



MAGNITUDE AND DETERMINANTS OF MATERNAL NEAR MISS IN
NEKEMTE SPECIALIZED HOSPITAL, EAST WOLLEGA ZONE, WESTERN
ETHIOPIA

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Summery

Background: Maternal Near Miss is one of the related concepts to maternal mortality where women survive merely by chance, luck, or by good hospital care. Maternal near miss is 'a woman who nearly died but survived a complication that occurred during pregnancy, childbirth or within 42 days of termination of pregnancy. Maternal near miss is a promising indicator to improve the quality of obstetric care and it is a direct indicator to reduce maternal mortality to attain the Sustainable Development Goal by 2030, as Ethiopia is expected to do more.

Objectives: To determine magnitude and assess determinants of maternal near miss cases in Nekemte specialized Hospital, western Ethiopia from May 1,2018.

Methods:-Hospital based unmatched case-control study design was conducted from a total of 183 mothers from which 61 mothers were with maternal near miss cases and 122 mothers as controls in Nekemte Specialized Hospital during the study period. Data on maternal near miss case was collected using Semi-structured questioner from maternal near miss cases Who were recruited consecutively in the study and two consecutive controls following each near miss cases. The collected data was checked, entered into Epi data version 3.1 and transported to and analyzed using SPSS version 22. Descriptive statistics was used to assess the frequency of dependent and independent variable, Binary logistic regression and multivariate logistic regression was used to examine association between dependent and each independent variables. A 95% CI and p-value of <0.05 was considered to be statistically significant

Result: The magnitude of maternal near miss cases were 4.97%. Multivariate logistic regression analysis reveals High gravidity has four times [AOR: 3.84 [95% CI: 1.23-11.91]], having no ANC follow up is six times more likely, [AOR: 6.02[95%CI:1.55-23.28]], prolonged second degree delay 12 times more likely [AOR:12[2.55-56.57]] and those with induced labor are nine times more likely [AOR :9.4[2.97-29.71]] to develop near miss events. The major causes of maternal near miss events were; severe obstetric hemorrhage (55.74%) followed by hypertension during pregnancy 40.98% (29.5% Severe pre eclampsia, 11.48% Eclampsia).

Conclusion : The magnitude of maternal near miss cases were relatively slower than studies done in other parts of the country. The study showed that multigravidity, having no antenatal care follow up, prolonged second degree delay and induction of labor were significantly associated determinants to cause maternal near miss cases.

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Abbreviations And Acronyms

ALT	Alanine transaminase
ANC	Ante Natal Care
AOR	Adjusted Odd Ratio
APH	Ante partum Hemorrhage
AST	Aspartate transaminase
CI	Confidence Interval
COR	Crude Odd Ratio
CT	Computed Tomography
EDHS	Ethiopian Demographic Health Survey
EP	Ectopic Pregnancy
ETB	Ethiopian Birr
GA	Gestational Age
GTD	Gestational Trophoblastic Disease
HC	Health Center
HDP	Hypertensive Disease of pregnancy
Hx	History
HIV	Human Immune deficiency Virus
ICU	Intensive care unit
JUTH	Jimma University Teaching Hospital
Km	Kilometer

LSCS	Lower uterine segment cesarean section
MCH	Maternal and child health
MD	Maternal Death
MDG	Millennium development goal
MMR	Maternal mortality ratio
MNM	Maternal Near Miss
MVA	Manual Vacuum Aspiration
NSH	Nekemte Specialized Hospital
OL	Obstructed Labor
OR	Odds Ratio
PPH	Post Partum Hemorrhage
SAMM	Severe Acute Maternal Morbidity
SD	Standard Deviation
SDGs	Sustainable Development Goals
SMO	Severe Maternal Outcome
SPSS	Statistical Package for Social Science
SSA	Sub-Saharan Africa
UK	United Kingdom
USA	United state of America
WHO	World Health Organization

Chapter One:

1. Introduction

1.1. Background

Maternal mortality is a worldwide problem; however, over 99% of these maternal deaths (MDs) occur in developing countries, and many of these deaths can be avoided. Maternal mortality is 'Just the tip of iceberg'; the base to the iceberg is maternal near miss (MNM) morbidity, which remains undescribed [1]. MNM is one of the related concepts to maternal mortality where women survive merely by chance, luck, or by good hospital care [2]. MNM has emerged as an adjunct to investigation of MDs, as the two represent similar pathological and circumstantial factors leading to severe maternal outcome [3]. MNM women are a special category of survivors, whose stories provide unique insights and valuable information on maternal mortality [4]. As near miss woman is still alive and precedes MD, the number of near miss cases occur more often than the MDs, thus may directly provide more information on obstacles that had to be overcome during the process of healthcare, and promote further understanding of the maternal mortality determinants as the woman herself can be a source of data [5,3]. MNM is a promising indicator to improve the quality of obstetric care [6–8].

The WHO defines a MNM case as 'a woman who nearly died but survived a complication that occurred during pregnancy, childbirth or within 42 days of termination of pregnancy' [8]. The WHO has proposed a package of 25 severity markers including combined different criteria based on clinical signs, laboratory tests, and management parameters that met the need for consensus criteria, which can be used all over the world. Standardization of the MNM definition established by WHO helps in better description of the MNM, especially in developing countries [9]. The prevalence of MNM may vary depending on several factors [8]. In general, near misses were approximately five times as frequent as MDs [10]. However, some studies reported that they are 10–24 times more frequent than MDs [11]. In developing countries, MNM cases often arrive at referral hospitals in a critical condition [2]. Obstetric hemorrhage, hypertensive disorders of pregnancy, dystocia, sepsis, embolism, and unsafe abortion are usually the main causes attributed to MNM conditions [12]. As pregnancy complications occur in 15% of women worldwide [12], any pregnant woman can develop life threatening complications with little or no advance warning, and without the ability to identify and treat this women maternal mortality cannot be reduced [6]. Knowledge about near-miss cases has the potential to highlight the deficiencies as well as the positive elements in the provision of obstetric services in any health system. Unlike in the developed countries, there is limited experience with the use of near-miss reviews as a tool for monitoring the quality of maternity services in developing countries. This is probably as a result of

the persistently high levels of maternal mortality that has over shadowed other severe obstetric complications, from which lessons could equally be learned about determinants and risk factors. [2,6,8]. Study done in Amhara regional state reveals that, mothers' occupational status, residence, husband educational status, mothers' educational status, monthly income, type of the current pregnancy, distance from Hospital, ANC follow up, duration of labor, number of ANC visits, duration of hospital stay, administrative problems, personal problems, information problems, community problems, gestational age, and medical personnel related problems were found independently associated with maternal near miss.[13]

Although the concept of MNM has started at the first of 19th and become increasingly important for those working in maternal health, as reported in several studies [2,6,8,10], to our knowledge few studies have been carried out for describing the magnitude and determinant factors in Ethiopia. The present study aspired to enhance the knowledge of the health practitioners about the nature of MNM problem. Concurrently, the outcome of the study will provide a relevant source of information for administrative authority in the selection of priorities of maternal healthcare interventions that can save a significant number of mothers' lives at different levels of healthcare delivery institutions giving maternal service.

1.2 Statement of the problem

The World Health Organization defines maternal near miss as a woman who nearly dies, but survives a complication occurring during pregnancy, childbirth, or within 42 days of termination of pregnancy[8]. MNM's harmful consequences are numerous, including separating mothers and newborns, interfering with bonding, lengthy hospital stays and healthcare costs, and emotional distress. MNM is increasingly used as an indicator of the quality of obstetric care and clinical practice [11, 12,14]. At the end of Millennium Development Goals (MDG) era on 2015, the maternal mortality ratio (MMR) was estimated to be 216 globally and 353 in Ethiopia. Almost all of these deaths occurred in low-resource settings and could have been prevented. The global MMR declined by 44% during the MDG era, representing an average annual reduction of 2.3% between 1990 and 2015. With the global community seeking to reduce MMR to less than 70 per 100,000 live births by 2030 as part of the Sustainable Development Goals, with the global annual rate of reduction of at least 7.3%. it requires a marked acceleration in progress in this area.[15]

According to the Ethiopian Demographic Health Survey 2016 report, Maternal Mortality Ratio was estimated to be 412, in which most of the causes could be preventable by giving good quality health service delivery system.[16] According to a systemic review by International Journal of Obstetrics and Gynecologic 2012 report the prevalence rate of MNM varied between 0.6 and 14.98% for disease specific criteria, between 0.04 and 4.54% for management-based criteria and between 0.14 and 0.92% for organ-dysfunction based on Mantel criteria. The rates are higher in low-income and middle-income countries of Asia and Africa among which Ethiopia is one.[17]

The prevalence of MNM may vary depending on several factors [8]. In general, near misses were approximately five times as frequent as MDs [10]. However, some studies reported that they are 10–24 times more frequent than MDs [11]. In developing countries, MNM cases often arrive at referral hospitals in a critical condition [2]. Obstetric hemorrhage, hypertensive disorders of pregnancy, dystocia, sepsis, embolism, and unsafe abortion are usually the main causes attributed to MNM conditions [12]. As pregnancy complications occur in 15% of women worldwide [12], any pregnant woman can develop life threatening complications with little or no advance warning, and without the ability to identify and treat this women maternal mortality cannot be reduced [6].In recent years, evidence from developing country settings suggests a positive contribution of

analyzing near miss/SAMM cases with a view of understanding health system failures in relation to obstetric care and addressing them [8].

Since there is only few studies have been performed on maternal near misses at national level and not at study area in particular, and little is known regarding the magnitude and determinants of near misses and how to prevent them. This study focuses on the impact of the three delays on maternal near miss which is not stressed by other researches. The aim of this study will be to determine the magnitude of maternal near misses in Nekemte Public Specialized Hospital and to identify the determinants that predispose to obstetric complications leading to near misses which can be significantly reduced by increasing community awareness and providing good quality health service utilization .

Chapter Two:

2. Literature Review

2.1: Definition:

A maternal near-miss case is “a woman who nearly died but survived a complication that occurred during pregnancy, childbirth or within 42 days of termination of pregnancy” [14,18]. In practical terms, women are considered near miss cases when they survive life-threatening conditions (i.e. organ dysfunction).Indeed, this is a recent and still slightly abstract concept that has been widely used by different authors, generating a certain degree of controversy regarding its definition [14,19]. Three different kinds of definitions have been used to describe near miss maternal morbidity: the definitions based on the admission of women to intensive care units during the pregnancy-puerperium cycle [20-23]; those based on the occurrence of certain diseases or complications such as preeclampsia, hemorrhage or severe sepsis, etc. [24-26] and those based on evidence of organic dysfunction [27].

2.2. Magnitudes of Near Miss

In 2015, globally the maternal mortality ratio (MMR) – the number of maternal deaths per 100 000 live births was estimated at 216, almost all of these deaths occurred in low-resource settings and could have been prevented.[14] Today, approximately 830 women die daily from pregnancy or childbirth globally. Almost all of these deaths occur in low-resource settings and most could be prevented [28]. Among developing regions, Sub-Saharan Africa (SSA) has the highest maternal mortality ratio (MMR) at 640 per 100,000 live births[28, 11]. Women in SSA have a 1 in 39 lifetime risk of dying in childbirth compared to 1 in 3,800 women in industrialized countries[29]. For every woman who dies of pregnancy complications, about 20 more—roughly 7 million women annually—experience injury, infection, disease, or disability

According to the study done in India 2016 report, maternal near- miss incidence ratio was 45.2 per 1000 live births which is double of that of Assiut University, womens Health Hospital on 2016, MNM incidence ratio which is 20 per 1000 live births.[30,31] This means that there was one maternal death for every seven cases of MNM.[31] As the study done in University of Campinas, Obstetrics and Gynecology, Campinas/SP, Brazil,2012 indicates. the near-miss rate was 4.4 cases per 1,000 live births. The near-miss/death ratio was 8.6 near-misses for each maternal death, and the overall mortality index was 10.4%[32].

According to the study done in Indian Tertiary Referral Center, Out of 4481 deliveries, 168 (3.74%) were near-miss cases and Near-miss incidence ratio was 37.65 per 1000 live birth.(33)The MNM rates in Morocco and Sagamu, Nigeria reveals that 12% and 14% respectively[34,10].

As USA systematic review of 82 studies from 46 countries shows Criteria for identification of cases varied widely. Prevalence rates varied between 0.6 and 14.98% for disease specific criteria, between 0.04 and 4.54% for management-based criteria and between 0.14 and 0.92% for organ-based dysfunction based on Mantel criteria. The rates are higher in low-income and middle-income countries of Asia and Africa. Based on meta-analysis, the estimate of near miss was 0.42% (95% CI 0.40– 0.44%) for the Mantel (organ dysfunction) criteria and 0.039% (95% CI 0.037–0.042%) for emergency hysterectomy[17].

There is a decline in pregnancy-related mortality ratio in Ethiopia since 2000, from 871deaths per 100,000 live births in the 7 years before the 2000 EDHS survey to 673 deaths per 100,000 live births in the 7 years before the 2005 EDHS survey, 676 deaths per 100,000 live births in the 7 years before the 2011 EDHS survey, and 412 deaths per 100,000 live births in the 7 years before the 2016 EDHS survey which indicates that mothers are still dying from pregnancy related complications and majority of them survived after suffering major complications that can be significantly reduced by quality of care.[16] .

According to results obtained from cross-sectional study of five Public Hospitals in Addis Ababa,2017 maternal near-miss incidence ratio is 8.01 per 1000 live births.[35]The Institution Based Cross Sectional Study in three Referral Hospitals of Amhara Regional state, revealed the overall proportion of maternal near miss was 23.3 % ,which is lower than experience in Debra Markos Referral Hospital five years review , 2012 which is 29.7%.[13, 36] indicating single hospital based study cannot be generalized to the total population. The study done in Jimma University Teaching Hospital ,2015 shows the incidence ratio of SMM was 73.8/1000 live births.(37)

2.3. Determinants associated to Maternal Near miss

The study done in Morocco shows the main risk factors were illiteracy, lack of antenatal care , complications during pregnancy, and having experienced a first phase delay and a first phase of third delay . The main reasons for the first delay were lack of a family authority figure who could make a decision, lack of sufficient financial resources, lack of a vehicle, and fear of health facilities. The majority of near misses demonstrated a third delay with many referrals.[34]

Case-control study done in UK shows; Six factors were independently associated with maternal death: inadequate use of antenatal care; substance misuse; medical co morbidities; previous pregnancy problems; hypertensive disorders of pregnancy; and Indian ethnicity. Odds associated with maternal death increased by three and a half times per unit increase in the 'risk factor' score.[38]

As a study done in Philippi shows, determinant factors of maternal morbidity and mortality include ; Significant Individual Risk(age, parity),the three Delays Model, Human and Reproductive Rights Approach, Health System Factors, Inter-sectoral Issues, Lifecycle Perspective i.e. water sources and geographical accessibility.[39]

The Hospital based study in Amhara region revealed determinant factors of maternal near miss were; No formal education, ≥ 7 days of hospital stay , not booked, presence of administrative related factors, personal factors , community related factors and medical personnel related factors. [13] But according to the study done in Debra Markos Referral Hospital; distance from the hospital, history of difficult labor, and antenatal care (ANC) utilization were found to be major determinates of maternal near miss cases.[36]

Unmatched case-control study conducted in six(6) Public hospitals in Tigray Region, Northern Ethiopia reveals, Women with no formal education, being less than 16 years of age at first pregnancy, induced labor, history of cesarean section or chronic medical disorder, and women who traveled more than 60 minutes before reaching their final place of care had higher odds of experiencing MNM.[40] According to the study done in JUTH,2015 the occurrence of any delay, intrapartum detection of complication, mode of delivery and duration of hospitalizations were found to statistically significant association with severe maternal outcome.(37)

2.4. Obstetric Cause of Maternal Near Miss

According to prospective case-control study done in Morocco2015,Hypertensive disorders during pregnancy (45%) and severe hemorrhage (39%) were the most frequent direct causes of near miss [34]. Case-control prospective study in maternal Hospital, Assiut university, Egypt ; The mean age of MNM cases was 28.4 ± 8.5 , whereas the mean gestational age of MNM was 35.66 ± 8.6 weeks. The main direct obstetric causes of MNM were hypertensive disorders of pregnancy (49.8%), obstetric hemorrhage (38.3%) and dystocia (32.5%). On the other hand, cardiovascular disorder was the most prevalent non obstetric cause among MNM cases (48.8%).[31]

Tertiary Referral Hospital of India,2014 study reports that; The mean age of the near-miss patients (168) was 28 ± 3.11 years. Most of the patients of near-miss were of multipara (71.42%). The

majority of the patients were un booked (65.24%).The major causes of near miss were hypertensive disorders (44.04%), severe hemorrhage (26.19%) and severe anemia (10.71%) [33].Another study done in the same country on 2016 shows; Most of the cases of maternal near- miss in this study were in the age group of 20-35 years (71.3%), multipara (61.5), in the third trimester. Most common cause for maternal near- miss in the present study was found to be hemorrhage (44.3%) followed by hypertensive disorders of pregnancy (HDP) 34.4% followed by dystocia (14.8%),sepsis(2.4%) and anemia (4.1%). Neurological dysfunction (10.7%) was the most common organ dysfunction. Nearly 42.6% near miss admissions were delivered by LSCS, 48.4% were live births and 28.7% were still births (30). In the same way in Brazil 2012; Hypertensive syndromes were the main cause of admission (67.7% of the cases, 107/158); however, hemorrhage, mainly due to uterine atony and ectopic pregnancy complications, was the main cause of maternal near-misses and deaths (17/43 cases of near-miss and 2/5 deaths). [32]

Facility based study in Nigeria ,2005; indicates demographic features of cases of near-miss and maternal death were comparable. Besides infectious morbidity, the categories of complications responsible for near-misses and maternal deaths followed the same order of decreasing frequency. Hypertensive disorders in pregnancy and hemorrhage were responsible for 61.1% of near-miss cases and 50.0% of maternal deaths. Majority of the cases of near-miss (82.5%) and maternal death (88.6%) were un booked for antenatal care. [10]

According to EDHS 2016; report The primary causes of maternal deaths are hemorrhage (mostly bleeding after childbirth),hypertension during pregnancy (pre-eclampsia and eclampsia), sepsis or infections, and indirect causes mostly due to interaction between preexisting medical conditions and pregnancy . [16]

Hospital based study in Addis Ababa,2017; reveals that the underlying cause for the majority of maternal near-miss cases was hypertensive disorder (53%), followed by obstetric hemorrhage (38%), pregnancy with abortive outcome (4%), and pregnancy-related infections (1%).The major contributing causes of maternal near-miss reported were anemia (40%) followed by prolonged/obstructed labor (9%).[35] In similar way facility based study in Debre Markos, shows; the most common types of near-miss events fall under the diagnostic categories of obstructed labor, hemorrhage and pregnancy induced hypertension. Obstructed labor and hemorrhage were responsible for 45% and 43% of near-miss cases, respectively. Hemorrhage at early pregnancy, late pregnancy and postpartum period were 17.11%, 9.05% and 16.63%, respectively. Least common cases of life threatening condition were septic abortion and infection, accounts 4%. [36] Hospital based case-control study in Tigray Region, North Ethiopia. Among

cases, severe obstetric hemorrhage (44.7%), hypertensive disorders (38.8%), dystocia (17.5%), sepsis (9.7%) and severe anemia (2.9%) were leading causes of MNM. Histories of chronic maternal medical problems like hypertension, diabetes were reported in 55.3% of cases and 33.2% of controls .[40] The study done in JUTH reveals that the commonest underlying causes of SMO were uterine rupture 27%,hypertensive disorders of pregnancy 24% and obstetric hemorrhage 24% (37).

This study could be used as a bench mark to take diagnosis of WHO maternal near miss diseases specific criteria (obstructed labor, hemorrhage, pregnancy induced hypertension, septic abortion and sepsis/infection) to attest the magnitude and determinants of maternal near miss cases.

2.5. Conceptual Frame Work

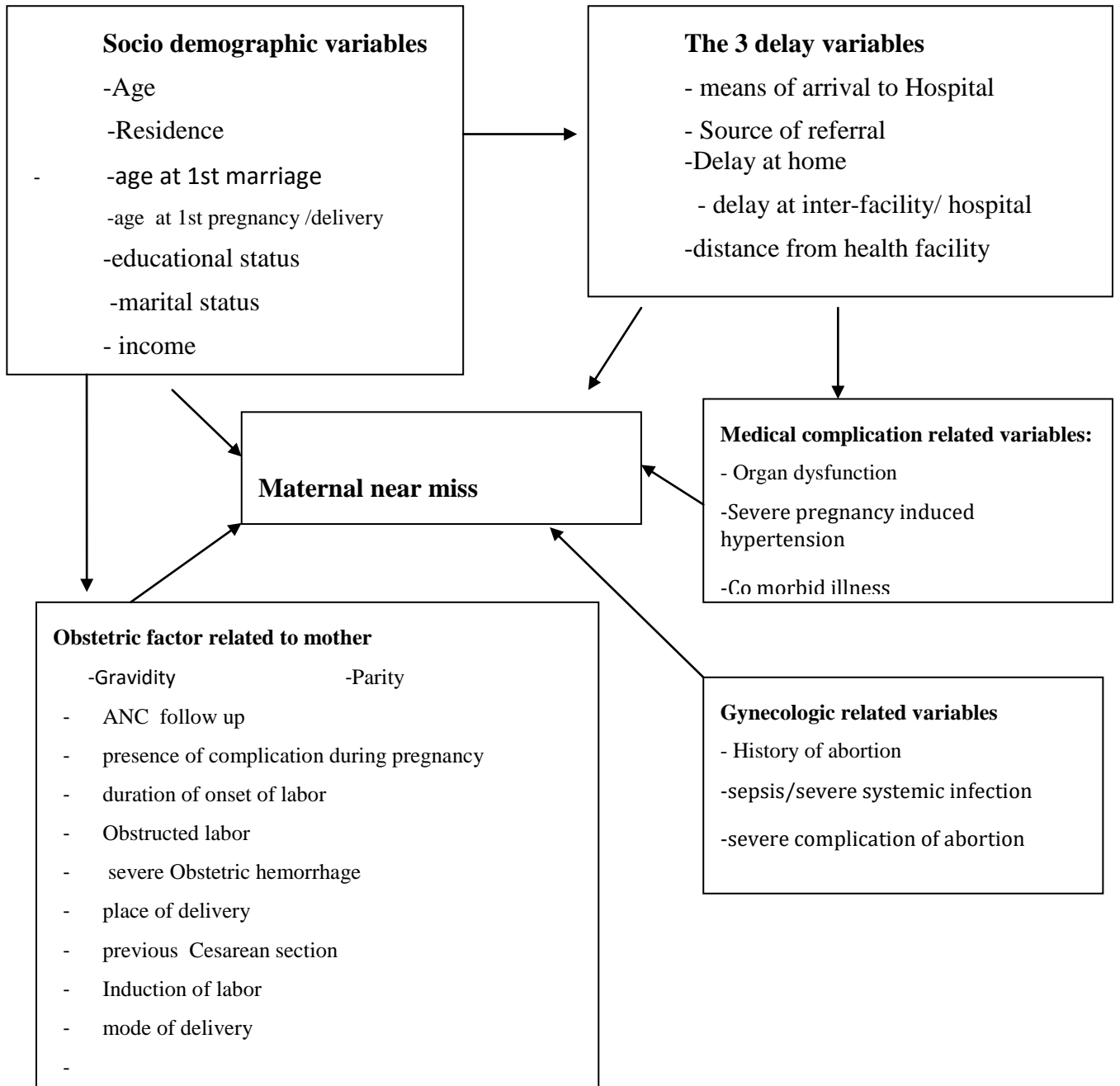


Fig 1: Conceptual frame work on Maternal near miss events.

2.6. Significance Of The Study

As more rigorous examinations for the quality of maternal health care are needed in order to identify specific problems and develop strategies to improve and reduce maternal morbidity and mortality. Therefore, the purpose of this study was to determine the magnitude and determinants of maternal near miss in the study area. The study finding will help to guide the development of policies and strategic programs for improving quality of maternal health and dealing with pregnancy related complications at national level in general and the study area in particular. In addition, the paper can be useful to other researchers as reference material while conducting further studies on related problems. The results also form baseline data for improving quality of Obstetric service and quality of health delivery systems in the country.

Chapter Three

3. Objectives

3.1.General objective

To determine the magnitude and assess determinants of maternal near miss cases in Nekemte Specialized Hospital, west Ethiopia, 2018.

3.2.Specific objectives

To determine magnitude of maternal near miss cases in Nekemte Specialized Hospital, west Ethiopia, 2018.

To assess determinants of maternal near miss cases in Nekemte Specialized Hospital, west Ethiopia, 2018.

To determine the causes of maternal near miss in Nekemte Specialized Hospital, West Ethiopia,2018

Chapter Four

4. Method And Materials

4.1. The study area and period:

Nekemte Specialized Hospital is found in Nekemte town, Oromia Regional State, which is located 331 km to the West of Addis Ababa, the capital city of Ethiopia,. The Hospital provides health service to more than 2.1 million populations. There is one other Referral Teaching Hospital, two health Centers,13 private clinics in the town. Currently there are 113 health professionals and 78 Administrative staffs. Gynecology and Obstetrics ward has two gynecologists and two emergency surgeons, 15 midwifery nurses and 10 cleaners. The Hospital has 178 beds for the inpatient services, 42 beds in Gynecologic and Obstetrics ward. The Hospital provides Medical treatment, ophthalmic treatment, Phsyatric treatment, major and minor operation, Orthopedic, inpatient services, MCH, control of HIV, laboratory, X-ray and ultrasound, pharmacy, and physiotherapy.

Data of maternal near miss cases who were managed in Nekemte Specialized Hospital Gyn/Obs ward from May1, to July 30,2018 was collected.

4.2. Study design:

Hospital based unmatched Case-control study was conducted.

4.3.Population

4.3.1. Source population:

The source population of the study was all mothers who were admitted and managed in Nekemte Specialized Hospital from May1 to July 30, 2018.

4.3.2. Study population:

The study populations was selected mothers who were admitted and managed for pregnancy and pregnancy related complications in Nekemte Specialized Hospital from May 1, to July 30, 2018.

4.4 Selection of cases and controls

A case is defined as a woman who was admitted and managed for pregnancy and pregnancy related complications in Nekemte Specialized Hospital from May1 to July30, 2018 and fulfills WHO disease specific criteria of maternal near-miss (Annex 1).

Severe maternal complications:

- Severe obstetric hemorrhage (APH,PPH)
- Severe Pregnancy induced hypertension (Severe preeclampsia, eclampsia)
 - Severe sepsis or severe systemic infection
 - Dystocia (Obstructed labor, uterine rupture , impending uterine rupture)
 - Severe complications of abortion

A control is defined as a woman who was admitted and have normal obstetric outcome or managed with cesarean section not for OL or Uterine rupture, in Nekemte Specialized Hospital from May1 to July30, 2018.

4.4.Inclusion And Exclusion Criteria

4.4.1. Inclusion Criteria

Cases and controls who fulfilled the above definition of case and control, and stayed at least 24 hours in the ward after admission in Nekemte Specialized Hospital from May1 to July30, 2018.

4.4.2. Exclusion Criteria

For Cases: Mothers with maternal near miss who are referred to other facility or cases who stayed less than 24 hours in the ward after admission.

4.5.Sample Size Determination And Sampling Technique

4.5.1. Sample Size:

The sample size was calculated by double population proportion using Epi Info version7, statistical calculation for unmatched case-control by taking measurable variables which have significant association from two different studies done in Amhara regional state and Debra Markos Referral Hospital as shown on the following table [13,36]:

Table 1: Sample size and its estimation using predictors for maternal near miss , September, 2018

Measurable Variables	C.I	P1	P2	OR	Non exposed to Exposed Ratio	Sample Size	10% non respondent rate	Final sample size
Residence	95%	42.3	15.7	3.94	2:1	113	11	124
ANC	95%	38	16	3.08	2:1	165	17	182
Bad Obstetrical History	95%	53.2	26.7	3.12	2:1	132	13	145

Using the above table, the sample size for the maternal ANC follow up status was highest than the sample size for other factors associated with maternal near miss. So the final sample size was 183 of whom 61 were cases and 122 were controls.

4.5.2. Sampling Technique

All mothers who were admitted and managed as Maternal Near Miss cases were recruited consecutively in the study and two consecutive controls following each MNM cases were included into the study subjects, during the study period (from May 1,2018 to July 30,2018G.c), in Nekemte Specialized Hospital .

4.6.Data Collection And Measurement

4.6.1. Study variable

4.6.1.1.Dependent variable

- ✓ Maternal near miss

4.6.1.2.Independent Variable

❖ Sociodemographic characteristics

- ✓ Age
- ✓ Source of referral
- ✓ Residence
- ✓ age at 1st marriage/pregnancy
- ✓ educational status
- ✓ Delay at home
- ✓ marital status
- ✓ delay at inter-facility/ hospital
- ✓ distance from health facility
- ✓ means of arrival to Hospital
- ✓ income per month

❖ **Obstetric factor related to mother**

- ✓ Gravidity
- ✓ Parity
- ✓ History of abortion
- ✓ ANC follow up
- ✓ presence of complication during pregnancy
- ✓ duration of onset of labor
- ✓ place of delivery
- ✓ age at 1st pregnancy /delivery
- ✓ previous Cesarean section
- ✓ Induction of labor
- ✓ mode of delivery

4.6.2. Data collection instrument and method

This maternal near miss tool was developed after reviewing WHO maternal near miss guideline and related literatures'. All complicated cases were identified at the end of each day by trained investigators (midwives) at the hospital. These cases were reviewed and approved by the principal investigator and the ward gynecologist. All of the women who recruited in the study were interviewed in the hospital using a pre tested questionnaire administered by the data collectors, who collected baseline data on the women's socio-demographic variables and antenatal, delivery, and postpartum care. Delays in obtaining care were collected according to the 3-delay model. The source of information's were the referral sheet, if it existed, or the woman, her husband, or her family. Information's on the women's history from pregnancy to the postpartum period and on their perceptions of the quality of care were collected from a sample of cases and controls. A specifically trained data collectors conducted semi-structured individual interviews with the women at discharge that focus on the women's perceptions of complications, their experiences with the processes of transfer and care, their opinions and views on the care they received, their contacts with staff, and their suggestions for improving health services. Cases were sequentially recruited where as two controls were selected following each MNM cases .

Pre- test

Before the actual data collection, the questionnaire was pre-tested on 5% of the study population at WURH before study period. Then possible modification was made on the check lists using the findings of the pre-test.

4.7.Data Processing And Analysis

The collected data of each questionnaire was checked for completeness & coded before data entry. Data was entered to Epi Data Version 3.1, transported to ,cleaned & analyzed using SPSS v.22.Descriptive statistics such as Frequency distribution; mean, standard deviation and range was computed to describe the major variables of the study. Odds Ratio and P-value was computed with logistic regression to see any relationship that exists between dependent and independent variables. Different frequency tables, graphs, charts & descriptive summaries were used to describe the study variables. Binary logistic regression and multivariate logistic regression were performed to identify the associations & predictors of the outcome variable. 95% CI was set to determine the level of significance, P – Value of < 0.05 was considered to be statistically significant. Finally, the data was described and presented using summarized frequency tables and charts.

4.8.Data Quality Control

To keep the quality of data detail training was given for data collectors, day to day activities during data collection; supervised and evaluated errors were corrected by the investigator before the following day activity. And to have good quality of data, the data collectors were health professionals. Furthermore principal investigator &supervisor had given feedback and correction on daily basis at the end of every data collection date. Completeness, accuracy, and clarity of the collected data were checked carefully. Any errors, ambiguity, incompleteness encountered were addressed on the following day before starting next day activities.

4.9. Ethical Consideration

Letter of ethical clearance was obtained from Ethical Review Committee of Jimma University. Letter of permission was obtained from Nekemte Specialized hospital administration. Permission was asked from the obstetrics and gynecology department ward head. All information's obtained from patients' were anonymous. For those less than 18 years old consent was obtained from parents. Furthermore, name of the study participants was excluded and confidentiality ensured for any response obtained from participants.

4.10. Dissemination Plan Of The Study Result

The study finding will be disseminated to Jimma university Institute of Health Science, Oromia Regional health bureau, West Wollega zonal health department, for Nekemte Specialized Hospital Administrative Office that can be used for intervention. Further attempt will be made to publish the result in standard scientific Journals.

4.11.Operational Definition

High gravidity: Mothers who becomes gravid five or more times

Maternal Near Miss (MNM): a woman who nearly dies, but survives a complication occurring during pregnancy, childbirth, or within 42days of termination of pregnancy

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

Major obstetric hemorrhage : Estimated blood loss of >2500 ml or mothers presented in shock due to bleeding or who needs blood transfusion or received treatment for coagulopathy

Mothers : Females who are in age range of 15-49 years who ever been pregnant

Severe systemic infection or sepsis: Presence of fever (body temperature >38°C), a confirmed or suspected infection (e.g. chorioamnionitis, septic abortion, endometritis, pneumonia), and at least one of the following: heart rate >90, respiratory rate >20, leucopenia (white blood cells <4000), leukocytosis (white blood cells >12 000).

Uterine rupture: Rupture of uterus during labour confirmed by Laparotomy.

Chapter Five

Results

5.1 Sociodemographic Characteristics

Of the 183 women who were enrolled in the study, 61 were near misses cases and 122 were controls with 100% response rate. There were 1227 pregnancy and pregnancy related admission during the three month study period that makes MNM rate of 4.97%. The mean age was 27.20 ± 6.06 SD years for the near misses and 24.8 ± 4.45 SD years for the controls. Mothers in the age range of 15-49 years were included in the study. In both the near-miss and control groups, the 20–34 age group was dominant, accounting for 73.77% and 90.16% of the participants, respectively. The near miss group was relatively different from the control group in terms of education and socioeconomic level. The proportion of age at first marriage less than 18 years high in both cases and controls (57.38 %,43.44 %) respectively. 70.49% of MNM Cases and 77.05% of controls belong to Protestant religion. The proportion of illiterate women was relatively higher among near-miss cases than controls. Majority of mothers who developed MNM were farmers which accounts three times more than the control group which accounts to 52.46%; and 18.03% respectively.

A higher proportion of women in the near-miss group belonged to the poorer family in comparison to the control group (40.98%,19.67%) respectively gets monthly income 1001-2000 ETB . The majority of MNM cases were from rural when compared to controls (72% , 50.82%) respectively. 80.33% of MNM Cases mothers are from Oromo ethnic group and 95.08% of them were married. Only 4 (2.2%) women were single in the studied population, from which 3 women belongs to the maternal near-miss group. Majority of the mothers who were managed at Nekemte Specialized Hospital came from >10km distance which accounts 75.41% of MNM cases and 50.0% for controls. (Table 2)

Table 2: Socio-demographic characteristics of study participan managed in Nekemte Specialized Hospital, September 2018. (N = 183)

Variables	Category	Case		Control		Total	
		N	%	N	%	N	%
Place of residence	Rural	44	72.13	62	50.82	106	57.9
	Urban	17	27.87	60	49.18	77	42.1
Age category	15-19 years	4	6.56	8	6.56	12	6.6
	20-34 years	45	73.77	110	90.16	155	84.7

	35-49 years	12	19.67	4	3.57	16	8.7
Ethnicity	Amhara	12	19.67	2	1.64	14	7.7
	Oromo	49	80.33	120	98.36	169	92.3
Religion	Protestant	43	70.49	94	77.05	137	74.9
	Orthodox	8	13.11	20	16.39	28	15.3
	Muslim	10	16.39	8	6.56	18	9.8
Marital status	Single	3	4.92	1	0.82	4	2.2
	Married	58	95.08	121	99.18	179	97.8
Age at first marriage	<18 years	35	57.38	53	43.44	88	48.1
	19-24 years	23	37.70	59	48.36	82	44.8
	>=25 years	3	4.92	10	8.20	13	7.1
Educational status	No education	18	29.51	17	13.93	35	19.1
	Read & write, but no formal education	2	3.28	4	3.28	6	3.3
	Primary education (grade 1-8)	19	3.11	32	26.23	51	27.9
	Secondary education (grade 9-10)	9	14.75	43	35.25	52	28.4
	More than secondary	13	2.13	26	21.31	39	21.3
Husband Educational status	No education	11	18.03	7	5.74	18	9.8
	Read & write, but no formal education	8	13.11	8	6.56	16	8.7
	Primary education (grade 1-8)	19	31.15	31	25.41	50	27.3
	Secondary education (grade 9-10)	5	8.20	36	29.51	41	22.4
	More than secondary	18	29.51	40	32.79	58	31.7
Occupational status	Farmer	32	52.46	22	18.03	54	29.5
	Housewife	14	22.95	60	49.18	74	40.4
	Unemployed	5	8.20	17	13.93	22	12.0

	Government employee	10	46.39	23	18.85	33	18.0
Income category	<=1000	0	0.0	3	2.46	3	1.6
	1001-2000	25	40.98	24	19.67	49	26.8
	2001-3000	17	27.87	43	35.25	60	32.8
	>=3001	19	31.14	52	42.62	71	38.8
Distance category	<=10km	15	24.59	61	50	76	41.5
	>10km	46	75.41	61	50	107	58.5
	Total	61	100	122	100	183	100.0

The mean distance of MNM cases were two times distal than those of controls with (35.38km \pm 37.73 SD, 19.47 km \pm 29.05 SD) respectively. The mean admission time for MNM cases and controls were (5.79 days \pm 3.98SD; 1.39 \pm 2.94SD) respectively. Table 3

Table 3: showing mean and Stander Deviation of variables related to Maternal Near Miss, of study participants managed at Nekemte Specialized Hospital, September 2018

Variables	Case			Controls			Total		
	N	Mean	SD.	N	Mean	SD	N	Mean	SD
Distance travelled	61	35.38	37.73	122	19.47	21.88	183	24.77	29.05
Monthly income	61	3311.48	2268.7	122	3394.1	1463.2	183	3366.6	1766.8
Age	61	27.20	6.06	122	24.8	4.45	183	25.60	5.17
Age at marriage	61	18.62	3.19	122	19.51	2.79	183	19.21	2.95
Age at 1st pregnancy	61	20.25	3.39	122	20.93	3.03	183	20.70	3.16
Admission time	61	5.79	3.98	122	1.39	2.94	183	2.86	3.91

Mothers delayed at home >6hrs were , 52.46% for cases and 74.59% for controls. A higher proportion of women in the near-miss group controls received adequate care at the final hospital in less than 30 minutes (81.97% vs. 91.82%,). Majority of MNM cases came with referral , 54.10% from HC and 23.31% were from District Hospital and the other 24.59% came by self referral. The means of transportation for MNM cases were 26.23% by Rent car and 72% by Ambulance.(Table 4)

Table 4: The three delay models to Maternal Near Miss cases from study participants admitted to Nekemte Specialized Hospital, September 2018. (N = 183)

Variable	Category	Case		Contol		Total	
		N	%	N	%	N	%
First delay	<=6 hours	32	52.46	91	74.59	123	67.2
	>6 hours	29	47.54	31	25.41	60	32.8
Second delay	<=30 minutes	12	19.67	41	33.61	53	29.0
	31-60 minutes	2	3.28	32	26.23	34	18.6
	>60 minutes	47	77.05	49	40.16	96	52.5
Third delay	<=30 minutes	50	81.97	112	91.82	162	88.5
	>30 minutes	11	18.03	10	8.18	21	11.5
Source of referral	Self	15	24.59	60	49.18	75	41.0
	Health centre	33	54.10	55	45.08	88	48.1
	District Hospital	13	23.31	7	5.74	20	10.9
Means of transportation	Traditional ambulance	1	1.64	0	0	1	0.5
	Rent car	16	26.23	59	48.36	75	41.0
	Ambulance	44	72.13	63	51.64	107	58.5
	Total	61	100	122	100	183	100

5.2: Obstetric Related determinants of MNM cases

Majority of mothers belongs to gravid 2-4 which accounts for 44.26% of MNM cases and 53.28% of the control group. Table 5 Majority of mothers who doesn't have ANC follow up belongs to the near miss group which accounts for 26.23% and only 1.64% for the control group. 27.87% of near miss cases had got ≥ 4 ANC which is much less than for the control group, 40.16%. Fig.2

Labor was induced in 32.79% of maternal near miss cases and 4.29% of the controls and the live birth outcome of 45.9%, 99.18% respectively. Table 5

There were 4.92% home delivery in the MNM cases; 88.52% of them delivered at Hospital and most of them (68.85%) delivered after 13-18hrs stay on labor. All of mothers in the control group delivered at Hospital ; for whom 93.44% of them were on labor for 13-18 hours. Table 5

Majority of mothers are nulliparous that accounts 32.79% of MNM cases and 42.63% of controls. Age at first pregnancy of <=16years six times in the MNM case group than that of control (13.11%,2.46%) . Previous history of 1-2 abortion accounts for 8.20% ,6.56% for near miss cases and controls respectively. Preterm admission was three times high in the near miss group which accounts 26.23% ; 9.84% for the controls. Until the time of discharge most of the newborns who were born from the near miss cases had died that accounts for 62.30% . Most of the maternal near miss cases stayed 3-7days in the Hospital for management ;62.30%. Table 5

Table 5: Obstetric related factors of study participants admitted to Nekemte Specialized Hospital, September 2018. (N = 183)

variables	Category	Case		Control		Total	
		N	%	N	%	N	%
Gravidity	Primigravida	19	31.15	48	39.34	67	36.6
	Gravida 2-4	27	44.26	65	53.28	92	50.3
	Gravida >=5	15	24.59	9	7.38	24	13.1
Parity	Para 0	20	32.79	52	42.63	72	39.3
	Para 1-2	16	26.23	47	38.52	63	34.4
	Para 3-4	16	26.23	20	16.39	36	19.7
	Para >=5	9	14.75	3	2.46	12	6.6
Age at first pregnancy	<=16 years	8	13.11	3	2.46	11	6.0
	17-18 years	17	27.87	24	19.67	41	22.4
	19-24 years	26	42.62	79	64.75	105	57.4
	>=25 years	10	16.39	16	13.11	26	14.2
Abortion	Nil abortion	56	91.80	114	93.44	170	92.9

	1-2 abortion	5	8.20	8	6.56	13	7.1
Gestational age	<28 weeks	12	19.67	3	2.46	15	8.2
	28-36 weeks	16	26.23	12	9.84	28	15.3
	37-42 weeks	33	54.10	107	87.70	140	76.5
Onset of labor	Spontaneous	41	67.21	116	95.08	157	85.8
	Induction of labor	20	32.79	6	4.92	26	14.2
Duration of labor	<=12 hours	42	68.9	49	40.16	91	49.73
	>12 hours	19	31.1	73	49.84	92	50.27
Vital status of new born at delivery	Alive	28	45.90	121	99.18	149	81.4
	Dead	33	54.10	1	0.82	34	18.6
Vital status of newborn at discharge	Alive	23	37.70	121	99.18	144	78.7
	Dead	38	62.30	1	0.82	39	21.3
Time since Uterine evacuation	<=24 hours	56	91.80	122	100	178	97.3
	>24 hours	5	8.20	0	0	5	2.7
Duration of admission	0.0-3.0 days	13	21.31	120	98.36	133	72.7
	3.1-7.0 days	38	62.30	0	0	38	20.8
	>7 days	10	16.40	2	1.64	12	6.6
Place of Delivery	Home	3	4.92	0	0	3	1.64
	Health Center	4	6.56	0	0	4	2.2
	Hospital	54	88.52	122	100	183	96.16
Maternal condition on discharge	Improved & discharged	61	100	122	100	183	100

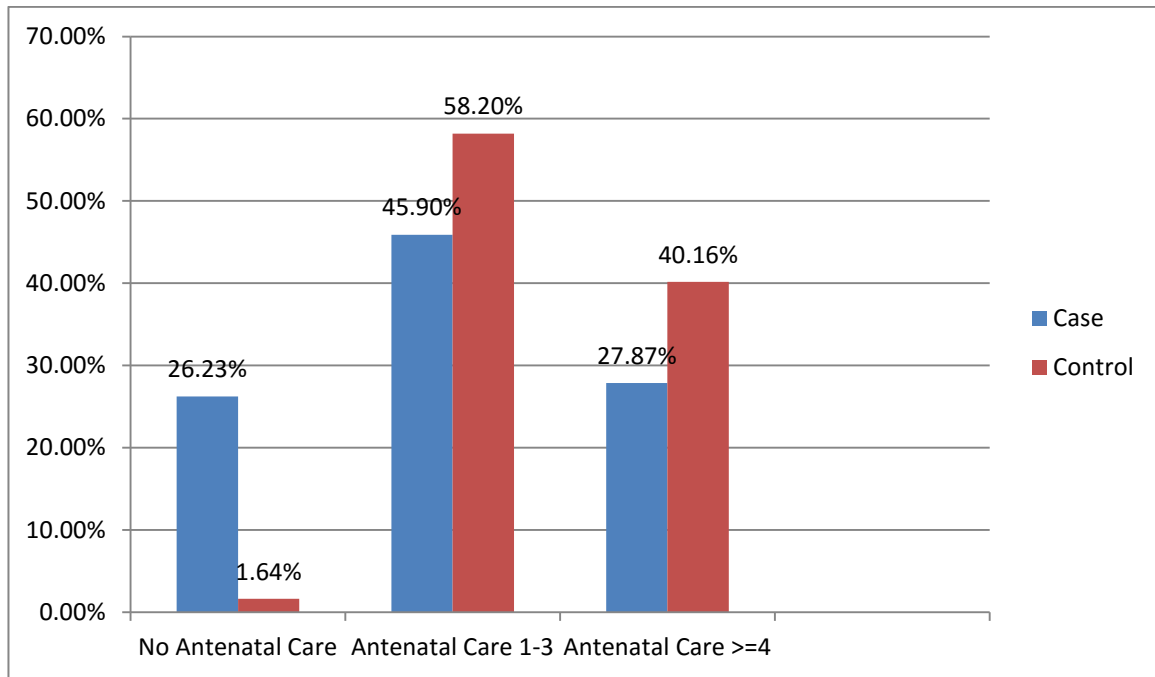


Fig. 2 : Figure showing frequency of Antenatal Care follow up of Study participants managed at Nekemte Specialized Hospital, September 2018

5.3 : Determinants of Maternal Near Miss cases:

The major cause of maternal near miss was severe obstetric hemorrhage (55.74%) followed by hypertension during pregnancy 40.98% (29.5% Severe pre eclampsia, 11.48% Eclampsia). The other causes were: Obstructed labor 19.67%, ruptured ectopic pregnancy, GTD with severe pregnancy and complicated abortions which collectively accounts 13.11% and pregnancy related severe sepsis of 4.92% in descending order. From near miss cases 21 (34.4%) mothers have more than one obstetric causes. Fig 3

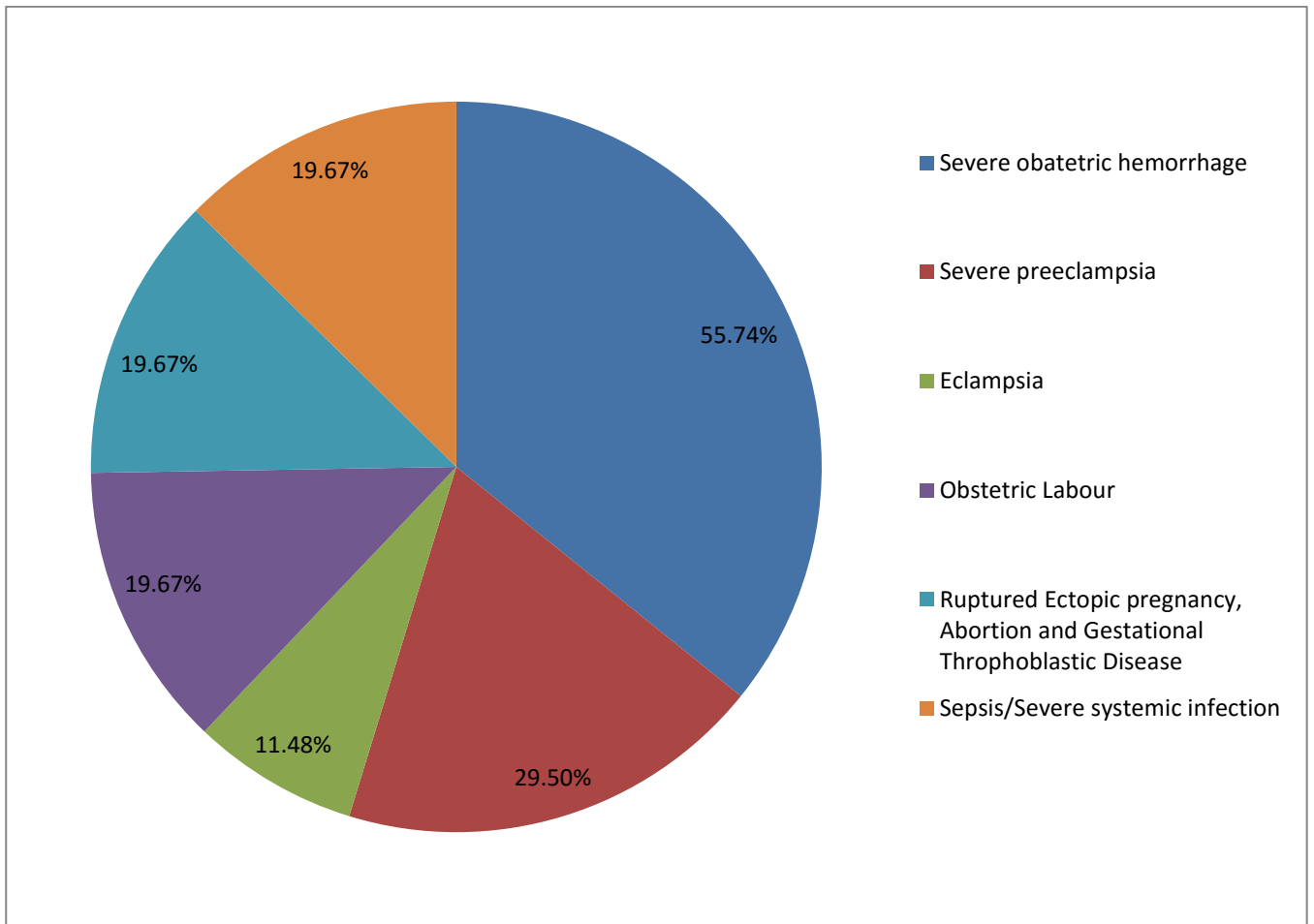


Fig. 3: showing causes of Maternal Near Miss cases managed at Nekemte Specialized Hospital, September 2018 (N=61)

Majority of mothers (39.34%) admitted with maternal near miss cases ,57.4% were transfused with more than three units of whole blood. and Laparotomy was done for 24.6% of near miss cases for ruptured uterus and ruptured ectopic pregnancy presented in shock. majority of mothers were presented with complication: Renal dysfunction 11.48%,Cardiovascular dysfunction 8.2%,hepatic dysfunction 6.56% hypercoagulopathy 3.3%, hysterectomy done for 6.56% of mothers for uterine rupture.

Maternal anemia ,HIV infection and previous cesarean delivery were the contributing factors which accounts for 23%, 1.64% and 14.75% respectively. Majority of maternal near miss cases 77.31% were presented by referral from HC, District hospital and private clinics ; for whom delivery/uterine evacuation was done within three hours after stabilization . Table 6

Table 6: maternal near miss case characteristics' of Nekemte Specialized Hospital , western Ethiopia ,September 2018 (N=61)

Variables	Category1	No	%
Critical interventions done or intensive care unit admission for near miss cases	Use of blood products (includes any blood transfusion	35	57.4
	Laparotomy	15	24.6
Organ dysfunction / life-threatening conditions associated with maternal near miss events :	Cardiovascular	5	8.2
	Respiratory dysfunction:	1	1.64
	Renal dysfunction	7	11.48
	Coagulation/hematologic dysfunction:	2	3.3
	Hepatic dysfunction	4	6.56
	Neurologic dysfunction	1	1.64
	Uterine dysfunction / Hysterectomy	4	6.56
	Total	24	39.34
CONTRIBUTORY / ASSOCIATED CONDITIONS :	Anemia	14	23
	HIV infection	1	1.64
	Previous caesarean section	9	14.75
About conditions mothers with near miss cases at arrival in the facility and the referral process,	Delivery or abortion occurred before arrival at any health facility	7	11.48
	Delivery within 3 hours of arrival in the health facility	18	29.51
	Laparotomy within 3 hours of hospital arrival or in other hospital	15	24.6
	Woman referred from other health facility	46	77.31

As maternal near miss cases were presented in critical condition, after stabilization pregnancy termination, delivery or uterine evacuation was performed after stabilizing the mother. vaginal delivery accounts for 50.58% followed by Laparotomy for ruptured uterus of 16.4%, cesarean section 16.39%, curettage/MVA 9.84% and Laparotomy for ruptured uterus for 4.92% of near miss cases .Fig 4

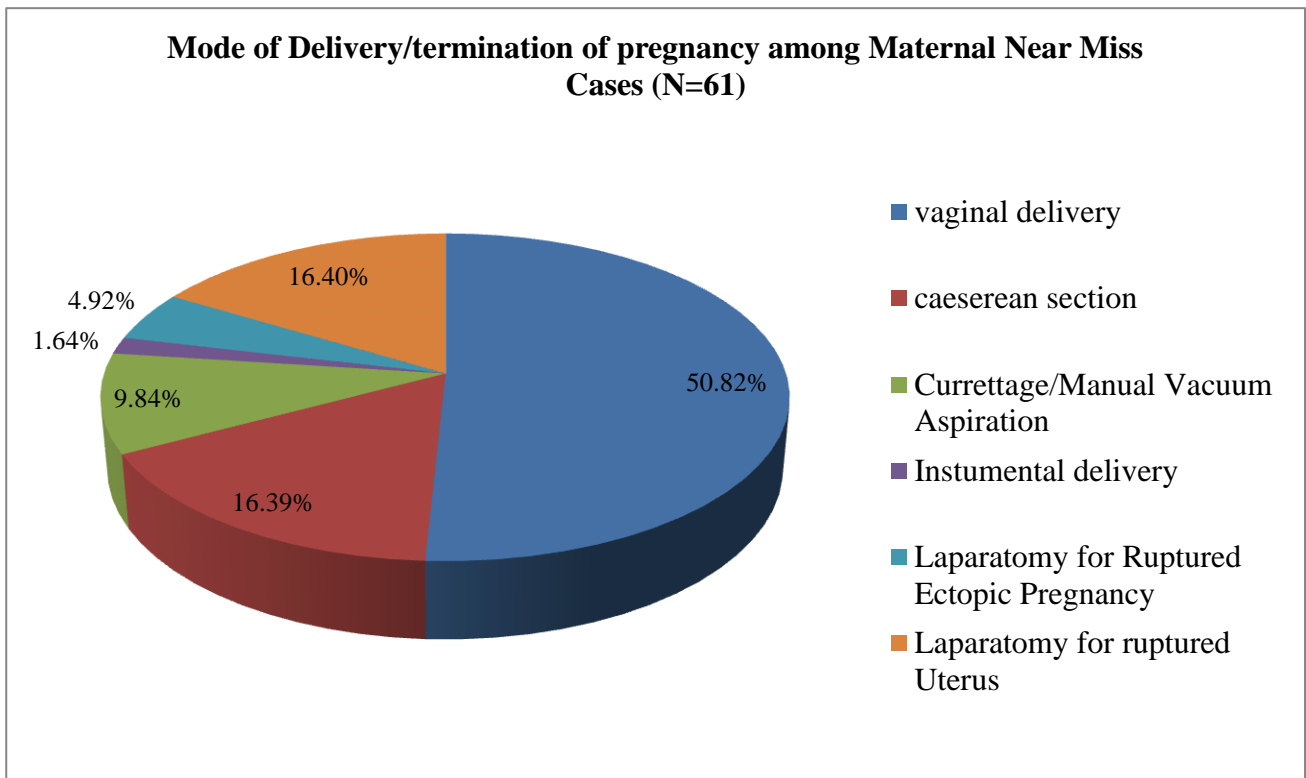


Fig 4: Figure showing mode of delivery of Maternal Near Miss cases of mothers managed at Nekemte Specialized Hospital, September 2018

5.4: Bivariate Analysis

Variables that has significant association on bivariate analysis with binary logistic regression collected and entered to multivariate analysis and presented on table:7.

Table 7: Table showing Bivariate Analysis for mothers managed at Nekemte Specialized Hospital, September 2018

Variables	Category	No Case	No Control	B	S.E	COR	95% CI.		P-Value
							Lower	Upper	
Place of residence	Urban	44	62			1*			.00
	Rural	17	60	-.918	.338	0.40	0.21	0.78	.007*
Age category	15-19 years	4	8						0.004
	20-34 years	45	110	1.792	.842	0.82	1.15	31.23	.033*
	35-49 years	12	4	1.992	.604	6	2.25	23.95	.001*
Husband education	No education	11	7	-1.250	.561	3.49	.10	0.86	.026*
	Read and write	8	8	-.799	.575	2.22	.15	1.39	.165
	Grade 1-8	19	31	-.309	.407	1.17	.33	1.63	.448
	Grade 9-10	5	36	1.176	.555	0.31	1.09	9.62	.034*
	More than secondary	18	40			1*			.005
Occupation	Farmer	32	22	-1.208	.469	3.35	.12	.75	.010*
	Housewife	14	60	.622	.481	0.54	.73	4.79	.196
	Unemployed	5	17	.391	.634	0.68	.43	5.12	.538
	Government employ	10	23			1*			.000
Distance	<=10km	15	61			1*			
	>10km	46	61	-1.121	.348	3.07	0.16	0.65	.001*
First delay	<=6hours	32	91			1*			
	>6 hours	29	31	-.978	.330	2.66	0.2	0.72	.003*
Second delay	<=30 min	12	41			1*			0
	31-60 min	2	32	1.544	.799	0.21	0.98	22.44	0.053
	>60 min	47	49	-1.187	.387	3.28	0.14	0.65	.002*
Means of transport	Rent car	17	59	.885	.34	2.42	1.25	4.70	.009*
	Ambulance	44	63			1*			.023
Gravidity	Primigravida	19	48						0.008*
	Gravida 2-4	27	65	1.438	.501	1.05	1.57	11.25	.004*

	Gravida .>=5	15	9	1.389	.480	4.21	1.57	10.28	.004*
Parity	Nullipara	20	52						0.008
	Para 1-2	16	47	2.054	.717	0.89	1.91	31.78	.004*
	Para 3-4	16	20	2.176	.727	2.08	2.12	36.62	.003*
	Para >=5	9	3	1.322	.746	7.80	0.87	16.19	0.077
Age at first pregnancy	<=16 years	8	3						0.011
	17-18 years	17	24	1.326	.748	0.27	0.87	16.3	.076*
	19-24 years	26	79	2.092	.714	0.12	2	32.82	.003*
	>=25 years	10	16	1.451	.788	0.23	0.91	20	0.066
ANC follow up	No	16	4	-2.350	.586	10.49	3.33	33.07	.000*
	Yes	45	118			1*			00
Gestational age	<28 weeks	12	3	-2.563	.676	12.97	0.02	0.29	.000*
	28-36weeks	16	12	-1.464	.431	4.32	0.1	0.54	.001*
	37-42weeks	33	107			1*			00
Duration of labor	<=12 hours	42	49			1*			0.055
	>12 hours	19	73	1.19	.332	0.30	1.72	6.32	.000*
Onset of labor	Spontaneous	41	116			1*			
	Induced	20	6	-2.244	.500	9.43	.04	.28	.000*

*=Statistically significant variables (P-value <0.05)

1*= Reference category

COR= Crude Odd Ratio

5.5: Multivariate Analysis

Multiple logistic regression analysis of candidate variables revealed that mothers with high gravidity , having no ANC follow up, prolonged second degree delay and induction of labor has significant association with maternal near miss case. For instance, those who were gravida two-four are five times more likely to suffer from near miss events AOR:4.94 [95% CI:1.46-16.8] ; and those who were gravida five and above were four times more likely to develop maternal near miss events AOR: 3.84 [95% CI: 1.23-11.91] . On the other hand mothers who have no ANC follow up are six times more likely to develop near miss events, AOR: 6.02[95%CI:1.55-23.28] and those with induced labor are nine times more likely to develop maternal near miss events, AOR: 9.40[95% CI: 2.97-29.71] Table 8

Table 8: Multivariate Analysis of associated variables for mothers managed at Nekemte Specialized Hospital, September 2018

Variables	Category	No. Case	No. Control	B	S.E	AOR	95% C.I.		P-value
							Lower	Upper	
Second delay	<=30 min	12	41			1*			
	31-60 min	2	32	.83	.44	2.30	.98	5.40	.057
	>60 min	47	49	2.49	.79	12.00	2.55	56.57	.002*
Gravidity	Primigravida	19	48			1*			
	Gravida 2-4	27	65	1.60	.62	4.94	1.46	16.80	.010*
	Gravida .>=5	15	9	1.34	.58	3.82	1.23	11.91	.021*
ANC follow up	No	16	20	1.79	.69	6.02	1.55	23.28	.009*
	Yes	45	163			1*			
Onset of labour	Spontaneous	41	116			1*			
	Induced	20	6	2.24	.59	9.40	2.97	29.71	.000*

*=Statistically significant variables (P-value <0.05)

1*= reference category

COR= Crude Odd Ratio

AOR= Adjusted Odd Ratio

CHAPTER 6

Discussion

Magnitude of Maternal Near Miss

The study showed the rate of maternal near miss was higher than the study done in India with MNM of 3.74% [33]. This is lower than the study done Morocco with rate of near miss of 12% and Nigeria with 14% MNM rate [34,10]. In similar way the study done in three Hospitals of Amhara Regional state, Debra Markos referral Hospital and JUTH showed that the rate of near miss cases to be 23.3% , 29.7% and 7.38% which is higher than the study result that can be explained by multi institutional and five years retrospective study for which some of the contributing factors have been resolved. [13,26,37] On the other hand the difference could be explained by different health delivery strategies, differences in socio-demographic characteristics of the populations and differences in case definitions. In the present study, maternal near miss was defined according to the WHO disease specific criteria

Determinants of Maternal Near Miss

The study found that mothers with high gravidity , having no ANC follow up, prolonged second degree delay and induction of labor has significant association with maternal near miss case.

The study done in Morocco shows the main risk factors for maternal near miss were illiteracy, lack of antenatal care , complications during pregnancy, and having experienced a first phase delay and a first phase of third delay . [34] Case-control study done in UK shows; factors independently associated with maternal near miss: inadequate use of antenatal care; substance misuse; medical co morbidities; previous pregnancy problems; hypertensive disorders of pregnancy; and Indian ethnicity. [37]

As a study done in Philippi shows, determinant factors of maternal morbidity and mortality include ; Significant Individual Risk (age, parity),the three Delays Model, Human and Reproductive Rights Approach, Health System Factors, Inter-sectoral Issues, Lifecycle Perspective i.e. water sources and geographical accessibility.[38] The Hospital based study in Amhara region revealed determinant factors of maternal near miss were; No formal education, ≥ 7 days of hospital stay , not booked, presence of administrative related factors, personal factors , community related factors and medical personnel related factors from which having no ANC follow up is similar to this study finding. [13] On the other hand according to the study done in Debra Markos Referral Hospital; distance from the hospital, history of difficult labor, and low antenatal care (ANC) utilization were

found to be major determinates of maternal near miss cases which are similar to this study findings as both are a single institutional based study.[36]

Unmatched case-control study conducted in six(6) Public hospitals in Tigray Region, Northern Ethiopia reveals, Women with no formal education, being less than 16 years of age at first pregnancy, induced labor, history of cesarean section or chronic medical disorder, and women who traveled more than 60 minutes before reaching their final place of care had higher odds of experiencing MNM from which induced labor coincides with this study finding.[39]

Obstetric Cause Of Maternal Near Miss

The major causes of maternal near miss were severe obstetric hemorrhage (55.74%) followed by hypertension during pregnancy 40.98% (29.5% Severe pre eclampsia, 11.48% Eclampsia) Obstructed labor 19.67%,ruptured ectopic pregnancy, GTD with severe pregnancy and complicated abortions which collectively accounts 13.11% and pregnancy related severe sepsis of 4.92% in descending order which is similar to EDHS2016 and study done in JUTH,2015[16,37].

Obstetric hemorrhage is the leading cause of MNM events in this study that accounts for 55.74% which agrees with the study done in India 44.3%, EDHS 2016 report , and study done in North Ethiopia Tigray 44.7%. [33,16,39] On the other hand study done in Morocco, Brazil, Egypt, and Addis Ababa prevailed hypertension in pregnancy as the leading cause of near miss events and obstetric hemorrhage as second most cause of near miss event. [34,31,32,35] In similar way study done in Debra Markos Referral Hospital showed obstructed labor as leading cause on near miss events. Maternal anemia, HIV infection and previous cesarean delivery were the contributing factors associated with near miss which is similar to study done in Addis Ababa[35] Sever sepsis is the least cause of maternal near miss events from this study finding which is similar to study done in India, Egypt, Debra Markos. [32,31,36]

Limitation Of The Study

Since the study is a single hospital based, and thus results cannot be generalized to the whole population.

Chapter 7

Conclusion and recommendation

7.1 Conclusion

The magnitude of maternal near miss cases is slightly lower than other studies finding. The study showed that multigravidity, having no antenatal care follow up, prolonged second delay and induction of labor were significantly associated determinants to cause maternal near miss cases. Majority of maternal near miss cases were from rural areas. Most of near miss cases came by referral and obstetric hemorrhage and pregnancy induced hypertension were the major cause of near miss events.

7.2 Recommendation

Based on the study finding the following recommendations will be given:

1. Nekemte Specialized Hospital Administrative Office, East Wollega Zonal Health Department , and Oromia Regional Health Bureau to aware communities about importance of ANC follow up.
2. Nekemte Specialized Hospital Administrative Office, East Wollega Zonal Health Department , and Oromia Regional Health Bureau to strengthen the referral linkage and continuous Ambulance service.
3. Nekemte Specialized Hospital Administrative Office, East Wollega Zonal Health Department , and Oromia Regional Health Bureau to strengthen the awareness on importance of limiting family size.
4. Further study is highly recommended to investigate maternal near miss cases in the catchment population

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Annex1: Table3: Showing WHO Maternal Near Miss Diagnosis Criteria

<p>Severe maternal complications</p> <ul style="list-style-type: none">• Severe postpartum haemorrhage• Severe pre-eclampsia• Eclampsia• Sepsis or severe systemic infection• Ruptured uterus• Severe complications of abortion	
<p>Critical interventions or intensive care unit use</p> <ul style="list-style-type: none">• Admission to intensive care unit• Interventional radiology• Laparotomy (includes hysterectomy, excludes caesarean section)• Use of blood products	
<p>Life-threatening conditions (near-miss criteria)</p> <ul style="list-style-type: none">• Cardiovascular dysfunction<ul style="list-style-type: none">– Shock, cardiac arrest (absence of pulse/heart beat and loss of consciousness), use of continuous vasoactive drugs, cardiopulmonary resuscitation, severe hypoperfusion (lactate >5 mmol/l or >45 mg/dl), severe acidosis (pH <7.1)• Respiratory dysfunction<ul style="list-style-type: none">– Acute cyanosis, gasping, severe tachypnea (respiratory rate >40 breaths per minute), severe bradypnea (respiratory rate <6 breaths per minute), intubation and ventilation not related to anaesthesia, severe hypoxemia (O₂ saturation <90% for ≥60 minutes or PAO₂/F_{IO}₂ <200)	<ul style="list-style-type: none">• Renal dysfunction<ul style="list-style-type: none">– Oliguria non-responsive to fluids or diuretics, dialysis for acute renal failure, severe acute azotemia (creatinine ≥300 μmol/ml or ≥3.5 mg/dl)• Coagulation/haematological dysfunction<ul style="list-style-type: none">– Failure to form clots, massive transfusion of blood or red cells (≥5 units), severe acute thrombocytopenia (<50 000 platelets/ml)• Hepatic dysfunction<ul style="list-style-type: none">– Jaundice in the presence of pre-eclampsia, severe acute hyperbilirubinemia (bilirubin >100 μmol/l or >6.0 mg/dl)• Neurological dysfunction<ul style="list-style-type: none">– Prolonged unconsciousness (lasting ≥12 hours)/coma (including metabolic coma), stroke, uncontrollable fits/status epilepticus, total paralysis• Uterine dysfunction<ul style="list-style-type: none">– Uterine haemorrhage or infection leading to hysterectomy
	<p>Maternal vital status</p> <ul style="list-style-type: none">• Maternal death

15. Means of arrival to Hospital: A. Traditional Ambulance B. Ambulance C. Rent Car

❖ **Obstetric factor related to mother**

1. Gravidity : _____
2. Parity: _____
3. Age at 1st pregnancy in years : _____
4. Hx of abortion: A. No B. yes if yes how much _____
5. ANC follow up: A. No B. Yes ,i.e if yes how much: _____
6. Onset of labor A. spontaneous B. Induction of labor
7. Gestational age at admission in weeks: _____

SCREENING QUESTIONS: In the questions 8 to 10, please specify:

0= The condition was not present during the hospital stay (control)

1= The condition was present at arrival or within 12 hours of hospital arrival

2= The condition developed after 12 hours of hospital arrival

3= Information not available / unknown or not applicable

8. Severe complications / potentially life-threatening conditions present

_____A0 Severe Obstetric hemorrhage (, Ruptured EP, Abortion, APH, PPH)

_____A1 Severe preeclampsia

_____A2 Eclampsia

_____A3 Sepsis or severe systemic infection

_____A4 Ruptured uterus

9. Critical interventions or intensive care unit admission

_____B0 Use of blood products (includes any blood transfusion)

_____B1 Laparotomy

_____B3 Admission to Intensive Care Unit

10. Organ dysfunction / life-threatening conditions:

_____C0 Cardiovascular

_____C1 Respiratory dysfunction:

_____C2 Renal dysfunction:

_____C3 Coagulation/hematologic dysfunction:

_____C4 Hepatic dysfunction

_____C5 Neurologic dysfunction

_____ C6 Uterine dysfunction / Hysterectomy:

❖ **MATERNAL AND PERINATAL INFORMATION**

11. Time since delivery or uterine evacuation in hours _____

12. duration of onset of labor in hour _____

13. place of delivery: A. Home B. Health post C. Health Centre D. Hospital

14. Final mode of delivery / end of pregnancy. Please specify: E3

1= Vaginal Delivery

6= Medical methods for uterine evacuation

2= Caesarean section

7= Laparotomy for ectopic pregnancy

3= Complete abortion

8= Laparotomy for ruptured uterus

4= Curettage / vacuum

9= Women discharged or died still pregnant

5. Instrumental delivery 10= Unknown / other

15. Regarding the vital status of the infant, please specify: 0=Alive 1=Dead

At birth: _____ E6

At hospital discharge or on the 7th day of life if still in the hospital: _____ E7

16. About conditions at arrival in the facility and the referral process, specify: (0=No 1=Yes)

_____ F0 Delivery or abortion occurred before arrival at any health facility

_____ F1 Delivery within 3 hours of arrival in the health facility

_____ F2 Laparotomy within 3 hours of hospital arrival or in other hospital

_____ F3 Woman referred from other health facility

_____ F4 Woman referred to any higher complexity hospital

17. **UNDERLYING CAUSES OF DEATH / NEAR MISS** :Please specify: (0=No 1=Yes)

_____ L1 Obstetric hemorrhage

_____ L2 Hypertensive disorders

_____ L3 Pregnancy-related infection

_____ L4 Other obstetric disease or complication

_____ L5 Medical/surgical/mental disease or complication

_____ L6 Unanticipated complications of management

_____ L7 Coincidental conditions

_____ L8 Unknown

19. **CONTRIBUTORY / ASSOCIATED CONDITIONS** :Please specify: (0=No 1=Yes)

_____ M0 Anaemia

_____ M1 HIV infection

_____ M2 Previous caesarean section

_____ M3 Prolonged/obstructed labour

_____M4 Other condition specified in the local manual of operations

_____M5 Other condition specified in the local manual of operations

_____M6 Other condition specified in the local manual of operations

20.Total date of admission in days :_____

21. Condition of the mother at discharge: A. Improved and discharged B. died:

Name of data collector:_____

Sign:_____

Date:_____

Assurance Of Principal Investigator

The undersigned agrees to accept responsibility for the scientific ethical and technical conduct of the research project and for provision of required progress reports as per terms and conditions of the College of Public Health & Medical Sciences in effect at the time of grant is forwarded as the result of this application.

Name of the student: _____

Date. _____

Signature _____

Approval Of The Advisors

Name of the first advisor: _____

Date. _____

Signature _____

Name of the second advisor: _____

Date. _____

Signature _____