



DETERMINANTS OF MATERNAL AND PERINATAL OUTCOMES AMONG
OBSTRUCTED LABOR MOTHERS IN JIMMA MEDICAL CENTER, SOUTH WEST
ETHIOPIA

THESIS SUBMITTED TO JIMMA UNIVERSITY POSTGRADUATE PROGRAM, FACULTY
OF MEDICAL SCIENCE, SCHOOL OF MEDICINE, DEPARTMENT OF OBSTETRIC AND
GYNECOLOGY FOR PARTIAL FULFILLMENT FOR THE REQUIREMENT FOR THE
CERTIFICATE OF SPECIALITY IN OBSTETRICS AND GYNECOLOGY

BY -: MISGANA LULU (MD, Obstetrics and gynecology resident)

JIMMA, ETHIOPIA
OCTOPER, 2021

DETERMINANTS OF MATERNAL AND PERINATAL OUTCOMES AMONG
OBSTRUCTED LABOR WOMEN IN JIMMA MEDICAL CENTER, SOUTH WEST
ETHIOPIA

BY -: MISGANA LULU (MD, Obstetrics and gynecology resident)

ADVISORS -: DEMISEW AMENU (MD, Consultant & Associate prof. of
obstetrics and gynecology, Urogynecology and Reconstructive Pelvic surgeon)

Mr. ZERIHUN ASEFA (BSc, MSc in Health Monitoring & Evaluation)

OCTOPER, 2021
JIMMA, ETHIOPIA

Abstract

Background – Obstructed labor is still a major cause of maternal, perinatal morbidity, and mortality in low-income countries. It is the leading cause of hospitalization of all obstetric patients in developing countries.

Objective- The main objective of this study was to determine maternal and perinatal outcomes and their determinants among obstructed labor and normal labor women at JMC

Method – A cohort study was conducted in mothers with OL and normal labor who delivered in the Jimma Medical Center during the study period. We consecutively enrolled eligible obstructed labor from October 2020 to September 2021. For each obstructed labor, we randomly selected one eligible normal labor admitted in the same-24-hour period to JMC, from October 2020 to September 2021. Data were collected using a structured questionnaire from both interviews of respondents and the respondents' records to assess socio-demographic and obstetrics characteristics. After delivery, both the obstructed labor and normal labor were followed daily by the maternity team and the outcomes were recorded for the first seven days after birth. Those mothers and newborns who were discharged before the seventh day were appointed and followed or on phone follow up was used for those who were unable to come back to interview the mother for both the maternal and fetal outcomes. A bivariate logistic regression and multiple logistic regressions were used to identify independent predictors that showed significant association with dependent variables. Finally, a statistically significant association was declared at a p-value < 0.05. The result of the bivariate and multivariable logistic regression was presented using Odds Ratios (OR) and Adjusted Odds Ratio (AOR) respectively with their 95% confidence intervals (CIs).

Result: Among mothers with obstructed labor and normal labor admitted to the labor ward and gave birth 32.6% and 6.5% had at least one maternal complication respectively. The three most common maternal complications with obstructed labor were PPH (16.3%), Puerperal sepsis (12%), uterine rupture (7.6%). At the 7th day of postoperative or postpartum 5.4% of mothers with obstructed labor are alive with sequel like foot drop and obstetric fistula while all there nothing in normal labors. Rural residence (AOR 3.239 95% CI 1.06,9.83), non-vertex fetal presentation (AOR 4.580 95% CI 1.77,11.84) and admission diagnosis with obstructed labor (AOR 3.721(1.10, 12.51) had a statistically significant association with at least one maternal complications. Among

mothers with obstructed labor and normal labor admitted to the labor ward and gave birth, 55.4% and 8.7% of the neonates had developed at least one complications respectively. The five most common neonatal complications with obstructed labor were PNA (21.7%), ENND (21.7%), Birth trauma (16.3%), EONS (15.2%) and MAS (15.2%). Mothers admitted with obstructed labor (AOR 5.458 95% CI 1.70,17.43) and having 1st minute APGAR score <7 (AOR 7.720 95% CI 2.41 24.66) had statistically significant association with at least one perinatal complication.

Rural residence (AOR 3.095 95% CI 1.24, 7.68), below secondary educational status (AOR 3.034 95% CI 1.19, 7.68), total duration of labor more than 12_hrs (AOR 11.237 95% CI 4.44, 28.43), distance from hospital more than 50 km (AOR 5.348 95% CI 1.57, 18.17) and laboring at home (AOR 4.350 95% CI 1.58,11.97) had shown statistically significant association with to develop obstructed labor.

Conclusion and recommendation;

The presence of obstructed labor has been associated with poor maternal and perinatal outcomes which were manifested by increased NICU admission, prenatal asphyxia, EONS and ENND. JMC should give emphasis to community mobilization and training, health workers to prevent obstructed labor and ready to manage obstructed labor and its complication.

Key words - Obstructed labor, maternal and perinatal outcomes, budget

CONTENTS	PAGES
ACRONYMS.....	3
CHAPTER ONE -INTRODUCTION.....	4
1.1 Background.....	4
1.2 Statement of the problem	6
1.3 Significance the study.....	7
CHAPTER TWO -LITERATURE REVIEW	8
3.1 General objective	13
3.2 Specific objectives	13
CHAPTER FOUR -METHODOLOGY.....	14
4.1 Study area.....	14
4.2Study period	14
4.3 Study design.....	14
4.4 Source population	14
4.5 Study population.....	14
4.7 Study variables.....	16
4.8 Data collection:	16
4.8.1 Data collection instrument:.....	16
4.8.2 Data collector	16
4.8.3 Data collection procedure.....	17
4.9 Data processing and analysis	17
4.10 Data quality control.....	17
4.11. Operational definition	18
4.13 Ethical consideration:	19
4.14 Plan for disseminating result.....	19
CHAPTER FIVE: RESULT	20
5.1 Sociodemographic characteristics:	20
5.2 Obstetric related characteristics	22
5.3 Maternal outcome among obstructed labor and normal labor	24
5.4 Perinatal outcome among neonates born to mothers with obstructed labor and normal labor	25
5.5 Factors affecting perinatal outcomes	28
5.6 Factors affecting maternal outcomes among mothers with obstructed labor and normal labor	29

CHAPTER SIX- DISCUSSIONS	31
6: DISCUSSION	33
CHAPTER-SEVEN: Limitation and strength of the study:.....	38
7.1 LIMITATION OF STUDY.....	39
7.2 STRENGTH OF STUDY.....	39
CHAPTER -EIGHT- CONCLUSION AND RECOMMENDATIONS	38
8.1 Conclusion	38
8.2 Recommendation:.....	38
Annex I	40
References.....	40
Annex II	43
Questionnaires	43

List of tables

Table 1: Sociodemographic characteristics of mothers admitted with obstructed labor and normal labor to JMC, November 2020 to September 2021 G.C	20
Table 2: Obstetric related characteristics among mothers with obstructed labor and normal labor admitted to JMC, November 2020 to September 2021 G.C	22
Table 3: maternal outcome among mothers with obstructed labor and normal labor admitted to labor ward, JUMC, November 2020 to September 2021 G.C.....	24
Table 4: Perinatal outcome among neonate born to mothers with obstructed labor and normal labor admitted to labor ward, JUMC, November 2020 to September 2021 G.C.....	26
Table 5: Factors affecting perinatal outcomes among mothers with obstructed labor and normal labor admitted to labor ward, November 2020 to September 2021 G.C.....	32
Table 6: Factors affecting maternal outcomes among mothers with obstructed labor and normal labor admitted to labor ward, November 2020 to September 2021 G.C.....	30

Acknowledgment

I would like to thank my advisors Dr. Demisew Amenu and Mr. Zerihun Asefa for their assistance and valuable comment throughout preparation of these papers. In addition, I will also like to pass my deepest gratitude for the research office of Jimma University. I will like to thank the Department of Obstetrics and Gynecology to allow me conduct the research and consultants for their constructive comments during the proposal presentation for giving me the opportunity to conduct this research. I would also like to pass my appreciation to mothers who has participated in the study.

ACRONYMS

APGAR – Appearance, Pulse rate, Grimace, Activity, Reflex

ANC- Antenatal Care

APH-Ante Partum Hemorrhage

CPD- Cephalo Pelvic Disproportion

C/S – Cesarean Section

ENND –Early Neonatal Death

Hrs.- Hour

ICU – Intensive Care Unit

JMC – Jimma Medical Center

Km-Kilometer

NICU – Neonatal Intensive Care Unit

NRFHRP – Non Reassuring Fetal Heart Rate Pattern

OL- Obstructed Labor

PNA- Perinatal Asphyxia

PPH – Postpartum Hemorrhage

RVF- Recto Vaginal Fistula

SSA-Sub Saharan Africa

VVF- Vesico Vaginal Fistula

WHO – World Health Organization

CHAPTER ONE -INTRODUCTION

1.1 Background

Maternal death refers to the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes.

Ending maternal deaths from preventable causes is a cornerstone of the ICPD Programme of Action and an important indicator in the Sustainable Development Goals. Despite global agreement and several decades of progress, nearly 300,000 women still die annually from preventable causes at or around the time of childbirth – more than one maternal death every two minutes. The number of maternal deaths has dropped 38 percent since 2000, from 342 maternal deaths per 100,000 live births in 2000 to 211 deaths per 100,000 live births in 2017. This translates into an average annual rate of reduction of 3.1 percent. This is less than half the 6.4 percent annual rate needed to achieve the Sustainable Development global goal of 70 maternal deaths per 100,000 live births by 2030. The developed countries accounts least bearing the majority of the burden and 86 percent of maternal deaths occurring in sub-Saharan African and Southern Asian countries(1). Globally about 73% of all maternal deaths were due to direct obstetric causes and deaths due to indirect causes accounted for 27.5% of all deaths. Hemorrhage accounted for 27.1%, hypertensive disorders 14.0%, sepsis 10.7%, abortion 7.9%, embolism 3.2%, and all other direct causes of death 9.6%. From other direct causes obstructed labor accounts 2.8%(2). Globally maternal mortality distribution was affected mainly by the two regions, sub-Saharan Africa and southern Asia, that accounted for 86% of all maternal deaths(2).

Three of the eight MDGs were health goals: Goal 4 (reduce child mortality), Goal 5 (improve maternal health) and Goal 6 (combat HIV/AIDS, malaria and other diseases). Ethiopia achieved most of the health MDGs: a 67% reduction in under-five mortality, a 71% decline in maternal mortality ratio. This was thus close to the target for MDG 5 (75%). These achievements are thought to be due to a comprehensive approach, including the health extension programme and strengthening of the health system have played important roles towards the achievements(3).

According to research done in Ethiopia, direct causes of maternal death is 83%. Hypertensive disorders 27.8%, Hemorrhage accounted for 23.9%, obstructed labor including uterine rupture 15.2%, sepsis 3.9%, unsafe abortion 1.5% of maternal deaths. The indirect causes of maternal death coexisted with most of the direct causes of maternal deaths(4).

Obstructed labor when the presenting part of the fetus cannot progress into the birth canal, despite strong uterine contractions(5). The issue of obstructed labor is an unsolved problem in Ethiopia so far(6). The incidence of obstructed labor as 4.2% to 18.6%in Ethiopia (5–7).

Maternal mortality from obstructed labor is largely the result of ruptured uterus or puerperal infection, whereas perinatal mortality is mainly due to asphyxia. Significant maternal morbidity is associated with prolonged labor, since both postpartum hemorrhage and infection are more common in women with prolonged labor. Obstetric fistulas are long term problems. Traumatic delivery affects both mother and child (8).

1.2 Statement of the problem

Globally deaths that happen after obstructed labor and its consequences are hard to measure because they can be coded as uterine rupture, hemorrhage, or sepsis. This is especially problematic in settings where verbal autopsies are used to establish cause of death(2). Even the most common cause of maternal mortality from obstructed labor is largely the result of ruptured uterus or puerperal infection, whereas perinatal mortality is mainly due to asphyxia (8).

The inequity gap remains a challenge that achieving the health-related SDGs requires the country to implement strategies, which specifically target more marginal populations and geographic areas. This also needs peace and stability; without which it is almost impossible to improve health in Ethiopia(3). During the maternal mortality rate reporting there are limited nationwide studies –limited in scope and coverage, including the national MDSR report, which did not include the maternal death reviews from the emerging regions of Ethiopia(9).

Obstructed labor is a preventable disease. Even though the cause MMR globally due to obstructed labor was small accounts only 2.85%, still meta-analysis done in Ethiopia 2017 it was the second major cause of MMR accounts 22.3% (2,9).

Our aim of this study to assess the complications in obstructed labor and outcomes. The data generated will help to improve maternal and fetal morbidity and mortality by planning prompt management for future cases of obstructed labor and its complications.

However, so far there were no data on maternal and perinatal out comes of obstructed labor and its outcomes in the study area. Thus the findings of this study provide to asses maternal and prenatal outcomes and its determinants of obstructed labor in the study area and could form the basis for further research, recommendation for prevention, management practice for governmental and non-governmental organization who works on improving maternal health.

The present study is, therefore aimed at identifying determinants of maternal and perinatal outcomes among mothers with obstructed labor who were managed in the Jimma medical center, south-west Ethiopia.

1.3 Significance the study

Even though there are few studies exploring obstructed labor in Ethiopia, there has not been studied recently on maternal and perinatal outcomes of obstructed labor and associated factors in the study area. Based on the limited data available, obstructed labor has been found to be common and has been associated with poor maternal and perinatal outcomes. Therefore, this study will be conducted to explore maternal and perinatal outcomes of pregnancies complicated by obstructed labor and normal labor with factors associated with the disorder and pregnancy outcomes. The results of this study may serve as the cornerstone finding that creates insight among health care planners and administrators. Further Zonal and Jimma town health care sectors and stakeholders, including health bureau and other concerned bodies may consume the findings while planning health care interventions. This study will provide base-line for further information regarding maternal and perinatal outcomes of obstructed labor and associated factors and the results of the study helps other researchers for studies to be conducted in the future.

CHAPTER TWO -LITERATURE REVIEW

2.1. Overview of literature review

Global consensus exists on the need to end preventable maternal deaths. Eliminating preventable maternal deaths is a cornerstone of the ICPD Programme of Action and is an important indicator of both Sustainable Development Goal(1). Deaths that happen after obstructed labor and its consequences are hard to measure because they can be coded as uterine rupture, hemorrhage, or sepsis(2). There has been a statistically significant reduction of obstructed labor caused maternal deaths over the 1990 to 2016 studied period for the Causes of maternal death in Ethiopia.(9).

2.1.1 Maternal and fetal outcomes among obstructed labor

Research done in Boston, Massachusetts, United States show that Prevalence of complications occurred in prolonged obstructed labor estimates were obtained from 132 participants. The median prevalence of reported sequelae within each category were: fistula (6.67% to 23.98%), pelvic floor (6.53% to 8.60%), genitourinary (5.74% to 9.57%), musculoskeletal (6.04% to 11.28%), infectious/inflammatory (5.33% to 9.62%), psychological (7.25% to 24.10%), neonatal (13.63% to 66.41%) and social (38.54% to 59.88%)(10).

Research done unmatched case and control at Eastern Uganda show that the respondents (cases) were generally young with a mean age of 24.5 ± 6 years, 54.4% are age group of 20-29 years and gave birth to babies of normal birth weight with a mean of 3.3 ± 0.4 Kg. Almost all (99%) respondents attended at least one ANC visit, mostly (96%) in public health facilities. Two-thirds (68%) of the respondents had no delivery plan in place, 43.3% have greater or equal 4 times ANC visit. The majority of respondents resided in rural areas (89%) with educational status up to primary in 51.5% and almost one-half (44%) had used herbal medications during labor. The cases were younger (mean age 23.5 ± 5.9 Vs 25.4 ± 5.9) than the controls(11).

Study done at the University of Maiduguri Teaching Hospital, Maiduguri, Nigeria the prevalence of obstructed labor was 2.13%. Cephalopelvic disproportion, persistent occipitoposterior position, and malpresentation were seen in 65.37%, 16.58%, and 11.71%, respectively. Complications were observed in 37.56% of the women with obstructed labor. The common morbidities were wound

sepsis, ruptured uterus, and puerperal sepsis, seen in 16.59%, 13.17%, and 7.81%, respectively. The case fatality rate was 0.98% and perinatal mortality was 34.15%(12).

The study done in India People's College of Medical Sciences and Research Centre Bhopal showed that 53% cases had a duration of trail more than 16 hours. 84% were referred from primary health centers of nearby rural areas. All cases of obstructed labor delivered by cesarean section (100%). 44% were primigravida. 72% of cases had Cephalopelvic disproportion as the cause. 28% of cases had longer stay more than 7 days in the hospital. 32% had fever during postoperative period. 12.5% cases had wound sepsis and 6% of cases required re-suturing of wounds during the postoperative period. 72% baby's birth weight was between 3 to 3.4 kg. 94% of the babies survived where as 6% of babies were still birth. 16% of babies born to obstructed labor mother had APGAR less than 7 at 5 minutes of birth. 6% fetus were IUFD. Of the total babies delivered to mothers with obstructed labor 44% of babies required NICU admission. There was no maternal mortality (13).

Research done at Suhul, Shire revealed that 45.2% were rural in residence, 54% educated up to primary education, 9.5% of the participant's live distance greater than 50 km between the residence that Hospital, mothers laboring for greater than 24hrs were 8.35%. Route of delivery were 68% C/S, 20% hysterectomy, 7% destructive delivery and 5% repair of ruptured uterus and BTL are intervention done at suhul, Shire (14). More than 89% of the mothers with obstructed labor of them had developed at least one complication. Postpartum hemorrhaged and puerperal sepsis 56.8% (28.4%) each and uterine rupture (25%) were the main maternal complications among the mothers with obstructed labor and other bladder injury 18.2%, VVF 9.1%, cervical tear 4.5% and maternal death 2.3%. Out of babies born to women with obstructed labor, 93.2% of the have developed at least one complication. 40.9% of the babies were stillbirths or died immediately after delivery. 88.9% of the babies born alive have birth asphyxia (Apgar score of less than 7/10 at first minute) at Suhul , Shire (14)

The study done in Amhara Region, Northwest Ethiopia a hospital-based unmatched case-control study shows that the mean age of the study participants was 27.66 years (27.4 ± 5.44 for cases and 28.15 ± 6.16 for controls). 53.7% came from rural, 72.9% education level is below secondary education, 64.7% have more than 3 ANC visit, 67.6% of cases more than 10km far from the hospital. Regarding the route of delivery most of the cases gave birth by C/D without tubal ligation

were 65.2%, C/D with tubal ligation 17.4%, hysterectomy 10.4%, destructive 4.8%, SVD 1.5% and instrumental delivery in 0.7%(15).

Research done at the Adama Hospital Medical College revealed that 9.6% were obstructed labor cases. Most (48.4%) of cases age were between 15 to 24years. 78.6% came from rural, 8.3%have no ANC follow up. Most mothers (67.6%) with obstructed labor were laboring for more than 24hrs. The causes of obstructed labor identified were CPD (54.1%), mal-position (29.7%) and mal-presentation 16.2%)(16).

Study done on Gimbi public Hospital result shows prevalence of OL were 18.1%, 62.1% were due to CPD,36.8% are age group of 20-24 years. Route of delivery were 66% underwent spontaneous vaginal delivery followed by (32.7%) caesarean section (C/S). Among all mothers with obstructed labor conducted, 4.4% PPH, 1.9% sepsis, 1.2% ruptured uterus. The maternal case fatality rate among OL is 1.7%. Out neonates born from obstructed labor 77.6% live birth and 31.0% end up with perinatal death of which 20.7% still birth which was commonly seen at extreme age, extreme parity and prolonged labor. From 45 live birth 51.1% developed asphyxia and 11% neonatal death at Gimbi (5).

Research done at Halaba Kulito Primary Hospital, Halaba revealed that 65.7% of cases were age between 20 to 29 years. Nearly two-third (64.8%) were rural residence. 55.5% were primigravida. 93.3% neonates born were alive and 6.7% were still birth. Three-fourth (73%) of cases were faced prolonged labor for more than 12hrs. Most route of delivery were caesarian section in 96.9% and destructive in 3.1%(6).

Research done systematic review and meta-analysis in Ethiopia revealed that incidence of obstructed labor in Ethiopia was 12.93%. Out of these, 67.3% did not have antenatal care follow-up, 77.86% were from the rural area, and 58.52% were referred from health centers and visited hospitals after 12 h of labor. The major causes of obstructed labor were cephalo-pelvic disproportion 64.65%, and malpresentation and malposition in 27.24% of the cases. The commonest complications were sepsis in 38.59%, stillbirth in 38.08%, postpartum hemorrhage in 33.54%, uterine rupture in 29.84%, and maternal death in 17.27% of mothers who gave birth in Ethiopia(17).

2.1.2 Maternal and fetal outcomes among low risk women presenting active phase of labor

Study done at Buganda Medical Centre in Tanzania revealed that most participants had age ranging between 18–40 years with mean age of 25.42 ± 5.25 years. Majority of women in active phases of labor were in the age group between 20–35 years 88.8%. Proportion of pregnant women who received key interventions including augmentation with oxytocin, artificial rupture of membranes and caesarean section were 20.8%, 22.4%, 24.0%. The most frequent indication for caesarean section was fetal distress which was 10.0% and SVD was 72.0%. In terms of maternal complications, there was genital tract injury and postpartum hemorrhage (PPH) 18.6 % and 18.4% respectively. In terms of fetal outcomes with regard to Apgar score and admission to the Neonatal Intensive Care Unit 19.2% of neonates have APGAR score <7 and need to admission to NICU 12.8% (18).

Study done at Obstet Gynecol revealed that the majority of women admitted with active phases of labor were 20–34 years old 78.1%, 38.1% are nulliparous and 61.9% are multiparous. Proportion of nulliparous vs multiparous women who received key interventions including augmentation with oxytocin, epidural and less than 12hrs from admission to delivery were 36.6% vs 20.7%, 71.8% vs 53.1% and 74.8% vs 96.5% respectively. Proportion of nulliparous vs multiparous women who delivered by Cesarean section, operative delivery and complicated with 3rd or 4th degree tear was 28.8% vs 3.65, 12.4% vs 2.8% and 6.7% vs 0.8%. Post-delivery Complication which occurred among nulliparous vs multiparous were blood transfusion, ICU admission and readmission within 30days are 0.5% vs 0.2%, 0.03% vs 0.04% and 0.6% vs 0.6%. Newborn outcomes of women admitted with active phase of labor need Resuscitation efforts at delivery, 5-min Apgar score less than 7, NICU admission, Readmission within 30 days and Exclusive breastfeeding among nulliparous vs multiparous women were 5.2% vs 2.8%, 1.2% vs 0.6%, 3.7% vs 2.5%, 1.9% vs 1.6% and 86.7% vs 79.7% respectively(19).

2.2 Conceptual frame work

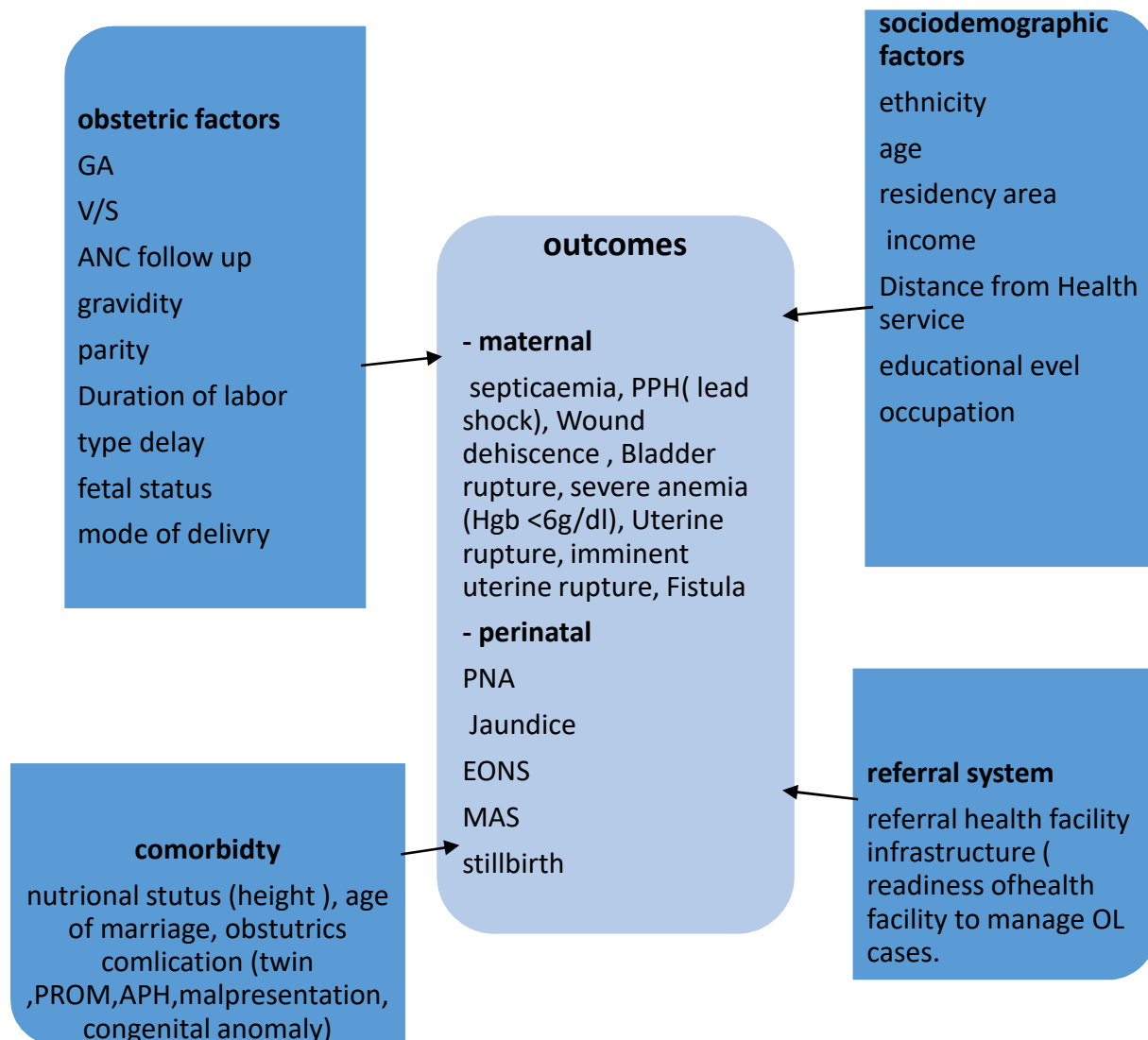


Figure 2.1 conceptual framework of OL

CHAPTER THREE - OBJECTIVE

3.1 General objective

- To determine perinatal and maternal outcomes among obstructed labor and normal labor mothers and its associated factors at JMC, Jimma, Ethiopia

3.2 Specific objectives

1. To describe socio demographic characteristics of OL and normal labor in JMC, Jimma, Ethiopia
2. To compare maternal outcomes of obstructed labor and normal labor in JMC, Jimma, Ethiopia
3. To compare perinatal outcomes of obstructed labor and normal labor in JMC, Jimma, Ethiopia
4. To identify factors associated with maternal and perinatal outcomes among obstructed labor and normal labor at JMC, Jimma, Ethiopia
5. To identify factors predicts obstructed labor at JMC, Jimma, Ethiopia

CHAPTER FOUR -METHODOLOGY

4.1 Study area

Jimma Medical Center (JMC) is located in Jimma city, Southwest Ethiopia 353 km from Addis Ababa. Jimma University is one of the higher institutions in Ethiopia. The main campus is situated to the east of the town at about 3kms from the down town, Jimma Municipality and 4kms before reaching to King Abajifar Palace. Jimma Medical Centre (JMC) which is part of Jima University (JU), established in 1930, is located in the main campus. It is a referral hospital which provides services for approximately 9,000 in patient and 80,000 outpatient attendances a year with a very wide catchment population of about 15 million people in southwest Ethiopia.

The hospital provides almost all major types of medical care and it has a total of 659 beds of which 52 are found in the maternity ward. The first and second stage rooms of the labor ward have 11 and 5 beds, respectively. The labor and maternity wards are run by midwives, medical interns, resident physicians of obstetrics and gynecology, and obstetrics and gynecology consultants. The hospital serves as a referral hospital for the southwestern part of the country and most of the laboring mothers come from rural areas.

4.2 Study period

The study was conducted from October 2020 to September 2021G.C.

4.3 Study design

A Cohort study design was employed with cases of women with OL and controls of women without OL admitted to labor ward and maternity ward in JMC.

4.4 Source population

All mothers and their newborns who gave birth in the hospital during the study period.

4.5 Study population

Study population is selected obstructed labor and normal labor of laboring mothers who were admitted to labor ward and maternity ward and who gave birth during the study period.

Obstructed labor: All laboring mothers with a diagnosis of OL and live fetus who were admitted to labor suit and gave birth during the study period and who fulfills the inclusion criteria

Normal labor: Selected laboring mothers without OL and live fetus who were admitted in active labor and deliver in the labor suit of JMC.

4.5.1 Inclusion criteria

- All pregnant women in labor with diagnosis of obstructed labor, live fetus and delivered in the Hospital and mothers admitted to the labor suit within the same 24-hour period in active labor, delivered to a live fetus without obstructed labor.

4.5.2 Exclusion criteria

- Women with other obstetric emergencies such as antepartum hemorrhage, Preeclampsia and eclampsia (defined as elevated blood pressure of at least 140/90 mmHg, urine protein of at least 2+, any of the danger signs and fits), premature rupture of membranes and other chronic medical illnesses.

4.6 Sample size and sampling:

We used the formula described by Fleiss with a continuity correction to estimate the sample size (20). Sample size was determined using the following assumptions of: $Z_{\alpha/2}$ = critical value for normal distribution at 95% confidence level which equals to 1.96 (z value at $\alpha = 0.05$) $d = 0.05$ margin of error (precision at $\alpha = 0.05$). The OpenEpi (www.openepi.com) online software for unmatched cohort study design was used to calculate the sample size. A previous study which compared EONS incidence in unexposed group 3.3% and incidence of EONS in exposed group 15.1% was our base.

With above formula we got 94 obstructed labor and 94 normal labor based on the following assumptions: two-sided 95% confidence level, power of 80%, ratio 1:1 from all outcomes maternal and perinatal among normal labor and obstructed labor which gave maximum sample size (21). We consecutively enrolled all eligible incident obstructed labor between October 2020 to September 2021 G.C.in JMC. We used simple random sampling to select one normal labor from a list of admissions in active labor immediately after enrolling each obstructed labor.

4.7 Study variables

The socio-demographic factors highlighted in the literature to predispose women to OL were the participant's age, marital status, occupation, level of education, the occupation and education level of the spouse as well as distance to the nearest health facility and the place of residence (14,16,22–24). The obstetric factors were gravidity, number of ANC visits, having a delivery plan in place, a history of being referred from a lower health facility and use of herbal medications during labor (14,21). Physical examination included the respondent's height and fetal birth weight.

4.7.1 Dependent variable

Maternal and fetal outcome

4.7.2 Independent variable

Age, income, Gravidity, Educational level, Place of residence (urban, rural), Gestational age, presence of ANC follows up, frequency of ANC, Place of ANC, Duration of labor, Mode of deliver, birth weight, APGAR score (1st and 5th minutes).

4.8 Data collection:

4.8.1 Data collection instrument:

Data was collected using a pretested semi-structural questionnaire and checklist which contains socio demographic characteristics of mothers, clinical presentations, obstetrics complication, laboratory data, maternal and perinatal outcomes parameters, associated factors and conditions of both mothers and neonates until 7th day of life.

4.8.2 Data collector

The questionnaire is prepared in English and at the time of interview of the Patient or family member it was translated to the local language, Amharic and Afaan Oromoo, by the data collector. Data was collected in two phases using questionnaire from the case notes of the participants' medical records, and from face-to-face interview with the patient or family member or the most senior health professional who participated in the management of the diseased. Data were collected by year 3 residents of obstetrics and gynecology.

4.8.3 Data collection procedure

Data were gathered by reviewing records of the laboring mothers and supplemented by interviewing the subjects. After delivery, both the obstructed labor and normal labor were followed daily by the maternity team and the outcomes were recorded for the first seven days after birth. Those mothers and newborns who were discharged before the seventh day were appointed and followed or on phone follow up was used for those who were unable to come back to interview the mother for both the maternal and fetal outcomes.

4.9 Data processing and analysis

After checking its completeness, edited, cleaned, coded and the collected data was entered in to epidata V.3.1 then exported to SPSS version 26 for analysis Statistical. Descriptive statistics were used to determine frequency, mean, and proportions of variables. Chi-square test were used to test for association between variables of interests, such as sociodemographic characteristics of mothers and pregnancy outcomes. In bivariate logistics regression, a variable whose $p \leq 0.25$ was considered as a candidate for multivariable logistic regression analysis. And variables having $p < 0.05$ after multivariable logistic regression analysis were considered as independent predictors for knowledge. **The backward elimination method was done to fit the final model.** Statistical significance was assessed using the chi-square test, odds ratios, and 95% confidence intervals, p values less than 0.05 used as cut off point for statistical significance. Hosmer-Lemeshow goodness of fit was used to check the goodness of the applied models (0.87). And, the model adequately fits the data.

4.10 Data quality control

Data collectors were trained year three GYN-OBS residents, two-days intensive training was given for data collectors on the objectives and contents of the training. Pre-testing of the questionnaire was done on 5 % (20 in number) of obstetric women at Shanan Gibe Hospital maternity ward prior to the actual data collection period to assess clarity, understandability, flow and consistency of the study tool. The data collectors were supervised by principal investigator during data collection. The collected data was reviewed and checked for completeness edited, cleaned, coded before data entry.

4.11. Operational definition

Alive with sequel; alive but loss one or more organ, develop fistula, foot drop for mothers or alive but diagnosed complication of PNA like cerebral palsy for neonates.

Apgar score: This is an assessment of the newborn condition right after birth, at 1, and 5 minutes, by evaluating the 5 indicators: color, heart rate, Grimace (response to stimuli), Activity (Tone) and Respiration (breathing rate).

Asphyxia (PNA): A condition in which insufficient or no oxygen and carbon dioxide are exchanged on a ventilator basis or APGAR less than 7 at 1st and 5th minutes.

At least one maternal complication: if mother develops one or more of the following PPH, puerperal sepsis, uterine rupture, bladder rupture, foot drop, postpartum psychosis, surgical site infection, obstetric fistula, wound dehiscence, ICU admission, maternal death.

At least one perinatal complication: if perinatal develops one or more of the following PNA, EONS, MAS, Birth injury, pathological jaundice, still birth, NICU admission, ENND.

Birth trauma- any physical injury to birth during the process of birth

Bladder rupture- disruption of bladder wall or communication of bladder to peritoneum

ENND – neonatal death within 7 days of life

EONS- any sign or symptoms of infection of neonate during the first seventh of life

Foot drop- abnormal gate (difficult walk) due nerve damage by compression.

Maternal near miss- a mother who recovered from severe complications like severe anemia, AKI, PPH, Uterine rupture.

MAS- any sign or symptom development of meconium aspiration of neonate after birth

Neonatal death: Death of the newborn in the 28 days of life.

Normal labor: mother admitted to the labor suit in active labor, delivered to a live fetus without obstructed labor.

Obstructed labor: mother admitted to labor suit with symptoms and sign suggestive of obstructed labor like dehydration, exhausted, cannula sign of vulva, grade III molding diagnosed by most senior physician.

Obstetrics Fistula- any epithelial communication between genital and urinary or bowel

Puerperal sepsis- any development of fever after 24_hrs of delivery.

Perinatal mortality – death after 28 weeks of gestation plus early neonatal death

Place of labor- to take as place of labor if mother laboring for more than or equal to 6 hrs that place.

PPH- excessive vaginal bleeding after delivery which lead vital sign derangement.

Still birth: Birth of a baby that has already died in the womb or died immediately after birth within 10 minutes.

Uterine rupture- disruption of uterine layer, it can be complete or partial

4.13 Ethical consideration:

Ethical clearance was obtained from College of Public Health and Medical Sciences ethical review committee and permission to conduct the study was obtained from JMC. Verbal consent was obtained from the study subjects and the right of the respondents to withdraw or not to participate was respected. Additionally, names of participants were not used in the study and information obtained from patients is held confidentially.

4.14 Plan for disseminating result

The final result of the study will be submitted to health Science College, department of obstetrics and gynecology. It will be used as a base line data for further study to be done. After approval publication in peer-reviewed, national, or international journals will be considered.

CHAPTER FIVE: RESULT

5.1 Sociodemographic characteristics:

During the twelve-months' study period, there were a total of 92 mothers with obstructed labor and 92 randomly selected normal labors who were included in the study making response rate of 97.9%. Mothers with obstructed labor 36(39.1%) and normal labor 40(43.5%) were in the age group of 19 -24 years. Eighty (87.0%) of obstructed labor & 82(89.1%) of normal labor were Oromo in ethnicity. Muslim by religion were 67(72.9%) in obstructed labor & 73(79.3%) in normal labor. Mothers with obstructed labor came from rural areas were 64(69.6%) and normal labor came from urban areas were 64(69.6%). Mothers in two third 60(65.2%)of obstructed labor and 63(68.5%) of normal labor have educational status up to primary education. Housewife accounts for obstructed labor 60(65.2%) and normal labor 68(79.3%). Most of the mothers with obstructed labor and normal labor were married 89(96.7%) & 85(92.4%) respectively and family income per month ranges from 200 - 8000 ETB: - (Table 1).

Table 1: Sociodemographic characteristics of mothers admitted with obstructed labor and normal labor to JMC, November 2020 to September 2021 G.C

Variables		Obstructed labor no=92 No(%)	Normal labor no=92 No(%)	p- value(X ²)
Age Mean age OL 25.05±4.16 Mean age NL 25.2±4.99	15-18	5(5.4)	4(4.3)	0.126
	19-24	36(39.1)	40(43.5)	
	25-29	34(37.0)	28(30.4)	
	30-34	17(18.5)	14(15.2)	
	>=35	0(0.0)	6(6.5)	
Ethnicity	Oromo	80(87.0)	82(89.1)	0.462
	Amhara	2(2.2)	3(3.3)	
	Kefa	6(6.5)	2(2.2)	
	Dewaro	2(2.2)	2(2.2)	
	Tigire	0(0.0)	2(2.2)	
	Others	2(2.2)	1(1.1)	
Religion	Muslim	67(72.8)	73(79.3)	0.562
	Orthodox	16(17.4)	10(10.9)	
	Protestant	8(8.7)	7(7.6)	
	Waaqeffataa	1(1.1)	2(2.2)	
	Others	0(0.0)	0(0.0)	
Residence	Urban	28(30.4)	64(69.6)	0.000
	Rural	64(69.6)	28(30.4)	
Educational status	Up to primary education	60(65.2)	63(68.5)	0.000
	Secondary and above	32(34.8)	29(31.5)	
Marital status	Single/Divorced/ Widowed	3(3.3)	7(7.6)	0.083
	Married	89(96.7)	85(92.4)	
Occupational status	Housewife	60(65.2)	68(73.9)	0.017
	Government employee	7(7.6)	5(5.4)	
	Student	2(2.2)	3(3.3)	
	Farmer	14(15.2)	2(2.2)	
	Merchant	4(4.3)	11(12.0)	
	Others	5(5.4)	3(3.3)	
Monthly income in birr	<1000	11(12.0)	3(3.3)	0.482
	1000-4999	67(72.8)	75(81.5)	
	>=5000	14(15.2)	14(15.2)	

5.2 Obstetric related characteristics:

The finding of this study shows that most of mothers with obstructed labor 35(38.0%) were primigravida and most of mothers with normal labor 57(62.0%) were gravida II to IV. With regard to ANC service almost two third of mother with normal labor 55 (60.4%) and one third of mothers with obstructed labor 33(36.7%) had four and above ANC visit. Majority of mothers with obstructed labor 71(83.5%) had ANC follow up at health center and half of mothers with normal labor 42(49.4%) had ANC follow up at Hospital level.

For the mothers with obstructed labor and normal labor the average total duration of labor is 18.48hrs and 8.53hrs respectively. The average duration of laboring at home for obstructed labor and normal labor was 5.74hrs and 4.44hrs respectively. No statistically significant difference between obstructed labor and normal labor. Most of mothers with normal labor 41(44.6%) were laboring at home and most of mothers with obstructed labor 82(89.1%) were laboring at health institute. There were 33(35.9%) mothers with obstructed labor laboring for more than 24hrs and no mothers with normal labor laboring for more than 24hrs. Non vertex fetal presentation for mother with obstructed labor are 30(32.6%) and mothers with normal labor are only 8(8.7%).

Most of mothers with obstructed labor 86(93.5%) were referred, from Hospital accounts 55(64%) and most of mothers with normal labor 65(70.7%) are came from home. Almost all mode of delivery in mother with obstructed labor 91(98.9 %) was abdominal from this cesarean delivery, uterine repair and hysterectomy accounts 84(90.2%), 6(6.5%) and 2(2.2%) respectively. Most of mothers with normal labor gave by spontaneous vaginal delivery, instrumental vaginal delivery and abdominal delivery accounting for 72(78.3 %), 5(5.4%) and 15(16.3%) respectively. The average fetal weight among mothers with obstructed labor and normal labor are 3369.65gm and 3259.71gm respectively. Mothers with obstructed labor 36(39.1%) unlike normal labor only 6(6.5%) were came from more or equal to 50 km from JMC: - (Table 2).

Table 2: Obstetric related characteristics among mothers with obstructed labor and normal labor admitted to JMC, November 2020 to September 2021 G.C

Variables		Obstructed labor N=92	Normal labor N=92	p-value (X ²)
		No(%)	No(%)	
Gravidity	I	35(38.0)	24(26.1)	0.004
	II-IV	35(38.0)	57(62.00)	
	≥V	22(23.9)	11(12.0)	
ANC Follow up	NO	3(3.3)	1(1.1)	0.312
	YES	89(96.7)	91(98.9)	
Place of ANC Follow up	Health center	71(77.2)	44(47.8)	0.000
	Hospital or private clinic	19(22.8)	47(52.2)	
Frequency of ANC follow up	<4	57(63.3)	36(39.6)	0.000
	≥4	33(36.7)	55(60.4)	
GA in wks	≤ 36.6	23(25.0)	19(20.7)	0.744
	37-41.6	66(71.7)	69(75.0)	
	≥ 42	3(3.3)	4(4.3)	
Total duration of labor in hrs	>12	66(71.7)	15(16.3)	0.000
	≤ 12	26(28.3)	77(83.7)	
Total duration of labor at home in hrs	≤ 6	66(71.7)	72(78.3)	0.307
	> 6	26(28.3)	20(21.7)	
Place of laboring	Home	10(10.9)	41(44.6)	0.000
	Healthy institute	82(89.1)	51(55.4)	
Reason for laboring for more than 24h	Lack of decision to go at health facility	12(36.4)	0(0.0)	
	Lack of access trans, money, health facility	10(30.3)	0(0.0)	
	Lack of timely care at health facility	11(33.3)	0(0.0)	
Place of referral	Health center	31(36)	22(81.5)	0.000
	Hospital	55(64)	5(18.50)	
Fetal presentation	Non vertex	30(32.6)	8(8.7)	0.000
	Vertex	62(67.4)	84(91.3)	
Distance from JMC in KM	≥50	36(39.1)	6(6.5)	0.000
	<50	56(60.9)	86(93.5)	
Mode of delivery	Abdominal	91(98.9)	15(16.3)	0.000
	vaginal	1(1.1)	77(83.7)	
Type of abdominal delivery	C/D	84(90.2)	15(16.3)	0.490
	Uterine repair	6(6.5)	0(0.0)	
	Hysterectomy	2(2.2)	0(0.0)	

5.3 Maternal outcome among obstructed labor and normal labor:

Of the total mothers with obstructed labor and normal labor admitted to labor ward 62(67.7% %) & 86(93.5%) of them had favorable maternal outcome and 30 (32.6 %) & 6(6.5%) of them developed at least one maternal complication (unfavorable maternal outcome) respectively. The most common maternal complications in obstructed labor were PPH 15(16.3%), Puerperal sepsis 11(12.0%), uterine rupture 7(7.6%), foot drop 5(5.4%) and bladder rupture 4(4.5%). The other complications were postpartum psychosis 2(2.2%), obstetrics fistula 1(1.1%) and surgical site infection 2(2.2%). All mothers with normal labor and 87(94.6%) mothers with obstructed labor were alive and without sequel on the 7th day of postpartum or postoperative. There were five (5.4%) mothers with obstructed labor alive with sequel like obstetric fistula and foot drop on the 7th day of postpartum or postoperative. Only one (1.1%) cases of mothers with obstructed labor were admitted to ICU and she was transferred to maternity ward and discharged improved. No normal labor group were admitted to ICU. During the follow up first seventh days of postpartum/postoperative there were 22(23.9%) of obstructed labor and 4(4.3%) of normal labor developed at least one complication. No mothers with obstructed labor and normal labor were complicated by maternal death. The total average duration of Hospital stay was 1day in mothers with normal labor and 8 days for mothers with obstructed labor. The maximum duration of Hospital stay was 9 days and 25 days for controls and cases respectively: - (Table 3).

Table 3: maternal outcome among mothers with obstructed labor and normal labor admitted to labor ward, JUMC, November 2020 to September 2021 G.C

Variables		Obstructed labor N=92	Normal labor N=92	p-value (X ²)
		No(%)	No(%)	
Maternal complication	Yes	30(32.6)	6(6.5)	0.000
	No	62(67.4)	86(93.5)	
Types of maternal complications	PPH	15(16.30)	3(3.3)	0.003
	Puerperal sepsis	11(12)	2(2.2)	0.010
	Uterine rupture	7(7.6)	0(0.0)	
	Bladder rupture	4(4.3)	0(0.0)	
	Foot drop	5(5.4)	0(0.0)	

	Surgical site infection	2(2.2)	2(2.2)	1
	Postpartum psychosis	2(2.2)	0(0.0)	
	Obstructed fistula	1(1.1)	0(0.0)	
ICU admission	Yes	1(1.1)	0(0.0)	
	No	91(98.9)	92(100.0)	
Duration of hospital stay in days Mean OL=8.18 Mean NL=1.14	≥7	64(69.6)	1(1.1)	0.000
	<7	28(30.4)	91(98.9)	
Condition of mother on 7 th day-postnatal	Alive without complication	87(94.6)	92(100)	
	Alive with sequel	5(5.4)	0(0.0)	

5.4 Perinatal outcome among neonates born to mothers with obstructed labor and normal labor:

Most of the neonates were in the normal birth weight, macrosomic, and low birth weight (1500-2499 gm) in 84(91.3%) vs. 86(93.5%), 7(7.6%) vs. 5(5.4%), and 1(1.1%) vs. 1(1.1%) of birth from obstructed labor and normal labor respectively. All (100%) neonates of birth from normal labor their APGAR score ≥ 4 at 1st minute & 7(8.2%) of the neonates with obstructed labor had low APGAR score < 4 at 1st minutes and there were born from obstructed labor 72 (78.3%) and normal labor 10(10.9%) had APGAR score less than 7 at 1st minute. All neonates of normal labor had APGAR score ≥ 7 and 23(27.1%) neonates of OL had low APGAR score less than 7 at 5th minutes. There were 7(8.2%) obstructed labor of neonates ended up in ENND while on resuscitation after delivery at the labor suit but no neonates in normal labor ended up in ENND before they are transferred to NICU.

A total of 44(47.8%) and 8(8.7%) neonates of obstructed labor and normal labor were admitted to NICU respectively. PNA 20(21.7%), EONS 14(15.2%), MAS 14(15.2%), Birth trauma 15(16.3%) and pathologic jaundice 4(4.3%) were the most common indication for NICU admission in obstructed labor while EONS 3(3.3%), PNA 1(1.1%), MAS 1(1.1%) and Birth trauma 1(1.1%) in normal labor. Twelve (13.0 %) & one (1.1%) of obstructed labor and normal labor neonates admitted to NICU were complicated by ENND respectively. From NICU admission

neonates of obstructed labor 37(40.2%) discharged improved and two neonates discharged alive with sequel later at 7th day of life one of them complicated with ENND. A total of 20(21.7%) & 1(1.1%) neonates of obstructed labor and normal labor were developed ENND respectively. The average duration of NICU stayed were 5.7days & 3days in obstructed labor and normal labor respectively: (Table 4).

Table 4: Perinatal outcome among neonates born to mothers with obstructed labor and normal labor admitted to labor ward, JMC, November 2020 to September 2021 G.C

Variables		Obstructed labor N=92	Normal labor N=92	p-value (X ²)
		No(%)	No(%)	
Sex	Male	55(59.8)	54(58.7)	0.881
	Female	37(40.2)	38(41.3)	
Birth weight in gram	1500-2499	1(1.1)	1(1.1)	0.02
	2500-3999	84(91.3)	86(93.5)	
	≥ 4000	7(7.6)	5(5.4)	
1 st min. APGAR score	<7	72(78.3)	10(10.9)	0.000
	≥ 7	20(21.7)	82(89.1)	
5 th min. APGAR score	<7	23(25.0)	0(0.0)	
	≥ 7	69(75.0)	92(100)	
Neonatal complications	Yes	51(55.4)	8(8.7)	0.000
	No	41(44.6)	84(91.3)	
NICU admitted	YES	44(47.8)	8(8.7)	0.000
	NO	48(52.2)	84(91.3)	
Admission diagnosis at NICU	EONS	14(15.2)	3(3.3)	0.005
	PNA	20(21.7)	1(1.1)	0.000
	MAS	14(15.2)	1(1.1)	0.000
	Birth trauma	15(16.3)	1(1.1)	0.000
	Pathological jaundice	4(4.3)	0(0.0)	
	Others	5(5.4)	5(5.4)	1
Condition of neonate at time discharge	Discharged improved	37(72.5)	7(87.5)	0.536
	Discharged alive but with sequel	2(4.0)	0(0.0)	
	Complicated with ENND	12(23.5)	1(12.5)	
Neonatal condition at 7 th day life	Alive without sequel	69(75)	91(98.9)	0.000
	Alive with sequel	3(3.3)	0(0.0)	
	Complicated with ENND	20(21.7)	1(1.1)	

5.5 factors predicting obstructed labor

Place of residence, educational status, occupational status, number of ANC follow up, place of ANC follow up, Gravidity, total duration of labor(>12hrs), place of labor, fetal presentation, mode of delivery and Distance of mothers residence from JMC (≥ 50 km) were variables identified as candidate on chi-square test (P-value <0.05) all candidate variables then entered to bivariate logistic regression analysis and then all variables with P-value <0.25 are fitted into the final multivariate logistic regression analysis model using enter method to identify independent factors affecting the maternal outcome or expose to develop obstructed labor.

Rural residence, below secondary educational status, distance more than 50kms far from JMC and duration of labor more than 12hrs and laboring at home had shown strong association with obstructed labor.

Mothers those came from rural area had 3 times more likely to have obstructed labor than those who came from urban area (AOR 3.095 95% CI 1.24, 7.68). Those mothers who had primary education and below had almost 3 times more likely to have obstructed labor than those mother of their education was secondary education or above (AOR 3.034, 95% CI 1.19,7.68). Mothers those came more than 50kms far from JMC were 5 times risk to develop obstructed labor than those came from near distance (<50 km) (AOR 5.348 95% CI: 1.57, 18.17). Duration of labor more than 12hrs had increased the risk of develop obstructed labor by more than 11 -fold compared with having duration of labor less than 12hrs (AOR 11.237 95% CI 4.44,28.43). Mothers those laboring in the home were 4 times high likely to develop obstructed labor than those mothers laboring at healthy facility (AOR 4.350 95% CI 1.58,11.97): (table 5)

Table 5: factors predicting obstructed labor November 2020 to September 2021
G.C

Variables		Obstructed labor N=92 No (%)	Normal labor N=92 No (%)	COR(95% CI)	AOR(95% CI)	P-value
Residency	Urban	28 (30.4)	64(69.6)	1	1	
	Rural	64 (69.6)	28(30.4)	5.224(2.788,9.790)	3.095(1.247,7.681)	0.015*
Educational Status	Up to primary	60 (65.2)	63(68.5)	2.797(1.344,5.823)	3.034(1.198,7.686)	0.019*
	Secondary and above	32 (34.8)	29(31.5)	1	1	
Frequency of ANC FF up	<4	57(63.3)	36(39.6)	2.639(1.448,4.810)	1.423(0.447,4.535)	0.551
	≥4	33 (36.7)	55(60.4)	1	1	
Place of ANC FF up	Health center	71 (77.2)	44 (47.8)	3.992(2.0.79,7.663)	1.599(0.608,4.208)	0.341
	Hospital	19 (22.8)	47 (52.2)	1	1	
Duration of labor in hrs	>12	66 (71.7)	15(16.3)	13.031(6.371,26.651)	11.237(4.441,28.433)	<0.001**
	≤12	26 (28.3)	77(83.7)	1	1	
Fetal presentation	Non vertex	30 (32.6)	8 (8.7)	5.08(2.180,11.841)	1.337(0.443,4.033)	0.606
	Vertex	62 (67.4)	84(91.3)	1	1	
Distance from JMC in km	≥50	36 (39.1)	6 (6.5)	9.107(3.601,23.031)	5.348(1.574,18.178)	0.007*
	<50	56 (60.9)	86(93.5)	1	1	
Place of laboring	Home	10(10.9)	41(44.6)	0.152(0.07,0.329)	4.350(1.581,11.975)	0.004*
	Health facility	82(89.1)	51(55.4)	1	1	

5.6 Factors affecting maternal outcomes

Out of 184 laboring mothers, 36(19.6%) of them had developed at least one maternal complication. Place of residence, education, number of ANC follow up, place of ANC follow up, total duration of labor(>12hrs), place of labor, fetal presentation, admission diagnosis, mode of delivery, and Distance of mothers residence from JMC (≥ 50 km) were variables identified as candidate on chi-square test (P-value <0.05) all the above candidate variables then entered to bivariate logistic regression analysis and then all variables had with P-value <0.25 are fitted into the final multivariate logistic regression analysis model using enter method to identify independent factors affecting the maternal outcome.

Rural residence, non-vertex fetal presentation and admitted with diagnosis of obstructed labor had shown strong association with to have at least one maternal complication.

Out of 36 mothers those developed at least one maternal complication 30(83.3%) of them came from rural area. Mothers those came from rural area had 3 times more likely to have at least one maternal complication than those who came from urban area (AOR 3.57 95% CI 1.16, 11.00). Almost half 19(52.8%) of the mothers who developed complications, their fetal presentation was non vertex. Those mothers with their fetal presentation was non vertex were 4.5 times risk to develop at least one maternal complication than those fetal presentation was vertex (AOR 4.725 95% CI: 1.85, 12.05). mothers those admitted with a diagnosis of obstructed labor had almost 4 times risk to develop at least one maternal complications (AOR 3.721 95% CI 1.10, 12.51); - (Table 7).

**Table 6: Factors affecting maternal outcomes using bivariate and multivariate regression
November 2020 to September 2021 G.C**

Variables		Maternal complication		COR(95% CI)	AOR(95% CI)	P-value
		Yes	No			
Residency	Urban	6(16.7)	86(58.1)	1	1	
	Rural	30(83.3)	62(41.9)	6.935(2.722,17.673)	3.577(1.163,11.006)	0.026
Frequency of ANC FF up	<4	35(97.2)	110(75.9)	0.090(0.012,0.680)	3.394(0.376,41.329)	0.253
	≥4	1(2.8)	35(23.6)	1	1	
Place of ANC FF up	Health center	31(86.1)	84(56.8)	4.502(1.656,12.244)	1.064(0.304,3.729)	0.923
	Hospital	5(13.9)	61(41.2)	1	1	
Duration of labor in hours	>12	25(69.4)	56(37.8)	3.734(1.706,8.170)	1.222(0.451,3.308)	0.693
	≤12	11(30.6)	92(62.2)	1	1	
Fetal presentation	Non vertex	19(52.8)	19(12.8)	7.588(3.367,17.100)	4.725(1.772,11.843)	0.001
	vertex	17(47.2)	129(87.2)	1	1	
Distance from JMC in km	≥50	15(41.7)	27(18.2)	3.175(1.451,6.947)	0.815(0.300,2.210)	0.688
	<50	21(58.3)	120(81.1)	1	1	
Admission Diagnosis	OL	30(83.3)	62(41.9)	6.935(2.722,17.673)	3.721(1.106,12.519)	0.034
	Normal labor	6(16.7)	86(58.1)	1	1	
Place of laboring	Home	5(13.9)	46(31.1)	0.358(0.131, 0.979)	1.956(0.515, 7.429)	0.325
	Health institute	31(86.1)	102(68.9)	1	1	

5.7 Factors affecting perinatal outcomes:

Out of 184 neonates born, there were 59(32.1%) neonates developed at least one neonatal complication. Place of residence, educational status, gravidity, number of ANC follow up, place of ANC, duration of labor, place of labor, fetal presentation, distance from JMC, admission diagnosis, mode of delivery and APGAR score at 1st & 5th minutes were variables identified as a candidate variable on chi-square test and then all above variables had P-value <0.05 were entered in to bivariate logistic regression analysis. All variables with P-value of <0.25 are fitted into multivariate logistic regression model using enter method to identify independent factors affecting perinatal outcome.

Type of admission diagnosis and 1st minute APGAR score of the neonate had shown strong association with at least one complication of perinatal outcome.

Out of 59 neonates those who had at least one neonatal complication 51(86.4%) their mothers were admitted with a diagnosis of obstructed labor. Mothers who were admitted to labor ward with diagnosis of obstructed labor had 5 times more likely to have at least one neonatal complication compared to normal labor (AOR 5.458 95% CI 1.70, 17.43). From those neonates who developed at least one neonatal complication 50(84.7%) were born with low APGAR score (<7). Having low APGAR score at 1st minute less than 7 had almost 8 times more likely to have at least one perinatal complication than those neonates having APGAR score greater than or equal to 7 (AOR 7.720 95% CI 2.41,24.66): - (Table 7).

**Table 7: Factors affecting neonatal outcomes using bivariate and multivariate regression
November 2020 to September 2021 G.C**

Variables		Neonatal complications		COR(95% CI)	AOR(95% CI)	P-value
		Yes	No			
Residency	Urban	21(35.6%)	71(56.8%)	1	1	0.366
	rural	38(64.4%)	54(43.2%)	2.379(1.255,4.511)	1.580(0.586,4.254)	
Distance from JMC by km	≥ 50	23(39.0)	19(15.2)	3.531(1.726,7.224)	1.255(0.473,3.324)	0.648
	< 50	36(61)	105(84.0)	1	1	
Frequency of ANC FF up	<4	53(94.6)	92(73.6)	6.337(1.854,21.665)	1.501(0.292,7.710)	0.627
	≥4	3(5.4)	33(26.4)	1	1	
Place of ANC FF up	Health center	46(82.1)	69(55.2)	3.733(1.730,8.058)	1.649(0.562,4.842)	0.363
	hospital	10(17.9)	56(44.8)	1	1	
Duration of labor in hrs	>12	40(67.8)	41(32.8)	4.313(2.226,8.358)	1.632(0.580,4.592)	0.353
	≤12	19(32.2)	84(67.2)	1	1	
Fetal presentation	Non vertex	21(35.6)	17(13.6)	3.511(1.677,7.348)	1.134(0.435,2.956)	0.797
	vertex	38(64.4)	108(86.4)	1	1	
Admission diagnosis	Obstructed labor	51(86.4)	41(32.8)	13.061(5.675,30.062)	5.458(1.709,17.433)	0.004
	Normal labor	8(13.6)	84(67.2)	1	1	
1 st min. APGAR Score	<7	50(84.7)	32(25.6)	16.146(7.143,36.494)	7.720(2.416,24.667)	0.001
	≥7	9(15.3)	93(74.4)	1	1	
5 th min. APGAR score	<7	14(23.7)	9(7.2)	4.010(1.622,9.916)	1.303(0.443,3.832)	0.631
	≥7	45(76.3)	116(92.8)	1	1	

CHAPTER SIX- DISCUSSIONS

6: DISCUSSION

Maternal mortality from obstructed labor is largely the result of ruptured uterus or puerperal infection, whereas perinatal mortality is mainly due to asphyxia. Significant maternal morbidity is associated with prolonged labor, since both postpartum hemorrhage and infection are more common in women with prolonged labor. Obstetric fistulas are long term problems. Traumatic delivery affects both mother and child (8).

Most mothers with obstructed labor, 39.1% and 43.5% with normal labor were aged between 19 to 24yrs and their mean age of 25.05 ± 4.16 & 25.2 ± 4.99 respectively. Majority of obstructed labor mothers, 69.6% resided in rural areas and 69.6% of normal labor resided in urban areas. In Two third, 65.2% of cases, their educational status is only up to primary education. These findings are similar with the research done at Eastern Uganda that showed respondents were generally young with a mean age of 24.5 ± 6 years, majority of respondents resided in rural areas 84% with no formal education 89% (11). Mothers who came from rural area were strongly associated to develop obstructed labor and at least one maternal complication than those who came from urban area (AOR 3.095 95% CI 1.24, 7.68) and (AOR 3.239 95% CI 1.06, 9.83) respectively. The reason could be due to the fact that mothers who lives in rural areas are less access to health facility earlier when compared to urban areas. Another reason could be lack of transportation. Mothers whose educational status below secondary education were strongly associated with obstructed labor (AOR 3.034, 95% CI 1.19,7.68). This is due to low educational level lack importance and awareness of health care. Other reason low educational status women were fail to facilitate financial for transportation. It is similar research done at Amhara 197 (72.9%) of participants were educational status below secondary and statically significant. It is consistent with studies conducted in Adama, Ethiopia, Amhara, Ethiopia, Uganda(11,15,16).

Most (93.5%) of obstructed labor came through referral form mainly (64%) from hospital and only 6.5% came from directly from home. Most mothers (93.5%) with normal labor came from within 50kms from JMC unlike of 39.1% of mothers with obstructed labor came from distance greater than 50 kilometers. The other most crucial variable which significantly associated with

obstructed labor was distance (AOR 5.348 95% CI: 1.57, 18.17). The result of this studies is similar with research conducted in Ethiopia (14,15,25). The reason may be because women who came from the remote area may be delayed to reach the health facility, and risk factors may not be identified early. Another reason could be due to no availability of maternal waiting area in Jimma town. As duration of labor prolong complication arise and increase unless it intervened.

According to the present study almost all obstructed labor 97.8% & normal labor 98.9% respondents attended at least one ANC visit, all of the cases and most of controls 91.6% in public health facilities. Only 36.7% mothers with obstructed labor unlike 60.4% normal labor had more than four times ANC visits. Similar research done at eastern Uganda almost all 99% respondents attended at least one ANC visit, mostly 96% in public health facilities (11). Study done at Amhara region, Ethiopia 159 (64.7%) had 4 or more ANC visit, showed higher when compared to present study(15). Reason may study area. Having ANC follow up and frequent ANC visit may be counseling on birth preparedness were reduce contribution to obstructed labor which was seen in our study when compare to normal labor but it is not statically significant.

In present study the mean time of total duration of labor for obstructed labor and normal labor was 18.48 ± 7.38 _hrs and 8.53 ± 3.8 _hrs respectively. But mean time of total duration laboring at home for both group have almost similar (5.74 ± 4.35 hrs Vs 4.44 ± 3.43 hrs). There were 35.9% mothers with obstructed labor laboring for more than 24hrs. research done at Suhul General Hospital, Ethiopia only 8.3% mothers with obstructed mothers laboring for more than 24hrs(14). This big difference is could be type hospital study takes place. Comparable with done at Adama, Ethiopia and Halaba southern Ethiopia(6,16). Total duration of laboring mother is one the highly significant associated factors which lead to develop obstructed labor (AOR 11.237 95% CI 4.44,28.43). This is again supported by a research done in Adama which revealed that mothers who were laboring for more than 24_hrs were more likely to experience obstructed labor compared with those mothers who were laboring less than 24_hrs. The reason may be poor referral system. The second reason could be inappropriate applying of partograph. Another reason long time of laboring mothers without intervention were higher risk to develop more complications for both mother and neonate. It can be due to failure to do emergency C/S at primary or general Hospital.

The present study the route of delivery for obstructed labor were Caesarean section, uterine repair, hysterectomy and SVD were 90.2%, 6.5%, 2.2% and 1.1% respectively compare to mothers with normal labor most (70.3%) of them route of delivery was SVD then followed by caesarean section and instrumental delivery were 16.3% and 5.4% respectively. Research done at People's College of Medical Sciences and Research Centre, Bhopal, Madhya Pradesh, India all cases of obstructed labor delivered by caesarean section. (100%). There was no maternal mortality (13). Study done at Nigeria teaching Hospital revealed that Cesarean section delivery was performed on 80.98% of the women with obstructed labor, however, only 3.90% of the non-obstructed labor had cesarean section. Other methods of delivery in women with obstructed labor included laparotomy (14.14%) and destructive delivery (4.88%)(12). Research done at Amhara region, Ethiopia regarding the route of delivery most of the cases gave birth by C/D without tubal ligation were 65.2%, C/D with tubal ligation 17.4%, hysterectomy 10.4%, destructive 4.8%, SVD 1.5% and instrumental delivery in 0.7%(15). In the present study destructive were not done because IUFD was not confirmed before operation. Caesarean section was higher up but hysterectomy and uterine repair was lower than research done at Nigeria, Amhara Ethiopia(12,15). Reason may be emergency cesarean section which is usually indicated when the fetus is alive was the most common intervention done to relieve obstructed labor.

Regarding maternal outcome, 30(32.6%) and 6(6.5%) of the obstructed labor and normal labor respectively had at least one complication. The most complications occurred with obstructed labor were PPH in 15(16.3 %) followed by puerperal sepsis in 11(12%), uterine rupture in 7 (7.6%), foot drop in 5(5.4%), bladder rupture in 4(4.3%) and 2(2.2%) as well as for both SSI and postpartum psychosis and obstetric fistula there were 1(1.1%) unlike mothers with normal labor only 3.3% PPH, 2.2% Puerperal sepsis and 2.2% SSI. On the 7th day of postoperative or postpartum all mothers with normal labor and 94.6% of mothers with obstructed labor are alive without sequel and 5.4% of mothers with obstructed labor are alive with sequel like foot drop and obstetric fistula. No maternal death from both group during study period. Similar study done at Nigeria Teaching Hospital revealed that Maternal complications were observed among 37.56% of the women with obstructed labor compared to 4.39% in women without obstructed labor. There were 2 cases of maternal death, giving a case fatality rate of 0.98%. The common morbidities observed in this study were wound sepsis, ruptured uterus, and puerperal sepsis, in 16.57%, 13.17%, and 7.81%, respectively(12). Unlike to this research done in Suhul general Hospital show that 88.6% of the

mothers with obstructed labor of them had developed at least one complication. Postpartum hemorrhaged 28.4, puerperal sepsis 28.4% and uterine rupture (25%) were the main maternal complications among the mothers with obstructed labor and other bladder injury 18.2%, VVF 9.1%, cervical tear 4.5% and death 2.3% at Suhul , Shire (14). Study done in India revealed that 50.5% cases had some kind of complication during postnatal period; about 32% had developed fever during postoperative period 12.5% cases had wound sepsis and 6% of cases required re-suturing of wound during postoperative period at India (13). In the present study the most three complications were PPH, Puerperal sepsis, and uterine rupture which are similar to study done showed above Nigeria teaching Hospital, India, Amhara region(12,13,15). Those mothers admitted with diagnosis of obstructed labor had almost 4 times more likely to develop at least one maternal complications (AOR 3.721 95% CI 1.10, 12.51). The reason may be that women with obstructed labor had been in labor for longer periods after rupture of membrane leading to ascending infection. Repetitive pelvic examination done to manage the cases could also increase the risk of puerperal sepsis. Uterine muscles fail to contract due to exhausted after prolonged obstructed labor increasing risk of PPH. Another complication of obstructed labor like uterine rupture could have increased rate of PPH in obstructed labor cases. Another reason could be due to the late arrival to the hospital after onset of labor, as most obstructed labor (71.7%) arrived more than 12 h after the onset of labor. Research done at Amhara region showed that 17.8% of obstructed labor and 8.1% of non-obstructed labor were non-vertex(15). In the present study revealed that non vertex fetal presentation for mother with obstructed labor are 32.6% and mothers with normal labor are only 8.7%. Similarly research done at Amhara region showed that 17.8% of obstructed labor and 8.1% of non-obstructed labor were non-vertex(15). Mothers those their fetal presentation non vertex had statistically significant to develop at least one maternal complication (AOR 4.725 95% CI 1.85, 12.05). the reason may be non-vertex fetal presentation was not detected during early labor. The second reason could be non-vertex fetal presentation were not referred to better healthy facility after last month of pregnancy during ANC follow up.

In this study most 51(55.4%) of the neonates of obstructed labor and 8 (8.7%) of neonates of normal labor had developed at least one complication of perinatal outcome. In this study there were almost half (47.8%) neonates of obstructed labor and 8.7% neonates of normal labor were admitted to NICU. Most obstructed labor (78.3%) neonate was low APGAR score <7 at 1st minute of delivery. One fourth (25%) of neonates of obstructed labor were low APGAR score (<7) at 5th

minute. The most common perinatal complications with obstructed labor were PNA in 20 (21.7%), EONS 14 (15.2%), MAS in 14 (15.2%) Birth trauma in 15 (16.3%), and pathological jaundice in 4 (4.3%) in the other hand neonates birth from normal labor complicated were EONS in 3 (3.3%), PNA in 1 (1.1%) and Birth trauma 1(1.1). Totally 20(21.7%) of neonates' birth from obstructed labor and 1 (1.1%) neonates birth from normal labor were complicated to ENND until the 7th day of life. Perinatal mortality rate among obstructed labor and normal labor were 217.4/1000 and 11/1000 respectively. Research done at Tertiary Hospital India revealed that 16% of neonates born to obstructed labor mother had APGAR score less than 7 at 5 minutes of birth. Of the total babies delivered to mothers with obstructed labor 44% of babies required NICU admission in Tertiary Hospital India (13). Research done at Nigeria teaching Hospital showed that cases of obstructed labor 28.78% babies were delivered with an Apgar score of <7 at 5-min compare to 10.73% of the non-obstructed labor. Seventy perinatal deaths (34.15%) were recorded in patients that had obstructed labor as against 5 (2.4%) in the non-obstructed labor(12). Study done at Suhul, Shire reported that out of babies born to women with obstructed labor, 93.2% of the have developed at least one complication. 40.9% of the babies were stillbirths or died immediately after delivery. 88.9% of the babies born alive have birth asphyxia (Apgar score of less than 7/10 at first minute) at Suhul ,Shire (14). When compare to this study low APGAR score of <7 at 5th min. slightly lower than Nigeria and higher than research done at India(12,13). Result of most others result was reporting higher number of still birth because of the study design, in others finding result were acceptable, it is between a lot of research done. This study revealed that neonates of obstructed labor had strongly significant association to develop at least one perinatal complications than those neonates normal labor (AOR 5.458 95% CI 1.70,17.43). Having low APGAR score <7 at 1st min. had strong association with to develop at least one perinatal complication; (AOR 7.720 95% CI 2.41,24.66). The reason could be Long time laboring mother without intervention lead asphyxia. Another may be low level of service given at NICU and Scarcity of infrastructure. Perinatal mortality among obstructed labor in this study was higher because may due to level of service given at NICU. The other reason could be infrastructure between country to country.

CHAPTER -SEVEN- CONCLUSION AND RECOMMENDATIONS:

7.1 Conclusion

Among mothers with obstructed labor and normal labor admitted to labor ward and gave birth 67.4% and 93.5% had favorable maternal outcome without complication and 32.6% and 6.5% had at least one maternal complication respectively. The most common maternal complications with obstructed labor were PPH, Puerperal sepsis, uterine rupture, foot drop, bladder rupture, postpartum psychosis and obstetric fistula. Rural residence, non-vertex fetal presentation and admission diagnosis with obstructed labor had statistically significant association with at least one maternal complication. Among mothers with obstructed labor and normal labor admitted to labor ward and gave birth, 55.4% and 8.7% of the neonates had developed unfavorable perinatal outcome with at least one complication and 44.6% and 91.3% had no complication respectively. The five most common neonatal complications were NICU admission, PNA, EONS, ENND and Birth trauma. The PNMR this study was 217 per 1000 total births of obstructed labor and 11 per 1000 total birth of normal labor. Admitted with a diagnosis of obstructed labor and having low APGAR score at 1st minute had shown statistically significant association with at least one perinatal complication.

Rural residence, below secondary educational status, total duration of labor more than 12_hrs, more than 50kms far from JMC and place of laboring had shown statistically significant association with obstructed labor.

7.2 Recommendation:

- Pregnant mothers diagnosed to have non-vertex after term should be referred to better facility for better care. (JMC, Zonal Healthy bureau)
- Create awareness about education (Zonal government)
- Primary and General Hospital should ready to do emergency c/d. (JMC, Zonal Healthy bureau).

- Improving the referral system, and infrastructure to reach health facility that had a capacity to be readiness to manage obstructed labor is recommended. (JMC, Zonal healthy bureau)
- Prepare maternal waiting area for those mothers come from remote area. (JMC, Zonal Healthy bureau, Zonal government)

CHAPTER-EIGHT: Limitation and strength of the study:

8.1 LIMITATION OF STUDYs

- Sample size was small so, difficult to represent entire obstructed labor
- Duration of follow up short only until 7th day
- Most complications of obstructed labor will have occurred after IUFD developed so, difficult represent all

8.2 STRENGTH OF STUDY

- This study includes all obstructed labor with alive fetus admitted to labor ward which prevent bias.
- Study design is cohort which is more reliable
- It is prospective study and outcomes of perinatal and maternal were followed until seven days of postnatal.

Annex I

References

1. Institute for Health Metrics and Evaluation (IHME). Transformative Result: Ending Preventable Maternal Deaths. an Indep Glob Heal Res Cent Univ Washingt. 2017;10–5.
2. Say L, Chou D, Gemmill A, Tunçalp Ö, Moller AB, Daniels J, et al. Global causes of maternal death: A WHO systematic analysis. *Lancet Glob Heal*. 2014;2(6):323–33.
3. Assefa Y, Van Damme W, Williams OD, Hill PS. Successes and challenges of the millennium development goals in Ethiopia: Lessons for the sustainable development goals. *BMJ Glob Heal*. 2017;2(2):1–7.
4. Geleto A, Chojenta C, Taddele T, Loxton D. Magnitude and determinants of obstetric case fatality rate among women with the direct causes of maternal deaths in Ethiopia: A national cross sectional study. *BMC Pregnancy Childbirth*. 2020;20(1):1–10.
5. Daniel Shiferaw 1 * and Sileshi Toma 2 1 2. 2019;5:282–93.
6. Ahmed Abdo R, Halil HM. Magnitude and Factors Associated With Obstructed Labor among Women Delivered at Halaba Kulito Primary Hospital, Halaba Special District, Southern Ethiopia. *J Women’s Heal Care*. 2019;08(01):6–11.
7. Gebresilasea GU, Temesgen WG, Mekdes KG, Negash WA, Mulugeta SS. Feto-maternal outcomes in obstructed labor in Suhul General Hospital, North Ethiopia. *Int J Nurs Midwifery*. 2017;9(6):77–84.
8. Ojaka D, Day WH, Benard R, Dulle F, For H, Degree M, et al. CSOs HSS support proposal. *World Heal Organ*. 2014;
9. Mekonnen W, Hailemariam D, Gebremariam A. Causes of maternal death in Ethiopia between 1990 and 2016: Systematic review with meta-analysis. *Ethiop J Heal Dev*. 2018;32(4):225–42.

10. Roa L, Caddell L, Ganyaglo G, Tripathi V, Huda N, Romanzi L, et al. Toward a complete estimate of physical and psychosocial morbidity from prolonged obstructed labour: A modelling study based on clinician survey. *BMJ Glob Heal*. 2020;5(7):1–9.
11. Musaba MW, Ndeezi G, Barageine JK, Weeks A, Nankabirwa V, Wamono F, et al. Risk factors for obstructed labour in Eastern Uganda: A case control study. *PLoS One*. 2020;15(2):1–14.
12. Bako B, Barka E, Kullima A. Prevalence, risk factors, and outcomes of obstructed labor at the University of Maiduguri Teaching Hospital, Maiduguri, Nigeria. *Sahel Med J*. 2018;21(3):117.
13. Bansal A, Kalra R. Feto maternal outcome in obstructed labor: a tertiary centre study. *Int J Reprod Contraception, Obstet Gynecol*. 2019;8(6):2499.
14. Gebresilasea GU, Temesgen WG, Mekdes KG, Negash WA, Mulugeta SS. Feto-maternal outcomes in obstructed labor in Suhul General Hospital, North Ethiopia. *Int J Nurs Midwifery*. 2017;9(6):77–84.
15. Dile M, Demelash H, Meseret L, Abebe F, Adefris M, Goshu YA, et al. Determinants of obstructed labor among women attending intrapartum care in Amhara Region, Northwest Ethiopia: A hospital-based unmatched case–control study. *Women’s Heal*. 2020;16.
16. Tadesse Gudina A. Magnitude of Obstructed Labor and Associated Risk Factors among Mothers Come for Delivery Service in Adama Hospital Medical College, Oromia Regional State, Central Ethiopia. *J Gynecol Obstet*. 2016;4(3):12.
17. Ayenew AA. Incidence, causes, and maternofetal outcomes of obstructed labor in Ethiopia: systematic review and meta-analysis. *Reprod Health [Internet]*. 2021;18(1):1–14. Available from: <https://doi.org/10.1186/s12978-021-01103-0>
18. Chuma C, Kihunrwa A, Matovelo D, Mahendeka M. Labour management and Obstetric outcomes among pregnant women admitted in latent phase compared to active phase of labour at Bugando Medical Centre in Tanzania. *BMC Pregnancy Childbirth*. 2014;
19. Kauffman E, Souter VL, Katon JG, Sitcov K. Cervical Dilation on Admission in Term Spontaneous Labor and Maternal and Newborn Outcomes. *Obstet Gynecol*. 2016;

20. Hemming K, Taljaard M. Sample size calculations for stepped wedge and cluster randomised trials: A unified approach. *J Clin Epidemiol*. 2016;
21. Abraham W, Berhan Y. Predictors of labor abnormalities in university hospital: Unmatched case control study. *BMC Pregnancy Childbirth*. 2014;
22. J.K. K, P.-O. Ö, E. T, P.K. M, K.O. P. Individual and health facility factors and the risk for obstructed labour and its adverse outcomes in south-western Uganda. *BMC Pregnancy Childbirth*. 2011;
23. SundaAdeoye I. Obstructed Labor in South East Nigeria Revisited: A Multi-Centre Study on Maternal Socio-Demographic and Clinical Correlates. *J Women's Heal Care*. 2014;
24. Fantu S, Segni H, Alemseged F. Incidence, Causes and Outcome of Obstructed Labor in Jimma University Specialized Hospital. *Ethiop J Health Sci*. 2011;20(3):145–51.
25. Fisseha G, Berhane Y, Worku A, Terefe W. Distance from health facility and mothers' perception of quality related to skilled delivery service utilization in northern Ethiopia. *Int J Womens Health*. 2017;9:749–56.

Annex II

Questionnaires

Questionnaire for the study of maternal and fetal outcome of obstructed labor and associated factors at JUMC among pregnant mothers admitted to labor ward and maternity ward

Information sheet and mothers Consent form (English)

Information sheet

Good morning? / Good afternoon? My name is Dr. Misgana Lulu. I am final year of obstetrics and gynecology resident at of Jimma University. I am conducting a study on maternal and perinatal outcome of obstructed labor in JUMC for my partial fulfillment of the requirements for the master degree in Obstetrics and Gynecology. You are chosen to participate in the study. I want to assure you that all of your answers will be kept secret. I will not keep a record of your name or address. You have the right to stop the interview at any time, or to skip any questions that you don't want to answer.

If you agree to participate in the study, interview will take about 15 minutes to complete. Do you have any questions?

Consent form

Do you agree to be interviewed?

Yes No

May I begin the interview now? To be signed by interviewer: I certify that I have read the above consent procedure to the participant.

Signed: _____

Part I Socio demographic status of mothers admitted to labor ward of JMC

1. Card number _____
2. Telephone number _____
3. Age in years _____
4. Ethnicity
 1. Oromo 2. Amhara 3. Kefa 4. Dawaro 5. Tigire 6. Others, specify _____
5. Religion
 1. Muslim 2. Orthodox 3. Protestant 4. Waaqeffataa 5. Others, specify _____
6. Residence
 1. Urban 2. Rural
7. Educational status
 1. Cannot read and write 2. Read and write only 3. Primary education
 4. Secondary education 5. Beyond secondary education
8. Marital status
 1. Single 2. Married 3. Divorced 4. Widowed
9. Occupational status
 1. Housewife 2. Government employee 3. Student 4. Farmer 5. Merchant 6. Other, specify _____
10. Monthly income in birr _____

Part II Obstetric characteristics of laboring mothers admitted to labor ward of JMC

11. Gravidity _____
12. Parity _____
13. ANC follow up
 1. Yes 2. No
14. If you have ANC follow up, where was the place of follow up?
 1. Health center 2. Private clinic 3. Public hospital 4. Private Hospital
15. How many ANC follow up do you have? _____
16. GA in weeks (Use LNMP or Early US or Ballard score) _____
17. What is the total duration of labor in hours? _____
18. Where were you laboring
 1. At Home 2. Health center 3. Hospital 4. Private clinic or Hospital

19. For how long were you laboring at home in hours? _____
20. What were the reasons for prolonged labor if labor lasted ≥ 24 hours in terms of delay models?
1. Lack of decision to go to health facility
 2. Lack of access (no transportation/money/health facility)
 3. Lack of timely care at health facility
21. What was the fetal presentation?
1. Vertex
 2. Breech
 3. Face
 4. Shoulder
 5. Brow
 6. Others, specify _____
22. Was the mother come referred? 1. Yes 2. From Home 3. No
23. If the mother came referred, where is the referral from? 1. Health center 2. Hospital
24. What was the reason for referral? Specify (use the reason for referral noted on the referral paper) _____
25. How far is the residence of the mother from Jimma medical center in kilometers? _____
26. What was the admission diagnosis? Specify
1. AFSOL without obstructed labor
 2. OBSTRUCTED LABOR
27. What was the mode of delivery? 1. SVD 2. Instrumental vaginal 3. Abdominal
28. If the mode of delivery was instrumental vaginal, what instrument was used?
1. Vacuum
 2. Forceps
29. If the delivery was abdominal, what type of abdominal delivery was it?
1. Cesarean section
 2. Laparotomy for uterine rupture followed by hysterectomy
 3. Laparotomy for uterine rupture followed by uterine repair.

Part III perinatal outcome assessment of laboring mothers admitted to labor ward of JMC

30. Fetal birth weight in grams _____
31. Fetal outcome at delivery 1. Alive 2. Stillbirth
32. If the fetus is alive at delivery, what was the APGAR score as 1st and 5th minutes respectively?

33. Sex of the fetus 1. Male 2. Female
34. Was the neonate admitted to NICU? 1. Yes 2. No
35. If the neonate is not admitted to NICU, what was the outcome at 7 days of life? Specify _____

1, Alive without no complication 2, Alive with sequel 3, complicated with ENND

36. If admitted to NICU, what was the admission diagnosis? Specify the likely final diagnosis ___

37. What was the neonatal outcome after being managed at NICU?

1. Discharged improved 2. Complicated by ENND 3. Discharged alive but with sequel,
specify _____

38. For how many days did the neonate stay at NICU? _____

39. What was the neonatal outcome at 7 days of life for neonates discharged from NICU before seven days of life or not discharged at 7 days of life? Specify 1. Alive without complication 2. Alive with sequel 3. Complicated by ENND

Part IV Maternal assessment after delivery to labor ward of JMC

40. Was there any complication after delivery during stay in the hospital? 1. Yes 2. No

41. If there is complication, which one?

1. Surgical site infections (SSIs) 2. PPH 3. Wound dehiscence 4. Puerperal sepsis/
endomyometritis 5. Septic shock with end organ damage 6. Obstetric fistula 7. Others,
specify _____

42. What is the maternal outcome at discharge or seven days postpartum/postop? Specify

1. Alive without complication 2. alive with sequel 3. complicated with maternal death

43. Was the mother admitted to ICU? 1. Yes 2. No

44. If the patient is admitted to ICU, what was the diagnosis at admission? Specify _____

45. What was the maternal outcome after admission to ICU? Specify 1. Discharged improved 2.

Discharged but with sequel 3, complicated with maternal death

46. What was the total duration of hospital stay in days? _____

47. If the maternal complications resulted in maternal death, what was the possible cause of death?

Specify (use the possible cause from the death summary) _____

Part V Postpartum on phone / appointment follow up for discharges before seven days.

48. How is your condition at home (follow the previous questionnaire filled for the mother)?
Specify the report of the mother _____

49. If there is maternal death, ask the details from the family and specify the cause of death _____

50. How is your newborn's condition at home (follow the previous condition of the newborn filled on questionnaire before discharge? Specify _____

51. If there is neonatal death, ask the details from the family and specify the cause of neonatal death _____

Data collector's name _____ Sign _____ Date _____