept the study.

**Risks:** by participating in this study you will not face any risk but if you suspect any risk you can rise at any time.

**Benefits & incentives:** No incentives you will get in participating in this study.

**Confidentiality:** Your information will not be disclosed for anyone except by the investigator. Your name will not be written in the paper but by only coding. This code only known by the data collector. The data may be seen by investigator, advisor and data collectors but for others not will be disclosed

**Time of interview:** The interview will take about 20-30 minutes

#### Consent sheet

I heard all information above about the purpose of study, confidentiality, risks & time taken for the interview in this study. If you ever have questions about this study, you should contact Principal investigator:

Dr Minalbat Abebe, Phone number; **0938266755** or **Email;** *minalbatabebe2@gmail.com*

**Agreement of the Participant:** Do you agree? A. Yes B. No

If yes continue or if no give thanks & proceed to other participant.

Name and sign of data collector \_\_\_\_\_ Date \_\_\_\_\_

## Annex II: Questionnaire

Date \_\_\_/\_\_\_/\_\_\_\_\_

Questionnaire code \_\_\_\_\_

### Section I: Sociodemographic characteristics of participants

| S.no | Variables                | Response  |
|------|--------------------------|---|
| 101  | Maternal age (in years)  | .....years  |
| 102  | Place of residence       | 1. Rural<br>2. Urban  |
| 103  | Religion                 | 1. Orthodox Christian<br>2. Muslim<br>3. Protestant<br>4. Other (specify) -----   |
| 104  | Marital status           | 1. Single<br>2. Married<br>3. Divorced<br>4. Widowed  |
| 105  | Educational status       | 1. Can't read and write<br>2. Can read and write<br>3. Primary (Grades 1–8)<br>4. Secondary (Grade 9–12)<br>5. Collage and Higher Education |
| 106  | Occupation at this time? | 1. Government employee<br>2. Merchant<br>3. Farmer<br>4. Private employee<br>5. Student<br>6. Others(specify)-----                          |

### Section II: Assessment of antenatal factors

| S.no | Questions   | Response  | Skip to                      |
|------|---|---|------------------------------|
| 201  | Parity  | -----   |                              |
| 202  | Gestational age   | -----weeks  | If unknown use Ballard score |
| 203  | Did you have at least one ANC follow up?                                      | 1. Yes<br>2. No   | If no, skip to 206           |
| 204  | Where is your ANC follow up?  | 1. Health center<br>2. Government hospital<br>3. Private institutions |                              |
| 205  | Does she have obstetrics complications?                                       | 1. Yes<br>2. No   | If no, skip to 208           |
| 206  | Which obstetrics complications does she have? (multiple response is possible) | 1. PIH<br>2. APH<br>3. Post term<br>4. PROM                           |                              |

|     |  |   |                    |
|-----|--|---|--------------------|
|     |  | 5. IUGR<br>6. Others (specify) -----  |                    |
| 207 | Does she have medical complications?                                       | 1. Yes<br>2. No   | If no, skip to 301 |
| 208 | Which medical complications does she have? (multiple response is possible) | 1. Diabetes<br>2. Hypertension<br>3. Cardiac disease<br>4. Pulmonary disease<br>5. UTI<br>6. Others (Specify) ----- |                    |

### Section III. Intrapartal factors

|     |   |  |                                 |
|-----|---|--|---------------------------------|
| 301 | Fetal heart rate abnormality detected                   | 1. Yes<br>2. No  | If no skip to 305               |
| 302 | Type of FHR abnormality detected                        | 1. Tachycardia (-----BPM)<br>2. Bradycardia (-----BPM)<br>3. Others (Specify)----- |                                 |
| 303 | Cervical dilatation at the detection of FHR abnormality | ----- cm   |                                 |
| 304 | Measures taken for FHR abnormality                      | 1. Respond for resuscitation<br>2. Instrumental delivery<br>3. Cesarean delivery   |                                 |
| 305 | Duration of labor                                       | ----- hrs  |                                 |
| 306 | Type of labor   | 1. Spontaneous labor<br>2. Induction<br>3. Augmentation                            |                                 |
| 307 | Where is she laboring?                                  | 1. Refer from other institution<br>2. At this hospital                             | If at this hospital skip to 310 |
| 308 | If referral, diagnosis at referral                      | -----  |                                 |
| 309 | Reason for referral                                     | -----  |                                 |
| 310 | Liquor status   | 1. Intact<br>2. Clear<br>3. MSAF<br>4. Bloody                                      |                                 |
| 311 | If rupture, specify ways of rupture of membrane         | 1. Spontaneous before labor<br>2. Spontaneous during labor<br>3. ARM               |                                 |
| 312 | Mode of delivery  | 3. SVD<br>4. Instrumental delivery<br>5. Cesarean delivery                         |                                 |

