JIMMA UNIVERSITY INSTITUTE OF HEALTH SCIENCES

SCHOOL OF MEDICENE DEPARTMENT OF OBSTETRICS AND GYNECOLOGY

PROPORTION OF NON-REASSURING FETAL HEART RATE PATTERN AND ASSOCIATED FACTORS AMONG LABORING MOTHERS AT JIMMA MEDICAL CENTER, SOUTH WEST ETHIOPIA, 2023.

BY; MISBA SOLOMON (MD, FINALYEAR OBGYN RESIDENT)

A RESEARCH PEPER TO BE SUBMITTED TO THE DEPARTMENT OF OBSTETRICS AND GYNECOLOGY, FACULTY OF MEDICAL SCIENCE, INSTITUTE OF HEALTH,JIMMA UNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR SPECIALTY CERTIFICATE IN OF OBSTETRICS AND GYNECOLOGY

APRIL 2023

PROPORTION OF NON-REASSURING FETAL HEART RATE PATTERN AND ASSOCIATED FACTORS AMONG MOTHERS WHO GAVE BIRTH AT JIMMA MEDICAL CENTER, SOUTH WEST ETHIOPIA, 2023.

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JIMMA, ETHOPIA.

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Abstract

Background: Non-reassuring fetal heart rate status (NRFHRS) is an abnormal fetal heart rate monitoring which necessitates immediate intervention. 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: The study was assessed proportion and factors associated with nonreasoning fetal heart rate pattern among mothers who gave birth at Jimma Medical Center, South-west Ethiopia from April to may 2023.

Method: An institutional based cross-sectional study was conducted on mothers who gave birth at jimma medical center 2023.the study subject was selected by conventional sampling method. Data was collected using interviewer administered pretested semi structured questionnaire. Data was analyzed by SPSS version 26.00 and result was presented using tables, graphs and pie chart. Then the study result was discussed in comparison with other similar study.

Results: The proportion of non-reassuring fetal heart rate pattern was 19.6% (95% CI= 16.22-22.58%).).post term[AOR=3.02(0.71,7.54))],G2MSAF[AOR=3.59(1.889,5.754) G3MSAF(AOR 4.5(CI 4.5(2.876,7.113)),induced labor [AOR= 4.2(95% CI 1.65,8.13)],augmented labor [AOR=3.33(95% CI 1.40,6.22)].referral from other health facilities [AOR 4.2(1.087,5.90] . all were significantly associated with NRFHRP.

Conclusion; This study found that proportion of fetal heart rate abnormality was higher. Post term, being referred ,meconium stained amniotic fluid, induced and augmented labors were significantly associated with the NRFHRPS

Acknowledgment

First of all, I would like to express my deepest gratitude and appreciation to my clinical advisors **Dr.Ahmed Siraj and Mr. Wondosen zewde** for their unreserved encouragement and provision of constructive comments and guidance while developing this proposal. Furthermore, I also thank Jimma University Medical Center, School of medicine, and department of obstetrics and gynecology for giving me this golden and educative opportunity.

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Acronyms

- ACOG-American college of obstetrics and gynecology
- APH - Antepartum hemorrhage
- AOR-Adjusted odd ratios
- BPM - Beats Per Minutes
- CI-Confidence interval
- COR-Crude odd ratios
- CTG- Cardio tomography
- DM – Diabetes mellitus
- EFM-Electronic fetal heart rate monitoring
- FHR- Fetal Heart Rate
- FMOH- Federal Ministry of Health
- HTN – Hypertension
- IUGR- Intrauterine growth restriction
- JUMC- Jimma University medical center
- JU – Jimma university
- MSAF-Meconium stained amniotic fluid
- NICD-National institute of child health and developement
- NRFHRP- Non Reassurance Fetal Heart Rate Pattern
- PIH- Pregnancy Induced Hypertension
- PMR-Perinatal mortality rate
- PROM-Premature rupture of membrane
- PTL-Preterm labor
- WHO -World Health Organization

CHAPTER ONE

1. INTRODUCTION

1.1. BACKGROUND

Fetal heart rate (FHR) is one of the important parameter to follow fetal well-being during intrapartum labor follow up(1).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(2).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 FMOH guideline 2021, 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 Cardio tomography (CTG) is not available; if FHR value less than 110 bpm lasting more than ten 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(6).

1.2 STATEMENT OF THE PROBLEM

Fetal heart rate pattern is one of the important parameter to assess fetal wellbeing during intrapartum follow up(2). NRFHRP show fetal hypoxia and/or acidosis which results birth asphyxia. FHR abnormalities are common intrapartum finding during labor follow up and have different prevalence around the globe(7). Fetal heart rate affected by multiple antepartum and intrapartum factors; which includes being post term, MSAF, induction and augmentation of labor, IUGR and referral from other health institution(8).

Globally more than 5 million perinatal deaths occurring each year, ending preventable stillbirths and neonatal deaths continue to form a significant part of the international public health agenda beyond 2015(9). 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(8). The PMR of Ethiopia is among the highest in Sub Saharan Africa and the trend has been stable between 90 and 40 per 1000 total births(10). These prevalence includes 30.7 % at Thailand(7), 21.2%at Israel(11), 18.6% at Addis Ababa(12) and 15.1% at Finote Selam hospital(8),19.4% at bahirdar tertiary hospital. 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(13).

NRFHRP 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(12). In a study done at Adigrat hospital Northern Ethiopia 2015, on determinants of caesarean deliveries and its major indications, 21.1% of caesarean deliveries is due to Nonreassuring fetal heart rate(1). In another study at felegehiwot referral hospital it accounts 15.9%(14). 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(15). Even though the problem is common There is paucity of data on assessment of the prevalence, and associated factors on NRFHRP in Jimma University Medical Center in particular.

1.3 Significance of the study

This study address the clinical question regarding the magnitude of nonreasoning fetal heart rate patterns during labor and factors determine it.intrapartum fetal heart rate monitoring and detecting abnormal pattern leads to appropriate and timely interventions.as Asphyxia is the major cause for perinatal death and long term neurologic sequel,which are potentially preventable,the study provides valuable insight into which factor is significantly associated with NRFHRPS,and enable health care providers to identify which mother is at risk and provide optimal antepartum and intrapartum care.

There is lack of comprehensive studies in jimma medical center on this topic.even though there are few studies in Ethiopia all are in Amhara region hospitals.by filling this evidence gap the study can contribute to the existing literatures add knowledge

As a teaching hospital Jimma 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 study expected to provide baseline information for further study on this topic.

CHAPTER TWO

2. Literature Review

2.1. Proportion of Nonreasoning Fetal Heart Rate Patterns

A retrospective cohort study done at Thailand, Siriraj hospital 2018, the incidence of abnormal fetal heart rate is 30.7%(7). In a study done at Israel on 2018, the prevalence of NRFHR pattern was 21.2%(11). 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%(12). Cross sectional study done at bahirdar at two tertiary hospitals in Bahir on prevalence and associated factors of fetal heart rate abnormalities, 2022, fetal heart rate abnormality is (19.4 %) (95% CI= 16.22-22.58%)(16). A retrospective study done at Finote Selam hospital on prevalence and associated factors of NRFHR pattern, 2020, the prevalence of NRFHR Pattern is 15.1%(8).Cross sectional study on magnitude, associated factors and Immediate outcomes of Non-Reassuring fetal heart rate status among laboring mothers at south Gondar zone Public hospitals, North West Ethiopia, 2022; shows More than one fifth (21.16%) with 95% CI: (17.9-24.7) labors were developed NRFHRS.(17)

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). Cross sectional study done at bahirdar at two tertiary hospitals in Bahir on prevalence and associated factors of fetal heart rate abnormalities, 2022, includes; bradycardia 62.2%, and tachycardia 38.8%(16).A retrospective study at Finote Selam primary hospital bradycardia accounts for 80% and tachycardia for 20% of cases (15).Cross sectional study on magnitude, associated factors and Immediate outcomes of Non-Reassuring fetal heart rate status among laboring mothers at south gondar zone Public hospitals, North, West Ethiopia, 2022; shows that Tachycardia 23.4% and bradycardia 76.6%

2.2 Determinants of Nonreasoning Fetal Heart Rate Patterns

2.2.1 Antepartum factors

A retrospective cohort study done on incidence, associated factors of FHR abnormality and pregnancy outcomes in Thailand Siriraj hospital nullparity increases FHR abnormality by 1.35 [AOR 1.35 (1.01, 1.82) 95% CI] (12), 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), Cross sectional study done at bahirdar at two tertiary hospitals on prevalence and associated factors of fetal heart rate abnormalities, 2022, the FHR abnormality was increased 2 times among nulliparous mothers as compared to multipara mothers [AOR=1.950 (1.085, 3.506)](). Retrospective study (on 2020) done at Finote Selam hospital on prevalence of NRFHR pattern nulliparity increases FHR abnormality by 2.72 [1.377, 5.381) 95% CI](8). A case control study done at Israel, null parity decreases the rate of fetal heart rate abnormality(11). Primigravida is a high risk pregnancy and has different antepartum and intrapartum complications. These include hypertensive disorders, prolonged labor, fetal distress, operative delivery, emergency cesarean delivery, need of oxytocin augmentation and obstructed labor(18).

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](8). Cross sectional study done at bahirdar at two tertiary hospitals on prevalence and associated factors of fetal heart rate abnormalities, 2022, show that referral from other health institutions has similar rate of FHR abnormality [AOR (0.964 (0.555, 1.677)), 95% CI](16).

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 <5th centile and abnormal umbilical artery Doppler study) and gestational age at delivery(19).

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%)(20). Cross sectional study done at bahirdar on two tertiary hospitals on prevalence and associated factors of fetal heart rate abnormalities, 2022, show 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)] A retrospective study done at Finote Selam primary hospital, augmentation of labor increased FHR abnormality [AOR 3.66 (1.782, 7.534), 95% CI](8)

The Cross sectional study done at bahirdar on two tertiary hospitals on prevalence and associated factors of fetal heart rate abnormalities, 2022, show that the FHR abnormality was 6 times greater among mothers who had meconium stained amniotic fluid [AOR = 6.412 (95% CI: (3.787, 10.855)](16).A retrospective study done at Finote Selam primary hospital MSAF increased FHR abnormality [AOR 6.49 (3.198, 13.173), 95% CI](8). 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%)(21). 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(7). 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.

A retrospective study done on evaluation of clinical diagnosis of fetal distress and perinatal outcome in a low resource Nigerian setting on 2016,find that postterm has association with abnormal fetal heart rate AOR 4.9(CI 1.173,7.712)(17)

Conceptual frame work

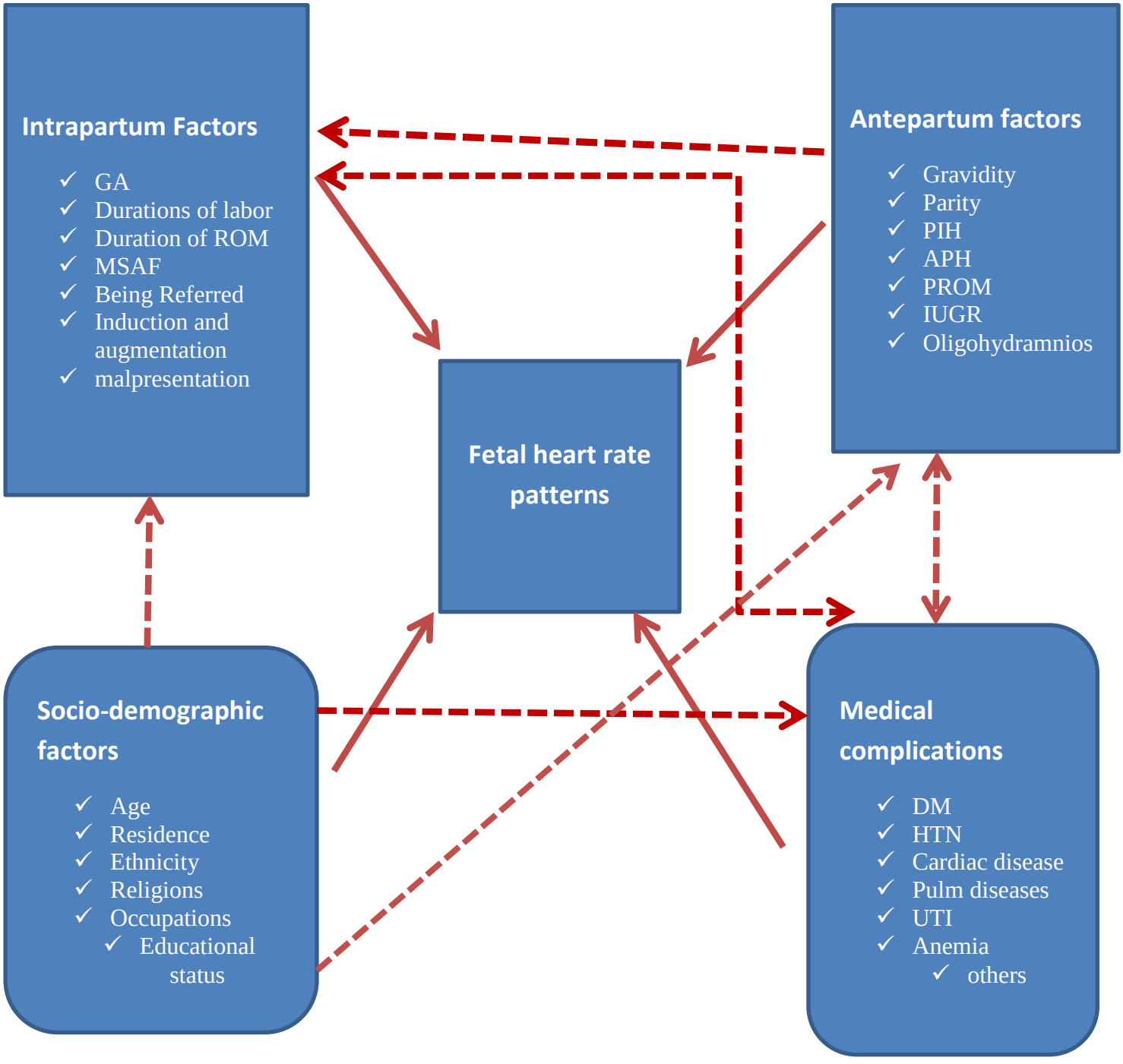


Figure 1: Developed conceptual frame work after reviewing different literatures

CHAPTER THREE

3. Objectives

3.1. General objective

- To assess the proportion of nonreasoning fetal hart rate patterns and associated factors among mothers laboring at Jimma medical center, south-west Ethiopia, from April to May, 2023.

3.2. Specific objectives

- To determine proportion of NRFHRP among mothers who give birth at Jimma medical center, south-west Ethiopia, from April to may, 2023.
- To identify factors associated with NRFHRP among mothers who gave birth at Jimma medical center, south-west Ethiopia, from April to may, 2023

CHAPTER FOUR

4. Methods and Materials

4.1. Study area and period

Study was conducted in Jimma University specialized Hospital, which is found in the city of Jimma, Oromia region, Ethiopia which is situated 354km southwest of Addis Ababa. The University is one of the largest and comprehensive public research universities in Africa. It has more than 4000 faculty and staff members. It also has 12 research faculties, a modern hospital (JUMC),a community school with numerous undergraduate and postgraduate programs, ICT center, and other numerous service providing and revenue generating enterprises. JUMC is one of the oldest public hospitals in Ethiopia (founded in 1930 E.C.) and is the only referral and teaching hospital in the south west part of Ethiopia. It provides services for approximately 15,000 inpatient, 160,000 outpatient, 11,000 emergency cases, and 4500 deliveries per year from catchment population of 20 million people for tertiary level care. The department of gynecology and obstetrics has units like gynecology OPD, ANC clinic, labor and delivery, maternity ward and gynecology ward each with nurses, midwifes, medical interns, residents and senior physicians.

4.2 Study design

An institutional based cross-sectional study conducted in JUMC to assess the proportion of NRFHRP and associated factors among mothers admitted for delivery, in the year 2023.

4.3 Population

4.3.1 The Source population; All mothers who give birth at JUMC, Jimma town, Oromia region, southwest Ethiopia

4.3.2 The Study population; All mothers who give birth at JMC, Jimma town, Oromia region, south west Ethiopia, in the study time period.

4.3.3 The sample population Selected mothers who give birth at JMC,Jimma town , Oromia region,south west Ethiopia, in the study time period

4.4. Inclusion and exclusion criteria

4.4.1 Inclusion criteria

All mothers with singleton pregnancy admitted with positive FHB and laboring at JMC during the specified time period that can give consent and are willing to participate in the study.

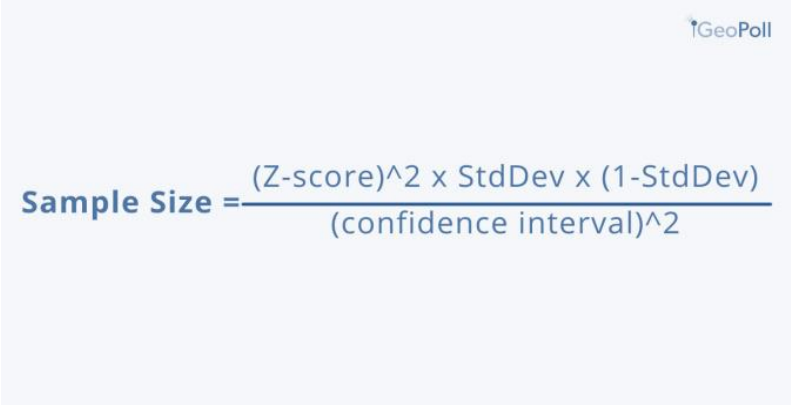
4.4.2. Exclusion criteria.

- Fetal lethal congenital anomaly
- Scheduled cesarean delivery
- Maternal fever,
- Thyroid disease
- Drugs (opioids. Sympathomimetic, parasympatomimetic…)

4.5. Sample size determination and sampling technique

4.5.1. Sample size determination:

Sample size determined using Epi info for single population prevalence using a prevalence value (P) of 21.5%, marginal error (d) 5% and 95% confidence interval (CI).Where;



Sample size - Initial sample size

Z-score – for 95% confidence level 1.96

StdDev- Percentage picking a choice expressed as decimal 0.215 taking from study at Gonder hospital(8).

Confidence interval- Margin of error (expressed in decimal, 0.05 (5%))

Sample size = 332

Adding non-response rate of 10% (33 mothers) makes ***the final sample size 365***

4.5.2 Sampling technique:

Convenience sampling method used (Every mother who fulfills the inclusion criteria were sampled until the sample size is reached).

4.6. Study Variables

4.6.1 Dependent variable

Fetal **heart** rate pattern.

4.6.2 Independent variables*:*

We will further categorize the independent variable into four major groups:

Socio-demographic factors

- Age
- Residency
- Educational status
- Occupation
- Religion

Antepartum factors

- Gravidity and Parity
- PIH
- APH
- PROM
- Oligohydramnios
- IUGR
- malpresentations

- Previous CS

Intrapartum factors

- Gestational age
- Duration of labor
- Referral from other institution
- MSAF
- Induction/Augmentation
- Fetal presentation

Medical illness

- Diabetes
- HTN
- Asthma
- Cardiac diseases
- Anemia
- UTI

4.7. Data collection and measurement

The data collection was done by four second year residents with close supervision by two third year residents and the principal investigator. The diagnosis was confirmed by fourth year resident. Training on methods of data collection was given for one day for the data collectors and for the supervisors. The data collected from clients and charts using semi-structured pretested questionnaire. The pretest was done at shenen gibe general hospital on 05% of the sample size population. The questionnaire was prepared in English. The questionnaire was adopted 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.

4.8. Operational Definition

A baseline fetal heart rate status: normal between 110 to 170 bpm, Tachycardia >170 bpm, bradycardia <110 bpm(2).

Non-reassuring fetal heart rate status (NRFHRS): Considered when there is baseline change (Tachycardia for 30minute or more or bradycardia for more than 10 minutes).

Prolonged rupture of membrane; if >=8hrs lapsed

4.9. Data quality management

From the very beginning, data collectors and supervisor had a full course of training regarding the basic principles of data collection procedure. The principal investigator and supervisors had day to day onsite supervision during the whole period of data collection. At the end of each day, each questionnaire 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.

4.10. Data processing and analysis

After all the necessary data collected, the data was coded on pre-arranged coding sheet by the principal investigator. Then entered to Epi data version 4.5 and analyzed using SPSS 26.00 version statistical software. Descriptive statistics compute and presented in the form of texts, tables and figures. A binary outcome variable was determined. 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 are significant on bivariate analysis (P-value <0.2) 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 taken at $\alpha < 0.05$.

4.11. Ethical clearance

Ethical clearance was obtained from ethical review board for human studies of Jimma University and permission obtained from the authorities of the hospital. Written consent was obtained from each study participants. Confidentiality assured by collecting data anonymously.

4.12. Dissemination of result

Finally, the result of the research to be reported to the department of obstetrics and gynecology so that all clinicians understand the significance of the problem. The finding will be presented to staff and students of JUMC and others, as possible. The results will be used as an important source of further research, for policymaking, and guideline development. Finally, the results will be published in renowned local and international journals.

CHAPTER FIVE

RESULTS

5.1 Socio-demographic characteristics of study participants

This study was conducted on 365 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 26.75 ± 5.6 years. The minimum and maximum age was 16 and 46 years respectively. Of all study participants; 213(58.4%) were from rural and 348(95.9%) of the participants were married. Around one third of participants 120 (33.1%) were house wife and 110(30.3%) cannot read and write (Table 1)

Table 1: Sociodemographic characteristics of mothers who was laboring at jimma medical center, jimma, south-West Ethiopia, 2023 (N=365)

Variables		**Frequency(n)**	**Percentages%**
Maternal age	less than 20	25	6.6%
	20 – 34	297	81.8%
	35 and more	43	11.6%
Place of residence	Rural	213	58.4%
	Urban	152	41.6%
Educational status	Cannot read and write	110	30.3%
	Can read and write	91	25,1%
	Primary school	77	21,2%
	Secondary school	58	15,2%
	Collage and higher educations	29	7.7%
Marital Status	Married	348	95.9%
	Single	7	1.9%
	Widowed	2	0.6%

	Divorced	6	1.7%
Religions	Muslim	227	62.5%
	Orthodox	88	24.2%
	Protestants	37	10.2%
Occupations	Government employee	22	6.1%
	Merchant	55	15.2%
	Farmer	84	23.1%
	Private employee	39	10.7%
	House wife	120	33.1%
	Others	20	4.5%

5.2 Antepartum factors

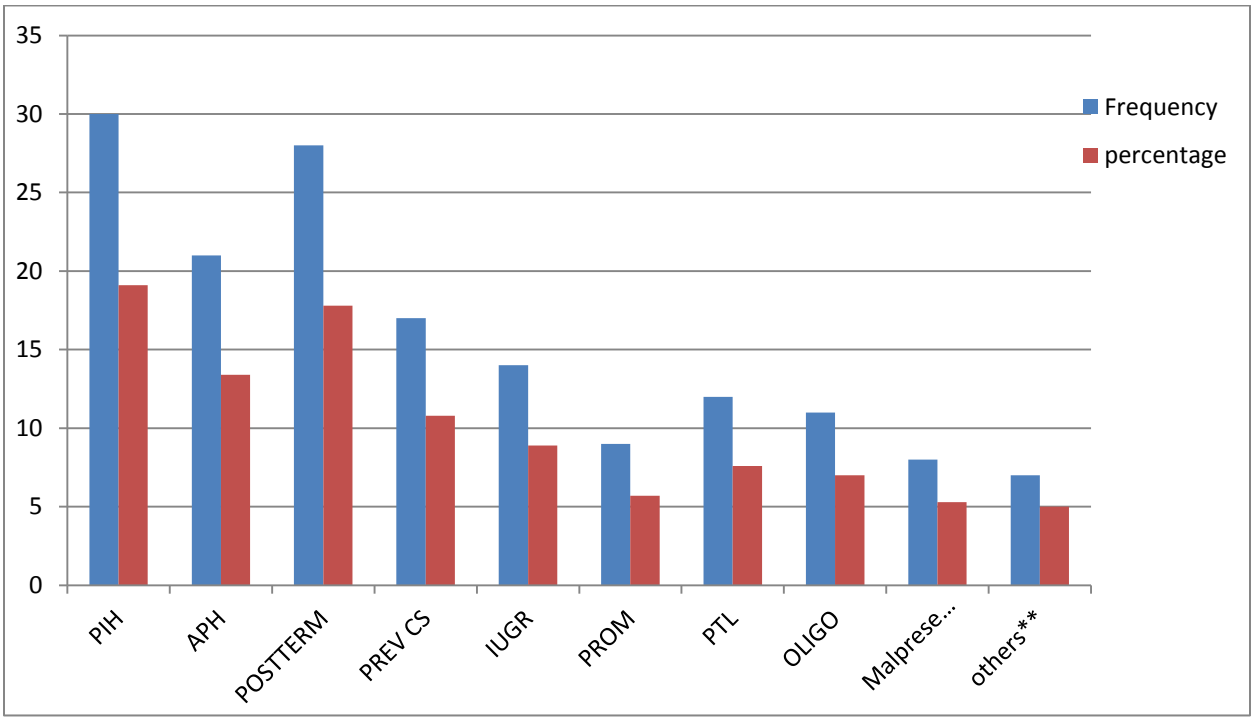
Out of all study participants, 352(97%) had at least one ANC visit and most of the participants their ANC follow up was at health centers 223 (61.2%). Among all study participants 84 (23%) of mothers had at least one obstetrics complications at current pregnancy and 29 (7.9%) mothers had at least one medical illnesses **(Table 2)**

Table 2: Antepartum factors of mothers who laboring at JMC, Jimma, south West Ethiopia, 2023 (N = 365)

Variables		Frequency(n)	Percentage%
Parity	Nulliparous	138	37%
	Multiparous	227	63%
ANC Visits	Yes	353	97%
	No	12	3%
Locations of ANC	Health centers	216	61.2%

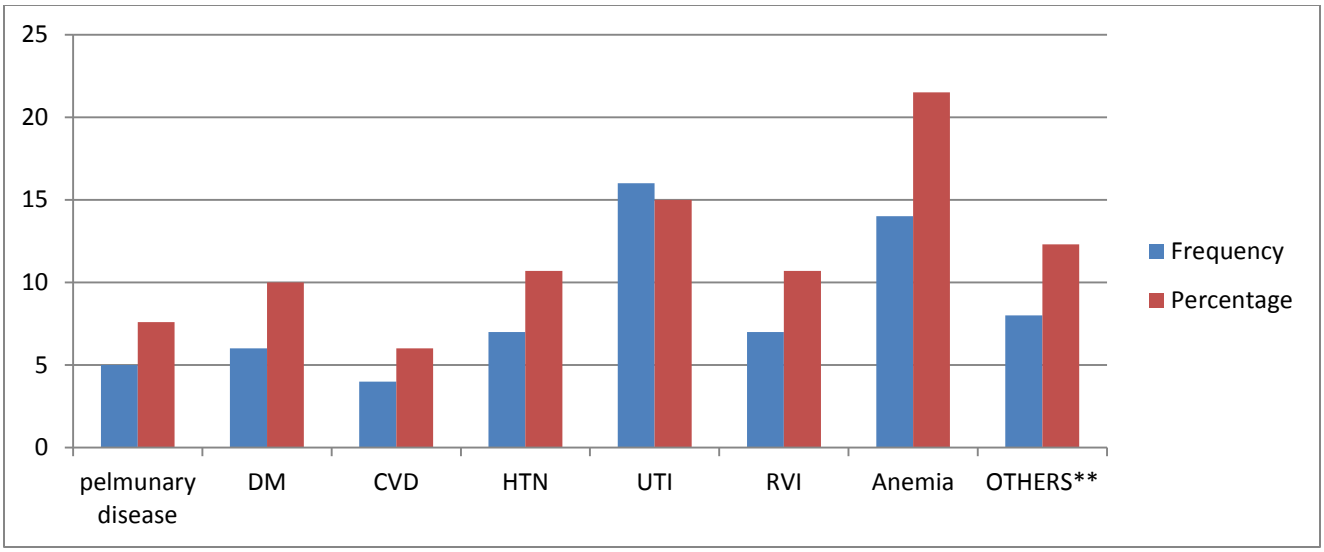
	Gov Hospitals	117	33.3%
	Private Institutions	13	3.5%
Number of ANC	Less than 8	249	70.8%
	8 and more	102	29.2%
Obstetric Complication	Yes	84	23%
	No	281	77%
BOH	Yes	12	3.2%
	No	353	96.8%
Medical Complications	Yes	29	7.9%
	No	327	92.1%

Figure 2: Obstetrics complications among mothers who gave birth at JMC,Jimma, South-West Ethiopia, 2022.



Others; GDM ,Polyhydramnios, macrosomia

Figure 3: Medical complications among mothers who gave birth at JMC, Jimma, South-West Ethiopia, 2023



Others*,HBSAG+,ITP…

5.3 Intrapartum factors

The mean gestational age for the study participant was 38.5 ±2 weeks. Among the total of 365 laboring mothers, the onset of labor was spontaneous with no augmentation in 274 (75%) and 122(33.6%) 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 151(41.4%) (**Table 3**).

Table 3: Intrapartum factors of mothers laboring at JMC, Jimma, south West Ethiopia, 2023 (N = 365).

Variables		Frequency(n)	Percentage%
Gestational age	Preterm	33	9%
	Term	304	83.3%
	Post term	28	7.7%
Onset of labor	Spontaneous and not augmented	274	75%
	Induced	91	25%

	Augmentation	22	5.9%
Referal status	Not referred	243	66.4%
	Referred	122	33.6%
Ways of rupture of membrane	Spontaneous before onset of labor	56	15.1%
	Spontaneous before onset of labor	245	66.5%
	ARM	64	17.4%
Duration of ROM	<8HRS	297	81.4%
	>=8HRS	68	18.6%
Liqor Status	Clear	269	73.37%
	G1MSAF	43	11.8%
	G2MSAF	35	9.5%
	G3MSAF	18	4.9%
Mode of delivery	SVD	200	54.8%
	Instrumental Delivery	14	3.8%
	Cesarean Delivery	151	41.4%

5.4 Fetal heart rate abnormalities

From the total of 365 mothers who was laboring at jmma medical center 71 (19.6 %) (95% CI= 16.22-22.58%) had nonreasoning fetal heart rate pattern. Detected FHR abnormalities were bradycardia and tachycardia which accounts for 43 (60.5%) and 28

(39.5%) respectively. Almost half of the FHR abnormalities were detected at active phase of labor 36 (49.9%) (table 4)

Table 4: Proportions and Types of fetal heart rate abnormalities among mothers who were laboring at JMC, Jimma,south-West Ethiopia, 2023 (n = 71)

Variables		Frequency(n)	Percentage%
NRFHRPS	NO	294	80.4%
	YES	71	19.6%
Types of NRFHRPS	Bradycardia	43	60.5%
	Tachycardia	28	39.5%
Stages of labor	LFSOL	19	27.3
	AFSOL	36	49.9%
	SSOL	16	22.5%

5.5 Associated factors of fetal heart rate abnormality

Bivariable analysis was done for 14 variables; those variables with P value of ≤ 0.2 were the candidates for multivariable logistic regression analysis. Educational status, occupation, parity, gestational age, induced and augmented labor, being referral , current pregnancy complication and having MSAF were variables fitted for multivariable logistic regression analysis. During multivariable logistic regression analysis being reffered, induced and augmented labor,post term pregnancy and having grade 2 and 3 MSAF were significantly associated with NRFHRP with p-value of < 0.05.

In this study the NRFHRPS was increased 4.2 times among mothers who referred from other health facilities compared with non-referred mothers [AOR=4.2 (1.087, 5.906)],4.2 times and 3.3 times greater among mothers with induction and augmentation of labor as compared to normal spontaneous labor [AOR=4.2 (CI 95% (1.65, 8.099) and AOR= 3.33 (CI 95%: (1.408, 6.22)]. The NRFHRP was 3.59 and 4.5 times greater among mothers

who had G2 and 3 MSAF as compared with not having MSAF 3.59(1.889,5.754)and 4.5(1.976,7.113) (Table 5).

Table 5: Factors associated with the proportion of mothers who laboring at JMC, South-West Ethiopia, 2023

Variables		NRFHRPS		COR(95%CI)	AOR(95%CI)	P-VALUE
		YES(%)	NO(%)			
Educational status	Cant read write	16(16.5)	81(83.5)	0.572(0.241-1.372)	0.76(0.600,0.933)	0.45
	Can read write	20(21.5)	73(78.5)	0.797(0.342-1.855)	0.912(0.68,1.08)	0.63
	Primary school	12(17.9)	55(82.1)	0.635(0.251-1.604)	0.78(0.54,0.812)	0.52
	Secondary school	12(18.5)	53(81.5)	0.378(0.260-1.667)	0.560(0.403,0.872)	0.71
	Higher educations	11(25.5)	32(74.5)		1	
Occupation	Govt employee	7(22.6)	24(77.4)		1	
	Merchant	15(16.2)	78(83.8)	0.659(0.241-1.805)	0.68(0.54.0.91)	0.91
	Farmer	16(16.3)	82(83.7)	0.669(0.247-1.815)	0.76(0.64,0.98)	0.83
	Private employee	9(21.4)	33(78.6)	0.935(0.305-2.836)	1.01(0.81,1.10)	0.57
	House wife	14(22.3)	48(77.7)	1.00(0.354-2.804)	1.08(0.67,1.99)	0.87
	Students	3(16.7)	9(83.3)	1.143(0.242-5,402)	1.13(0.623,2.11)	0,71
	Daily laborer	7(25.9)	20(74.1)	1.20(0.340-4.000)	1.19(0.73,2.21)	0,59
Parity	Nulliparous	37(24.0)	117(76)	1.646(0.978-2.772)	1,54(1.01,2.54)	0.09
	Multiparous	34(16.2)	177(83.8)		1	
GA in wks	<37	4(12.1)	29(87.9)	1.746(0.591-5.158)	1.674(0.62,3.70)	0.08
	37-41+6	59(19.4)	245(80.6)		1	
	42 and above	8(28.5)	20(71.5)	2.900(0.768-10.949)	3.02(0.71,7.54)	**0.04****
Type of Labor	Normal spontaneous labor	39(14.3)	235(85.7)		1	
	Induced labor	18(37.5)	30(62.5)	3.615(1.840-7.104)	4.2(1.65,8.1)	**0.02****

	Augmented labor	14(32.6)	29(67.4)	2.909(1.413-5.990)	3.33(1.40,6.22)	**0.01** **
Referral	NO	31(12.8)	212(87.2)		1	
	YES	40(32.8)	82(67.2)	3.336(1.956-5.689)	4.2(1.087,5.90)	**0.01** **
Liquor Status	Clear	40(15.3)	229(84.7)		1	
	G1MSAF	9(20.9%)	34(79.2%)	1.51(0.941-2.698)	1.421(0.618,2.99)	
	G2MSAF	**14(40%)**	**21(60%)**	**3.81(1.967,5.899)**	**3.59(1.889,5.754)**	**0.03** **
	G3MSAF	**8(44%)**	**10(56%)**	**4.58(1.886,7.144)**	**4.5(1.976,7.113)**	**0.01** **
Obstetric compln	Yes	22(35.4)	62(64.6)	1.680(0.945-2.988)	1.52(0.90,2.67)	0.17
	No	49(17.5)	232(82.5)		1	

CHAPTER SIX

DISCUSSION

Fetal heart rate abnormalities are used to forecast fetal compromisation or fetal distress which results in fetal academia due to poor fetal oxygenation. The objective of this study was to assess proportion and factors associated with nonreasuring fetal heart rate pattern among mothers who were laboring at jimma medical center; south-west Ethiopia, April to May 2023.

The finding of this study revealed that the proportion of NRFHRP was 19.6% (95% CI= 16.22-22.58%).The finding was comparable with the study conducted at Addis Abeba (18.6%) (19),at bahirdar at(19.4)(22) and study done at Israel (21.2%) (9).

However, the finding of this study is higher than the study conducted at Finote Selam primary hospital which is 15.1% (11).the reason may be the study at Finote Selam was retrospective and performed at primary hospital in which mothers may at lower risk

The finding also higher compared with study at Tanzania (9.9%).this significant difference may be because of they didn't include mothers with placental abruption, cervical dilation above 7cm and preterm pregnancies (21) Compared with study done at Zimbabwe where prevalence was (11.2%)(19), the finding of this study is significantly higher may be due to their study include only term pregnancy, cephalic presentation and normal fetal heart rate at admission.

The proportion of FHR abnormality in this study was lower than the study done in Thailand, Siriraj hospital where the proportion of FHR abnormality was (30.7%) (7). The possible explanation for this discrepancy might be due to use of continuous EFM and they include all types of abnormal FHRPS which not include in our study (late deceleration, absent variability, variable deceleration and sinusoidal pattern)

In this study the NRFHRP was significantly associated with post term, the referred mothers, presence of grade 2 and 3 MSAF, induced and augmented labor.

According to this study NRFHRP was increased by three fold on post term pregnancy compared to term pregnancy (AOR; 3.02(0.71,7.54). This finding is consistent with a retrospective study done at nigeria (17), prospective observational study done at China (12).

The FHR abnormalities were 3 times greater among mothers who gave birth after augmented labor(AOR, 3.33(CI;1.40,6.22)) and 4 times greater among mothers who gave birth after induced labor(AOR, 4.2(CI;1.65,8.1)) as compared with spontaneous labor. This finding is consistent with the study done at bahirdar (2),Gonder(22) and Israel (9). 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 and augmentation might be due to conditions which cause placental insufficiency or decrease in amniotic fluid which increases fetal heart rate abnormality.

The NRFHRPS were increased by 3.6 and 4.5 times in those fetuses having grade 1 and 2 MSAF (AOR,3.59(1.889,5.754)) and (4.5(1.976,7.113))respectively, as compared with clear liquor. This finding is consistent with the study done at Finote Selam (11), bahirdar and gonder(22)). 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 and has cause-effect relationship with MSAF. However, this is contrary to the report from the case control study conducted in India [17] which found no significant association between meconium-stained liquor and NRFHRP. This may be due to the difference in methodology and they exclude post term and non-cephalic fetal presentations.

According to finding of this study Mothers who were referred from other health facilities increase NRFHRPS by four folds(AOR, 4.2(CI,1.087,5.90)). This result consistent with study done at Gonder(22).This may due to referred mothers usually has complications that Couse fetal distress .but this finding is against study done at bahirdar(2) where there is no association between referral and NRFHRP. it may due to proportion of referred participant lower at their study .

CHAPTER SEVEN

CONCLUSION AND RECOMENDATIONS

7.1 Conclusion

This study found that proportion of NRFHRP was higher. Post term, being referred ,meconium stained amniotic fluid, induced and augmented labors were significantly associated with the NRFHRPS

Limitations of the study

This study is unable to assess cause and effect relationships since the study design is cross-sectional

This study assess only bradycardia and tachycardia but not other abnormal FHRP due to lack of CTG

This study done only at tertiary hospitals and the population might not be representative

7.2 Recommendations

To Health care providers and To the Hospital

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

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8.ANNEXES

Annex I: Information and consent Sheet

Date _____

Code_____

Health facility_____

My name is ……. I am here on behalf of Dr Misba Solomon (Final year Obstetrics and Gynecology Resident), he is working on this research project by with the objective to assess magnitude and associated factors of nonreasuring fetal heart rate pattern in jimma university medical center, jimma, south 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 Misba solomon, Phone number; 0921620395 or Email; misbasol2019@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
		2. Urban
103	Religion	1. Orthodox Christian
		2. Muslim
		3. Protestant
		4. Other (specify) ----------
104	Marital status	1. Single
		2. Married
		3. Divorced
		4. Widowed
105	Educational status	1. Can't read and write
		2. Can read and write
		3. Primary (Grades 1–8)
		4. Secondary (Grade 9–12)
		5. Collage and Higher Education
106	Occupation at this time?	1. Government employee

		2. Merchant	
		3. Farmer	
		4. Private employee	
		5. Student	
		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 2. No	If no, skip to 206
204	Where is your ANC follow up?	1. Health center 2. Government hospital 3. Private institutions	
205	Does she have obstetrics complications?	1. Yes 2. No If no, skip to 208	If no, skip to 208
206	Which obstetrics complications does she have? (multiple response is possible)	1. PIH 2. APH	

		3. Post term 4. PROM 5. IUGR 6. Others (specify) ----	
207	Does she have medical complications?	1. Yes 2. No	If no, skip to 301
208	Which medical complications does she have? (multiple response is possible)	1. Diabetes 2. Hypertension 3. Cardiac disease 4. Pulmonary disease 5. UTI 6.Anemia 7. Others (Specify) -------	

Section III. Intrapartal factors

S,no	Factors	Response	Skip
301	Fetal heart rate abnormality detected	1. Yes 2. No	If no skip to 305
302	Type of FHR abnormality detected	1. Tachycardia (-------BPM) 2. Bradycardia (---------BPM) 3. Others (Specify)----------	
303	Cervical dilatation at the detection of FHR abnormality	-------- cm	
304	Measures taken for FHR	1. Respond for resuscitation	

	abnormality	2. Instrumental delivery 3. Cesarean delivery	
305	Fetal presentation	1.Vertex 2.Non-vertex(specify)	
306	Duration of labor	-------- hrs	
307	Type of labor	1. Spontaneous labor 2. Induction 3. Augmentation	
308	Where is she laboring?	1. Refer from other institution 2. At this hospital	If at this hospital skip to 310
309	If referral, diagnosis at referral	----------	
310	Reason for referral	----------	
311	Liquor status	1.Intact 2. Clear 3. MSAF 4. Bloody	
312	If rupture, specify ways of rupture of membrane	1. Spontaneous beforelabor 2. Spontaneous during labor 3. ARM	
313	Mode of delivery	3. SVD 4. Instrumental delivery	

5. Cesarean delivery