Maternal Outcome of Operative Vaginal Delivery and associated factors in Nekemte Town Health facilities, East Wollega, Ethiopia.

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Abstract

Background: Operative vaginal delivery (OVD) refers to a vaginal birth in which the operator uses forceps, a vacuum, or other devices to extract the fetus from the vagina, with or without assistance of maternal pushing. Every day in 2017, approximately 810 women died from preventable causes related to pregnancy and childbirth Skilled care before, during and after childbirth can save the lives of women and newborns. In country like Ethiopia, there is insufficient evidence which shows on the maternal outcome of OVD and associated factors. Hence this study is aimed to determine maternal outcome of OVD and associated factors among mother who gave birth in Nekemte town health facilities, East Wollega Zone, Oromia Region, Ethiopia.

OBJECTIVE: The main aim of the study is to determine maternal outcome of operative vaginal delivery and associated factors among mothers who gave birth in Nekemte town health facilities, East Wollega Zone, Oromia Region, Ethiopia.

MATERIALS AND METHODS*:* The study was conducted in Nekemte health facilities and cross-sectional study design was employed. All mothers who had operative vaginal deliveries were included in the study by Consecutive sampling technique until we get 406 mothers. All data was entered into Epi Data manager Version 4.1, and exported to Statistical Package for Social Science (SPSS) Version 26 software and further analysis was performed. Descriptive statistics was used to determine the frequency of dependent and independent variables. Bivariate and multi variable Logistic regression was used to examine the association between dependent and independent variables and variables whose p-value is <0.25 on bivariate analysis was assumed as candidate variable for multiple logistic regression. Finally variables with p<0.05, was fitted in the final model as factors affecting Maternal outcome of OVD. The study was conducted from November 10, 2021-December 25, 2021 and twenty one thousand and nine hundred fifty four Ethiopian Birr will be required to accomplish this study.

Result: Sociodemographic and Economic Characteristics

In the present study 406 mothers was participated making a response rate of 100%. Majority of the respondents (273, 67.2%) was from outside Nekemte town and the rest 133(32.8%) was Nekemte town residents. Majority of the respondents was housewife (353, 86.9%) by their occupation and married by their marital status (396, 97.5%). Respondents mean age was 24.3±3.3 and their average income was 3473.7±1271.01.

Conclusion and discussion: In the current study, the magnitude of unfavorable maternal outcome among mothers who attended operative vaginal delivery was high. High fetal head station during delivery and having a neonatal birth weight of > 4kg was significant predictors of unfavorable maternal outcome and the finding of this study was recommended to nekemte town health facilities to arrange training for performance improvement to reduce death as a result of **ovd.** **Keywords:** Maternal outcome, Operative vaginal delivery, associated factors, Nekemte, Ethiopia.

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First of all, I would like to thank Jimma University student research program office for giving me this golden opportunity to participate in research program and develop my research skill so that I can understand the problem of our society and set forth a solution for now & for the future. I would also like to express my deepest appreciation, heart-full thanks to my advisors Mrs. ALEMI.KEBEDE AND Mrs. BEKELU.TEKA for their great concern, dedication in providing me literature, relevant guidance, suggesting constructive ideas & reviewing the proposal from the beginning of this research proposal. Last but not least I would like to thank my friends who have helped me thought out my work.

ACRONYMS AND ABBREVIATIONS

ANC	Antenatal Care
AOR	Adjusted Odd Ratio
BEOC	Basic Emergency Obstetric Care
CI	Confidence Interval
C/S	Caesarian Section
ICU	intensive care unit
MOH	Minster of Health
MSAF	Meconium Stained Amniotic Fluid
NRFHB	Non-Reassuring Fetal Heart Beat
NPC	Nekemte private clinic
NSH	Nekemte specialized hospital
NHC	Nekemte health center
OVD	Operative Vaginal Delivery
PSOL	Prolonged second stage labor
RR	Relative Risk
SPSS	Statistical Package for Social Science
WUTH	Wollega University Teaching Hospital

CHAPTER ONE: INTRODUCTION

1.1 Background

Most deliveries in health mothers occur spontaneously. Due to different complication the spontaneous vaginal delivery might not be possible and application of extra procedures could be mandatory. In few occasions where the complications are capable to induce surgical options, the application of caesarean section could be indicated. The various fetal and maternal reasons, different procedures that will assist maternal efforts would be applied. These options include the use of forceps and vacuums. Operative vaginal delivery (OVD) refers to a delivery in which the operator uses forceps, a vacuum, or other devices to extract the fetus from the vagina, with or without the assistance of maternal pushing (1).The decision to use an instrument consistent in their occurrence and lead to prolonged labor. In certain critical conditions (genital bleeding, prolapse of the umbilical cord and eclampsia) extraction of the fetus with forceps remains the only condition for fast vaginal delivery and the timing of such an intervention must be in the interests of maternal impacts of the procedure against the alternative options of cesarean birth or expectant management. Asphyxia of the fetus is the most common and a leading indication for OVD .Ineffective uterine contractions and the arrest of the head the baby in the same plane of the pelvis of mother. Operative vaginal deliveries are accomplished by applying direct traction on the fetal skull with forceps or by applying traction to the fetal scalp by means of a vacuum extractor. The indication for operative vaginal delivery performed with either the vacuum extractor or forceps are the same (2–4). The frequency of operative vaginal deliveries is estimated to be 10% of all vaginal deliveries. Most of these are vacuum deliveries with forceps deliveries comprising less than 3% of total deliveries (5). Instrumental vaginal delivery is a key element of essential obstetric care, scaling up its use in resource poor countries through training and supply of appropriate equipment .it is likely to contribute significantly to reduced maternal and new born morbidity or mortality (6). OVD is an ideal alternative to a cesarean delivery in the appropriately chosen patient. Its enhanced use certainly assisted the universal public health goal of reducing cesarean delivery rate, particularly the primary cesarean delivery rate (7). Although it is assumed as an alternative for caesarean delivery, OVD itself is not free of complications. With varying rates of practice, OVD is associated with complications for the mother and fetus.

In developed countries, complication related with instrumental delivery is not significant as a result of advancement in skill on management of instrumental delivery and accessibility of resources. However, in developing countries like Ethiopia, mother and their newborn develop complication and even death due to instrumental delivery. Mostly those problems are avoidable if early interventions are undertaken(8). Complication due to instrumental delivery can be minor complication like laceration of vagina and perineum and major complication associated with traumatic hemorrhage, bladder injury and pelvic muscle injury, to anal and urinary incontinences (9). Fetal complications may range from simple face marks to nerve injury, ocular trauma, intracranial hemorrhage, and cephalohematoma (10). It is found that re-hospitalization was found to be more likely among women with assisted vaginal delivery than among women with spontaneous vaginal delivery. Among women with assisted vaginal delivery, significant increased risks were seen for re-hospitalization with postpartum hemorrhage, obstetrical surgical wound complications, and pelvic injury (11).In developing country there is insufficient evidence generated on maternal outcome of OVD and associated factors to plan appropriate strategies. At present, one woman in 12 will die of maternal causes in Sub-Saharan Africa, compared with one woman in 4000 in northern Europe with perinatal mortality rates of 10 per 1000 live births (12). To reduce the mortality ratio, one of the life-saving services is providing emergency obstetric care at least starting from the health center level. Basic emergency obstetric care (BEOC) is proposed to be delivered at a health center level, whereas comprehensive emergency obstetric care is planned to be carried out at the district hospital level (13). Emergency obstetric operative interventions (caesarean section and instrumental delivery), in conjunction with other life support measures, are considered to be instrumental to avert perinatal as well as maternal deaths.

1.2 Statement of the problem

Every day in 2017, approximately 810 women died from preventable causes related to pregnancy and childbirth. Of this, 94% of maternal deaths occur in low and lower middle-income countries. Skilled care before, during and after childbirth can save the lives of women and newborns (14).

The highest burden of severe maternal morbidity is in Sub-Saharan Africa, where estimates are as high as 198 per 1000 live births. Hemorrhage and hypertensive disorders are the leading conditions contributing to severe maternal morbidity across all regions. Severe maternal

morbidity not only puts the woman's life at risk, her fetus/neonate may suffer consequences of morbidity and mortality as well. Adverse delivery outcomes occur at a higher frequency among women with severe maternal mortality. Reducing preventable severe maternal morbidity not only reduces the potential for maternal mortality but also improves the health and well-being of the newborn (15).In Ethiopia WHO MMR estimation for the year 2006 (850/100,000 live births) was even higher than the estimation for the year 2000 (700/100,000 live births) and this showed maternal change in Maternal Mortality Ratio(MMR) is minimal as well as in significant and still high in Ethiopia(16). The top five causes of maternal mortality in 2013 were other direct maternal causes such as complications of anesthesia, embolism (air, amniotic fluid, and blood clot), and the condition of per partum cardiomyopathy (25.7%), complications of abortions (19.6%), maternal hemorrhage (12.2%), hypertensive disorders (10.3%), and maternal sepsis and other maternal infections such as influenza, malaria, tuberculosis, and hepatitis (9.6%). Most of the maternal mortality happened during the postpartum period and majority of the deaths occurred at the age group of 20–29 years (17).

OVD had increased risk of maternal mortality and morbidity index (at least one of: maternal mortality, admission to intensive care unit [ICU], blood transfusion, hysterectomy, or internal iliac artery ligation) (adjusted odds ratio 2·1) (18).Although operative vaginal delivery may be performed, as infrequently as in 1.5% of deliveries in some countries, it may be as high as 15% in other countries. In the United Kingdom, the rates of instrumental vaginal delivery range between10% and 15%; these rates have remained fairly constant, although there has been a change in preference of instrument. The rate of operative vaginal delivery in 2004 for which complete data were available was only 5.2% in the United States. Obstetric forceps were used in 1.1% of deliveries and 4.1% were delivered via the vacuum extractor. Since 1989, there has been an 80% decrease in the frequency of operative forceps use, steadily falling over 15 years from 5.5% in 1989 to 1.1% in 2004. During this time, the frequency of vacuum extractor procedures peaked in 1997 at 6.2% thereafter decreasing by one third to a level of 4.1% in 2004(19).

Worldwide nearly 600,000 women of reproductive age group die every year as result of complication arise from pregnancy, delivery, and pueperium of these 75%- 80% of the cases are as result of direct complications like: eclampsia(high blood pressure) , postpartum hemorrhage ,

infection(sepsis),unsafe abortion and prolonged/obstructed labor. (20,21). Knowledge on the magnitude of the problem and identification of possible risk factors for maternal outcome related to OVD may reduce the maternal complication. Hence this study is aimed to determine maternal outcome of OVD and associated factors among mothers who gave birth in Nekemte town health facilities, East Wollega Zone, and Oromia Region, Ethiopia.

1.3 Significance of the study

This study will determine maternal outcome of operative vaginal delivery and associated factors among mothers who gave birth in Nekemte Town health facilities, East Wollega Zone, Oromia Region, Ethiopia, 2021. This study will depict the outcomes and predictor variables. Findings from this study will help;

- Local administrators to gain a glimpse of patient outcome in their institution as well as factors associated with it and for planning in future interventions.
- Helpful for governmental, nongovernmental, the hospital administrators and professionals working on mother and child related issue to consider the outcome of the study during their planning and provision of obstetric service.
- The findings can also be used for researchers on further study and problem identification.

CHAPTER TWO: LITERATURE REVIEW

2.1 Maternal Outcome of operative vaginal delivery

A retrospective study conducted in India, found 68.5% of patients requiring forceps application were primigravida. The most common indication was fetal distress (54.2%) followed by maternal exhaustion. The most common maternal complication was extension of episiotomy (10), 1 case of uterine rupture which was in a previous lower segment caesarean section case, 2 complete perineal tears, and 3 cases of vaginal and cervical lacerations. Postpartum hemorrhage requiring blood transfusion occurred in 4 cases. A total of 19 babies had poor Apgar scores and 9 of them needed NICU admission (22).In a retrospective study of 70 consecutive ventouse and 70 consecutive forceps deliveries to compare maternal and neonatal morbidity in terms of perineal laceration, episiotomy extension, postpartum hemorrhage, Apgar score, neonatal injuries and NICU admissions depicted maternal morbidity in terms of periurethral tear, second and third degree perineal tear were significantly more in forceps group ($p=0.0332$ and $p=0.0173$ respectively) (23).Comparison of outcomes between operative vaginal deliveries and spontaneous vaginal deliveries in southeast Nigeria, found an incidence of operative vaginal delivery were 4.7%. The most common indications for vacuum and forceps delivery were prolonged second stage of labor (44.9%) and poor maternal effort (27.8%). The risk of fetal scalp bruises and caput succedaneum was higher for operative vaginal delivery than for spontaneous vaginal delivery, with no significant difference in maternal morbidity. The perinatal mortality rate was 0.9 per 1000 live births (24).In Ethiopia, out of the 2348 pregnant mothers who gave birth in the labor ward of Jimma University Medical Center, 242 (10.3%) were by operative vaginal delivery (OVD). The commonest indication for operative vaginal delivery is found to be non-reassuring fetal heart rate pattern, 136 (56.2%). The proportion of mothers who had favorable outcome among para II-IV mothers and for whom prolonged SSOL is an indication for OVD is higher which is 98.1% and 98.3%, respectively. Based on type of OVD used the proportion of mothers with favorable maternal outcome is almost equal between forceps and vacuum deliveries (95.8%versus 96.0%). Almost all (99.1%) of outlet forceps/vacuum deliveries have favorable maternal outcome. Of all 242 OVDs 8 cases (3.3%) were complicated with PPH and the PPHs were secondary to three uterine atony and five episiotomy extension cases. There

is one case complicated with fourth degree genital tear with no PPH and one maternal death after forceps is applied for shortening of SSOL for cardiac illness and the death is ascribed to be secondary to cardiac arrest (25).It is also found that the incidence of post-partum infection after operative vaginal delivery ranges from 0.7% to 16% and the peak time for post-partum infections is 6–7 days after delivery. The risk of perineal infection is associated with both episiotomies and tears. The most serious post-partum infection is that caused by Group A streptococcus (GAS) which can cause severe sepsis, septic shock and death (up to 60% in septic shock) (26).The occurrence of obstetric anal sphincter injuries was high in vacuum assisted vaginal deliveries than spontaneous deliveries. Obstetric anal sphincter injuries occurred in 2.3% of in OVDs and 1.7% [p = 0.01] in spontaneous vaginal deliveries. (27) Consistent with this study, a risk of anal incontinence in the first year postpartum is associated with operative vaginal delivery, particularly forceps. Operative vaginal delivery also appears to increase the risk of occult anal sphincter injury regardless of the instrument used, it does, increase the risks of perineal pain, postpartum dyspareunia and sexual disorders compared with spontaneous vaginal delivery, particularly in cases of perineal tears (28).

2.2 Factors that associated with maternal outcome of operative vaginal delivery.

In a particular study, type of instrument used for operative vaginal delivery and presence of grade two and grade three meconium stained amniotic fluid are factors associated with maternal outcome while neonatal birth weight is factor affecting maternal outcome of operative vaginal delivery (24).Of 529 operative vaginal deliveries, 79 (14.9%) had higher order perineal lacerations and 14 (2.7%) had a wound breakdown. The only significant risk factor for higher order lacerations was chorioamnionitis; $P< 0.05$). Risk factors for perineal wound breakdown included episiotomy $p < 0.01$ for forceps delivery is high than vacuum with post-partum narcotic use (29). Risk factors for severe lacerations with forceps delivery were identified as birth weight, fetal head station, malrotation and the number of extractions. Obstetric anesthesia may protect against severe lacerations (30).

Conceptual framework

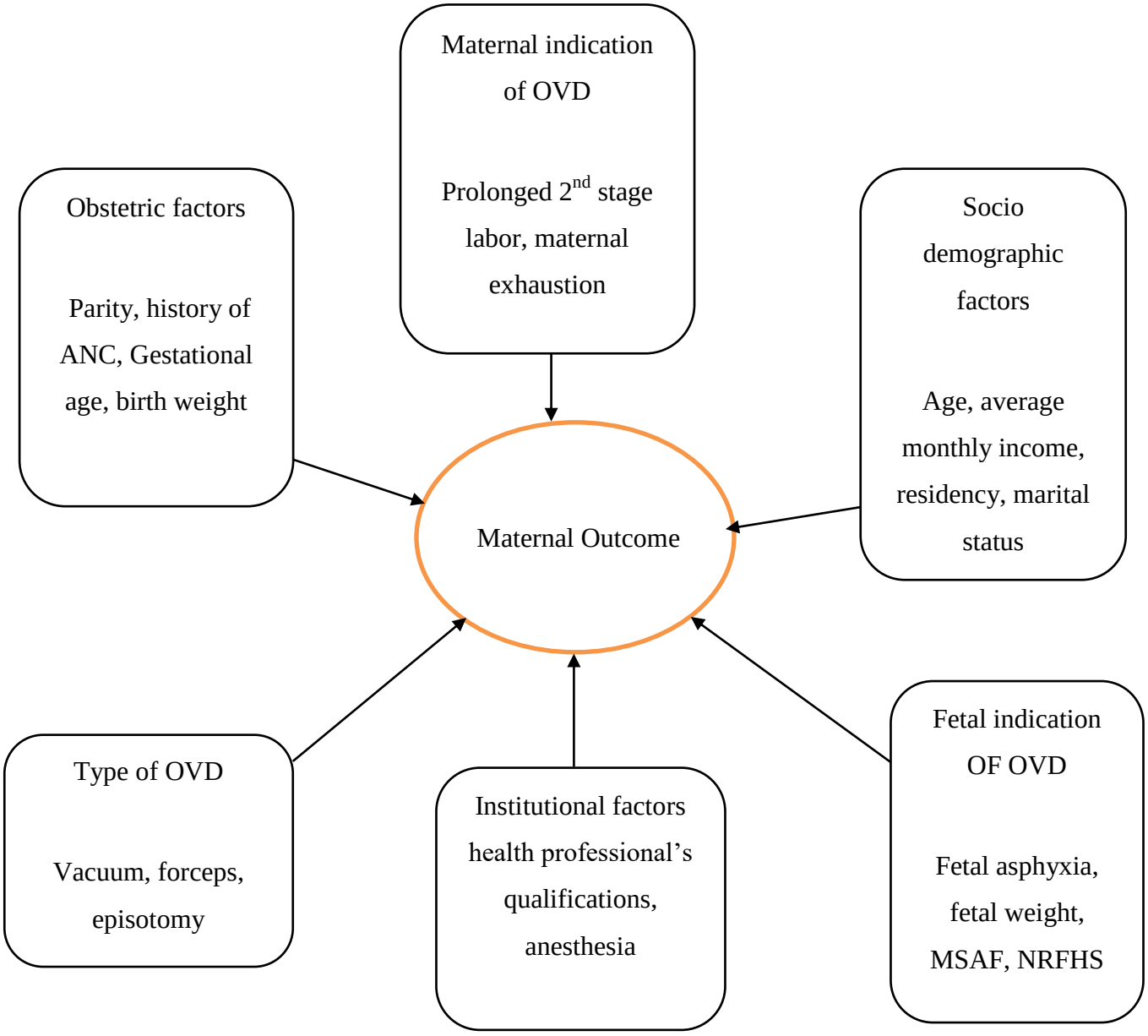

Figure 1 Conceptual framework developed after reviewing different literatures (31).

CHAPTER THREE: OBJECTIVES

3.1 General objective

The general objective of the study is to determine maternal outcome of OVD and associated factors among mother who gave birth in Nekemte Town health facilities, East Wollega zone, Oromia region, Ethiopia 2021.

3.2. Specific objectives

1. To describe magnitude of unfavorable maternal outcome of OVD among mother who gave birth in Nekemte Town health Facilities, East Wollega zone, Oromia region, Ethiopia 2021.

2. To determine Factors Associated with unfavorable maternal Outcome of OVD among mother who gave birth in Nekemte Town health facilities, East Wollega zone, Oromia region, Ethiopia 2021.

CHAPTER FOUR: METHOD AND MATERIAL

4.1 Study area and period

Nekemte town is located in Western parts of Oromia regional state at geographical location of 9°46′N latitude and 36°31′E longitude, with elevation ranging from 1,960 m to 2,170 m altitude. It is located in the Oromia region Ethiopia, 352 km South West of the capital city of Addis Ababa. The health facilities are serving for a total population of over 2 million peoples of Nekemte Town, East Wollega Zone, parts of west Wollega Zone, Horo guduru Wollega Zone and West Shoa Zone. Currently, Nekemte health facilities provide both outpatient and inpatient services. It has medical, obstetrics and gynecology, surgical, and pediatrics ward for the inpatient services. A Nekemte Town health facility has a total of 500 beds among these 100 beds for obstetrics and gynecology ward and also has 99 delivery couches. In these health facilities there are a total number of 295 workers, 195 health professionals and 100 administrative staffs; from the health professionals 4 gynecology, 13 midwifery, 10 clinical nurses, 12 health officer, 14 Bsc nurses in obstetrics and gynecology ward. The study was conducted in 11 selected nekemte town health facilities (Two selected Nekemte health centers, three Nekemte higher clinic, four medium clinics Nekemte specialized hospital, and Wollega University teaching hospital) which are located in East Wollega zone, Nekemte town.The study will be conducted from November10, 2021-December25,2021 in nekemte town health facilities.

4.2 Study design

Cross sectional study design was be employed.

4.3 Population

4.3.1 Source population

All mothers who had operative vaginal deliveries in nekemte town health facilities.

4.3.2 Study population

All mothers who had operative vaginal deliveries in nekemte town health facilities during the study period.

4.4 Inclusion and Exclusion criteria

4.4.1 Inclusion criteria:

All pregnant mothers who had operative vaginal delivery after 28 weak of gestation in nekemte town health facilities.

4.4.2. Exclusion criteria:

Critically ill Mothers but not include OVD cases and mother with critical illness are excluded from the study.

4.5 Sample Size

The sample size is calculated using single population proportion formula for first objective with prevalence of OVD 59.8% which is proportion of mothers who have OVD with complication(32) taken from Felege Hiwot specialized hospital north west Ethiopia, 95% confidence interval and margin error of 5% (D=0.05).

$$\frac{(Z\alpha/2)^2 p(1-p)}{w^2}$$

n = $(1.96)^2$ * 0.598 (1-0.598)/0.05^2

n = 369 and by adding10% non-response rate, the minimum sample size of the study will be 406 for first objective. And for the second objective the sample size is calculated with Epi Info 7 software using the double population proportion formula with the assumptions; 95% confidence interval, 5% margin of error, power of 80%, 1:1 ratio.

S.NO	Variables	Proportion	CI	Ratio	Power	Non response rate	Sample size	Reference
1	Parity(Primi para)	70.5	95%	1:1	80	10%	112	32
2	Residency(Rural)	59.5	95%	1.1	80	10%	212	25
3	Pregnancy induced hypertension	48.6	95%	1:1	80	10%	382	40
4	Fetal distress	56.2	95%	1:1	80	10%	261	25

The calculated samples for both objectives are compared to obtain the maximum sample. Since the sample size calculated by a single population proportion is large, it is taken as a final sample.

4.6 Sampling Technique

Since application of OVD is random case consecutive sampling technique were employed to recruit 406 study participants from total 22 Health facilities in Nekemte town health facilities in which only 11 provide OVD services and these are (NRH, WUTH, two selected nekemte health centers, and seven private for profit health facilities(three higher clinics and four medium clinics) . Finally the study participants will be recruited using Consecutive sampling technique until adequate sample will be obtained.

4.7 Data collection procedure and tool

Data will be collected using face to face exit interviewer administered structured questionnaires and reviewing mothers folder in Nekemte town public health facilities from November 10, 2021-December 25 , 2021. The information retrieved from mothers folder are; anthropometric (BMI), medical (hypertensive disorder during pregnancy),and obstetric related information(parity, GA, fetal asphyxia,MSAF),Institutional related variables(Availability of Anesthesia, Qualification of health professionals , Existing instruments such as Vacuum, Forceps or both), Type of OVD

used (Vacuum, Forceps, Episiotomy) and maternal outcome (Episotomy extension, Cervical laceration, Genital laceration, Vaginal laceration, Infection and Hemorrhage) that cannot be

obtained by interview after document review check lists and Structured questionnaire was developed and adapted after review of relevant literatures and standard text books (33, 34, and 35).The socio demographic variables such as ; Age, Level of education, Income, Residency ,Marital status, Current occupation of the mother, current occupation of the father and Religion will be obtained by interviewing of mothers in nekemte town health facilities.

The questionnaires is translated into local languages (Afan Oromo, Amharic) and then back translated to English by third party (Language teacher) to check its consistency. The data from health facilities will be collected by three nurses. One health officer will supervise the data collectors during the data collection process. All data collectors and supervisor will be selected from other health facilities.

The contents of questionnaires are:

- Socio-demographic characteristics: Questions including information on age, marital status, average monthly income, place of residence and occupation, educational status.
- Medical related variable; Hypertensive disorder during pregnancy.
- Obstetric related variables: Parity, Types of OVD, Weight of new born in gram.
- Indication for instrumental delivery: on reassuring fetal heart beat, maternal exhaustion, prolonged second stage labor, MSAF.
- Maternal complication: Cervical laceration, perineal tear, extended episiotomy, bleeding.
- Institutional related variable: Types of instrument that Health facilities have, availability of Anesthesia, Qualification of health professionals.

4.8 Operational Definitions

1.Operative delivery - Obstetric procedure in which active (operative) measures either abdominal (caesarean delivery) or vaginal are taken to accomplish deliveries (36).

2.Operative vaginal delivery – Applying direct traction on the fetal skull with forceps or vacuum(37).

3.Parity - Number of births (both life birth infants & stillbirth) of at least 28 weeks of gestational age (38).

5.Unfavorable Maternal outcome- Mothers having at least one maternal complication related to instrumental delivery are classified as having unfavorable maternal outcome (perineal tear, cervical laceration, vaginal laceration, episiotomy extension, traumatic hemorrhage (primary PPH), urinary retention, uterine rupture) (39).

6. Favorable maternal outcome- If mother have no complication after OVD it considered as favorable maternal outcome.

4.9 Study variables

Dependent variable

Maternal outcome

Independent variables

- Demographic and socio economic: Age, educational status, average monthly income of the family.
- Medical condition: Hypertension, BMI.
- Obstetric related variables of mothers: Parity, mode of delivery, GA, ANC follow up, types of OVD , status of liqueur, weight of new born in gram.
- Indication for instrumental delivery: Non reassuring fetal heart beat, maternal exhaustion, prolonged second stage labor, MSAF, Abruption placenta.

- Maternal complication: cervical laceration, vaginal laceration, genital tear, perineal tear, extended episiotomy, bleeding, infection.
- Institutional related variable; Qualification of health professional who assisted the mother(Obsteterecian,MD, HO,BSC midwive,BSC nurse), availability of instruments and medication (anesthesia, vacuum, forceps).

4.10. Data management and statistical analysis

The collected data will be manually cleared and checked. All data will be entered into Epi Data manager Version 4.1, and exported to Statistical Package for Social Science (SPSS) Version 26 software and further analysis will be performed. Descriptive statistics will be used to determine the frequency of dependent and independent variables. Bivariate and multivariable Logistic regression will be used to examine the association between dependent and independent variables and variables whose P-value is < 0.25 will be candidate for multivariate analysis. Finally variables whose p-value is <0.05 will be fitted in the final model.

4.11. Quality assurance

After the questionnaire has been prepared, it will be translated in to the local languages. Pretest of data collection tool (questionnaire) will be done in selected Nekemte town private and public health facilities by taking 5% of the total sample size before actual data collection and necessary correction will be done after the pretest prior to the actual data collection period. Adequate training will be given to the data collectors and daily entrance of collected data will be done.

4.13. Ethical clearance

Ethical clearances will be obtained from Jimma University Review Board. Both Written and verbal consent will be obtained from each participant before the study. After getting permission from the study participant, each study participant will be informed about the research, their right to abandon the involvement at any time and confidentiality of information will be maintained

during data collection, analysis, interpretation, and publication of results. Findings will be communicated in aggregated form and individual information will be kept confidentially.

4.12. Plan for dissemination and ensuring utilization of findings.

The research result report will be submitted and presented to Jimma University, the institute of Health, department of population and family health and other local administrator of Nekemte town public and private health facilities. Efforts will be made to present the finding of this study to various national and international conferences, and this work will be published on reputable journals.

CHAPTER FIVE: RESULTS

5.1 Sociodemographic and Economic Characteristics

In the present study 406 mothers were participated making a response rate of 100%. Majority of the respondents (273, 67.2%) were from outside Nekemte town and the rest 133(32.8%) were Nekemte town residents. Majority of the respondents were housewife (353, 86.9%) by their occupation and married by their marital status (396, 97.5%). Respondents mean age was 24.3±3.3 and their average income was 3473.7±1271.01

Table 1*:* Socio-demographic and economic characteristics of the study participants in attending selected nekemte health facilities of Nekemte town, from July-September 2021.

Variables	Category	Frequency	Percentage
Residence	Nekemte town	133	32.8
	Outside of Nekemte town	273	67.2
Educational status	Unable to read and write	16	3.9
	Able to read and write	101	24.9
	1-8	48	11.8
	9-12	77	19.0
	>12	164	40.4
Occupation	Housewife	353	86.9
	Others	53	13.1
Marital status	Married	396	97.5
	Others	10	2.5
Average monthly income	<2000ETB	21	5.2
	2000-3000ETB	182	44.8
	>3000ETB	203	50.0
Age of mothers	<30 years	386	95.1
	>= 30 years	20	4.9

5.2 Clinical Characteristics of Mothers

In the present study in most of the cases indications for OVD was non-reassuring fetal status where it was 179(44.1%) of the cases followed by prolonged second stage labour, 160(39.4%) and maternal exhaustion was the least indication. Almost all of the mothers had history of ANC follow-up (397, 97.8%). Of the mothers who had history of ANC follow-up nearly half (198, 48.8%) of them had four and above visits (table 2).

Table 2*:* Obstetrics related variables characteristics of the study participants attending in selected Nekemte town health facilities, from July-September 2021.

Variables	Category	Frequency	Percentage
Indications for OVD	NRFD	179	44.1
	Prolonged 2nd stage of labor	160	39.4
	Maternal exhaustion	67	16.5
Type of OVD	Vacuum	106	26.1
	Forceps	300	73.9
ANC	Yes	397	97.8
	No	9	2.2
No of ANC visit	No	9	2.2
	One visit	26	6.4
	Two to three visits	173	42.6
	Four and above	198	48.8
GA	Preterm	32	7.9
	Term	335	82.5
	Post-term	39	9.6
Parity	1	100	24.6
	Multiparous	306	75.4
Mode of previous delivery	No	100	24.6
	SVD	31	7.6
	OVD	253	62.3
	CS	22	5.4
Time of application of OVD	on arrival	34	8.4
	followed	372	91.6
Episiotomy	No	376	92.6
	Yes	30	7.4
Gestational DM	Yes	132	32.5
	No	274	67.5
Hypertension	Yes	134	33.0
	No	272	67.0

5.3 Newborn characteristics

Regarding newborn characteristics, almost all (386, 95.1%), 286(70.4%), 352(86.7%) of the newborns were alive, females and between 2500-3999gnm respectively. All most all (394, 97%) of the newborns FHB was in category 3 (table 3).

Table 3*:* Newborn characteristics of the study participants in attending Hospitals of Nekemte town, from July-September 2022.

Variables	Category	Frequency	Percentage
FHB	Category 1	6	1.5
	Category 2	6	1.5
	Category 3	394	97.0
Sex of the newborn	Male	120	29.6
	Female	286	70.4
Fetal status	Alive	386	95.1
	Stillbirth	20	4.9
Weight of new born (gms)	1500-2499	14	3.4
	2500-3999	352	86.7
	>=4000	40	9.9

5.4 Maternal outcome

The outcome variable of the present study was maternal outcome of the OVDs. The prevalence of unfavorable maternal outcome was 21.4% (figure 1).

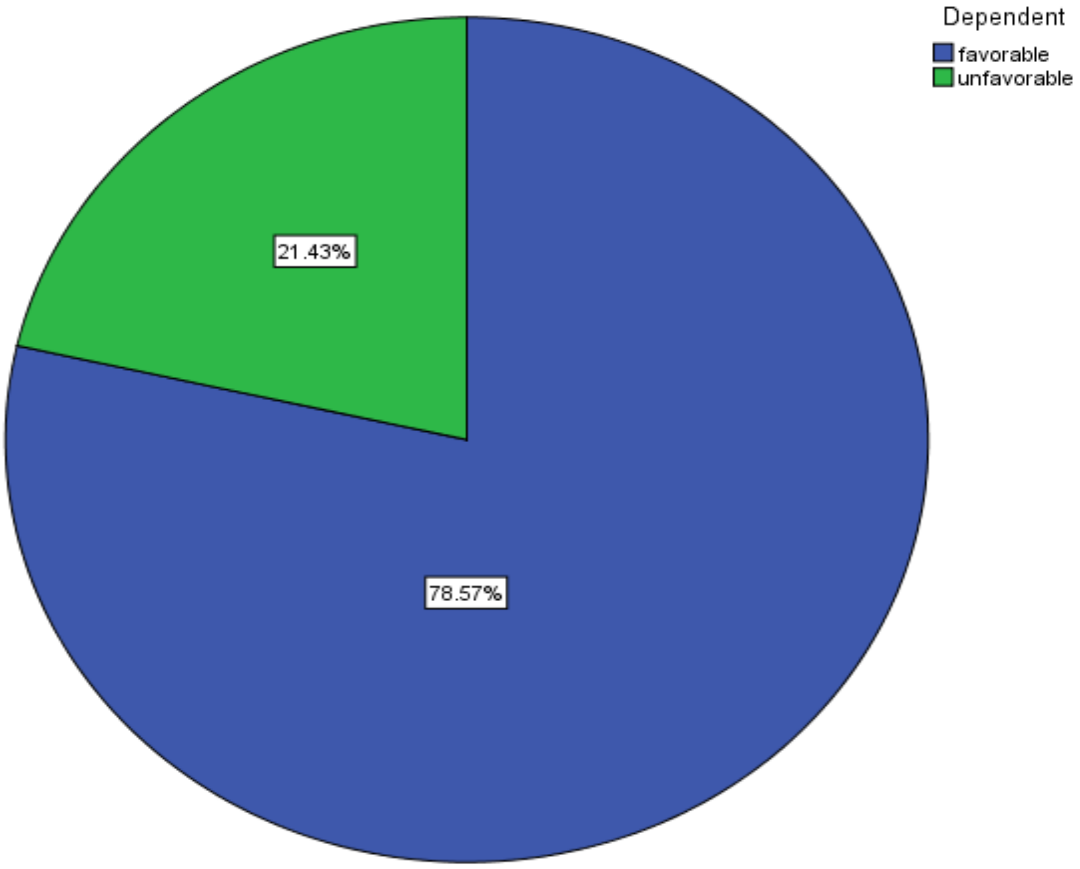

Figure 1: Maternal outcome of mothers delivering at Hospitals of Nekemte town from July-September 2022.

.

Regarding the specific types of maternal complications (maternal outcome) 26(29.9%) of them faced traumatic hemorrhage (primary PPH), 19(21.8%) had uterine rapture while 18 (20.7%) of them had urinary retention and episiotomy extension. And also significant number of mothers lost their lives by the OVD (TABLE 4).

Table 4: Types of maternal complications

Maternal complications	Frequency	Percent
Traumatic hemorrhage (primary PPH)	26	29.9
Uterine rupture	19	21.8
episiotomy extension	18	20.7
Urinary retention	18	20.7
Maternal death	6	6.9
Total	87	100.0

5.5 Factors associated with unfavorable maternal outcome

To identify associated factors for unfavorable maternal outcome bivariate and multivariate logistic regression analysis were performed. Firstly, bivariate analysis was performed to avoid before performing multivariate analysis and variables whose p-value was < 0.25 were considered as candidate variable for multivariate analysis. Accordingly seven variables were candidate for multiple logistic regression (P-value <0.25) (table 5).

Table 5 : Bivariate analysis showing associated factors with maternal outcome of mothers delivering at Hospitals of Nekemte town, from July-September 2022.

	B	S.E.	Wald	Df	Sig.	Exp(B)	95% C.I.for EXP(B)	
							Lower	Upper
q1indicati			.044	2	.978			
q1indicati	-.068	.345	.039	1	.844	.934	.475	1.839
Indicati	-.067	.351	.036	1	.849	.935	.470	1.861
OVD	-.212	.284	.557	1	.455	.809	.463	1.412
Time of application	1.053	.372	8.012	1	**.005***	2.867	1.383	5.946
q13deliver(1)	-1.308	1.419	.849	1	.357	.270	.017	4.368
q15episiot(1)	.094	.473	.039	1	.843	1.098	.434	2.777
q22weighto(1)	1.125	.348	10.466	1	**.001**	3.081	1.558	6.092
q22weighto(2)	.796	.283	7.892	1	**.005**	2.217	1.272	3.865
q23fetalst(1)	.455	.638	.508	1	.476	1.576	.451	5.507
q24applica(1)	2.430	1.161	4.379	1	**.036**	11.357	1.166	110.572
q103educat(1)	.553	.573	.931	1	.335	1.738	.566	5.340
q103educat(2)	.120	.306	.154	1	.695	1.127	.619	2.052
q103educat(3)	-.268	.433	.385	1	.535	.765	.328	1.785
q103educat(4)	.080	.336	.057	1	.811	1.083	.561	2.091
q103educat(1)	.553	.573	.931	1	.335	1.738	.566	5.340
q107reside(1)	.033	.257	.017	1	.897	1.034	.625	1.710
q303ga(1)	-.426	.504	.713	1	.398	.653	.243	1.755
q303ga(2)	-.094	.418	.051	1	.822	.910	.401	2.065
q304anc(1)	-.048	.811	.003	1	.953	.954	.195	4.674
age_newcate(1)	-.479	.504	.903	1	.342	.620	.231	1.663
parity(1)	.344	.269	1.637	1	**.201**	1.411	.833	2.392
q302modeof(1)	1.308	.775	2.848	1	**.091**	3.699	.810	16.896
q302modeof(2)	1.247	.848	2.163	1	**.141**	3.478	.660	18.318
q302modeof(3)	.901	.758	1.413	1	**.235**	2.463	.557	10.886
marital_catego	-1.343	.644	4.340	1	**.037**	.261	.074	.924
income_cate(1)	-.937	.763	1.509	1	**.219**	.392	.088	1.747
income_cate(2)	.110	.246	.200	1	.655	1.116	.689	1.807
Station	1.940	.285	46.180	1	**.000**	6.955	3.975	12.169

Finally, multiple logistic regression analysis was performed by putting all the seven variables which were candidate by bivariate analysis using SPSS by enter method and variables whose P-value is less than 0.05 were fitted in the final model. Among seven variables entered in multiple logistic regressions only two variables (station at application of OVD and birth weight of the new born) showed statistically significant association with unfavorable maternal outcome.

By putting all other variables constant the likelihood of unfavorable maternal outcome is 2.2 times higher among mothers who gave birth whose weight is greater than 4kg (95% C.I. 1.103-5.3, P-value= <0.028) and 6.7 times among mothers in which OVD was applied while the station was high that of the station was at outlet (95% C.I. 3.561-12.863, P-value= <0.001).

In table 7 below multiple logistic regressions output is presented including AOR with 95% C. I and P-value of all variables entered.

Table 6: Multivariate analysis showing associated factors with maternal outcome of mothers delivering at Hospitals of Nekemte town, from July-September 2022.

	B	S.E.	Wald	Df	Sig.	Exp(B)	95% C.I.for EXP(B)	
							Lower	Upper
station(1)	1.912	.328	34.064	1	.000	6.768	3.561	12.863
q9time(1)	.675	.471	2.051	1	.152	1.963	.780	4.942
q302modeof			2.029	3	.566			
q302modeof(1)	1.166	.896	1.695	1	.193	3.209	.555	18.565
q302modeof(2)	.566	.899	.397	1	.529	1.762	.303	10.254
q302modeof(3)	.578	.784	.543	1	.461	1.782	.383	8.284
income_cate			2.406	2	.300			
income_cate(1)	.361	.471	.587	1	.444	1.435	.570	3.612
income_cate(2)	.450	.293	2.359	1	.125	1.568	.883	2.785
parity(1)	-.955	.498	3.682	1	.055	.385	.145	1.021
marital_catego(1)	.123	.581	.044	1	.833	1.130	.362	3.530
weightn_NB			5.142	2	.076			
weightn_NB(1)	.883	.401	4.857	1	.028	2.419	1.103	5.306
weightn_NB(2)	.384	.336	1.304	1	.253	1.468	.760	2.834
Constant	-2.798	.944	8.781	1	.003	.061		

Model fitness was tested with Hosmer and Lemshow test and the assumption were fulfilled as the p-value of the hosmer and lemshaw was not significant.

Hosmer and Lemeshow Test			
Step	Chi-square	df	Sig.
1	3.878	7	.794

CHAPTER SIX: DISCUSSION

6.1. Prevalence of maternal outcome of operative vaginal delivery

Operative vaginal delivery refers to a delivery in which the operator uses forceps, a vacuum, or other devices to extract the fetus from the vagina, with or without the assistance of maternal pushing (1). With varying rates of practice, OVD is associated with complications for the mother and fetus. In developed countries, a complication related to instrumental delivery is not significant as a result of advancement in skill on the management of instrumental delivery and accessibility of resources. In developing countries like Ethiopia, mother and their newborn develop different degree of morbidity and even mortality due to instrumental delivery (31). With the aim of assessing maternal outcome of operative vaginal delivery and associated factors, a cross sectional study was conducted among 406 mothers who had operative vaginal delivery in Nekemte town public health facilities.

In the present study, the prevalence of unfavorable maternal outcome was 21.4%. This finding is consistent with the studies done in in Lumbini Medical College Teaching Hospital, Nepal (32) and Greece (33) which showed 17.3% and 18.1% prevalence rates of unfavorable maternal outcomes respectively. However, the present finding is higher than the findings from the studies done in India (14.1%) (34), Nigeria (15.85%) (35) Bahir Dar (12.1%) (31) and Jimma (4.1%) (22). This discrepancy in prevalence rate of unfavorable maternal outcome could be due to the difference in study setting, study design, sample size, birth attendant skill, type of instrument used for OVD and maternal indication for OVD. For instance, the studies done in Bahir Dar and Nigeria used retrospective study design. Similarly, relatively small sample size was used in the studies done in India (120 operative vaginal deliveries and Jimma (242 operative vaginal deliveries).

According to this study, the most common indication for operative vaginal delivery was found to be non-reassuring fetal status (44.1%). This is comparable to the findings of the studies done in Nepal (36) and Jimma (22) which reported that the commonest indication for OVD were fetal distress.

6.2.Factors that associated with maternal outcome of operative vaginal delivery

The commonest maternal complication in the present study was primary PPH which accounted for 29.9% of the complications. This is higher than the findings from Jimma (3.3%) (22) and Nepal (16.9%) (36) . On the other side, the finding from Aksum Saint Marry Hospital (37) reported a 33.9% prevalence of postpartum hemorrhage. This discrepancy can be explained by the difference in the type of operative deliver, maternal condition, postpartum management practice and blood loss documentation practice in different health facilities.

According to the present study, mothers who gave birth to neonates with birth weight of greater than 4kg were 2.2 times more likely to have unfavorable outcome. This finding is consistent with the findings from Aksum (37). High birth weight is associated with several maternal complications. This can be due to direct consequence of a big baby or as a result of prolonged labor, uterine atony, and perineal tears which leads to the occurrence of PPH (38).

In the current study, station at application of OVD was another predictor of unfavorable maternal outcome. Unfavorable outcome was 6.7 times more likely to occur in mothers whose station was high during OVD application than whose station was at outlet. This finding is in accordance with the study done in Aksum (37). This might be due to the descent problem that indicated no progress of labor secondary to cephalopelvic disproportion (CPD), it may be due to macrocosmic baby, and can cause PPH secondary to perineal tear (39).

6.3. Strength of the study

- Using mixed method of data gathering by separating incomplete mothers' cards from mothers' folders which is document review and questioner administered exit interview after identifying which health facilities provide operative vaginal delivery from all 22 nekemte health facilities after document review check list prepared.

6.4. Limitation of the study

- First, this study is retrospective review of records. The data obtained from the record was limited due to unregistered and limited information regarding basic socio- demographic and clinical characteristics, which may affect the result of the study. Second, the true prevalence of operative vaginal delivery may be underestimated or overestimated because of some cases with might be died .Due to limitations of cross-sectional studies, which decreases the causal relationship between independent factors and outcome variables.

CHAPTER SEVEN: CONCLUSION AND RECOMMENDATION

7.1 Conclusion

In the current study, the magnitude of unfavorable maternal outcome among mothers who attended operative vaginal delivery is high. High fetal head station during delivery and having a neonatal birth weight of > 4kg were significant predictors of unfavorable maternal outcome.

7.2 Recommendation

Based on the finding of this study the following recommendations are forwarded;

- Nekemte Town Health facilities, should arrange practical trainings for health professionals on safe operative delivery and improve proficiency in these vaginal procedures to reduce the maternal morbidity and mortality associated with the procedure.
- Health professionals working in the maternity unit should cautiously follow mothers during OVD. Health professionals need to make sure that a specific obstetric indication for OVD is present before undertaking the procedure and they need to strictly follow the mother thereafter.
- Health professional should also promote companionship in labor, active management of the second stage of labor and encouraging mothers to have the recommended number of ANC follow up so as to reduce the rate of operative vaginal delivery and to improve maternal outcome.
- Further prospective studies with large sample size are recommended to delineate determinants of maternal outcome

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Annexes

Annex I

Consent form (English version)

My name is _____, I am Nurse working in Nekemte referral hospital and now I am collecting data for the research being conducted to determine maternal outcome of operative vaginal delivery and associated factors among mothers who gave birth at Nekemte town public and private health facilities, east Wollega zone, Oromia region, Ethiopia by Yohannes Assefa who is the student of Masters of Reproductive Health in Jimma University. The investigator employed me for this data collection to maintain your data strictly confidential, we believe that the findings of this study will have some evidence and information for governmental and non -governmental organizations. Study will be conducted through exit interview administered structured questioners and review of mothers folders in nekemte town public and private health facilities from November10-December25. it will not cause any harm. Your name and other personal identifiers will not be recorded on data collection form and the information that you give us will be kept confidential and will also be used for this study purpose only. You have full right not to participate for this study.

Are you willing to participate for this study?

1. Yes 2. No (End the interview)

Signature of the interviewer which shows that the respondent has consented (verbally) to take part in the study _____

ANNEX II Document review check list

1	Indication(s) for OVD	1. Arrest of descent 2. Fetal asphyxia 3. Fetal distress 4. Maternal exhaustion 5. Prolonged 2nd stage 6. Other _____
2	Discussed with patient: Risks:	1. Yes 2. No
3	Benefits:	1. Yes 2. No
4	Patient consent obtained prior to procedure:	1. Yes 2. No
5	Fetal heart rate:	1. Category I 2. Category 2 3. Category 3
6	Fetal weight	_____grams

7	Anesthesia	1. None 2. Local 3. Epidural 4. Spinal 5. Pudendal 6. Other: _____
8	Instrument applied	1. Vacuum 2. Forceps 3. Other _____
9	If forceps was applied	1. no of pulls_____ 2. Rotation of fetal head 2.1 None 2.2 0–45º 2.3 45–90º 2.4 >90º

10	Total time instrument applied (minutes):	_____minutes
11	If Vacuum cup applied : Hard cup Soft cup Other:	1. Type of cup 1.1.Hard cup 1,2 Soft cup 1.3 Other:_____

		2. Pressure setting: 2.1 # of pulls: _____ 2.2 # of pop offs _____
12	Was instrument-assisted delivery successful	1. Yes 2. No
13	Maternal status	1. Alive 2. Dead
14	Episiotomy:	1. YES 2. No
15	If YES:	1. Median 2. Mediolateral, 3. right Mediolateral, 4. left Mediolateral
16	Lacerations	1. Yes 2. No
17	If yes	1. 1st degree 2. 2nd degree 3. 3rd degree 4. 4th degree
	Maternal complications	1.Perineal tear 2. Cervical laceration 3. Vaginal laceration 4. Traumatic hemorrhage (primary PPH) 5. Urinary retention 6. Uterine rupture

		7. episiotomy extension
18	Other maternal complications	_____
19	Sex of the new born	1. Male 2. Female
20	Clinical qualification	1. Obstetricians 2. BSC nurse 3. BSC mid wives 4. MD 5. BSc HO
21	Clarify the current pregnancy	1. Parity _____ 2. BMI_____ 3.
22	Hypertensive disorder	1. Yes 2. No
23	DM during pregnancy	1. Yes 2. No

ANNEX II: QUESTIONER

1	Socio-demographic and economic characteristics of mothers	
101	Age	

102	Average monthly Income in Ethiopian birr	_____ETB
103	How much education have you had?	A .Unable to read and write B. Read and Write only C. Completed grade 1-8 D. Completed grade 9-12 E. Diploma F. Degree and above
104	What is your marital status?	1. Married 2. Single 3. widowed 4. Divorced 5. Separated

105	Current Occupation of mother	1. Housewife 2. Government work 3. Farmer 4. Private employee 5. Merchant 6. Others
106	Current Occupation of husband	1. Government 2. Farmer 3. Private employee 4. Merchant 5. Others
107	Place of residence	1. Nekemte town 2. Outside of Nekemte town

2	Medical related variables	
200	Hypertensive disorders during the current pregnancy?	1. Yes 2. No
201	History of DM during current pregnancy?	1.Yes 2.No

202	BMI	
	Weight of the newborn in grams	1.1500-2499 2.2500-3999 3.>/=4000
	Fetal status	1. Alive 2. Dead
	Time of application	1. On arrival 2. Followed

3	Obstetric related variables among mothers	
300	Parity	1. I 2. II-IV 3. ≥V
301	If multipara Place of previous Delivery	1. At home 2. Health post 3. Health center 4. Hospital
302	Mode of previous Delivery	1. Spontaneous delivery 2. Instrumental delivery 3. Caesarian section
303	GA of pregnant women	1. Pre term 2. Term 3. Post term
304	ANC follow up	1. yes 2. No_____skip to 205
305	If yes to ANC follow up number of ANC follow up?	1. One visit 2. Two to three visit 3. Four and above visit

DECLARATION

I, the undersigned, declare that this thesis is my original work, has not been presented for a degree in this or any other university and that all sources of materials used for the thesis have been fully acknowledged.

Name: Yohannes Assefa

Signature: ———————————————

Name of institution: Jimma University

Date of submission:———————————

This thesis has been submitted for examination with my approval as University advisor

Name and signature of the first advisor

_____

Name and signature of the second advisor

_____