MEKELLE UNIVERSITY COLLEGE OF HEALTH SCEINCE

SCHOOL OF PUBLIC HEALTH DEPARTMENT OF REPRODUCTIVE HEALTH

MAGNITUDE AND DETERMINANTS OF MATERNAL COMPLICATIONS DURING PREGNANCY AND POST PARTUM INETHIOPIA: A SURVEY STUDY USING PMA DATA

PI: MAEDOT FISHA (Bsc)

ADVISER: DR. GIRMATSION FISSEHA

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Name of Principal Investigator	Maedot Fiseha
Advisors	Dr. Girmatsion Fisseha (PhD) Dr. Mache Tsadik (PhD)
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Address of Investigator (email, cell phone and landline telephone)	maedotfisha@gmail.com +251914005995

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Mekelle University College of Health science, Department of Reproductive Health

Advisor's Approval Sheet

This is to certify that the thesis prepared by Maedot Fisha; entitle Magnitude and Determinants of Maternal Complications during Pregnancy and Post Partum in Ethiopia: A Survey Study Using PMA Data " is submitted in partial fulfillment of the requirements for the degree of MPH with specialization in "**Reproductive Health**" to the Graduate Program of the College of Health science of Mekelle University and has been carried out by Maedot Fisha ID No: Chs /rrh/ 007/13 under my supervision. Therefore, I recommend that the student as fulfilled the requirements and hence hereby can submit the thesis to the Department of Reproductive Health.

Name of Advisors

DR. Girmatsion Fisseha Signature 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 Research Publications Office in effect at the time of Grant is forwarded as the result of this application.

Name of the student:

Date._____ Signature _____

Approval of the primary Advisor

Name of the primary advisor:_____

Signature _____ Date._____

Approval of the examiner

Name of the examiner:_____

Signature _____ Date._____

Approval of Graduate Program Coordinator

Name of coordinator: _____

Signature: _____ Date: _____

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Abbreviations/Acronym

ANC – Anti natal Care

ASEAN - Association of Southeast Asian Nations

C/S- Caesarian Section

EPDS - Edinburgh Postnatal Depression Scale

GI – Gastro intestinal

HDP - Hypertensive Disorder during Pregnancy

IUFD – Intra Uterine Fetal Distress

LLMICs – Low and Lower Middle Income Countries

MMR – Maternal Mortality Ratio

MOHE - Ministry of Health Ethiopia

ODK - Open Data Kit

PIH – Pregnancy Induced Hypertension

PNC – Post Natal Care

PPD – Post Partum Depression

PTL- Preterm Labor

USA – United State of America

UTI – Urinary Tract Infection

WHO - World Health Organization

Abstract

Background: A maternal complication is a physical or mental issue that affects the mother's health, the fetus's health, or both. Even women who were healthy before getting pregnant can experience complications. These complications may make the pregnancy a high-risk pregnancy. All pregnancies are at risk. According WHO (world health organization) most of the complications develop during pregnancy and most are preventable or treatable. Other complications may exist before pregnancy but are worsened during pregnancy. In Ethiopia the these complications were the major direct obstetric complications

Objective: To determine the magnitude and determinant factors during pregnancy and postpartum complications data from PMA Ethiopia

Methods: Performance Monitoring for action (PMA) surveys are a prospective cohort survey based on a multistage stratified cluster sampling design with urban-rural stratification. The sample size of this study is 1678 and the study population was women's who have pregnant or women 0-4 weeks of postpartum. The magnitude of complications during pregnancy and postpartum period will be computed by using STATA 17 software. Multivariable logistic regression analysis was used to control confounding variables at the p-value < 0.05 and the strength of the statistical association with maternal complication during pregnancy and post partum was measured by using adjusted odds ratios and ` 95% confidence intervals.

Result: magnitude of maternal complication during pregnancy and postpartum is 37.31% and38.74% respectively. Women who have develop a complication both during pregnancy and post partum were 18.3%. Women who have completed the higher education [AOR =0.191, 95% CI: (0.093, 0.392)]. A woman who has a grand multi Para [(AOR = 0.662, 95 % CI: (0.442, 0.993)]. Women's who have obtain ANC follow up[AOR =0.758, 95% CI: (0.573, 1.004)]. Women with twin pregnancies [(AOR = 1.97, 95 % CI: (0.974, 3.963)] these factors associated with maternal complication during pregnancy. Living with a man [AOR = 2.453, 95% CI: (1.214, 4.957)]. Women who attended greater than 4 ANC follow up [AOR = 0.727, 95% CI: (0.526, 1.006)]. Women with twin pregnancy [AOR = 3.596, 95% CI: (1.225, 10.556)]. Postpartum visit [AOR = 0.682, 95% CI: (0.482, 0.965)] these factors associated with postpartum complication.

Conclusion: Maternal complication during pregnancy and postpartum in Ethiopia was found to be major maternal health issue. Being living with a man, uneducated mother and their life partners, twin pregnancy, absence of post natal visit and low ANC visit were important predictors of maternal complications during pregnancy and postpartum period. By implementing targeted interventions to address the identified maternal complications, focusing on high - risk areas and populations to improve maternal health outcomes.

Key words: maternal complication during pregnancy, postpartum complication, community, PMA, Ethiopia

1. INTRODUCTION

1.1 Background

Maternal complications during pregnancy are a physical or mental issue that affects the mother's health, the fetus's health, or both. Even women who were healthy before getting pregnant can experience complications. These complications may make the pregnancy a high-risk pregnancy(1,2). While most pregnancies and births are uneventful, all pregnancies are at risk. Around 15% of all pregnant women will develop a potentially life-threatening complication that calls for skilled care, and some will require a major obstetrical intervention to survive(3).

According WHO (world health organization) most of the complications develop during pregnancy and most are preventable or treatable. Other complications may exist before pregnancy but are worsened during pregnancy, especially if not managed as part of the woman's care. Some common complications of pregnancy include like, High blood pressure, gestational diabetes, Infection, Preeclampsia, preterm labor, depression and anxiety, pregnancy loss(Miscarriage), and stillbirth etc(2–4).

The postnatal period, defined here as the period beginning immediately after the birth of the baby and extending up to six weeks (42 days), is a critical time for women, newborns, partners, parents, caregivers and families. Yet, during this period, the burden of maternal and neonatal mortality and morbidity remains unacceptably high (5). During the postpartum period, there are a number of potential complications can occur. Some of which can cause significant morbidity and mortality. These changes include those in the reproductive, urinary, cardiovascular, gastro intestinal and endocrine systems. In addition, hemorrhage, Postpartum fever (typically from infection, puerperal psychosis or postnatal psychosis are common complications during this time frame (6).

The determinant factors are occurring during pregnancy and postpartum period. The socio demographic characteristics are marital status, attendance of school, occupational status, and difficulty managing income (7,8).

Obstetrical characteristics are history of abortion, history of child death, history of children being hospitalized, unplanned pregnancy, the status of the last infant, weight of the infant, the onset of labor, negative life events, and illness/complication during pregnancy (9).

The other characteristic also substance use, previous psychiatric history, and social support history are substance use before pregnancy, substance use during pregnancy, family history of mental illnesses, history of depression, abuse at home, satisfaction with marriage, support from baby father and status of satisfaction with mother-in-law were significantly associated with maternal pregnancy and postpartum period (9,10).

In addition to the above, factors that prevent women from receiving or seeking care during pregnancy and childbirth are: health system failures that translate to

(i) poor quality of care, including disrespect, mistreatment and abuse,

(ii) insufficient numbers of and inadequately trained health workers and

(iii) shortages of essential medical supplies; and (iv) the poor accountability of health systems (11).

In Ethiopia have reported ante partum hemorrhage, postpartum hemorrhage, retained placenta, obstructed labor, postpartum sepsis, ruptured uterus, hypertensive disorders, complications of abortion, ectopic pregnancy as the major direct obstetric complications (12). And negative psychological feelings or mood swings during pregnancy, delivery, and the first year after giving birth (13). The magnitude of these complications were the major direct obstetric complications accounted for 40,080 (58.9%) of the cases while 27,922 (41.1%) of women experienced other direct obstetric complications(14). Prolonged labor was the leading cause of major direct obstetric morbidity, accounting for 23.4% of the total cases. Hypertensive disorders was the second most frequent cause of major direct maternal morbidity as 11.6% of mothers experienced this condition (14). The study conducted that out of the 122 mothers participated, 16(13.11%) were found to have postpartum depressive symptoms as measured by an EPDS score of $\geq$ 13 (15).

In addition, the Tigray region was under war and siege health services were severely compromised and also significantly affected, there were initially almost collapsed services for more than two years and later the materials and the services provided in the health facility were limited. The maternal mortality ratio in were 840 (95% CI 739-914) per 100 000 live births. Hemorrhage, 107 (42.8%), pregnancy-induced hypertension, 21 (8.4%), and accidents, 14 (5.6%), were the main causes of mortality. Additionally, 203(81.2%)of the mothers died outside of a health facility. This result was high as compared with the pre-war level of 186/100 000(16).

Another study also it supports the above result. This study showed that the top underlying causes for maternal complication in Tigray were preeclampsia (n = 303, 43.8%), obstetric hemorrhage (n = 166, 24.0%) and sepsis (n = 130, 18.8%) (17).

1.2 statement of the problem

According to the Ethiopia Ministry of Health (EMOHE), direct obstetric complications account for 85% of deaths (18). The long-term conditions disable women following delivery-related complications, such as fistula, uterine prolapsed, chronic pelvic pain, depression and exhaustion. Fistula is especially common in Ethiopia, primarily due to the frequency of adolescent pregnancy combined with neglected prolonged labor (18). High maternal mortality rates are also directly related to high neonatal mortality rate of 29/1,000 live births. This reflects the difficult state of the mother at the time of birth. The main cause of neonatal deaths includes prematurity, asphyxia and sepsis(19). Among the direct causes of maternal deaths, reports from evidence showed that abortion related deaths are on decline while bleeding during and after child deaths are causes most of the deaths (19).

The major complications that account for nearly 75% of all maternal deaths are severe hemorrhage, infection, high blood pressure during pregnancy (pre-eclampsia and eclampsia), complications during childbirth and unsafe abortion (11). Women in low-income countries have a higher lifetime risk of maternal death. A woman's lifetime risk of maternal death is the probability that a 15-year-old woman will eventually die from a maternal cause. In high income countries, this is 1 in 5300, versus 1 in 49 in low-income countries (11). Many postpartum conditions cause considerable suffering in women's daily life long after birth, both emotionally and physically, and yet they are largely underappreciated, under recognized, and under reported (20).

Studies showed that of the accessible health facilities in the Tigray region, more than 90 per cent were partially or completely damaged, with 98 per cent lacking essential family planning supplies, and 93 per cent of referral facilities lacking the basic supplies necessary for providing key obstetric services or signal functions for pregnant women and newborns(21).

However; the magnitude and determinant factors of maternal complications during pregnancy and postpartum in Ethiopia have some studies. But, most studies have been facility-based, which may not accurately reflect the true burden of maternal complication. Identifying the magnitude and determinants of complications during pregnancy and postpartum period in Ethiopia is essential to minimize the morbidity and mortality of mothers. No single cause has been identified as determinants of complications during pregnancy and postpartum time. Place of residence, the educational status of the mother, mode of delivery, substance abuse, unplanned pregnancy, chronic

physical illness, death of infant, unstable marital condition, marital status have been cited (22–24). Complications of pregnancy are health problems that are related to, or arise during pregnancy. Complications that occur primarily during childbirth are termed obstetric labor complications, and problems that occur primarily after childbirth are termed puerperal disorders. While some complications improve or are fully resolved after pregnancy, some may lead to lasting effects, morbidity, or in the most severe cases, maternal or fetal mortal (25). Living a healthy lifestyle and getting health care before, during, and after pregnancy can lower your risk of pregnancy complications (26).

This research is relevant. Because, the magnitude and determinant of complications during pregnancy and postpartum in community level was not well studied and some studies do not investigate maternal morbidity at health centers and clinics, which may also contribute to an underestimation of the total number of maternal complication. So, determining the magnitude during pregnancy and postpartum complications is critical to manage and prevent further complication. It will also help to identify its impacts on mother and child.

1.3 Significance of the study:

This study will provide magnitude and determinant factors during pregnancy and postpartum complications will be helpful for health professionals and strengthening health systems in order to respond to the needs and priorities of women. To ensure the health and well-being of both the mother and the child helps to reduce the risk of complications, education, and long term societal impact. To know about obstetric complications can help them to seek health care earlier before obstetric complications arise. For researchers, as a baseline data who will be interested to perform their research on identified gaps on the magnitude and determinant factors during pregnancy and postpartum complications. Local government also will be helped to design relevant interventions based on the study finding with the view of reducing the maternal morbidity and mortality related to pregnancy. Finally, it will be helpful to generate and provide evidence-based information on the problem to more focus, which is subsequently essential to designing and implementing appropriate preventive and intervention measures.

2. Literature Review

2.1. Over view of maternal complication during pregnancy and post partum

Maternal health refers to the health of women during pregnancy, childbirth and the postnatal period. Each stage should be a positive experience, ensuring women and their babies reach their full potential for health and well-being (27). Some women experience health problems during pregnancy. These complications can involve the mother's health, the fetus's health, or both. Even women who were healthy before getting pregnant can experience complications. These complications may make the pregnancy a high-risk pregnancy(28)

Many more women suffer from morbidity and disability following childbirth, which greatly impacts their overall health and well-being. The true extent of maternal morbidity is unknown, but it has been suggested that for each maternal death, 20 or 30 women suffer from maternal morbidity. WHO has defined maternal morbidity as "any health condition attributed to and/or complicating pregnancy, and childbirth that has a negative impact on the woman's well-being and/or functioning" (29)

2.1.1. Types of maternal complication

Complications develop during pregnancy and most are preventable or treatable. Other complications may exist before pregnancy but are worsened during pregnancy, especially if not managed as part of the woman's care. The other also during delivery and after delivery (postpartum period) (11).

Pregnancy complications are medical conditions that may affect the mother or the fetus's health during pregnancy. Complications during pregnancy can happen for many reasons. Preexisting medical conditions or new ones (caused by being pregnant) can cause pregnancy complications(30). Common complications of pregnancy include anemia, gestational diabetes, infections, gestational hypertension and pre-eclampsia (31).

Common complications during labor and delivery are different and problems may arise. If complications occur, providers may assist by monitoring the situation closely and intervening, as

necessary. Perineal tears, abnormal heart rate of the baby, water breaking early, prenatal asphyxia and excessive bleeding are the common complications during delivery (2).

The postpartum (or postnatal) period begins after childbirth and is typically considered to last for six weeks. There are three distinct phases of the postnatal period; the acute phase, lasting for six to twelve hours after birth; the sub acute phase, lasting six weeks; and the delayed phase, lasting up to six months. During the delayed phase, some changes to the genitourinary system take much longer to resolve and may result in conditions such as urinary incontinence. WHO describes the postnatal period as the most critical and yet the most neglected phase in the lives of mothers and babies; most maternal and newborn deaths occur during this period(32). Common Postpartum Complications are postpartum infections most often in the urinary tract and uterus, excessive bleeding after delivery, postpartum depression, sleep deprivation, vaginal pain, breast pain and tenderness, discomfort during sex and vaginal discharge(33).

Consequences of maternal complication can lead to her death, further morbidities or disability in the extended postpartum period (up to one year) and can negatively impact the health of her baby, the health of her other children, and the social and economic standing of her family(4).

2.2. Magnitude of maternal complications during pregnancy and postpartum

According to the World Health Organization (WHO), maternal morbidity is unacceptably high. About 287 000 women died during and following pregnancy and childbirth in 2020. Almost 95% of all maternal deaths occurred in low and lower middle-income countries in 2020, and most could have been prevented. Sub-Saharan Africa and southern Asia accounted for around 87% (253 000) of the estimated global maternal deaths in 2020. Sub-Saharan Africa alone accounted for around 70% of maternal deaths (202 000), while southern Asia accounted for around 16% (47 000). The high number of maternal deaths in some areas of the world reflects inequalities in access to quality health services and highlights the gap between rich and poor. The MMR in low-income countries in 2020 was 430 per 100 000 live births versus 12 per 100 000 live births in high income countries (11).

The maternal mortality ratio was three per 100,000 or fewer in the Netherlands, Norway, and New Zealand (25). Another study conducted in Brazilian puerperal women, eight hundred and fifteen

(87.8%) out of 928 puerperal women reported at least one complication during pregnancy, with an average of 2.4 complications per woman. Among the observed complications UTI (31.5%), followed by anemia (24.4%), leucorrhea (23.6%), vaginal bleeding (23.5%), preterm labor (PTL) (22.6%) and PIH (19.5%) were the most frequent complications(35). Another study showed that in Peru the prevalence of postpartum complications in 2019-2020 is 37.7% of the total. In 2019, 38.1% of the women aged 12 to 49 presented complications after childbirth. Likewise, in 2020, 37.2% of women presented complications after childbirth(36).

In the Association of Southeast Asian Nations (ASEAN) countries a study conducted on maternal depression during pregnancy and postpartum period showed that the prevalence of AD ranged from 4.9% in Vietnam to 46.8% in Thailand. Eight studies reported a prevalence of 5.0–14.9%, while eight studies reported a prevalence of 15.0–25.0%, one study reported a prevalence of less than 5%, and one study reported prevalence greater than 25.0%. By country, the prevalence ranged from 10.3% to 20.0% in Malaysia, 7.1% to 17.0% in Singapore, and 4.9% to 24.5% in Vietnam.

The number of studies reporting the prevalence of PD was 24 in eight member countries. The prevalence ranged from 4.4% in Malaysia to 41.7% in Thailand. One study reported less than 5% and five studies more than 25.0% prevalence. Eleven studies reported prevalence of 5.0–14.9%, while seven studies reported prevalence of 15.0–25.0%. By country, the prevalence ranged from 19.9% to 26.2% in Indonesia, 31.8% in Lao PDR, 4.4% to 14.3% in Malaysia, 16.4% in Philippines, 9.0% to 23.3% in Singapore, 5.3% to 41.7% in Thailand, 12.6% in Timor-Leste, and 8.2% to 27.6% in Vietnam(37).

In Sub-Saharan Africa, some studies showed that maternal mortality refers to deaths due to complications from pregnancy or childbirth. The highest number of maternal deaths annually, with a maternal mortality ratio (MMR) of 553 deaths per 100,000 live births, which is over 50 times higher than the MMR for high-income countries with 11 deaths per 100,000 live births(38).

A study conducted in Marrakesh, Morocco Self reported prevalence of post partum morbidity was 13.1 %. Hemorrhage, fever and pregnancy-induced hypertension were the main complications: 71.92; 12.18 and 10.64 % respectively(39).

A study in Ethiopia, in Debre Marcos town a total of 308 postpartum women cards were reviewed with 100% response rate. The magnitude of postpartum morbidity was found to be 101 (32.8%).

Over all morbidities sepsis had the highest prevalence 51 (50.5%). The main causes of postpartum sepsis were genitor-urinary tract infection accounted 29(56.9%), wound infections 16 (31.3%) like C/S 6 (37.4%), episiotomy 5 (31.3%), perineal tear 5 (31.3%) and breast complications 6 (11.8%) (40).

Also in Addis Ababa the study revealed that the prevalence of postpartum depression (PPD) was 19.7% (41). In another study in Yirgalem ,SNNPR, Ethiopia was the leading surgical complications during intra-operative included; hemorrhage, 91(64.5%), incision extension 40(28.4%) and the major post- operative complications were surgical wound infection 34(43.0%) and febrile morbidity 45(57.0%) (42). A study conducted in Tigray region showed that the maternal mortality ratio was 840 (95% CI 739–914) per 100 000 live births. This happens because of postpartum complications, Hemorrhage, 107 (42.8%), pregnancy-induced hypertension, 21 (8.4%), and accidents, 14 (5.6%) (43).

In addition, the Tigray region was under war and siege health services were severely compromised and also significantly affected, there were initially almost collapsed services for more than two years and later the materials and the services provided in the health facility were limited. The maternal mortality ratio in were 840 (95% CI 739-914) per 100 000 live births. Hemorrhage, 107 (42.8%), pregnancy-induced hypertension, 21 (8.4%), and accidents, 14 (5.6%), were the main causes of mortality. Additionally, 203 (81.2%) of the mothers died outside of a health facility. This result was high as compared with the pre-war level of 186/100 000 (16).

2.3 Determinants for pregnancy and postpartum complications

2.3.1 Socio-demographic factors

Age

A study conducted in Greece, women of younger age, had significantly higher mean EPDS scores (44). Another study conducted in Indonesia showed that age was identified as the most dominant variable influencing maternal complication was mother's age (OR 5.837), indicating that risk-age mothers had a probability of 5.837 times at risk (45).

Study conducted in Tanzania maternal age was an associated factor for HDP found the odds of HDP in pregnant women aged 35 years or older were 5.3 times more as compared to younger women (AOR: 5.32; 95% CI: 2.55, 11.10) (46).

In Niger participants in the age category of 26-30 years had the highest proportion of ante partum depression (45.2%) while the least proportion was noted in those aged 36-40 years (47). The study in Ghana showed that respondents who were 25–39 years of age had a higher probability of using PNC services compared to their counterparts who were less than 25 years of age (adjusted odds ratio [AOR] = 7.41, 95% CI: 1.987.71) (48).

A study in southern Ethiopia, hosanna town hadya zone Respondents with an advanced age had 3.29 times better knowledge of the danger signs during pregnancy than those who were younger [adjusted odds ratio (AOR) = 3.29, 95% CI 1.15–9.38] (49). In southwest Ethiopia the study showed that age from 15 to 24 years are 58% times less likely to develop post-partum depression than those who has age greater than 30 years (AOR = 0.420, 95% CI 0.18, 0.98) (24).

Maternal education

The finding of the study conducted in Sub-Sahara Africa revealed that low maternal education is significant predictors of maternal complication (46). The study conducted in Niger educational level was statistically significant for ante partum depression. Those with tertiary education had a higher proportion of ante partum depression (58.9%), followed by those with secondary education (38.4%), then those with primary education (2.7%) (47).

In Ghana the study showed that Mothers with high school (SHS) education and above were 3.65 times more likely to patronize PNC services within 48 h than mothers without formal education (AOR = 3.65, 95% CI: 1.97–13.66) (48).

Study in Ethiopia showed that a multilevel analysis have done among women who attended higher education's as compared to those women who didn't attend formal education has The odds of completion of the continuum of care for the maternity services were two times (AOR = 2.03: 95%CI; 1.14 - 3.61) more likely (50).

Marital status

Study conducted in south Africa unmarried pregnant women (odds ratio (OR) 1.93; 95% CI 0.04 - 1.02; p<0.05) (51). Another study also in Ghana showed that married mothers are 10.34 times more likely to use PNC services within 48 h than single or cohabitation mothers (AOR = 10.34, 95% CI: 3.69–28.97)(48)

Study conducted in Ethiopia, Addis Ababa Unmarried postnatal mothers were 2.69 times more likely to develop postpartum depression than those who were married [AOR = 2.69, 95% CI =1.33, 5.45] (41). Another study in debremarkos Divorced/widowed women had eleven times higher odds of developing postpartum complications than married women [AOR = 10.920, 95% CI: (2.168, 54.998)](40). In yeka sub city also the study showed Single were seven times [AOR = 7.4, 95%CI (4.2, 12.9) more likely to experience post-partum depression than married women.(52)

Residence

Study revealed in Swaziland shows that in relation to residence, women in rural areas are times more likely [OR = 1.35, 95% (C.I: 0.4 - 4.1)] to use postnatal care than those in urban areas (53). A study in southern Ethiopia showed that urban residence increased the likelihood of PNC utilization (APR = 3.52; 95% CI: 2.15, 5.78) as compared to the rural residence (54). Another study also in Yirgalem general hospital showed that which living in rural setting (AOR= 3.37, 95%CI: 1.68, 6.77) more likely to develop maternal complication (42).

2.3.2 Medical factors

A studies were exploring in Greece, among women Gestational hypertension and breastfeeding difficulties were significantly associated with higher PPD symptoms (44).

A Cross-Sectional Study conducted in Saudi Arabia, among mothers during the postpartum period factors associated with postpartum depression, family support has a strong effect on PPD, and mothers without family support have a higher risk of developing PPD than mothers with family support. Of the mothers who had unexpected pregnancies, 68.0% had PPD. The result found that unplanned pregnancies had a substantial risk of PPD (55).

A study conducted in Ghana, showed that Mothers with high school (SHS) education and above were 3.65 times more likely to patronize PNC services within 48 h than mothers without formal

education (AOR = 3.65, 95% CI: 1.97–13.66). Married mothers are 10.34 times more likely to use PNC services within 48 h than single or cohabitation mothers. Additionally, the study showed that mothers who attended ANC at least four times during pregnancy were 6.92 times more likely to go for PNC services within 48 h compared to those mothers who had less than four ANC visits during pregnancy (48).

In Nigeria, the study conducted a descriptive cross-sectional analysis, revealed that on some psychosocial factors were significantly associated with having PPD; having an unsupportive partner, experiencing intimate partner violence and not getting help in taking care of their baby (56).

In a cohort Study conducted in Ethiopia, showed that factors such as multiplicity of pregnancy, Glasgow coma scale, maternal history of previous preeclampsia or eclampsia, antenatal care follow-up, seizure recurrence, type of maternal diagnosis, educational status, maternal age, elevated white blood cells, low platelets, and elevated serum creatinine and liver enzyme levels were statistically related with significant association to maternal complications (57).

Another study in Ethiopia, southern Oromia, showed that factors associated with postpartum hemorrhage among mothers who gave birth on the health institutions with the hypertensive disorder during pregnancy had 3.3 times higher odds of developing PPH compared to those who did not have the hypertensive disorder [AOR = 3.3, 95% CI (1.13, 9.64)] and Women who had prenatal anaemia (Hgb < 11 g/dl) had 5.7 times higher odds of developing primary PPH compared to those who did not have prenatal anemia (Hgb > 11 g/dl) during pregnancy [AOR = 5.68, 95% CI (3.13, 10.32)] (58).

Health institution-based cross-sectional study was conducted in Addis Ababa among 461 postnatal mothers. From total postnatal mothers 91(19.7%) of them had postpartum depression. Occupational status, marital status, income management, sex of baby, history of child death, unplanned pregnancy, negative life event, substance use during pregnancy, history of depression, and marriage satisfaction were determinant factors of postpartum depression.(41) In another study showed that, the factors found to be associated with maternal complication were rural residency, Previous CS scar, having one or more obstetric complication, stage of labor, type of cesarean section, timing of cesarean section, gestational age and duration of the surgery (59).

2.3.3 Obstetric factors

A study conducted in Brazil was factors predicting death from obstetric causes, examining the differences between direct and indirect causes. Ethnicities were more strongly associated with mortality from direct causes. Regarding marital status, being in a stable union was associated with a lower odds of mortality from indirect obstetric causes than being single (60).

A study conducted in the sub-Saharan Africa, the findings revealed a significant association obstetric–gynecological complications during birth were present to a greater degree for sub-Saharan women originally from countries practicing FGM. Those women with obstetric–gynecological complications presenting at higher percentages of the present study sample were intra partum and urgent caesareans, intense postpartum hemorrhage, tears (2nd and 3rd degree) with concurrent episiotomies (during the one same birth), severe risk of fetal distress, failed induction, and non-progressive labor (61).

This study established pregnancy-related complications and associated factors among women attending ANC at a specialized maternal and child health national referral hospital in Uganda, respondents who had a late first ANC (>20 weeks) had an 85% higher likelihood of having pregnancy-related complications as compared to those who had an early first ANC visit (≤20 weeks) (APR= 1.85, 95% CI:1.17-2.92). A gravidity between 4-6 pregnancies had a 32% lower likelihood of having pregnancy-related complications as compared to those who had gravidity between 1-3 pregnancies (APR= 0.32, 95% CI: 0.17-0.57). Gravidity greater than 7 pregnancies had a 32% lower likelihood of having pregnancy-related complications as compared to those who had gravidity between 1-3 pregnancies (APR= 0.32, 95% CI: 0.14-0.73). A parity of ≥ 3 births had a 269% higher likelihood of having pregnancy-related complications as compared to those who had never given birth yet (APR= 3.69, 95% CI: 1.50-9.08).(62).

cross-sectional study was conducted among 250 mothers in Nigeria Among the obstetric related factors of the respondents, having more than five children, mode of delivery, by cesarean section, mothers' poor state of health since delivery, experiencing postpartum blues and not exclusively breastfeeding the baby were associated with PPD (56).

A study conducted in Hawassa city, Southern Ethiopia This study revealed that, women delivered with cesarean section were 2.85 times increased odds of developing puerperal sepsis than those women who were delivered by spontaneous vaginal delivery (Adjusted odd ratio(AOR) = 2.85; 95%

CI: 1.36–5.98). And women whose placenta was removed manually have 6 times higher odds of developing puerperal sepsis than those women whose placenta was delivered by controlled cord traction (AOR = 6.0; 95% CI: 1.39–26.26) (63).

Another study conducted in Ethiopia also showed that more than half of the mothers (55.1%) mentioned at least three obstetric danger signs during pregnancy, childbirth, or postpartum. About 8.4% of women encountered any obstetric complications during pregnancy, childbirth, or postpartum (64). Study conducted in north Ethiopia women who did not have an ANC follow-up (AOR: 10.41, 95% CI: 2.92–37.19) and those with1-3 ANC visits only (AOR: 4.75, 95% CI: 1.69–13.31) had greater odds of delivering at home compared with women who had 4 or more ANC visits. (65)

The study in Ethiopia, in Debremarkos also shows Women who didn't obtain ANC visit were 3.71 times more likely to develop postpartum morbidity when compared to their counterparts [AOR = 3.710, 95% CI: (1.749, 7.870)] on this study also those mothers who hadn't attend postpartum visit were 91.2% less likely to have postpartum morbidity compared to mothers who had postpartum visit [AOR =0.088, 95% CI: (0.040, 0.194)](40).

Another study in Ethiopia, yirgalem town also grand multiparty has 21.03 times more risk of developing maternal complications than prim gravida (AOR=21.03, 95% CI: 19.30, 47.50) (42)

2.3.4 Access to health service

A mixed method study conducted in Zambia showed that more time traveling to health facilities were the barrier to use health service(66). In another study conducted that barriers utilization of maternal health service in LLMICs were negative attitudes toward services, negative attitudes towards the competence of service providers, and negative experiences from past services(67).

A systematic review study showed that in low income countries in Africa, the barriers for a quality of care were lack of sufficient bed capacity and private birth space in maternity wards was an issue reported(68).

Another study in Ethiopia showed that The odds of home delivery was 8.75 times greater among women with "poor knowledge "of obstetric complications as compared to women who had "good knowledge"(AOR: 8.75, 95% CI: 2.32–32.92) and time to reach health institution on foot was

strongly associated with home delivery. The odds of home delivery was5.15 times higher among women living more than two hours walking distance to the nearest health center compared to those within one hour of the nearest center (AOR: 5.15, 95% CI: 1.28–20.70) (65)
The study in Ethiopia, debremarkos town showed that birth attendant had significant association with postpartum maternal complication. Women delivered by doctor had fewer odds to develop postpartum complications than women delivered by unskilled birth attendants [AOR =0.111, 95% CI: (0.027, 0.454)]. Similarly, women delivered by nurse/health officer less likely to develop postpartum morbidity than women delivered by unskilled birth attendants [AOR =0.058, 95% CI: (0.009, 0.361)] (40)

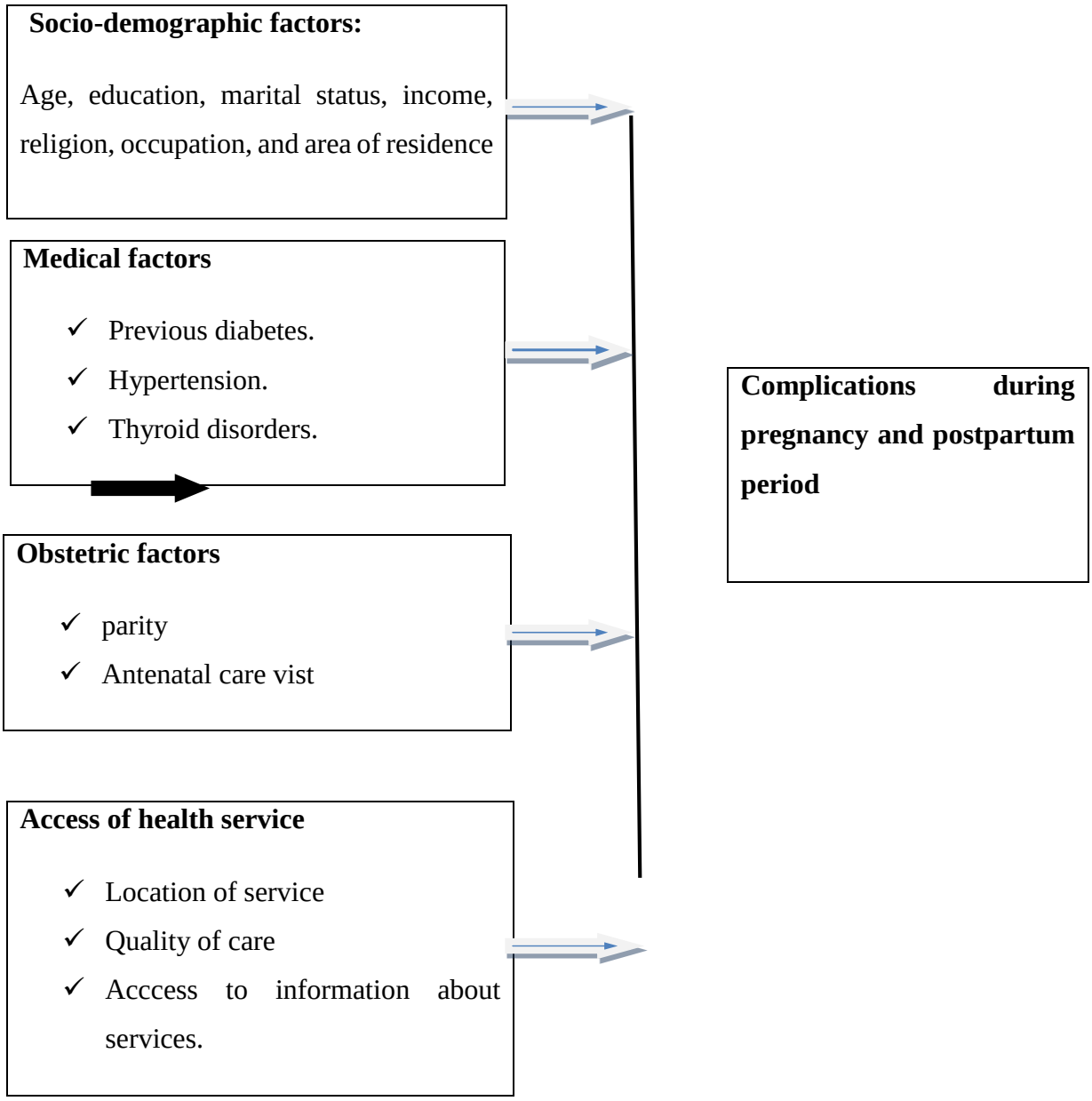
Study conducted in Sidama zone, southern Ethiopia previous negative experiences with health facilities, fear of going to an unfamiliar setting; lack of privacy and perceived costs of maternal health services were the main factors causing the first delay in deciding to seek care. Transport problems in inaccessible areas were the main contributing factors(69). Another study conducted in Addis Ababa Ethiopia also showed that the length of time spent travelling to public health facilities also associated with barriers on use of maternal health services(70).

2.4 Conceptual frame work

The conceptual frame work represents factors when studying complications during pregnancy, delivery and postpartum period among women 0-4 weeks postpartum or pregnant at baseline

received a 6-week follow-up survey approximately 6-week after the delivery. It illustrates the relationship between different variables and how they bring an impact on maternal health. The dependant variable is maternal complication. With regard to independent factors; Socio demographic factors, Medical factor: Psychosocial factor and Behavioral factor: These independent factors might influence a woman how she challenges with those different complications.

Conceptual frame work



The conceptual frame work was adopted and adapted from(71,72)

Figure 1: the diagram shows conceptual framework of factors associated with pregnancy and postpartum complications from PMA survey data was conducted in 2021 – 2022.

3. Objective

3.1 General Objective

To determine the magnitude and determinant factors during pregnancy and postpartum complications data from PMA Ethiopia Mekelle, Tigray, Ethiopia 2024 Prospective cohort survey.

3.2. Specific Objectives

- To determine magnitudes of pregnancy and postpartum complications.
- To identify factors associated to pregnancy and postpartum complications.

4. Methods and materials

4.1. Study area and study periods

We used data from the Performance Monitoring for Action Ethiopia (PMA Ethiopia) survey of women of reproductive age and survey conducted in 2023. PMA Ethiopia is a five-year project implemented in collaboration with Addis Ababa University, Johns Hopkins University, and the Federal Ministry of Health. It measures key reproductive, maternal and newborn health (RMNH) indicators. The funding is provided by the Bill & Melinda Gates Foundation. PMA Ethiopia employed multistage stratified cluster sampling, where households were selected in sampled clusters or enumeration areas (EAs). EAs were selected with probability proportional to size within strata. For Amhara, Oromia, SNNP and one urban region Addis Ababa, strata were defined by both region and urban/rural residence. For the remaining regions, regions served as the strata, without additional urban/rural stratification. Within panel regions, a census of all households was conducted. From the census, enumerators identified all women who were age 15-49 and regular members of the household. Women were screened and those who reported being pregnant or having given birth in the past six weeks were eligible for the survey. Those who were able and willing to give consent were enrolled into the study. Data collection was undertaken in the original EAs selected for Cohort 2 in Addis, Amhara, and Oromia. With the creation of the Sidama region in 2020 from within the SNNP region, eight EAs were removed from the panel, as they were located in the new Sidama region. With the removal of Tigray, Afar, and the eight EAs in SNNP, the final EA sample size for the second cohort was 162 EAs.

4.2. Study Design

This study used a prospective cohort data from Performance Monitoring for Action Ethiopia (PMA Ethiopia) 2023 prospective cohort survey2.

4.3 Source Population:

The source population was all women aged 15–49-years old in the selected households and a women were screened and who reported being pregnant or having given birth in the past six weeks were eligible for the cohort survey.

4.4 Study population:

The study populations have women who were 5-9 weeks postpartum at baseline who consented to the baseline survey, women 0-4 weeks postpartum at baseline that consented to the baseline and

consented to follow-up, and women pregnant at baseline that consented to the baseline and consented to follow-up were eligible for the 6-week follow-up survey.

4.5. Inclusion and Exclusion criteria

Inclusion criteria:

Women who were 5-9 weeks postpartum at baseline who consented to the baseline survey, women 0-4 weeks postpartum at baseline that consented to the baseline and consented to follow-up, and women pregnant at baseline that consented to the baseline and consented to follow-up were eligible for the 6-week follow-up survey.

4.6 Sample size determination

.PMA Ethiopia employed multistage stratified cluster sampling, where households were selected in sampled clusters or enumeration areas (EAs). EAs were selected with probability proportional to size within strata. For Amhara, Oromia, and SNNP, strata were defined by both region and urban/rural residence. For the remaining regions, regions served as the strata, without additional urban/rural stratification. Within panel regions, a census of all households was conducted. From the census, enumerators identified all women who were age 15-49 and regular members of the household. Women were screened and those who reported being pregnant or having given birth in the past six weeks were eligible for the survey. Those who were able and willing to give consent were enrolled into the study. Data collection was undertaken in the 162 EAs selected for Cohort1.

4.6.1 Sampling procedure

This study used data from baseline and six-week postpartum interview PMA Ethiopia 2023. A total of 162 EAs were located into the panel regions were in this study. A total of 2,330 Women were received a 6-week follow-up survey approximately 6-week after the delivery. Women completed the 6-weeks follow-up survey conducted between November 2021 and October 2022.

From those, 33 women's interrupted the follow up and remains 2024 women. Women (n=273) who were completed 5-9 weeks postpartum at baseline received the 6-week follow-up survey at the same time as their baseline interview. Among the women's 2297 were interviewed at baseline and six week follow up. Among the respondents have 248 been incomplete, 99 abortions / miscarriage, 133respondent relocation 14 refused 46 not at home and 79 respondents have other reasons. At the end 1678 respondents were completed the interview. So, we use n=1678 for analytical sampling.

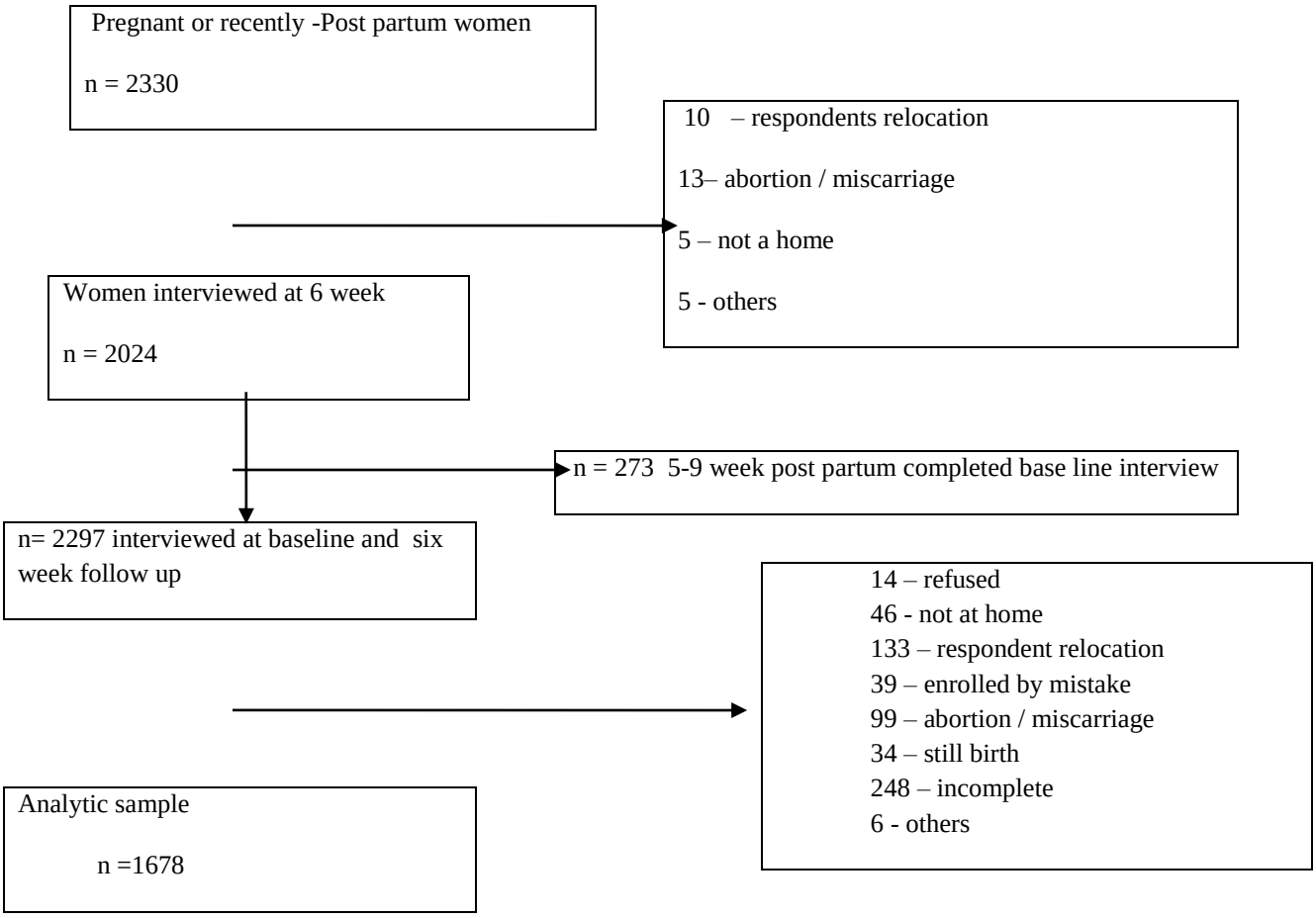


Figure 2. The sample selection process of the study

4.7 Variables

4.7.1 Dependent variables:

Complications during pregnancy and post partum period.

Complications during pregnancy and Postpartum period measures by using of (yes/no) response.

Following pregnancy, the woman is at risk for infection, hemorrhage, and the development of a Deep Vein Thrombosis (DVT). The nurse can remember the key points of a postpartum assessment by learning the acronym BUBBLE-LE, which stands for breasts, uterus, bladder, bowels, episiotomy, lower extremities, and emotions.(73)

4.7.2Independent Variables

Socio demographic characteristics:

- ✓ Age,
- ✓ education,
- ✓ marital status,
- ✓ ethnicity,
- ✓ income,
- ✓ religion
- ✓ Occupation and area of residence.

Medical factors

- ✓ previous diabetes
- ✓ hypertension
- ✓ Thyroid disorders

Obstetric factors

- ✓ Parity
- ✓ antenatal care visit

Access of health service

- ✓ Location of service
- ✓ Quality of care

- ✓ Acccess to information about services.

4.8 Operational definitions and Measurements

Postpartum period - is a time that starts one hour after delivery and extends up to 42 complete days postpartum.

Postpartum complications - health problems that can occur in the weeks and months after giving birth. They can range from relatively minor to life-threatening. Some examples including bleeding, urinary incontinence, depression, psychoses, post-traumatic stress disorder, anxiety, fatigue, and sleep disorders.(11)

Postpartum hemorrhage or postpartum bleeding (PPH) - is often defined as soaking through more than one sanitary pad in an hour for two consecutive hours, passage of large clots (size of a golf ball or large) and dizziness or fainting.

Postpartum depression (PPD)-is a medical condition that many women get after having a baby. Its strong feelings of sadness, anxiety (worry) and tiredness that last for a long time after giving birth.

Infection - after childbirth can be eliminated if good hygiene is practiced and if early signs of infection are recognized and treated in a timely manner.

Pre-eclampsia should be detected and appropriately managed before the onset of convulsions (eclampsia) and other life-threatening complications. Administering drugs such as magnesium sulfate for pre-eclampsia can lower a woman's risk of developing eclampsia.

Gestational hypertension- can develop into preeclampsia. This condition occurs often in young women with a first pregnancy. Gestational hypertension is diagnosed when blood pressure readings are higher than 140/90 mm Hg in a woman who had normal blood pressure prior to 20 weeks and has no proteinuria (excess protein in the urine).

4.9. Data processing and data analysis

Before the actual analysis the combined household and female date set was merged with 5-9 week post partum completed base line interview data. By using of STATA 17 frequencies and

percentages were computed to characterize the study population and weighted the data to correct biases in the sample that may affect the generalizability of the results.

To investigate factors associated with complications during pregnancy and postpartum complication by using of different data analyses techniques. The magnitude of complications during pregnancy and postpartum period was computed by using STATA 17 software we use complex survey analysis to weight the regression analysis. Multicollinearity was checked using the variance inflation factor (VIF). Model fitness was checked by Hosmer Leme show. All variables with a p-value less than 0.25 in the Bivariable analysis were included in multivariable logistic regression model. Multivariable binary Logistic regression will be carried out to identify factors associated with maternal complication during pregnancy and postpartum period.

4.9.1 Data quality management and control

In PMA Ethiopia survey, data were collected by well experienced PMA filed staff, resident enumerators' workers using smart phones Open Data Kit (ODK) system using by real time data generation and timely feedback and also questionnaires appeared in three local languages (Amharic, Afan Oromo, and Tigrigna). Data was checked for completeness and consistency for all completed questioners; those with complete response were considered for analysis. Even though PMA Ethiopia data have been cleaned in order to ensure its appropriateness for analysis, data cleaning and quality before conducting different analyses techniques.

4.10 Ethical consideration

Ethical approval (MU-IRB 2412/2024) was obtained from Mekelle University College of health sciences Institutional Review Board (IRB). This study was use data from Performance Monitoring for Action Ethiopia (PMA Ethiopia). Informed consent was obtained from respondents during the data collection process of PMA Ethiopia. Collected at national level with written consents and ethical consideration during data collection. (https://www.pmadata.org) . All methods were carried out in accordance with relevant guidelines and regulations.

4.11. Plan for dissemination of result

The results will be submitted to Mekelle University; college of health sciences school of public health, department of Reproductive Health and copy of the document will be shared to study health facilities and Regional Health Bureaus.

5. Results

5.1. Socio- demographic characteristics

In this study, a total of 1678 postpartum women were assessed the follow up survey. Among these 774 (46 %) were aged 15-25 years, 717 (43%) were aged from 26 – 35. The mean (±SD) age of the mothers‟ were 27.4 (±6.2) years and majority of the mothers (46%) were in the age group of 15-25 years. 1598 (95%) respondents are currently married and 16 (1%) were divorced/ separated. 1259 (75%) respondents were rural residents and 1,598 (95 %) were married. From the assessed 1678 women's 244 (15%) are completed secondary school and 522 (31%) are never attended to school. On the other hand most (53%) were Oromia by ethnicity (Table 1).

Table 1: Distribution of women by socio demographic/economic characteristics, PMA 2023(weighted, n = 1678)

		Un Weighted		Weighted	
Variable	Category	Frequency	Percentage	Frequency	Percentage
Age of the mother (in years)	15-25	731	43.56	774	46
	26-35	755	44.99	717	43
	36-49	192	11.44	187	11
Marital Status	Currently married	1,569	93.50	1598	95
	Living with a man	69	4.11	42	3
	Divorced /separated	21	1.25	16	1
	Never in union	19	1.13	22	1
Maternal education	Never attended	446	26.58	522	31
	Primary	741	44.16	778	46
	Secondary	285	16.98	244	15
	Technical & vocational	72	4.29	51	3

	Higher	134	7.99	83	5
Residence	Urban	710	42.31	419	25
	Rural	968	57.69	1259	75
Wealth index	Lower quintile	520	30.99	666	40
	Middle quintile	274	16.33	338	20
	Higher quintile	884	52.68	676	40
Husband /partner education	Never attended	375	22.89	461	28
	Primary	648	39.56	694	41
	Secondary	353	21.55	291	17
	Technical & vocational	68	4.15	57	4
	Higher	194	11.84	175	10
Region	Amhara	376	22.41	361	21
	Oromia	605	36.05	884	53
	SNNP	462	27.53	355	21
	Addis	235	14.01	78	5
Religion	Orthodox	669	39.87	564	34
	Protestant	506	30.15	481	29
	Moslem/Muslim	480	28.61	611	36
	Other	23	1.37	22	1

Obstetrics characteristics

Among the total study participants, 648 (41%) was reported, the mother had previously given birth once only. 635 (40%) were multiparous. During their most recent pregnancy 1223 (73 %) of women had history of ANC follow up. a women only 531 (43 %) had more than four ANC visits. Majority of them 1,592 (95 %) deliver spontaneously and 641 (38%) were deliver in their home. Regarding to delivery assistance by skilled health professionals were 1036 (62%) and 805 (48 %) were Received injection on thigh to prevent excess bleeding. Mothers who have delivered in health centers (health institutions) were 1037 (62%) but, they get postnatal care only 817 (69 %) (Table2).

Table2. Distribution of women by obstetric characteristics PMA Ethiopia 2023(weighted, n = 1678)

		Un weighted		Weighted	
Variable	Category	Frequency	Percentage	Frequency	Percentage
Parity (Number of times given live birth)	Primi gravida	702	45.09	648	41
	Multiparous	605	38.86	635	40
	Grand multi Para	250	16.06	309	19
History of ANC follow up	No	447	26.64	455	27
	Yes	1,231	73.76	1223	73
Number of times receiving ANC	1-3	570	46.30	700	57
	>4	661	53.70	531	43
Delivery by caesarean	No	1,526	90.94	1592	95
	Yes	152	9.06	86	5
Place of delivery	Her home	496	29.56	641	38
	Institutional delivery	1,182	70.44	1037	62
Delivery assisted by	No one assisted	496	2.86	642	38
	Skill birth attendant	1182	19.55	1036	62
Received injection on thigh to prevent excess bleeding	No	790	47.08	873	52
	Yes	888	52.92	805	48
PNC	No	347	29.36	365	31
	Yes	835	70.64	817	69

Pregnancy related complications

Among the pregnant mother participants who have developed a migraine are 359 (21.39 %) and have a high blood pressure are around 66 (3.93%). Two hundred seventy (16.09 %) were developed edema of the face/ feet/ body where as 69 (4.11%) had convulsion and 163 (9.71%) have high fever. Other pregnancy complications are 230 (13.71%) and 77 (4.59 %) of the mothers experienced lower abdominal pain and worsening vision respectively (Table3).

Table3. Pregnancy-related complications among women who participated in the study PMA 2023

Variable	Category	Frequency	Percentage
Migraine	No	1,319	78.61
	Yes	359	21.39
High blood pressure	No	1,612	96.07
	Yes	66	3.93
Edema face/feet/body	No	1,408	83.91
	Yes	270	16.09
Convulsion	No	1,609	95.89
	Yes	69	4.11
Vaginal bleeding	No	1,637	97.56
	Yes	41	2.44
High fever	No	1,515	90.29
	Yes	163	9.71
Abnormal vaginal discharge	No	1,654	98.57
	Yes	24	1.43
Lower abdominal pain	No	1,448	86.29
	Yes	230	13.71
Worsening vision	No	1,601	95.41
	Yes	77	4.59

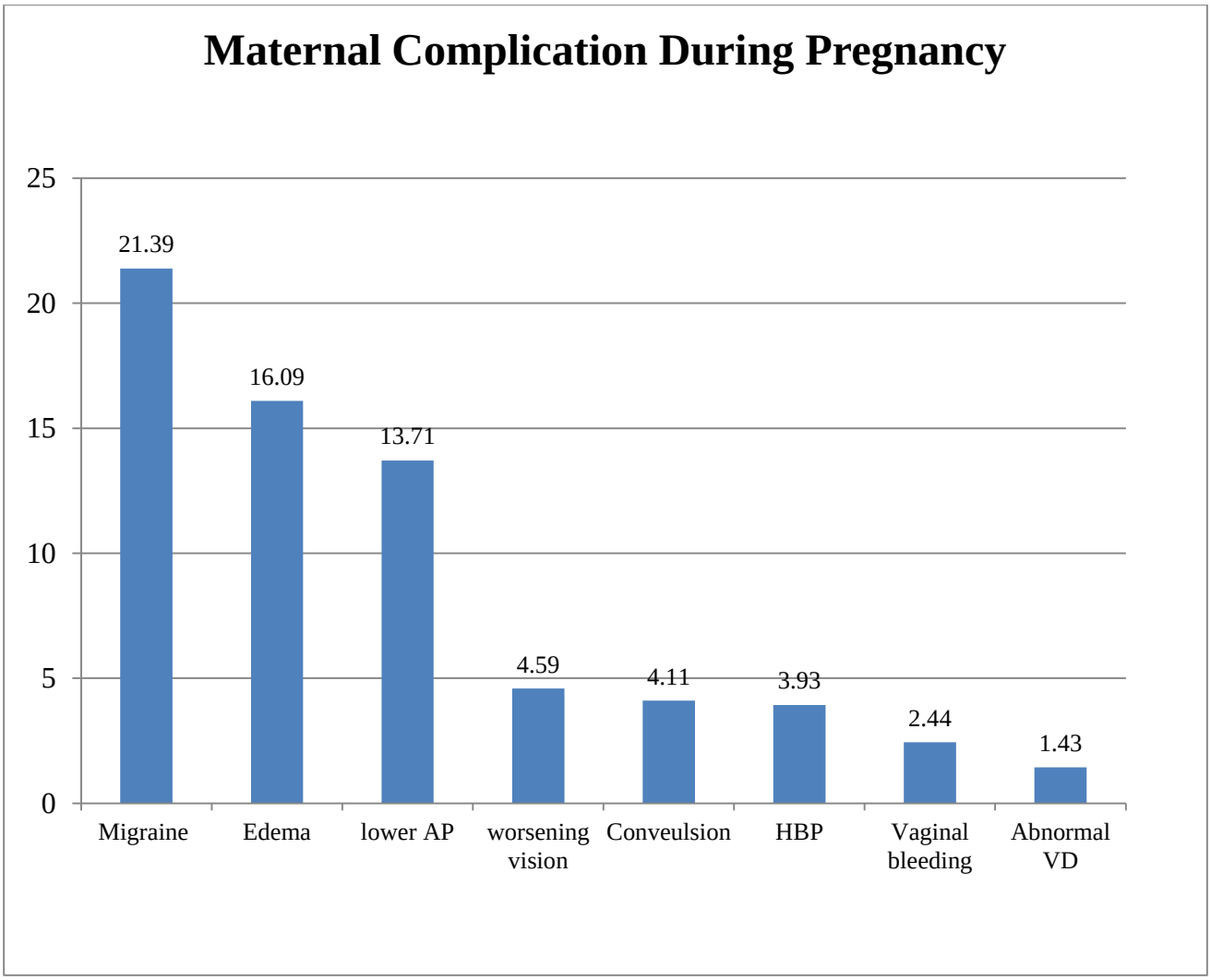


Figure 3. Types of maternal complications during pregnancy women who participated in the study PMA Ethiopia 2023.

Complications on post partum period

In this study a total 1678 mothers had participated. 255 (15.20 %) mothers who have developed severe bleeding during delivery and around 73 (4.35 %) has experienced rupture of membrane and no labor pain for >24hrs. 229 (13.65 %) of the respondents had with prolonged labor and 190 (11.32%) have convulsions during delivery (Table4).

Table4. Complications during postpartum among women who participated in the study PMA Ethiopia 2023.

Variables	Category	Frequency	Percentage
Severe bleeding during delivery	0. No	1,423	84.80
	1. Yes	255	15.20
During delivery leaking/ Rupture membrane & no labor pain for >24 hrs	0. No	1,605	95.65
	1. Yes	73	4.35
During delivery: leaking/rupture membrane before 9mos	0. No	1,638	97.62
	1. Yes	40	2.38
Mal presentation or mal position	0. No	1,595	95.05
	1. Yes	83	4.95
Prolonged labor (>12hrs)	0. No	1,449	86.35
	1. Yes	229	13.65
Convulsions during delivery	0. No	1,488	88.68
	1. Yes	190	11.32
After delivery (<24hr) retained placenta (>30min)	0. No	1,581	94.22
	1. Yes	97	5.78
After delivery (<24hr) high fever with foul discharge	0. No	1,464	87.25
	1. Yes	214	12.75
After delivery (<24hr) severe Bleeding	0. No	1,481	88.26
	1. Yes	197	11.74
After delivery (<24hr) Convulsions	0. No	1,490	88.80
	1. Yes	188	11.20

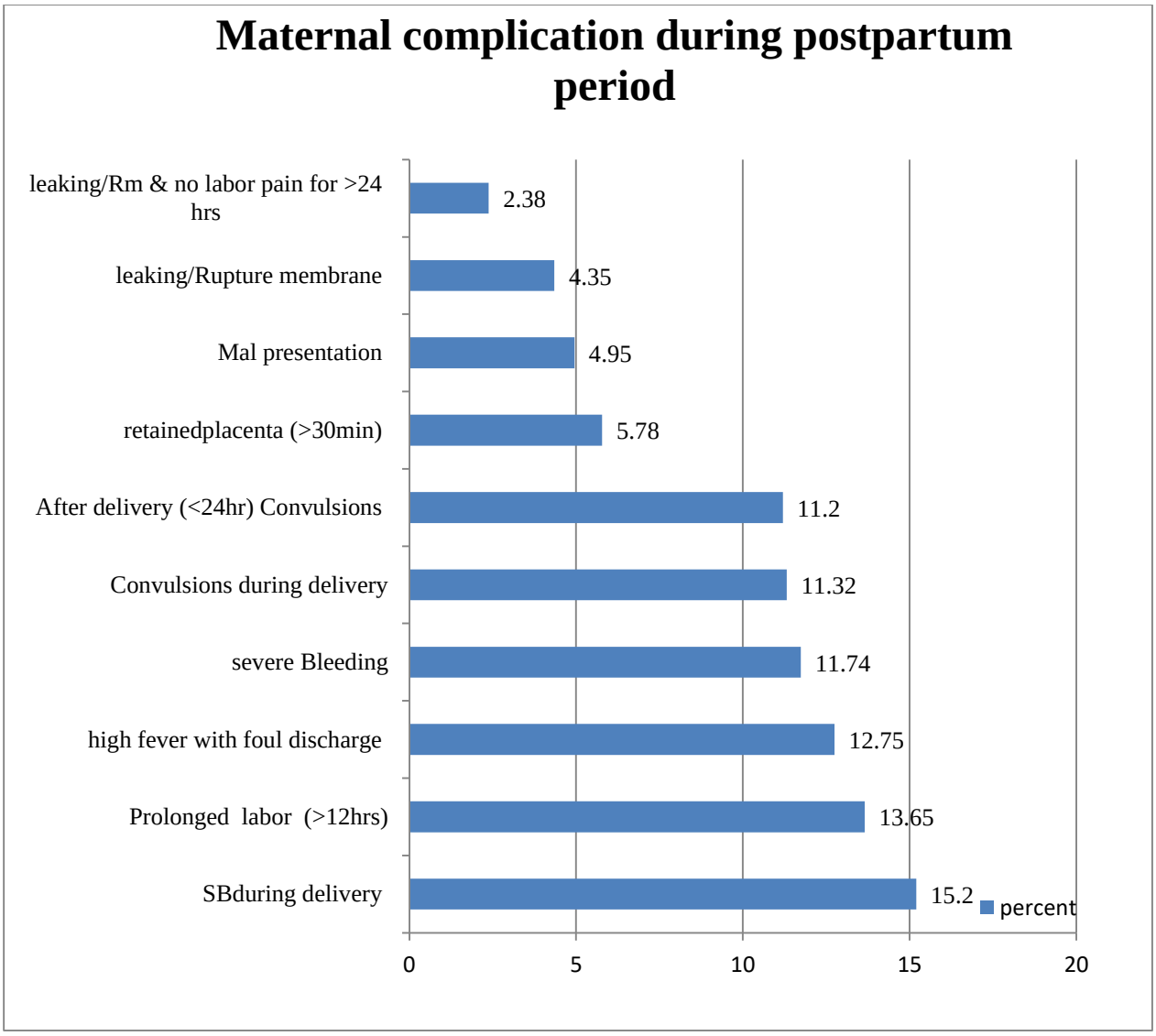


Figure 4. Types of maternal complications on postpartum period women who participated in the study PMA Ethiopia 2023.

Magnitude of maternal complication during pregnancy and postpartum period

A total of 1678 women aged 15 to 49 have assessed during pregnancy and post partum period. From those mothers who have develop complications during pregnancy either postpartum period. The magnitude of maternal complication during pregnancy was found to be 626 (37.31 %). The magnitude of maternal complication on postpartum period was around 650 (38.74%) and women are who have developed a complication during pregnancy either postpartum period was 948 (56.50 %) see the next (table 5).

Table5. Frequency and percentage of either complication during pregnancy or postpartum Period PMA Ethiopia 2023.

Maternal complication during pregnancy	Frequency	Percent	Cumulative
0. No	1,052	62.69	62.69
1. Yes	626	37.31	100.00
Maternal complication on postpartum period			
0. No	1,028	61.26	61.26
1. Yes	650	38.74	100.00
Maternal complication either during pregnancy or postpartum period			
0. No	730	43.50	43.50
1. Yes	948	56.50	100.00

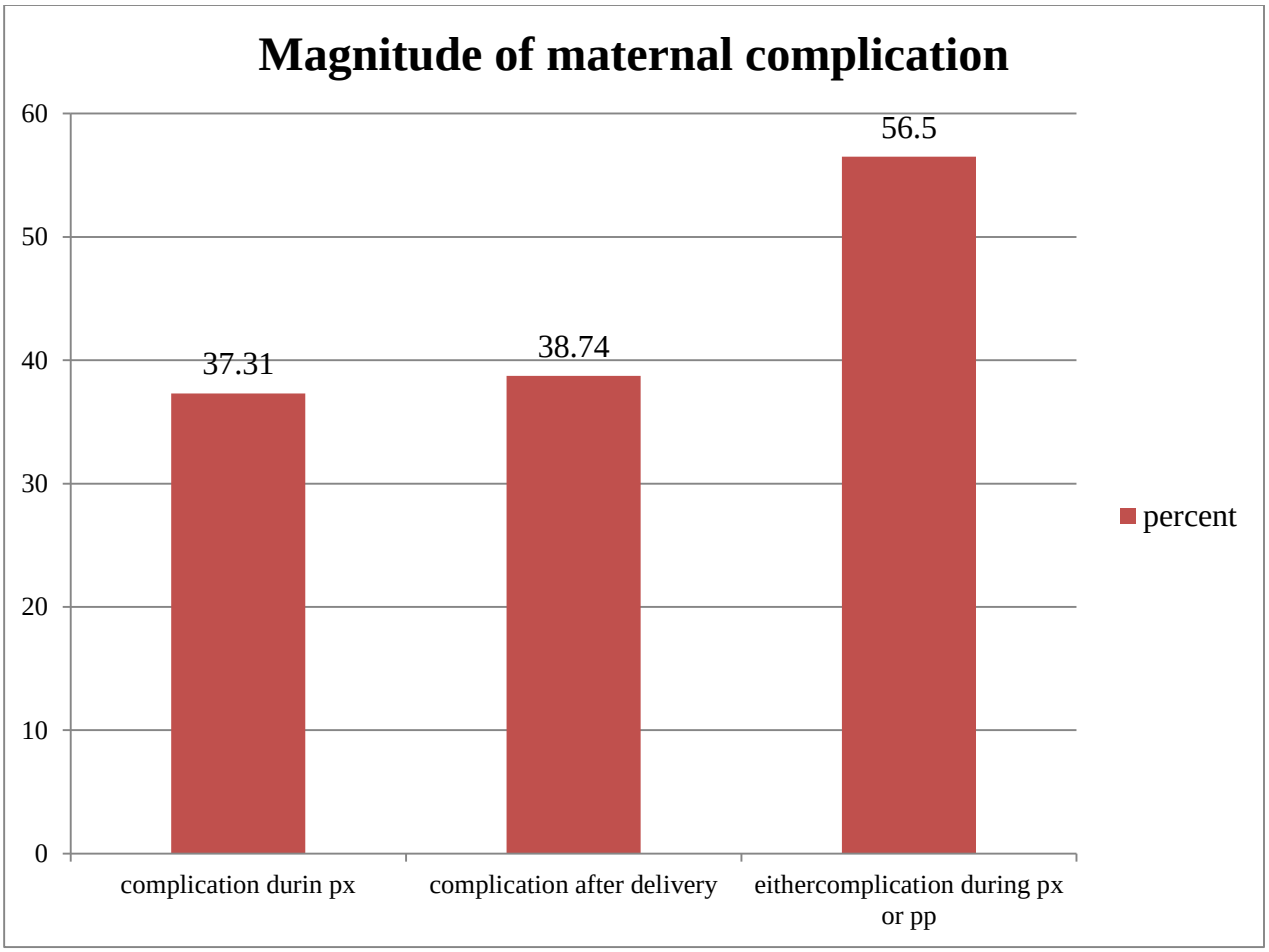


Figure 5. Magnitude of maternal complication during pregnancy and post partum period PMA Ethiopia 2023.

Magnitude of maternal complication both during pregnancy and postpartum period

Women aged 15 to 49 have assessed during pregnancy and post partum period. A total of 1678 women who have completed the postpartum cohort follow up. From those who have developed maternal complication on both during pregnancy and post partum period were 307 women or (18.3%).

Table 6.Complications that have developed both during pregnancy and postpartum period

Postpartum complications	Complications during pregnancy		
	0. No	1. Yes	Total
0. No	709	319	1028
1. Yes	343	307	650
Total	1052	626	1678

Factors associated with maternal complication during pregnancy

Variables considered for multivariate logistic regression analysis were those with a p-value < 0.25 in bivariate analysis and these were marital status, husband /partner education, religion, region, Parity, maternal education, residence, wealth quintile, history of ANC follow up, and type of pregnancy. After controlling for confounding variables using multiple logistic regression; maternal education, region, Parity, history of ANC follow up and type of pregnancy showed significant and independent association with maternal complication during pregnancy.

Women who have completed the higher education has about 81 % less likely to develop maternal complications during pregnancy compared to those women's who have never attend to school [AOR =0.191, 95% CI: (0.093, 0.392)]. Women's from Addis Ababa, SNNP, and Oromia region have 45.3% less likely to develop maternal complication compare to women's from Amhara region [AOR = 0.547, 95 % CI: (0.349, 0.858)]. A woman who has a grand multi Para 33.8% less likely to develop maternal complication compared to their counterparts who are primi gravida women's [(AOR = 0.662, 95 % CI: (0.442, 0.993)]. Women's who have obtain ANC follow up 24.2% less likely to develop maternal complication than women who have not obtain ANC follow up [AOR =0.758, 95% CI: (0.573, 1.004)]. Women with twin pregnancies are about 1.97 times more likely to develop maternal complication during pregnancy when compared to women's with singleton pregnancy [(AOR = 1.97, 95 % CI: (0.974, 3.963)] (table 6).

Table7. Bi-variable and multivariable logistic regression analysis of factors associated complications during pregnancy in Ethiopia, PMA 2023(weighted, n = 1678)

Variable	Bivariate Analysis				Multivariate Analysis		
	COR (95% CI)			P - value	AOR (95% CI)		
Marital status							
Currently married	1				1		
Living with a man	0.610 (0.343 - 1.085)			0.277	0.692 (0.357 - 1.343)		
Divorced /separated	1.085 (0.382 - 3.085)			0.808	1.198 (0.279 - 5.138)		
Not currently in union: Widow	0.368 (0.129 - 1.046)			0.132	0.381 (0.109 - 1.337)		
Husband/partner education							
Never attended	1				1		
Primary	0.700 (0.529 - 0.925)			0.275	0.835(0.601 - 1.154)		
Secondary	0.595 (0.425 - 0.833)			0.108	0.697 (0.449 - 1.083)		
Technical & vocational	0.564 (0.291 - 1.092)			0.753	0.881 (0.399 - 1.942)		
Higher	0.371 (0.249 - 0.553)			0.145	0.624 (0.330 - 1.177)		
Religion							
Orthodox	1				1		
Protestant	0.568	0.432	0.746	0.950	0.988	0.679	1.436
Moslem/Muslim	0.775	0.595	1.010	0.717	0.943	0.684	1.298
Other	0.187	0.040	0.875	0.061	0.215	0.043	1.072
Maternal education							
Never attended	1				1		
Primary	0.838 (0.646 - 1.087)			0.823	0.963 (0.693 - 1.338)		
Secondary	0.768 (0.545 - 1.0823)			0.472	0.844 (0.533 - 1.338)		
Technical & vocational	0.693 (0.384 - 1.252)			0.255	0.659 (0.322 - 1.351)		

Higher	0.187 (0.112 - 0.311)	0.000	0.191** (0.093 - 0.392)
Parity			
Primi gravida	1		1
Multiparous	1.233 (0.961 - 1.581)	0.342	1.138 (0.872 - 1.487)
Grand multi Para	0.892 (0.644 - 1.235)	0.046	0.662 (0.442 - 0.993)
Residence			
Urban	1		1
Rural	1.221 (0.983 - 1.516)	0.867	1.031 (0.723 - 1.469)
Wealth quintile			
1. Lower quintile	1		1
2. Middle quintile	0.662 (0.629 - 1.193)	0.133	0.767 (0.543 - 1.084)
3. Higher quintile	0.821 (0.643 - 1.047)	0.456	1.154 (0.792 - 1.683)
Region			
Amhara	1		1
Oromia	0.414 (0.315 - 0.543)	0.000	0.493** (0.353 - 0.688)
SNNP	0.305 (0.226 - 0.411)	0.000	0.338** (0.224 - 0.511)
Addis	0.385 (0.273 - 0.544)	0.009	0.547* (0.349 - 0.858)
History of ANC follow up			
No	1		1
Yes	0.787 (0.614 - 1.007)	0.050	0.758 (0.573 1.004)
Pregnancy type			
Single	1		1
Twin	2.757 (1,498 - 5.072)	0.049	1.965 (0.974 - 3.963)

Note: ∗*P* value <0.05, CI = Confidence Interval, COR = Crude Odds Ratio, AOR = Adjusted Odds Ratio.

Factors associated with maternal complication on postpartum period

Variables considered for multivariate logistic regression analysis those with a p-value < 0.25 in Bivariate analysis and these were maternal age, maternal education, number of ANC follow up, pregnancy type, marital status, injection for bleeding prevention, post natal mother check up, religion and region. After controlling for confounding variables using multiple logistic regressions; marital status, pregnancy type, number of ANC follow up and post natal follow up showed significant and independent association with maternal complication during postpartum period.

A women living with a man had 2.45 times higher odds of developing postpartum complications than married women [AOR = 2.453, 95% CI: (1.214, 4.957)]. Women who attended greater than 4 ANC follow up are 27.3 % less likely to develop post partum complication than women's who have attended less than 3 follow ups [AOR = 0.727, 95% CI: (0.526, 1.006)]. An Odds Ratio (AOR) of 3.596 for maternal complication in women with twin pregnancy indicates that these women are approximately 3 times more likely to experience maternal complications postpartum compared to women with singleton pregnancies [AOR = 3.596, 95% CI: (1.225, 10.556)]. More over; those mothers who had attend postpartum visit were 31.8 % less likely to have postpartum complication than mothers who had not visit the postpartum follow up [AOR = 0.682, 95% CI: (0.482, 0.965)] (table 7)

Table8. Bi-variable and multivariable logistic regression analysis of factors associated with complication on postpartum period in Ethiopia PMA2023 (weighted, n = 1678)

Variables	**Bivariate Analysis**		**MultivariateAnalysis**
	COR (95% CI)	P –value	AOR (95% CI)
Age			
15-25	1		1
26-35	0.889 (0.702 - 1.124)	0.061	0.716 9 (0.529 - 0.9700
36-49	1.301 (0.913 - 1.854)	0.080	1.511 (0.935 - 2.439)
Marital status			
Currently married	1		1
Living with a man	2.577 (1.456 - 4.562)	0.006	2.453 *(1.214 - 4.957)

Divorced /separated	1.922 (0.707 - 5.226)	0.313	1.510 (0.500 - 4.558)
Not currently in union: widowed	1.393 (0.557 - 3.479)	0.102	2.909 (0.787 - 10.747)
Religion			
Orthodox	1		1
Protestant	0.796 (0.612 - 1.037)	0.627	0.948 (0.627 - 1.435)
Moslem/Muslim	0.614 (0.470 - 0.803)	0.365	0.853 (0.603 - 1.208)
Other	0.535 (0.175 - 1.633)	0.721	0.737 (0.152 - 3.571)
Region			
Amhara	1		1
Oromia	0.594 (0.453 - 0.779)	0.701	0.493 (0.353 1.329)
SNNP	0.711 (0.534 - 0.947)	0.105	0.338 (0.224 1.109)
Addis	0.537 (0.380 - 0.759	0.784	0.547 (0.349 1.125)
Maternal education			
Never attended	1		**1**
Primary	1.039 (0.800 - 1.349)	0.557	0.423 (0.789 - 1.757)
Secondary	1.044 (0.744 - 1.465)	0.280	0.391 (0.769 - 1.9550
Technical & vocational	0.560 (0.303 - 1.035)	0.242	0.166 (0.318 - 1.217)
Higher	0.635 (0.403 - 1.001)	0.414	0.154 (0.382 - 1.163)
Number of times receiving ANC			
1-3 (ref)	1		1
>4	0.750 (0.579 - 0.969)	0.05	0.727 (0.526 - 1.006)
Pregnancy type			
Single	1		1
Twin	4.582 (2.304 - 9.114)	0.020	3.596 *(1.225 - 10.556)
Receive injection to prevent bleeding			
0. No	1		1
1. Yes	1.356 (1.088 - 1.691)	0.077	1.377 (0.966 - 1.964)
Post natal check up			

0. No	1		1
1. Yes	.617 (0.464 - 0.822)	0.031	0.682* (0.482 - 0.965)

Note: ∗*P* value <0.05, CI = Confidence Interval, COR = Crude Odds Ratio, AOR = Adjusted Odds Ratio.

6. Discussion

This study was carried out to determine magnitude of maternal complication during pregnancy and post-partum period to identify and predicting associated factors on the community at national level in Ethiopia. Pregnancy is a fascinating and complex process that typically lasts about nine months, during which a fertilized egg develops into a fetus. This study showed that magnitude of maternal complication during pregnancy is 37.31%. These finding studies done in Thailand 46.8 % and 31.8 % in Lao PDR (37).

On the other hand childbirth is a joyful experience for many but unfortunately it can be a difficult period bringing new problems that occurred especially in the first 24 hrs of child birth and many more may continue to happen lifelong in the days following child birth. On this study showed that magnitude of post-partum maternal complication is 38.74%. On the other hand finding of this study is higher when compared to a study done in Marrakesh, Morocco 13.1% in Peru 37.2%. Study conducted in Ethiopia, in DebreMarcos town 32.8% (36). In this study maternal complication either during pregnancy or postpartum found to be 56.5%.

Another study in Uganda also, prevalence of postpartum complications was 14.1% (37/263). Among these 37 women who presented with a complication, the majority had postpartum hemorrhage (74). And study in Ethiopia in Dessie town, also About 22 cases of PPH were registered which makes the magnitude of PPH is 5.8% during one year period. The causes of PPH identified during the study period were uterine atony (45%) followed by retained placenta (40%) and genital tear (14%) (75).

Migraine (21.39 %), edema face/feet/body (16.09%) and lower abdominal pain 13.71 were the three major causes of maternal complication during pregnancy in this study. And Severe bleeding during delivery (15.2%), Prolonged labor (>12hrs) (13.65%) and after delivery (<24hr) high fever with foul discharge (12.75%) were causes for major complications on postpartum period. Related to this study in China the incidence rate of each complication during pregnancy ranged from 0.9 to 4.2%, and the top three pregnancy complications observed included gestational hypertension (4.2%), preeclampsia or eclampsia (3.5%), and anemia (3.7%) (76).

Many literatures reported conflicting results regarding causes of maternal complication during pregnancy and postpartum morbidities. Findings of this study were lower when compared to a

study conducted in Brazil (UTI (31.5%), followed by anemia (24.4%), leucorrhea (23.6%), vaginal bleeding (23.5%)). (35) The higher than study sepsis had the highest contribute more than half prevalence 51 (50.5%) (41).

In this study, post natal care follow up showed that a significant association with maternal post partum complication. A woman's who have attended to the post natal care service was 31.8 % less likely to develop postpartum complication than mothers who had not visit the postpartum follow up [AOR = 0.682, 95% CI: (0.482, 0.965)]. But, studies in Nepal were PNC service utilization was not found with statistical association with PNC utilization (77).

The study showed that mothers who attended ANC at least four times during pregnancy were 27.3% less likely to develop postpartum complication compared to those mothers who had less than four ANC visits during pregnancy[AOR = 0.727, 95% CI: (0.526, 1.006)]. this result is similar with the study showed that in Ghana mothers who attended ANC at least four times during pregnancy were 6.92 times more likely to go for PNC services within 48 h compared to those mothers who had less than four ANC visits during pregnancy (AOR = 6.92, 95% CI: 1.46–32.78) (48).

Being educated mother also decreases the complications during pregnancy by 81 % than those women are who have never attended to school [AOR =0.191, 95% CI: (0.093, 0.392)]. The same study in sub-Saharan countries were the odds of women who had a lower education level were 1.65 times more likely to develop HDP compared to women who had a higher or above education level (OR: 1.65; 95% CI: 1.17, 2.13) (46)

In this study, marital status showed a significant association with postpartum complications. Being living with a man increase the odds of having postpartum complication by a factor 2.45 [AOR = 2.453, 95% CI: (1.214, 4.957)]. This result is similar with the study conducted in South Africa unmarried pregnant women (odds ratio (OR) 1.93; 95% CI 0.04 - 1.02; $p<0.05$) were more likely to experience maternal complication(51).

This study confirmed that there is a statistically significant association between a grand multi Para and occurrence of complications during pregnancy. A grand multi Para mothers has 33.8 % less likely to develop maternal complication compared to their counterparts who are primi gravida women's [(AOR = 0.662, 95 % CI: (0.442, 0.993)].Consistent to this study is a study done in

Uganda have a gravidity greater than 7 pregnancies had a 32% lower likelihood of having pregnancy-related complications as compared to those who had gravidity between 1-3 pregnancies (AOR= 0.32, 95% CI: 0.14-0.73)(62).

Strength and limitation of the study

Strength of the study

Findings from PMA data can inform public health policies and programs aimed at improving maternal health service. The data includes essential indicators related to maternal health, such as access to care, complications and outcomes. The data was collected regularly and changes in maternal complications it's important to understand health dynamics.

Limitation of the study

Much of the data relies on self reported, which may introduce bias or inaccuracies in reporting maternal complications. The sampling method can lead to underrepresentation of certain populations. Last but not least, as a matter of fact PMA Ethiopia did not collected data from Tigray region due to the conflict, therefore any form generalization need to consider this in mind.

7. CONCLUSION AND RECOMMENDATION

7.1. Conclusion

Being living with a man, uneducated mother and their life partners, twin pregnancy, absence of post natal visit and low ANC visit were important predictors of maternal complications during pregnancy and postpartum period. And in this study shows that a significant prevalence of maternal complications such as severe bleeding during delivery, prolonged labor (>12hrs), convulsions, after delivery (<24hr) high fever with foul discharge, after delivery (<24hr) severe bleeding and after delivery (<24hr) convulsions. This indicates that these complications adversely affect maternal and neonatal health outcomes, leading to increase morbidity and mortality.

7.2. Recommendation

Based on the findings from this thesis, the following recommendations are proposed to address maternal complications during pregnancy and postpartum in Ethiopia. To minimize the maternal complication different stakeholders can be engaged on this program.

Regional ministry of health

- As a regional health bureau by enhancing health care access to improve prenatal and postpartum care, particularly in rural areas.
- Community education programs should be developed to raise awareness about maternal health issues.
- Training community health workers to provide accurate information and support to pregnant women can be beneficial.

For ministry of health (MOH)

- Policy makers must prioritize maternal health initiatives by allocating adequate resource and integrating maternal health services into broader health programs.
- To collaborate with partnership NGOs and community organizations to implement maternal health initiatives.
- Evaluate progress and discuss new strategies for improving maternal health.

For researchers

- Further research on specific complications and their long term impacts on women and children.
- Ongoing data collection and analysis to monitor maternal health trends and outcomes.

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Annex

Data extraction tools

50	did you seek treatment for High fever with foul/smelly discharge or lower abdominal pain	0. No 1. Yes	
51	did you seek treatment for Severe/heavy bleeding	0. No 1. Yes	

S.no	Variables	Response	Remark
1.	EA_ID		
2.	Region	1. Amhara 2. Oromia 3.Addis Ababa 4.SNNP	
3	Age	1. 15-25 2. 26-35 3. >=35	
4	Education level	1. Never attended 2. Primary 3. Secondary 4. Technical & vocational 5. Higher	
5	Marital status	1. Married 2. Living with a partner 3. Divorced / separated 4. Widow / widower 5. Never married	
6	Religion	1. Orthodox 2. Catholic 3. Protestant 4. Moslem 5. Traditional 6. Wakefeta 7. Other	
7	Occupation	0. No 1. Yes	
8	Area of residence	0. Urban 1. Rural	
9	Convulsion	0. No 1. Yes	

10	Vaginal bleeding before delivery	0.No 1. Yes	
11	Severe headache with blurred vision	0.No 1. Yes	
12	Edema (swelling) face/feet/body	0.No 1. Yes	
13	High fever	0.No 1. Yes	
14	Abnormal vaginal discharge (foul smelling/dark	0.No 1. Yes	
15	did you receive antenatal care for this pregnancy,	0.No 1. Yes	
16	Pregnancy outcome	1. Live birth 2. Still birth 3. Miscarriage (spontaneous 4. Abortion	
17	Lower abdominal pain	0. No 1. Yes	
18	Worsening vision, particularly at night	0. No 1. Yes	
19	Did you seek treatment at a health facility for Severe headache with blurred vision?	0. No 1. Yes	
20	Did you seek treatment at a health facility for convulsion?	0. No 1. Yes	
21	Did you seek treatment at a health facility for Edema face/feet/body?	0. No 1. Yes	
22	Did you seek treatment at a health facility for Vaginal bleeding before delivery?	0. No 1. Yes	
23	Did you seek treatment at a health facility for High fever?	0. No 1. Yes	
24	Did you seek treatment at a health facility for Abnormal vaginal discharge (foul smelling/dark)?	0. No 1. Yes	
25	Did you seek treatment at a health facility for Lower abdominal pain?	0. No 1. Yes	
26	Did you seek treatment at a health facility for Difficulty seeing at night?	0. No 1. Yes	
27	Place of deliver	1.home 2. Government hospital	
52	did you seek treatment for Convulsion	0. No	

		3. Government health center 4. Private hospital/clinic 5. other	
28	Delivery by a skilled attendant	0. No 1. Yes	
29	Arrangement for transport for delivery	0. No 1. Yes	
30	Where to go if experience of pregnancy danger signs?	0. No 1. Yes	
31	Severe headaches with blurred vision as a danger sign in pregnancy	0. No 1. Yes	
32	Edema/swelling of the face/feet/body as a danger sign in pregnancy?	0. No 1. Yes	
33	Convulsions/fits as a danger sign in pregnancy?	0. No 1. Yes	
34	Bleeding before delivery as a danger sign in pregnancy?	0. No 1. Yes	
35	receive any tablets that should be taken to prevent bleeding after delivery	0. No 1. Yes	
36	Life partner encourage you to go to the clinic for antenatal care	0. No 1. yes	
37	your partner discuss where you planned to deliver	2. No 3. yes	
38	Where did you give birth	1. at home 2. institutional delivery	
39	reasons you did not go to a health facility for delivery	1.Not necessary 4. Not understand that service is needed 5. Cost too much 6. Lack of money 7. Too far 8. Transport problem	
40	Assistant during delivery	1.No one assisted 2. skilled health professional	
41	Have severe bleeding during delivery	0. No 1. Yes	
42	Leaking/rupture of membrane and no labor pain for >24 hours	0. No 1. Yes	
		1. Yes	

43	Leaking/rupture of membrane before 9 months	0. No 1. Yes	
44	Mal presentation (the feet/hand came out first) or mal position	0. No 1. Yes	
45	Prolonged labor (>12 hours)	0. No 1. Yes	
46	Convulsions	0. No 1. Yes	
47	seek treatment for the complications you experienced during delivery	0. No 1. Yes	
48	Retained placenta? (more than 30 minutes)	0. No 1. Yes	
49	Severe/heavy bleeding	0. No 1. Yes	
53	Did you receive an injection in your thigh immediately after you delivered to prevent excess bleeding	0. No 1. Yes	
54	Did the doctors or nurses explain to you why they were doing examinations or procedures on you	0. No 1. Yes	
55	Has any health extension worker visited you since delivery?	0. No 1. Yes	
56	Did you go visit another professional healthcare provider other than an HEW since delivery, either for yourself or for the baby?	0. No 1. Yes	
57	Whom did you see, not including an HEW? Anyone else?	1.Doctor 2.Health officer 3. Nurse/Midwife	
58	Sometimes conflict can occur in relationships at any time during your pregnancy,	0. No 1. Yes	
59	Push you, shake you, or throw something at you	0. No 1. Yes	
60	Slap you	0. No 1. Yes	
61	Twist your arm or pull your hair	0. No 1. Yes	
62	Punch you with his fist or with something that could hurt you	0. No 1. Yes	
63	Kick you, drag you, or beat you up	0. No 1. Yes	
64	Threaten or attack you with a knife, gun, or other weapon	0. No 1. Yes	

65	Physically force you to have sexual intercourse with him when you did not want to	0. No 1. Yes	
66	Used threats or pressure to make you have sex when you didn't want to, but did not use physical force?	0. No 1. Yes	