MEKELLE UNIVERSITYCOLLEGE OF HEALTH SCIENCES

DEPARTMENT OF MIDWIFERY

POST GRADUATE PROGRAM

DETERMINANTS OF PREMATURE RUPTURE OF MEMBRANE AMONG PREGNANT WOMEN ADMITTED TO PUBLIC HOSPITALS OF CENTRAL ZONE OF TIGRAY, NORTHERN ETHIOPIA, UNMATCHED CASE CONTROL STUDY 2024/25

A RESEARCH THESIS SUBMITTED TO MEKELLE UNIVERSITY DEPARTMENT OF MIDWIFERY FOR THE PARTIAL FULFILLMENT OF MASTER IN CLINICAL MIDWIFERY.

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MAY, 2025

MEKELE UNIVERSITY, ETHIOPIA

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FULL TITLE OF THE THESIS	DETERNINANTS OF PREMATURE RUPTURE OF MEMBRANE AMONG PREGNANT WOMEN ADMITTED IN PUBLIC HOSPITALS OF CENTRAL ZONE OF TIGRAY, NORTHERN ETHIOPIA, 2024/2025
DURATION OF PROJECT	DECEMBER 1/2024 TO JANUARY 30/2025
STUDY AREA	SELECTED PUBLIC HOSPITALS OF CENTAL ZONE OF TIGRAY
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Examiners' Thesis Approval Sheet

We, the undersigned, members of the Board of Examiners of the final open defense by "**Nigusalem Takele**" have read and evaluated his thesis "determinants of premature rupture of membrane among pregnant women admitted in public hospitals of central zone of Tigray, northern Ethiopia, 2024/2025" and evaluated the candidate. This is therefore to certify that the thesis has been accepted in partial fulfillment of the requirements for the Master's Degree in Clinical midwifery.

Name of chair person_____signature_____Date____

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Final approval and acceptance of the thesis is contingent upon the submission of the final copy of the thesis to the candidate's Department through the office of the Department Graduate Program Coordinator. Thesis Approved by

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Certification of the Final Thesis

I hereby certify that all the corrections and recommendations suggested by the Board of Examiners are incorporated into the final thesis entitled "determinants of premature rupture of membrane among pregnant women admitted in public hospitals of central zone of Tigray, northern Ethiopia,2024/2025" by **Nigusalem Takele**

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Advisor's Approval Sheet

"Determinants of premature rupture of membrane among pregnant women admitted in public hospitals of central zone of Tigray, northern Ethiopia, 2024/2025" is submitted in partial fulfillment of the requirements for the degree of master's thesis with specialization in "clinical midwifery" Mekelle University college of health science department of midwifery post Graduate program and has been carried out by Nigusalem Takeles under my supervision. Therefore, I recommend that the student has fulfilled the requirements and hence hereby can submit the thesis to the Department.

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Acknowledgment

I would like to thanks for Mekelle University, college of health sciences, department of midwifery for supporting and assigning me to do this Thesis

I wish to express my sincere gratitude to my academic advisors Dr Haltom Gebrehiwot and **Mr.** Berhane Gebrezgabiher for the immense academic guidance and support you gave me during my time in my thesis work. I want to express my sincere gratitude to my data collectors, supervisors, hospital staffs and study participants.

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List of Abbreviations/acronyms

AOR-Adjusted Odds Ratio

APH-Antepartum Hemorrhage

BEMONC-Basic Emergency Obstetrics and New Born Care

CEMONC- Comprehensive Emergency Obstetrics and New Born Care

COR-Crude Odds Ratio

CS-Cesarean Section

GDM-Gestational Diabetic Mellitus

MUAC -Mid Upper Arm Circumference

NICU-Neonatal Intensive Care Unit

PROM-Premature Rupture of Membrane

RDS-Respiratory Distress Syndrome

SDG-Sustainable Development Goal

SPSS-Statistical Package for Social Science

STI-Sexual Transmitted Infections

Abstract

Back ground

Pre-labor rupture of membrane is rupture of membranes before to the onset of labor[1]. Premature rupture of membranes, occurring in 1–4% of pregnancies globally, remains a significant obstetric complication affecting both developed and developing countries. It contributes to maternal and neonatal morbidity, mortality, and economic burdens.

Despite existing interventions, premature rupture of membranes (PROM) continues to be a public health concern. In Ethiopia, particularly in the war affected Tigray, there is limited evidence on its determinants. Identifying these factors is essential to guide effective prevention and management strategies.

Objective*:* To identify the determinants of premature rupture of membrane among pregnant women admitted to public hospitals in the central zone of Tigray, northern, Ethiopia ,in 2024/2025.

Methods*:* A hospital-based unmatched case–control study was conducted on 264 pregnant women (88 cases and 176 controls) admitted to public hospitals from December 1,2024 –January 30, 2025.Pregnant women admitted to maternity wards of selected hospitals with a painless gush of fluid spilling out from the vaginal canal were considered as PROM. Interviewer-administered questionnaires tools were used to collect data. The data was coded and entered into Epi-info version 7 and exported to SPSS version 27 for analysis. Binary logistic regression was used to test the association between the dependent and independent variable. P value less than 0.25 in bivariable analysis were entered to multivariable analysis to identify the determinants of PROM. Level of significance was declared at P-VALUE <0.05. Odds ratio with 95% confidence interval were used to determine the strength of the association.

Result: The study identified several factors significantly associated with PROM. Pregnant women without antenatal care were 4.45 times more likely to experience PROM (AOR = 4.45, 95% CI: 1.78–11.07). A previous history of PROM also showed a strong association (AOR = 3.40, 95% CI: 1.22–9.48). Women with a mid-upper arm circumference (MUAC) below 23 had higher odds of PROM (AOR = 3.18, 95% CI: 1.68–5.99). Additionally, abnormal vaginal discharge (AOR = 3.31, 95% CI: 1.26–8.66), polyhydramnios (AOR = 4.22, 95% CI: 1.41–12.64), and urinary tract infection (UTI) (AOR = 1.59, 95% CI: 0.71–3.61) were identified as contributing factors, although the association with UTI did not reach statistical significance.

Conclusion: Antenatal care follow-up, history of PROM, abnormal vaginal discharge, low mid-upper arm circumference (MUAC), and polyhydramnios were identified as significant determinants of premature rupture of membranes. Strengthening antenatal care services and addressing modifiable risk factors through early detection and management may help reduce the occurrence of PROM and its associated complications.

Key words: *Premature rupture of membrane, determinants, pregnant women, central zone of Tigray*

1. Introduction

1.1. Back ground

Pre-labor rupture of membrane (PROM) is rupture of membranes before to the onset of labor[1]. Rupture of membrane that occurs before 37 completed weeks of gestation is referred to as preterm PROM while term PROM refers to a rupture of membrane that happens after 37th completed weeks of gestation[2].

Three to 15% of pregnancies are affected by pre-mature rupture of membranes (PROM), which varies slightly in severity throughout the world[3, 4]. In Africa, it is comparatively higher. For example, the prevalence of PROM varies from 1.4 to 23.5% in Ethiopia and was 13.8% in Uganda [5, 6].

PROM has no known or identifiable cause. However, a number of studies have shown that certain behavior factors, such as smoking and chewing khat (a leafy plant with psychoactive chemicals), trauma or falls, a history of abortion, a history of premature rupture of membranes, a history of cesarean section, abnormal vaginal discharge (vaginal discharge following genital tract infection including STI), antepartum hemorrhage (APH), and socioeconomic/demographic factors (maternal age, level of education, and income) were associated to the occurrence of PROM. Furthermore, common obstetric factors linked to the prevalence of PROM include malposition, multiple pregnancy , and maternal medical problems[7].

A high rate of cesarean sections (C/S), chorioamnionitis, abruption-placenta, cord prolapse, respiratory distress syndrome (RDS), birth asphyxia, low APGAR score (<7/10), preterm labor, low birth weight, admission to the neonatal intensive care unit (NICU), and perinatal deaths are among the serious maternal and perinatal complications linked to PROM[8, 9].

44% of prenatal morbidity and 7% of perinatal deaths are caused by pre-labor membrane rupture (PROM)[10]. About one-third of preterm births, which are the main cause of newborn death, and 13–60% of intra-amniotic infections or chorioamnionitis in pregnant women are attributed to PROM[11]. Maternal and neonatal mortality and morbidity, as well as the national economic loss from prescription drug costs, hospital stays, missed productivity, and healthcare expenditures, are only a few of the numerous detrimental repercussions of PROM[10, 11].

1.2 statement of the problem

One of the most prevalent pregnancy problems and a global public health concern, PROM affects both industrialized and developing nations[12, 13]. The prevalence of PROM is between 1% and 4% of pregnancies worldwide [14]. About 8% of pregnancies are complicated by term premature rupture of membranes (PROM), whereas up to 3% of pregnancies are complicated by preterm premature rupture of membranes (PPROM)[2, 3]. Two-thirds of pregnancies are at term, from which 2% of fetal fatalities from perinatal and neonatal problems arise, while roughly one-third of preterm pregnancies result in PROM[4, 14].

One-third of preterm births are caused by perinatal and neonatal death and morbidity, which are mostly caused by PPROM. 90% of neonatal deaths are caused by preterm neonates, although making up only 8–10% of live births. Impaired breathing, trouble feeding, poor body temperature control, and an increased risk of infection are the main issues that preterm infants face[15]. The burden of PROM can be borne by an individual, a community or social group, a medical facility, or a nation globally. It can cause serious morbidity in the mother, fetus, and newborn, which can lead to death and long-term issues[16, 17].

A study carried out in India found that early rupture of the membrane was responsible for 15% of perinatal deaths and 33% of perinatal morbidity. In addition to perinatal morbidities and deaths, PROM is a contributing factor to maternal amniotic fluid infections, which can lead to deadly sepsis and cord prolapse[18, 19]. However, the prevalence of PROM was reported to be 22.4% in a research conducted in Dire Dawa, Ethiopia[20].

Despite efforts, the biggest problem facing developing nations is still maternal and child morbidities and mortality. If governments are unable to reduce maternal and child mortality, they must establish a new strategy known as the sustainable development objective. Goal 3 of the current global agenda's Sustainable Development Goals (SDGs) aims to improve maternal and child health by lowering poverty, enhancing mothers' nutritional status, and ensuring that all people have access to high-quality primary healthcare. Countries all throughout the world are currently working very hard to achieve the objective of lowering maternal death to 70 per 100,000 live births and neonatal mortality to 12 per 1000 live births[21].

By providing prompt, evidence-based, high-quality therapies without care delays, a significant percentage of maternal problems can be avoided[22] .

There are a number of different ways to lessen the negative perinatal consequences of PROM. At all hospital levels, a management protocol was created for specific obstetric cases that included PROM. Prophylactic antibiotics were used for prolonged PROM (greater than 12th), and steroids were administered after pre-labor rupture of membranes distant from term[23].

To avoid and control obstetric emergencies like PROM that result in morbidity and mortality, Ethiopia has implemented a number of regulations, guidelines, and measures. In order to reduce maternal and newborn mortality associated with PROM and its complications, interventions have been implemented. Health workers receive basic and comprehensive emergency obstetric and neonatal care (BEmONC and CEmONC) training; health facilities receive follow-up and capacity building; exempted maternal services are offered; facility and national management protocols are prepared; maternity waiting rooms are available; advanced health extension packages are distributed; and health information related to role models is disseminated. Kebeles has been taken in by[16] .

Only in facilities with a Neonatal Intensive Care Unit (NICU) that can care for the premature infant should PPROM that is far from term be treated. This is a problem, especially in underdeveloped nations like Ethiopia, where the majority of medical facilities lack adequate equipment.

In Ethiopia, fetal-maternal problems associated with PROM remain a major health concern despite all of these efforts. Designing strategies and interventions to minimize PROM complications and improve pregnancy outcomes requires evaluating the modifiable or treatable risk factors. Although earlier research attempted to evaluate the factors that influence PROM at different levels and at different times, the factors that influence PROM were not thoroughly examined in the Tigray region of northern Ethiopia, particularly in this study area. Rapidly reducing maternal and neonatal mortality requires identifying the factors associated with premature membrane rupture, a major cause of maternal mortality and morbidity. The purpose of this study is to evaluate the factors that contribute to premature membrane rupture in pregnant women admitted to general hospitals in the central zone of the Tigray region in northern Ethiopia.

1.3 Significant of the study

This study provides valuable insights for healthcare providers, policymakers, pregnant women, and other stakeholders by identifying the key determinants of PROM. The findings can inform

clinical practice by guiding healthcare providers in early identification and management of women at risk for PROM, thereby improving maternal and neonatal outcomes.

For policymakers, non-governmental organizations (NGOs), and development partners, the study serves as evidence to design targeted interventions, develop comprehensive maternal health strategies, and allocate resources effectively to minimize the risk and burden of PROM.

The research also contributes to the scientific body of knowledge and can serve as a reference for future researchers conducting studies on similar topics, particularly in low-resource or post-conflict settings like Tigray.

Moreover, the study raises community awareness about the seriousness of PROM and emphasizes the importance of antenatal care, nutrition, and infection prevention during pregnancy. Empowering communities with this knowledge can help reduce delays in seeking care and encourage proactive health-seeking behaviors among pregnant women.

2. LITRATURE REVIEW

2.1. Socio-economic and demographic factors

An institutional-based cross-sectional study Pre-labor rupture of membranes and associated factors among pregnant women in Northwest Ethiopia showed that low-monthly income mothers were 3.33 times more likely to develop PROM compared to high-income mothers [24]. Similarly, hospitals based cross sectional study done prevalence of preterm premature rupture of membrane and associated factors in ambo town revealed that woman whose economic status less than one thousand Ethiopian birr was two times more likely to develop PPROM than those who earn more than three thousand Ethiopian birr [25]. Whereas facility based case–control study determinants of premature rupture of membrane done in Southern Ethiopia public hospitals indicated that mothers with very rich wealth index were 90%less likely to experience PROM than mothers who had very poor wealth index [26]. Another studies done in different places of Ethiopia indicated that age, educational status, residence and occupation had no any association with PROM [5, 26-31].

2.2. Maternal obstetric and medical related factors

Institutional based cross sectional study done on determinant factor of premature rupture of membrane on the Inpartum mother in IRNA showed that the chances of premature rupture of membranes in the mother with grand multipara were 0.008 times greater than compared with mothers with primi para and mother who has history of premature rupture of membranes were 23.736 times greater the chances for premature rupture of membranes in the next delivery than mothers who do not have a history of premature rupture of membranes [32]. Similar study done in Ethiopia showed that being grand multigravida predisposes for PPROM is nearly five times more likely than Prmigravid [25]. But different studies revealed that gravidity/parity has no significant association with PROM[13, 24, 25, 33-35].

According the study done in Uganda revealed that pregnant women of gestational age 37 weeks or more were 70% less likely to experience premature rupture of membranes compared to their counterparts with gestational age less than 34 weeks (AOR = 0.3, 95% CI: 0.14-0.71, p = 0:01) [13].

In contrast this study, case-control study done determinants of term premature rupture of membrane in Saint Paul's Millennium Medical College Hospital, Addis Ababa, Ethiopia showed that gestational ages between 37+ 0 and 38 + 6 weeks are strongly associated with PROM. Pregnant ladies with a gestational age of 37 + 1 to 38 + 6 weeks have almost three times higher odds of PROM than those with a gestational age of 39+ 0 to 40+ 6 weeks [34], but institutional based study done Pre-labor rupture of membranes and associated factors among pregnant women in Northwest Ethiopia Mothers with gestational age <37 weeks were 3.28 times more likely to have PROM than mothers with a gestational age of 37 to 40 weeks [24].

Case–Control Studies done determinants of premature rupture of membranes among Pregnant Women in Southern Ethiopia and northern Ethiopia revealed that lack of ANC was identified as a risk factor for PROM. Those mothers with no ANC were 3.5 times more likely to develop a PROM than those respondents who got ANC[30].

According the study done in Uganda indicated that pregnant women with no history of urinary tract infections were 50% less likely to have premature rupture of membranes [13]. Whereas different studies done in Oromia region like at jimma, Ambo town, and dire dawa revealed that participants who had UTIs during the pregnancy were a significant association with PROM. The odds of developing PROM were 2.61, 2.62 and 2.7 times respectively higher among those who had UTIs compared to their counterparts [20, 25, 28]. Similar a hospital-based cross-sectional study done in Hiwot Fana Comprehensive Specialized University Hospital (HFCSUH) and Debre tabor general hospital showed that women who experienced a UTI during the current pregnancy had a 2.5 and 2.6-fold respectively increased risk of developing PROM compared to women who did not[5, 31]. Whereas different study revealed that the occurrence of PROM was differed from having UTI during the current pregnancy[24, 27, 33, 36].Facility based study done in South Africa indicated that women who had hypertensive disorders of pregnancy had a 2 fold increase the occurrence of PROM than normotensive pregnant women [37]. Similar studies done in Gedeo Zone and different hospital of southern Ethiopia revealed that women who were hypertension during pregnancy were 2.8 and 9 times respectively higher than women without hypertension [26, 29]. Other study done in jima zone and Northern Ethiopia showed that pregnant women who had previously experienced pregnancy-induced hypertension had a 3 and 7 times respectively higher likelihood of developing PROM than their counterparts[28, 36].

Institutional based cross sectional study done in hiwot fana comprehensive specialized university hospital (HFCSUH) showed that those women with APH were about 3.4 times more likely to have PROM when compared to women who did not have APH during the present pregnancy[31] .Similar study done in Debre tabor general hospital, North West Ethiopia revealed that women who had history of vaginal bleeding in current pregnancy were 2.58 times more likely develop preterm PROM as compare to their counterpart[5].Whereas according to the different studies showed that there is no significant association between PROM and APH [27-29, 36].

Finding from study done determinants of prelabor rupture of membrane among pregnant women in Jimma zone, Oromia region, Ethiopia revealed that abnormal vaginal discharge was found to be a determinant of PROM. Pregnant women who had abnormal vaginal discharge were 2 times more likely to develop PROM compared with those who had no abnormal vaginal discharge [28]. Similar study done in saint Paul's hospital, Addis Ababa, Debre tabor general hospital and North west Ethiopia showed that Pregnant women who had abnormal vaginal discharge were3.5,5.3 and 6.6 times respectively more likely to develop PROM compared with those who had no abnormal vaginal discharge[5, 24, 34]. Institutional study done in Tigray region Mekelle town showed that Pregnant women who had abnormal vaginal discharge were 3 times higher to develop PROM than those counterpart[33].

According the study done in South Africa indicated that women with a previous history of abortion were more than four times likely predisposed to PPROM as compared with women who did not experience abortions [37]. Similar study done in different place of Ethiopia revealed that women who have previous history of abortion were statistically significant in the occurrence of PROM as compared to the counterpart[27-31, 33, 35, 38]. In contrast this study previous history of abortion have no significant association with PROM[34, 36].

Institutional based case-control study done in ambo town in Oromia region revealed that previous history of PROM remained statistically significant. The odds of pre-labor rupture of the membrane were 2.3 times higher among women who had a previous history of PROM than those who had not and Women who had anemia were nearly two times more likely to develop PPROM as compared to those who are not [25].

Similar study done in dire dawa town revealed that the odds of pre-labor rupture of the membrane were 2.6 times higher among women who had a previous history of PROM than those who had not and Women who had a history of anemia in their current pregnancy were 2.4 times more likely to develop pre-labor rupture of membranes than those who had no history of anemia[20]. Another study done in Harar region, Ethiopia showed that women who have history of PROM were strongly associated with the development of current PROM [31, 35]. Similar facility based study done in Welayta zone and southern Ethiopia Gedo zone revealed that presence of PROM in the past was discovered to be a powerful predictor of PROM. Pregnant women with a history of PROM were 3.6 and 4.7times respectively more likely than those without to develop into cases of PROM[29, 38]. Similar study done in Amhara region indicated that pregnant women who had history of PROM were strongly associated to develop preterm PROM than those who didn't have [5, 36].

Another study done in Tigray region**,** Mekelle town revealed that women who have previous premature rupture of membrane was the strongly associated risk factor than the others. The odds of developing premature rupture of membranes among women who had previous PROM was 4.45 times higher than who had not history of PROM [33]. Whereas different studies showed previous history of PROM and anemia during current pregnancy were not a risk factor for PROM [5, 27, 28, 30, 31].

Facility based case control study done determinants of prelabor rupture of membrane among Pregnant women admitted to hospitals in wolaita zone, Southern Ethiopia revealed that the odds of developing PROM was nearly 5 times higher among mothers who had a history of chronic medical conditions compared to mothers without a history of chronic medical and Pregnant mothers with a history of previous caesarean delivery were approximately 3.6 times more likely to develop PROM than pregnant women without a history of caesarean delivery[38].Similar cross sectional study done in Wolkite Comprehensive Specialized Hospital, Gurage Zone, Southern Ethiopia showed that the odds of having preterm premature rupture of membrane among pregnant women who have GDM were nearly six times higher as compared with those who did not have GDM[27].

Finding from study done determinants of Premature Rupture of Membranes among Pregnant Women Admitted to Public Hospitals in Guraghe Zone and Gedeo Zone, Southern Ethiopia showed that pregnant women who previously experienced a cesarean delivery had 3and 3.5 times respectively higher chance of becoming a PROM case than their counterparts [29, 30].Another study done in Harar town, Eastern Ethiopia revealed that Pregnant women who had a history of cesarean delivery were 2 times more likely experiencing PROM than those who had no history of cesarean delivery [35].Similar study done in Tigray region ,Mekelle city public hospitals showed that history of cesarean delivery was found significantly associated with PROM. Those who had history of cesarean delivery were 3 times more likely to develop premature rupture of membranes than counter parts [33].In contrary those findings different study revealed that history of cesarean delivery had no any association with PROM[13, 20, 28, 31].

Facility based retrospective cross sectional study done determinants of preterm premature rupture of membranes and associated perinatal and maternal outcomes at General Justice Gizenga Mpanza Hospital, South Africa and in dire dawa, Ethiopia indicated that women with previous records of preterm delivery were 2 and 2.5 times respectively more likely to develop PPROM than those who did not have[20, 37].In contrast this different studies revealed that having history of preterm birth is not risk factor for PROM[13, 25, 30, 31, 35]. Another case control study done in southern Ethiopia revealed that pregnant mother who had two and above years interbirth interval were 75% (AOR: 0.25, 95% CI: [0.129, 0 0.488]) lower to have PROM than mothers who had below 2 years interbirth interval[26].

According the study done determinants of premature membrane rupture among mothers receiving labor care at different public hospitals in Northeast Ethiopia showed that the odds of PROM among pregnant women who had a chronic cough were 4.23 times higher as compared with their counterparts[39].

2.3. Behavioral/habits and nutritional related factors

Institutional based study done in dire dawa town and Hiwot Fana Comprehensive Specialized University Hospital, Ethiopia revealed that women who had a history of chewing “Khat” were nearly 2 and 2.6 times respectively more likely to have pre-labor rupture of the membrane as compared to those who had not chewed [20, 31]. Similar study done in Jimma zone, Oromia region, Ethiopia found that maternal khat chewing was significantly associated with PROM. Pregnant

mothers who chewed khat had 3.4-fold (AOR = 3.40, 95% CI: 1.70–6.80) higher odds of to have PROM compared to the odds of mothers who didn't chew khat.

Study participants with MUAC measuring less than 23 cm were 2.8 times (AOR = 2.80, 95% CI: 1.51–5.19) more likely to develop PROM than participants with MUAC measuring greater than or equal to 23 cm[28]. Another study done in Public Hospitals in Southern Ethiopia and Debre tabor general hospital, North West Ethiopia revealed that when comparing pregnant women with MUAC ≥23cm, those with MUAC <23cm were almost 3.7 and 6 times more likely to sustain[5, 30].Another case control study done in southern Ethiopia revealed that pregnant mother who had history of smoking during pregnancy were experienced PROM 17 times more likely than participants who did not smoke[26]. Whereas study done in mekelle city public hospitals, Tigray region, Ethiopia showed that pregnant women who experience carrying heavy objects, smoking, sexual intercourse and accident were not associated with PROM[33].

2.4. Fetal related factors

According the Cross sectional study done in Northwest Ethiopia showed that the odds of mothers who had twin pregnancies were more than 4-fold more likely to have PROM compared to singleton pregnancies and mothers with polyhydramnios were 5 times more likely to occur PROM compared to non-polyhydramnios [24]. Similar study done in Tefera Hailu Memorial Hospital, Northern Ethiopia indicated that compared with their counterparts, women with a history of multiple pregnancies had a 7.62-fold increased chance of getting PROM [36]. In contrast those study multiple pregnancy had no significant association with the occurrence of PROM [30, 35]. Study done in Jimma zone, oromia region, Ethiopia indicated that fetal malpresentation was identified as a determinant of PROM. The odds of developing PROM were 2.6 times higher for pregnant women with breech presentation of the fetus compared to mothers with cephalic presentation of the fetus [28].

Conceptual framework

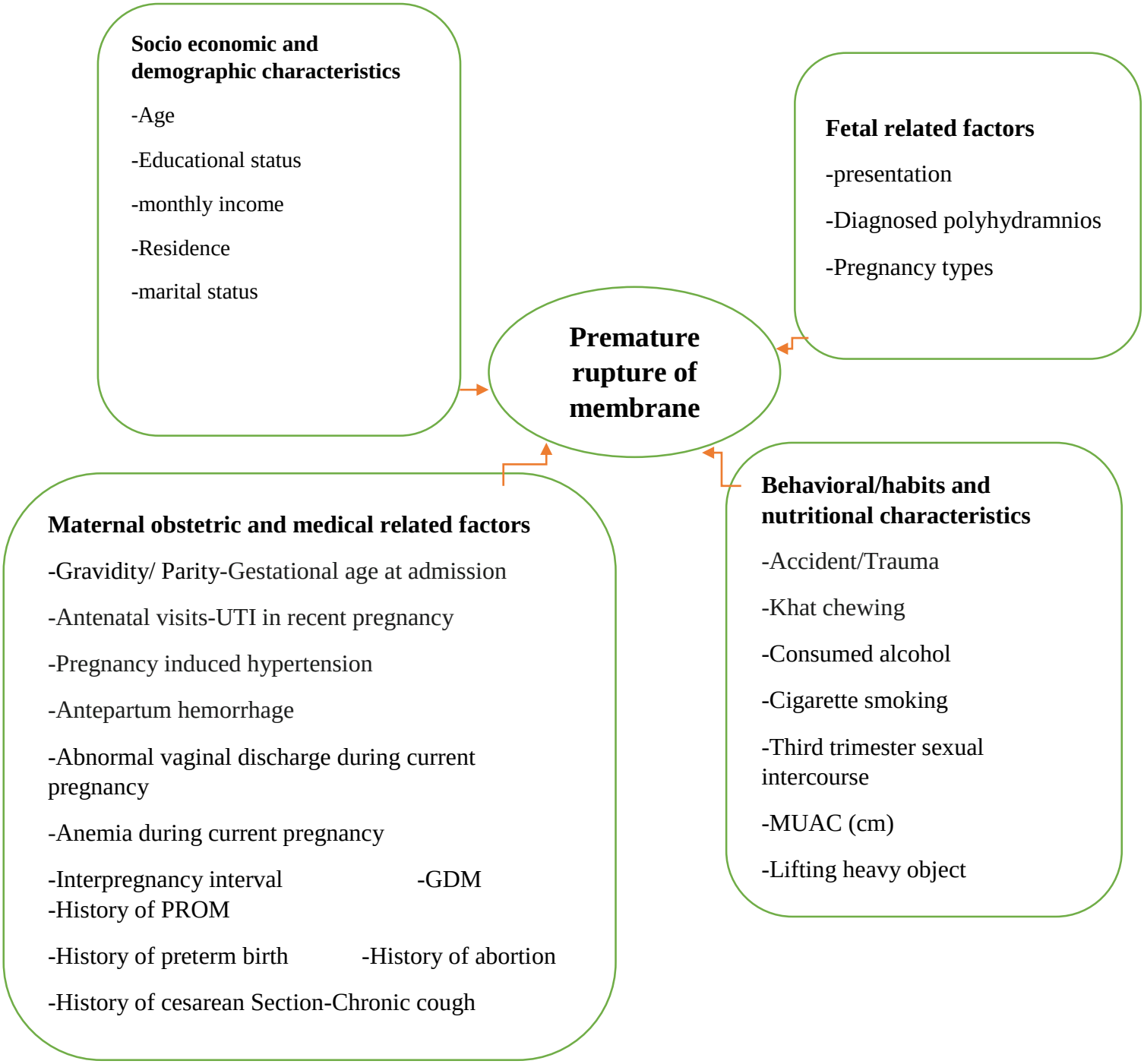

Figure 1 : Conceptual framework on assessment of determinants of PROM among pregnant women admitted at public hospitals of central zone of Tigray, northern Ethiopia, 2024/2025[29, 33]

3. Objective

- To identify the determinants of premature rupture of membrane among pregnant women admitted to public hospitals in central zone of Tigray, northern Ethiopia in 2024/2025.

4. METHODS AND MATERIAL

4.1. Study area

The study was conducted at public hospitals central zone of Tigray. It is bordered on east by eastern zone, south by southeastern zone, west by western zone and north by Eritrea. The attitude of this zone mainly falls between 2000 and 3000 meters above the sea level. Cities and towns in the central zone includes Aksum, Adwa and Tembien Abiyi –Adi. Aksum is the zonal city of central zone of Tigray. It is located in the northern Ethiopia, 1024 km far from Addis Ababa and 220 km from Tigray regional capital city of Mekelle.

Central zone of Tigray has a total population 1,245,824. Of these 613,797 are men and 632,027 are women. In central zone of Tigray there are one comprehensive specialized hospital, three general hospitals, eight primary hospitals and 54 health centers [40]. The study was conducted in public hospitals because public hospitals provide inpatient services including maternity service where high risk mothers such as PROM APH, preeclampsia, gets care. Public hospitals include three general hospitals; Saint merry, Adwa, Abiyi-Adi and Aksum referral hospital, the primary hospitals includes; Wukromaray, Semema, Burshuwa, Enticho, Edaga-Arbi,Yechila primary hospitals and two private hospitals Den Bosco and Natina primary hospitals.

4.2. Study period

The study was conducted from December 1, 2024 –January 30, 2025 at public hospitals of central zone of Tigray region.

4.3. Study design

Hospital based unmatched case control study was conducted.

4.4. population

4.4.1 Source of population

All pregnant women admitted to public hospitals in the Central Zone of the Tigray. Cases are defined as pregnant women diagnosed with PROM by a clinician, while controls are pregnant women who began labor with an intact amniotic membrane as confirmed by clinical diagnosis.

4.4.2 study population

All pregnant women admitted to the selected public hospitals in the central zone Tigray during data collection period.

4.4.3. Eligibility criteria

Inclusion criteria

- Pregnant women admitted to public hospitals in the Central Zone of the Tigray.
- Women who consent to participate in the interview.
- Women who gave birth at a gestational age of 28 weeks or more.

Exclusion criteria

- Pregnant women with known major fetal anomalies.
- Women with maternal conditions requiring immediate delivery (e.g., severe preeclampsia, eclampsia, antepartum hemorrhage, or other obstetric emergencies).

Selection of cases and controls

- **Cases:**

  Women diagnosed with PROM defined as spontaneous rupture of the amniotic sac before the onset of labor, confirmed by a physician, midwife, or other qualified health professional. The diagnosis is based on a clinical history of fluid leakage or a gush of clear fluid from the vagina, and confirmation via sterile speculum examination showing clear fluid leaking from the cervical os.
- **Controls:**

  Women admitted to labor and delivery units who entered labor with intact amniotic membranes, as confirmed by clinical assessment performed by a physician .

4.5. Study Variables

4.5.1 Dependent variable

Occurrence of Premature rupture of membrane

4.5.2 Independent variables

Socio economic and demographic characteristics; Age, Educational status, monthly income, Residence, marital status

Maternal obstetric and medical related factors; Gravidity/Parity, Gestational age at admission, Antenatal visits, UTI in recent pregnancy, Pregnancy induced hypertension,

Antepartum Hemorrhage, Abnormal vaginal discharge during current pregnancy**,** Anemia during current pregnancy**,** Interpregnancy interval, GDM, History of PROM**,** History of preterm birth, History of abortion**,** History of cesarean section, Chronic cough

Fetal related factors; presentation**,** diagnosed polyhydramnios**,** multiple pregnancy

Behavioral/habits and nutritional characteristics; Accident/Trauma**,** Khat chewing**,** Consumed alcohol**,** Cigarette smoking**,** third trimester sexual intercourse**,** MUAC (cm)**,** Lifting heavy object

4.6. Sample Size Determination

Double population proportion formula was used to calculate sample size using Epi-info Version 7. Previous studied showed that abnormal vaginal discharge, previous history of cesarean section, history of PROM and history of abortion were statistically significantly associated with premature rupture of membrane [33]. So that, after computing percent of case exposed, percent of control exposed, and AOR for each variable later on history of cesarean section is selected by considering maximum sample size based on the following assumptions, 95% confidence levels, 80% power of study, 1 to 2 cases to control ratio, AOR=3.15 percent of control exposed=4.4 percent case exposed=16.2 and 5 % non-response rate expected. It gives a total of 252 mothers (84 cases and controls 168) with non-response rate of 5 % total of 264(88case and 176 controls) are included in this study.

Table 1: Sample size determination for factors associated with PROM among pregnant women from December 1, 2024 – January 30, 2025 at public hospital of central zone Tigray ,Ethiopia.

Variables	% of case exposed	%of controls exposed	AOR	Number of cases	Number of controls	Total sample size	Non responses (5 %)	Final sample Size	Reference
History of abortion	31.2	10.6	3.06	50	99	149	7	156	33
C/S history	16.2	4.4	3.15	84	168	252	12	264	33
Abnormal vaginal discharge	48.8	15.6	3.31	26	56	78	4	82	33

4.7. Sampling Procedure

The Central Zone of Tigray has a total of twelve public hospitals, including one referral hospital, three general hospitals, and eight primary hospitals. From these, five public hospitals were selected using a simple random lottery method:

1. Aksum Specialized Comprehensive Hospital
2. Abiyi-Adi General Hospital
3. Enticho Primary Hospital
4. Burshuwa Primary Hospital
5. Edaga Arbi Primary Hospital

To assess the obstetric case flow at each facility, the number of PROM cases recorded in the registration books over the three months preceding the data collection period was reviewed. Based on this information, the total sample size was proportionally allocated to each hospital according to its reported case flow.

Cases were enrolled consecutively as they presented to the labor and delivery units until the required sample size for each hospital was achieved.

For the controls, a systematic sampling technique was employed. For every identified case, two controls were selected. The sampling interval (K = 14) was calculated by dividing the total number of eligible controls who visited the selected hospitals in the previous three months (2,460) by the total number of controls required (176), i.e., $K = 2460 \div 176 \approx 14$.

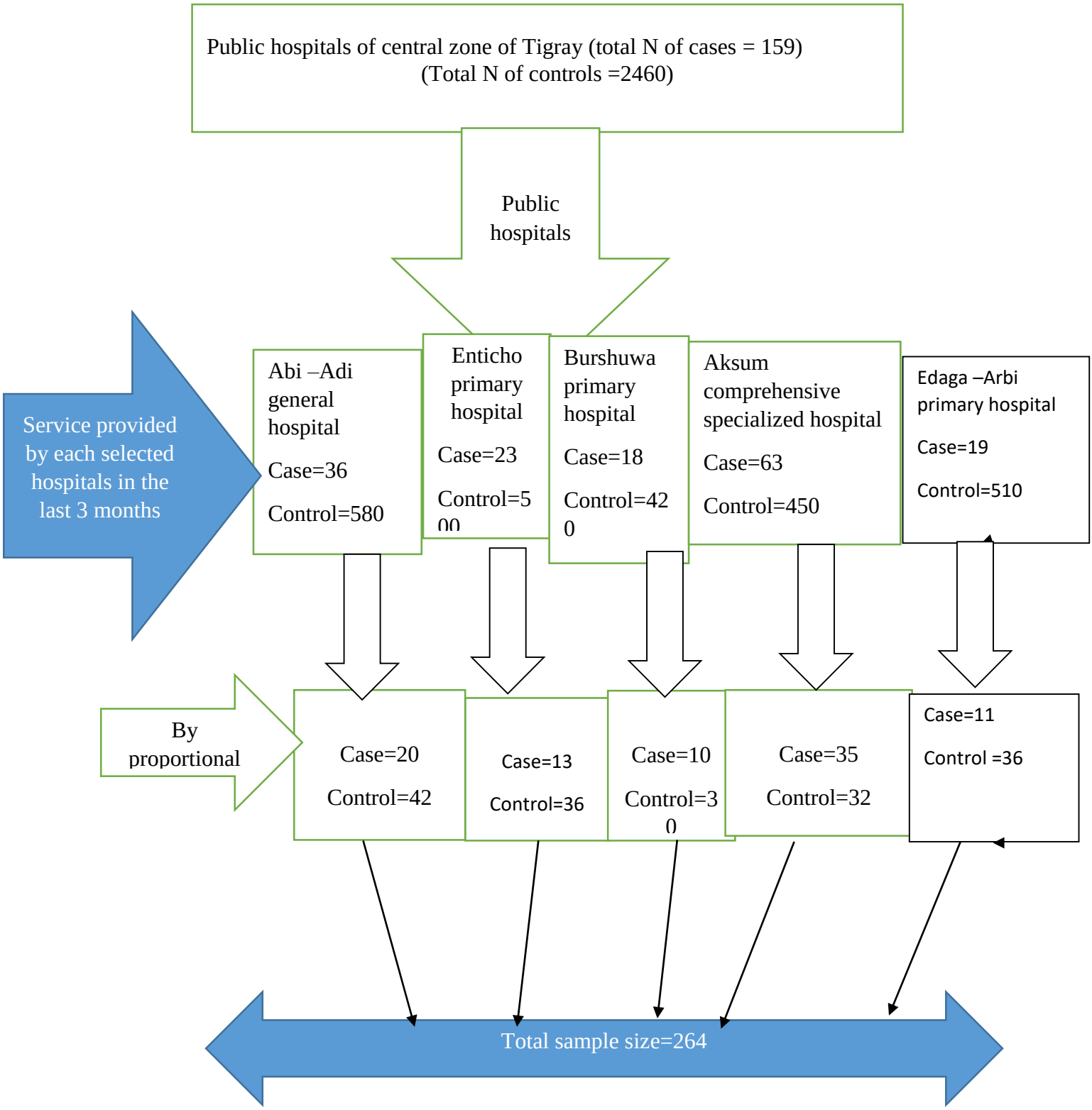

Figure 2 : Diagrammatic presentation of sampling procedure

4.8. Data collection tool and procedures

Data was collected from both cases and controls through face- to –face interview conducted by trained data collectors using pretested and structured questionnaire. The interviewer-administered questionnaire was adapted after a thorough review of relevant literatures to ensure content validity and contextual relevance's. In addition to interviews medical records of both case and control were reviewed to extract clinical and obstetrics data not obtainable through interviews. This included information such as gestational age, diagnosis of PROM, urinary tract infections (UTIs), sexually transmitted infections (STIs), anemia, and hypertensive disorders of pregnancy. Data collection was conducted over a 60-day period. Five Bachelor of Science (BSc) midwives from external health institutions were recruited and trained to serve as data collectors to minimize bias. The Mid-Upper Arm Circumference (MUAC) of participating mothers was measured using non-elastic, non-stretchable MUAC tapes, placed at the midpoint between the shoulder and the elbow of the left arm. Measurements were recorded to the nearest 0.1 centimeter.

4.9. Data quality assurance

The questionnaire was initially prepared in English and then translated into the local language, Tigrigna, prior to data collection. To ensure consistency, it was subsequently back-translated into English by an independent translator.

A pre-test was conducted on 5% of the calculated sample size (4 cases and 9 controls) at Adigrat General Hospital to assess the clarity, relevance, and completeness of the questionnaire. Based on the pre-test findings, necessary modifications were made.

To ensure high-quality data, five trained data collectors were oriented on the objectives of the study, ethical considerations, and procedures for interviewing patients, reviewing medical charts, and extracting data from the operation theatre registry. They also received specific instructions on the selection of controls.

Throughout the data collection process, the principal investigator closely supervised the data collectors and reviewed all completed questionnaires daily to check for completeness, accuracy, and internal consistency.

4.10. Data processing and analysis

The collected data were first checked for completeness, then coded and entered into EPI INFO version 7 statistical software. The dataset was subsequently exported to SPSS version 27 for further

analysis. During data cleaning, any inconsistencies or errors were identified and corrected. bivariate logistic regression analysis was conducted to assess the association between each independent variable and the dependent variable. Variables with p value < 0.25 during bivariate analysis were considered for Multivariable logistic regression model to control for potential confounding factors

Finally, those variables which have p-value of less than 0.05 with 95% confidence interval were declared as having statistically significant association with premature rupture of membrane. Descriptive statistics such as percentages, frequency distributions and appropriate graphic presentation was used for describing the data. The adequacies of the model were checked by Hosmer and Lemeshow goodness (which was 0.315).

4.11. Operational Definition

Some of the variables were found differently from literature to literature. So, in this study, the following terms are used:

Premature rupture of membrane: is a rupture of fetal membranes that occurs at least one hour before the onset of labor, resulting in spontaneous leakage of amniotic fluid occurring after 28 weeks of gestational age[41] .

Preterm Pre-labor ruptures of membrane: rupture of membrane occurs after 28 weeks of gestational age and before 37 weeks [41].

Term Premature rupture of membrane: occurs after 37 completed weeks of gestational age, including post-term cases occurring 42 completed weeks and above [41].

Early PROM: rupture of fetal membranes less than 12 hours duration[42].

Prolonged PROM: rupture of fetal membranes 12 or passed more than 12 hours' duration [42].

Consumed alcohol=the intake of any alcoholic drink at least ones during the third trimester of the pregnancy.

Lifting heavy object =lifting of items weighing more than 10 kg at least ones per week during pregnancy

4.12. Ethical consideration

Ethical approval for the study was obtained from the Institutional Review Board (IRB) of the College of Health Sciences (CHS), Mekelle University. An official letter of permission was also secured from the Tigray Regional Health Bureau. Additionally, formal letters of support and

permission were submitted to each of the selected hospitals, and approval was granted by hospital managers or medical directors.

Prior to data collection, written informed consent was obtained from each participant after a detailed explanation of the study's purpose, procedures, potential risks, and benefits. Participants were assured that their participation was entirely voluntary and that they had the right to withdraw from the study at any time without any consequences.

To ensure confidentiality and privacy, interviews and physical assessments were conducted in private settings, and personal identifiers were not included in the data. The information collected was used solely for research purposes and handled with strict confidentiality throughout the study process.

4.13. Dissemination and utilization of results

Result of the study will disseminate to Mekelle University College of health sciences department of midwifery and other concerned bodies like Tigray Health bureau, and other nongovernmental organizations supporting maternal and child health services.

Furthermore, efforts will be made to present the findings at national and international conferences**.** Additionally, the results will be published in peer-reviewed national and international journals to ensure broad dissemination and contribute to the global body of knowledge.

5. RESULTS

5.1 Socio demographic factors of the study participants

A total of 264 respondents participated in the study, yielding a 100% response rate. Among them 88 were diagnosed with PROM (cases), while 176 did not develop PROM(controls). Regarding

marital status, 78 (88.6%) of the cases were married, compared to 163 (92.5%) of the controls. In terms of residence, 53 (60.2%) of the cases lived in urban areas, whereas a higher proportion of controls, 135 (76.7%), were urban residents.

Table 2 : Socio demographic factors of study participants for the determinants of PROM among pregnant women admitted in public hospitals of central zone of Tigray, Ethiopia 2024/2025

Variables	Categories	Cases (n=88)	Control (n= 176)	Total N=264 (%)
Age	<20years	8(9.1%)	18(10.2%)	26(9.9)
	20-34 years	67(76.1%)	139 (79%)	206(78)
	>=35 years	13(14.8%)	19(10.8)	32(12.1)
Marital status	Married	78(88.6)	163(92.6)	241(91.3)
	Others*	10(11,2%)	13(7.4%)	23(8.7)
Educational status	Unable to write and read	5(5.7%)	9(5.1%)	14(5.3)
	Elementary	20(22.7%)	44(25%)	64(24.3)
	Secondary	36(40.9%)	71(40.3%)	107(40.5)
	Diploma and above	27(30.7%)	52(29.5%)	79(29.9)
Residence	Urban	53(60.2%)	135(76.7%)	188(71.2)
	Rural	35(39.8%)	41(23.3%)	76(28.8)
Monthly income	<1000 birr	7(8%)	9(5.1%)	16(6.1)
	1001-2000 birr	18(20.5%)	49(27.8%)	67(25.4)
	2001-3000 birr	14(15.9%)	23(13.1%)	37(14)
	3001-4000 birr	26(29.5%)	43(24.4%)	69(26.1)
	>4000 birr	23(26.1%)	52(29.6%)	75(28.4)

N.B; Others *(single, windowed and divorced)

5.2 Obstetric and Medical Factors

Among the study participants 69 (78.4%) of cases had ANC follow up and compared to165(93.8%) of the controls. A total of 40 of the respondents were diagnosed with UTI. of whom 18 were cases with prom. Abnormal vaginal discharge was reported in 31 participants, with 19 diagnosed as PROM cases. Among the 18 mothers who developed antepartum hemorrhage (APH)**,** 12 also experienced PROM, while among 146 mothers without APH, 76 developed PROM. Additionally, 21 mothers had cesarean deliveries, and 9 of these had PROM.

Table 3 : Obstetric and medical factors of study participants for the determinants of PROM among pregnant women admitted in public hospitals of central zone of Tigray, Ethiopia 2024/2025.

Variables	Categories	Cases n=88	Control n=176	Total N=264(%)
Gravidity	Prim gravida	27(30.7%)	66(37.5%)	93(35.2)
	Multigravida	61 (69.3%)	110(62,5%)	171(64.8)
Parity	Null parity	30(34.1%)	70(39.8%)	100(37.9)
	Primipara	17(19.3%)	42(23.9%)	59(22,4)
	2-4	32(36.4%)	51(29%)	83(31.4)
	>=5	9(10.2%)	13(7.4%)	22(8.3)
Interpregnancy interval	<24 months	22(25%)	31(17.6%)	53(20.1)
	≥24 months	39(44.3%)	80(45.5%)	119(45.1)
Gestational age	<37 weeks	13(14.8%)	18(10.2%)	31(11.7)
	37-42 weeks	71(80.7%)	153(87%)	224(84.9)
	>42 weeks	4(4.5%)	5(2.8%)	9(3.4)
ANC follow up	Yes	69(78.4%)	165(93.8)	234(88.6)
	No	19(21.6%)	11(6.3%)	30(11.4)
Antepartum hemorrhage	Yes	12(13.6%)	6(3.4%)	18(6.8)
	No	76(86.4%)	170(96.6%)	246(93.2)
Urinary tract infection	Yes	18(20.5%)	22(12.5%)	40(15.2)
	No	70(79.5%)	154(87.5%)	224(84.8)
Pregnancy induced hypertension	Yes	8(9.1%)	11(6.3%)	19(7.2)
	No	80(90.9%	165(93.8%)	245(92.8)
Gestational diabetes mellitus	Yes	6(6.8%)	6(3.4%)	12(4.5)
	No	82(93.2%)	170(96.6%)	252(95.5)
Anemia	Yes	6(6.8%	15(8.5%)	21(8)
	No	82(93.2%)	161(91.5%)	243(92)
Abnormal vaginal discharge	Yes	19(21.6	12(6.8%)	31(11.7)
	No	69(78.4%)	164(93.2%)	233(88.3)
History of PROM	Yes	20(22.7%	8(4.5%)	28(10.6)
	No	68(77.3%)	168(95.5%)	236(89.4)
History of abortion	Yes	15(17%)	19(10.8%)	34(12.9)
	No	73(83%)	157(89.2%)	230(87.1)
History of cesarean section	Yes	9(10.2%)	12(6.8%)	19(7.2)
	NO	79(89.8%)	164(93.2%)	245(92.8)
History of preterm birth	Yes	6(6.8%)	7(4%)	13(4.9)
	No	82(93.2%)	169(96%)	251(95.1)
Chronic cough during current pregnancy	Yes	5(5.7%)	6(3.4%)	11(4.2)
	No	83(94.35)	170(96.6%)	253(95.8)

5.3 Behavioral and Nutritional Factors

Among the respondents, 44 reported having sexual intercourse during pregnancy, of whom 13 developed prom. Eleven participants (11.1%) experienced a history of falling trauma, with 5 of those developing Regarding nutritional status, 104 respondents had a mid-upper arm circumference (MUAC) less than 23 cm, and among them, 50 were diagnosed with PROM.

Table 4 : Behavioral and nutritional factors of study participants for the determinants of PROM among pregnant admitted in public hospitals of central zone of Tigray, Ethiopia 2024/2025.

Variables	Categories	Cases (n=88)	Control (n= 176Total	Total N=264(%)
Kchat chewing during current pregnancy	Yes	2(2.3%)	4(2.3%0	6(2.3)
	No	86(97.7%)	172(97.7%)	258(97.7)
Cigarette smoking during current pregnancy	Yes	3(3.4%)	3(1.7%)	6(2.3)
	N0	85(96.6%)	173(98.3%)	258(97.7)
Consuming alcohol during current pregnancy	Yes	7(8%)	14(8%)	21(8)
	No	81(92%)	162(92%)	243(92)
Sexual intercourse during 3rd Trimester pregnancy	Yes	13(14.8%)	31(17.6%)	44(16.7)
	No	75(85.2%)	145(82.4%)	220(83.3)
History of fall down or trauma	Yes	5(5.7)	6(3.4%)	11(4.2)
	No	83(94.3%)	170(96.6%)	253(95.8)
MUAC	<23	50(56.8%)	54(30.7%)	104(39.4)
	>=23	38(43.2%)	122(69.3%)S	160(60.6)

5.4 Fetal related factors

Among the respondents 15 of them gave to multiple birth,8 of them diagnosed with PROM. Twenty-four of the respondents were diagnosed with PROM among them 13 of them were diagnosed with PROM.14.2% of the respondent's babies were born with non-cephalic position.

Table 5 : Fetal related factors

Variable		cases(n=88)	control(n=176)
Number of fetus	Single	81(92%)	168(95%)

	Multiple	7(8%)	8(4.5%)
Fetal presentation	Cephalic	80(90.9%)	167(94.9%)
	Non cephalic	8(9.1%)	9(5.1)
Polyhydramnios	Yes	13(14.8%)	8(4.5%)
	No	75(85.2%)	168(95.5%)

5.5 Determinant Factors

Binary logistic regression was conducted to identify factors associated with PROM. In binary logistic regression analysis were found to be Variables significantly associated with PROM with a **p-value < 0. 25**. These variables were residence, ANC follow up, APH, UTI, GDM, history of abortion, abnormal vaginal discharge, history of PROM, MUAM<23, fetal presentation and poly hydraminious. However, after adjusting confounder variables in the multivariable logistic analysis, the following factors were remained significantly associated with PROM ($p < 0.05$). Those were ANC follow up, history of PROM, abnormal vaginal discharge, MUAM<23 and poly hydraminious.

The odds of developing PROM among women who had not ANC follow up were 4.4 times (AOR 4.445, 95%(CI: 1.78-11.067) higher than their counterparts. Besides, the odds of having PROM among women who have history of PROM were 3.39 times more likely than these counterparts (AOR = 3.397, 95%(CI: 1.218-9.476). Similarly, abnormal vaginal discharge was found to be a determinant of PROM. Pregnant women who had abnormal vaginal discharge were 3.3 times (AOR =3.309, 95% (CI: 1.264-8.664) more likely to develop PROM compared with those who had no abnormal vaginal discharge. The current study found that study participants with MUAC measuring less than 23 cm were 3.17 times (AOR = 3.176, 95 %(CI: 1.684-5.993) more likely to develop PROM than participants with MUAC measuring greater than or equal to 23 cm. Furthermore, the odds of developing PROM were 4.2 times (AOR = 4.22 ,95%(CI: 1.409-12.636) higher for pregnant women who had polyhydramnios during current pregnancy than compared to women without polyhydramnios.

Table 6 : Bivariable and multivariable logistic regression analysis the determinants of PROM among pregnant women admitted in public hospitals of central zone of Tigray, Ethiopia 2024/2025

VARIABLE		CASE	CONTROL	COR	P VALUE	CI	AOR	P VALUE
Residence	Urban	53	135					
	Rural	35	41	2.174	0.006	1.252-3.775	0.607(0.31-1.180)	0.139
ANC follow up	YES	69	165				4.445(1.78-11.067)*	0.001
	NO	19	11	4.130	0.000	1.867-9.137		
APH	YES	12	6	4.474	0.004	1.619-12.364	1,635(0.507-5.27)	0.410
	NO	76	170					
UTI	YES	18	22	1.800	0.092	0.908-3.567	1,594(0.705-3.605)	0.262
	NO	70	154					
GDM	YES	6	6	2.073	0.219	0.647-6,626	2.453(0.633-9.500)	0.194
	NO	82	170					
VDS	YES	19	12	3,763	0.001	1.733-8.173	3.309(1.264-8.664)*	0.015
	NO	69	164					
HX PROM	YES	20	8	6.176	0.000	2.596-14.698	3.397(1.218-9.476)*	0.019
	NO	68	168					
History OF ABORTION	YES	15	19	1.698	0.156	0.817-3.529	1.781(0.711-4.462)*	0.218
	NO	73	157					
MUAC	<23	50	54	2.973	0,000	1,750-5.049	3.176(1.684-5.993)*	0.000
	>=23	38	122					
FETAL PRESANTION	CEPHALIC	80	167	1.856	0.221	0.690-4.989	0.835(0.225-3.099)	0.787
	NO CEPHALIC	8	9					
POLYHAY DRAMINOS	YES	13	8	3.640	0.006	1.448-9.151	4.22(1.409-12.636)*	0.010
	NO	75	168					

6. DISSCUSSION

The premature rupture of membranes (PROM) is a critical obstetric complication that can significantly affect maternal and neonatal outcomes. Identifying the determinants that contribute to PROM is essential for developing effective interventions. In this discussion, I analyze the influencing factors highlighted: lack of antenatal care, abnormal vaginal discharge, history of PROM, mid-upper arm circumference (MUAC) less than 23, and polyhydramnios, and contextualize these findings with existing research conducted in different countries.

Women with Lack of Antenatal Care follow up were four times more likely to have PROM than counterpart. This finding is similar with study conducted in Southern Ethiopia [30]. This is explained by the fact that poor health infrastructure and low ANC follow up in rural areas. Lack of ANC prevents early detection of complications.

Similarly, finding from this study revealed that pregnant women who had abnormal vaginal discharge were 3.3 times more likely to have PROM compared with those who had no abnormal vaginal discharge. This is in line with study conducted in saint Paul's hospital Addis Ababa [34], Debre tabor general hospital[5], North west Ethiopia [24] . This is due to abnormal vaginal discharge causes inflammation of the vagina and cervix and release of enzymes that weaken fetal membranes, leading to rupture of the amniotic membrane.

A previous occurrence of PROM is a significant predictor of future incidents. The odds of having PROM among women who have history of PROM were 3.39 times more likely than these counterparts. This finding was supported with study conducted in Ambo town [25], Ethiopia, harar town, Ethiopia [35], hiwet fana comprehensive hospital, Ethiopia [31] , Mekelle town Tigray, Ethiopia[33] and in IRNA, Noer Pamekasan[32] . This is explained by women with previous PROM may have cervical insufficiency, untreated infections and connective tissue disorders making them prone to recurrence.

Mid-Upper Arm Circumference (MUAC) is an important indicator of nutritional status in pregnant women. The current study found that study participants with MUAC measuring less than 23 cm were 3.17 times more likely to develop PROM than participants with MUAC measuring greater than or equal to 23 cm. This is in line with study done in southern Ethiopia [30] debre tabor [5], and jimma town, Ethiopia [28]. This is due to the fact maternal

undernutrition impair collage formation and reduce tissue strength, this in turn weakening the fetal membranes.

The odds of developing PROM were 4.2 times higher for pregnant women who had polyhydramnios during current pregnancy than compared to women without polyhydramnios. This study is similar with study done in Northwest Ethiopia [24] .Excessive amniotic fluid stretches the fetal membranes beyond their tensile limit, increasing the risk of rupture.

7. Limitations of the study

Due to the retrospective nature some independent variables there might be recall bias.

8. CONCLUSSION

This study identified key determinant factors of PROM, underscoring the interconnected roles of maternal health, nutrition, infections, and obstetric history. Our findings are consistent with previous research from Ethiopia and other African settings, emphasizing the critical importance of antenatal care and effective management of infections in reducing PROM-related complications. Strengthening community health programs that focus on maternal education, nutritional support, and regular monitoring could significantly decrease the incidence of PROM and improve maternal and fetal outcomes. Health systems should prioritize addressing these factors—particularly lack of ANC follow-up, MUAC < 23 cm, history of PROM, abnormal vaginal discharge, and urinary tract infections—in their clinical protocols to more effectively mitigate the risks associated with PROM.

9. Recommendations

Based on the study findings, the following recommendations are made to the Ministry of Health, Tigray Health Bureau, and relevant governmental and non-governmental stakeholders:

For the Ministry of Health:

- Develop and strengthen strategies focused on reproductive health education, with particular emphasis on the prevention, early detection, and management of STIs, including abnormal vaginal discharge, to reduce the risk of PROM.

For the Tigray Regional Health Bureau:

- Ensure early initiation and completion of antenatal care (ANC) follow-up by creating a supportive environment for effective ANC service delivery across all health facilities.
- Introduce targeted screening protocols during ANC visits for women with a previous history of PROM and provide appropriate counseling and follow-up care.
- Implement routine nutritional screening for all pregnant women. Those with MUAC measurements below 23 cm should receive nutrient-rich food supplementation and nutritional counseling.
- Strengthen routine screening for UTIs during ANC visits and ensure timely treatment to prevent complications such as PROM.

For the district Health Bureau and Health Facilities:

- Monitor and ensure the consistent implementation of ANC protocols, including assessment for nutritional status, infections, and obstetric history.
- Enhance health education at community and facility levels about the importance of ANC, nutrition, and infection prevention during pregnancy.
- Provide capacity building for health care providers on the management and prevention of PROM, especially in rural and underserved areas.

For Governmental and Non-Governmental Organizations:

- Collaborate with the health sector to support maternal health programs that address malnutrition, access to ANC, and infection control.
- Mobilize resources to improve infrastructure, equipment, and supplies needed for quality ANC services, especially for vulnerable populations.

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11. Annexes

Annex I; Information sheet

Study title: DETERMINANTS OF PROM AMONG PREGNANT WOMEN ADMITTED IN PUBLIC HOSPITALS OF CENTRAL ZONE OF TIGRAY, NORTHEN ETHIOPIA, 2024.

Purpose: The aim of this study is to assess the determinants of prom among pregnant women admitted in public hospitals of central zone of Tigray.

Procedure: You are randomly selected to be one of the study participants. If you are willing to participate in this study, you will be requested to sign the consent form after you clearly understand the aim of this study. Finally, you are kindly requested to give your genuine response in the interview questionnaire.

Risk and /or Discomfort: By participating in this project, you may have some discomfort. There are no or minimal anticipated risk but you will take time about 20 minutes for interview

Benefits of being in the study: There may not be direct benefits to you for giving us information for the study but your participation is likely to help us in assessing the prevalence and associated factors of use of herbal medicines. The findings will help to put recommendations in order to improve maternal and fetal outcome.

Confidentiality and Privacy Protections: You do not need to tell your name to the data collector. All your responses and the results obtained will be kept confidentially by using coding system whereby no one will have access to your responses.

Incentives/Payments for Participating: You will not be provided any incentives or payment to take part in this project.

Right to Refusal or Withdraw: You have the full right to refuse from participating in this research. You have also the full right to withdraw from this study at any time you wish. **Contacts and Questions:** If you have any questions about the study, please ask now. If you have questions later, want additional information, or wish to withdraw call the researcher conducting the study

Cell phone No –**0926700270**

E-mail: kingotakele19@gmail.com.

Annex II – consent form for English version

Consent Information sheet

My name is Nigusalem Takele. I am a principal investigator student of post graduated in clinical midwifery at Mekelle University, College of Health Sciences, and Midwifery department to conduct a study on the determinants of PROM among women who gave birth at public hospitals of central zone of Tigray. The permission will be received from Mekelle University to conduct this study. I am also briefed that the result of the study will be used by Tigray regional health bureau to commence appropriate strategies to battle this problem.

This research proposal is approved by institution review board of Mekelle University. You are selected randomly to participate in this study. Your participation is purely based on your willingness. You have the right to choose not to take part in this study. If you choose to take part, you have the right to stop at any time. If you are willing to participate or refuse or decide to withdraw later, you will not be subjected to any ill-treatment.

If you agree to participate in the study, you will be asked to answer some questions about determinant factors of PROM. The interview with you will take about 20 minutes. The study will explore about the covariates of PROM. It can also provide baseline data for policy makers and other researchers for further improvements of determinants of PROM. The information that you provide will be kept confidential by using only code numbers and locking the data. Based on the understanding of the information I gave you, are you willing to participate in this study?

1. Yes
2. No

Signature of the participant_____ Date_____

Data collector Name_____Signature_____Date_____

Annex III :Data Collection tool

Instruction: for each of the following questions, please carefully review the charts and provide answers as appropriate. (For number categories, circle the number of coding categories and for open categories, write the information needed in the provided space).

Name of data collector: ---------- **Signature:** ----------

MRN: ---------- **Date:** ----------**Hospital:** ----------

Case ☐ **Control** ☐

1 Socio economic and demographic characteristics

Code	Questions	Response	Remark
SD1	Age in completed year	----------	
SD2	Marital status	1.single 3. Widowed 2.married 4.divorced	
SD3	Educational status	1. Illiterate 2. Elementary 3.secondary 4. Diploma and above	
SD4	Residence	1.urban 2.rural	
SD5	Monthly income	----------	

1 Maternal obstetrics and medical factors

MOM1	Gravidity	-----	
MOM2	Parity	------	
MOM3	Interpregnancy interval (years)	--------	
MOM4	Gestational age at birth in weeks	1.< 37 weeks 2.37-42 weeks 3.> 42 weeks	
MOM5	ANC follow up for current pregnancy	1.yes 2.no	

MOM6	Ante partum hemorrhage	1.yes 2.no	
MOM7	UTI during current pregnancy	1.yes 2.no	
MOM8	PIH	1.yes 2.no	
MOM9	Gestational diabetes mellitus	1.yes 2.no	
MOM10	Anemia during current pregnancy	1.yes 2.no	
MOM11	Abnormal vaginal discharge during current pregnancy	1.yes 2.no	
MOM12	History of PROM	1.yes 2.no	
MOM13	History of abortion	1.yes 2.no	
MOM14	History of cesarean section	1.yes 2.no	
MOM15	preterm birth history	1.yes 2.no	
MOM16	Chronic cough during current pregnancy	1.yes 2.no	

1 Behavioral/habits and nutritional characteristics of mothers

BN1	Khat chewing during current pregnancy	1.yes 2.no	
BN2	Cigarette smoking during current pregnancy	1.yes 2.no	
BN3	Consumed alcohol during current pregnancy	1.yes 2. no	

BN4	Third trimester sexual intercourse?	1.yes 2. no	
BN5	History of fall or trauma in pregnancy	1.Yes 2.No	
BN6	MUAC (cm)	1.<23 2.>=23	

1 Fetal related factors

Ff1	Number of fetuses	1.single 2.multiple	
Ff2	Fetal presentations	1.cephalic 2. non cephalic	
Ff3	Diagnosed polyhydramnios	1.yes 2.no	

Annex IV፡ትግርኛ መሕትት

መእተዊ

እዚ ሓበሬታ ወሃቢ ፅሑፍ ሓፈሻዊ ዕላምኡ ኣብዚ እነካይዶ መፅናዕቲ ተሳተፍቲ ንክትኮኑ ፍቓድኩም ን ምሕ ታ ት ኮ ይ ኑ ብ ዛ ዕ ባ እ ነ ካ ይ ዶ መፅ ና ዕ ቲ ሙ ሉ እ ሓ በ ሬ ታ ክ ዋ ሃ በ ኩ ም እ ዩ ፡ ፡ ብ ተ ወ ሳ ኺ እ ዉን ካ ብ ተ ሳ ተ ፍ ቲ እ ን ደ ሊ ዮ ሓ ገ ዝ ብ ዝ ር ዝ ር ዝ ተ ገ ለ ፀ ኮ ይ ኑ ኣ ብ ዚ ከ ይ ዲ ድ ሕ ን ነ ት ፣ ክ ብ ር ን መ ሰ ል ን ተ ሳ ተ ፍ ቲ ብ ዘ ረ ጋ ገ ፀ መ ን ገ ዲ ን ኽ ኸ ዉ ን እ ን ወ ስ ዶ ም ጥ ን ቃ ቀ ታ ት እ ዉ ን ኣ ቐ ሚ ጥ ና ኣ ለ ና ፡ ፡ ስ ለ ዝ ኮ ነ ኣ ብ ዚ መ ፅ ና ዕ ቲ ተ ሳ ታ ፊ ን ም ኻ ን ን ኽ ዉ ስ ና እ ዚ ሓ በ ሬ ታ ብ ዕ ም ቆ ት ም ር ዳ እ ጠ ቓ ሚ ይ ኸ ዉ ን ፡ ፡ ዝ ኾ ነ ዓ ይ ነ ት ሕ ቶ ወ ይ ከ ዓ ግ ል ፂ ዘ ይ ኮ ነ ሓ ሳ ብ እ ን ተ ገ ጢ ም ወ ን ብ ዘ ይ ዝ ኾ ነ ስ ኽ ፍ ታ ክ ን ዲ ዝ ደ ለ ይ ኦ ግ ዜ ን ክ ሓ ታ ይ ላ ቦ ፡ ፡ ኣ ብ ዚ መ ፅ ና ዕ ቲ ተ ሳ ታ ፊ ን ም ኻ ን እ ን ተ ወ ሲ ነ ን እ ሞ እ ዚ ዉ ሳ ነ ኣ ን እ ቲ መ ፅ ና ዕ ቲ ይ ኹ ን ን ሰ ን ዝ ገ ብ ሩ ና ሓ ገ ዝ ን ካ ል ኦ ት ዝ ተ ጠ ቐ ሱ ዛ ዕ ባ ታ ት ሙ ሉ እ ብ ሙ ሉ እ ተ ረ ዲ እ ወ ን ብ ሰ ና ይ ድ ሌ ተ ን ም ኻ ነ ን ኣ ብ ቲ እ ተ ዳ ለ ወ ና ይ ስ ም ም ዕ ቕ ጥ ዒ ብ ም ፍ ራ ም ከ ረ ጋ ግ ፃ ል ና እ የ ን ፡ ፡ ን ዝ ገ ብ ራ ል ና ም ት ሕ ብ ባ ር ን ሓ ገ ዝ ን ኣ ቐ ዲ ም ና ም ስ ጋ ና ነ ቅ ር ብ ፡ ፡

ዓላማ ናይዚ መፅናዕትን ናተን ተሳትፎን

ሓፈሻዊ ዕላማ እዚ መፅናዕቲቅድሚ ሕርሲ ቀሽቲ ኣነሽቲ ምፍሳስ ከምፅኡ ዝኽእሉ ነገራት ንምፍላይ እዩ ፡ ፡ ካ ብ ዚ መ ፅ ና ዕ ቲ እ ዚ ብ ዝ ረ ከ ብ መ ረ ዳ እ ታ ድ ማ ብ ቀ ን ዱ ን መ ን ግ ስ ቲ ት ግ ራ ይ ብ ሓ ፈ ሻ ድ ማ ን ማ ሕ በ ረ ሰ ብ ዓ ለ ም ብ ዝ ተ ፈ ላ ለ የ መ ን ገ ዲ ብ ም ሃ ብ ዝ ከ ኣ ል መ ፍ ት ሒ ን ክ ፍ ጠ ር ክ ግ በ ር እ ዩ ፡ ፡

ተሳተፍቲ እዚ መፅናዕቲ ብከመይ ይሕረዩ

ዕላዊ መረፃ ተሳተፍቲ ምስኣካየድና እቲ ሓበሬታ ዉሃቢ ወረቐት ክተንቢብዎ ክወሃበኩም አዩ።ዝተወሰነ ሕቶታት ብምሕታት ሕ ድ ሕ ድ ነ ጥ ቢ ከ ምዝ ተ ረ ደ ኣ ኩ ም ምስ ኣ ረ ጋ ገ ፅ ና ኣ ብ ዚ መ ፅ ና ዕ ቲ ን ምስ ታ ፍ ድ ሌ ት ዘ ለ ወ ን ኣ ዴ ታ ት ብ ድ ሌ ተ ን ኣ ብ ቲ ና ይ ስ ም ም ዕ ቕ ጥ ዒ ይ ፍ ር ሙ፡ ፡ ብ ድ ሌ ተ ን ም ስ ገ ለ ፃ ነ ዚ መ ፅ ና ዕ ቲ እ ዚ ዝ ተ ዳ ለ ወ ሕ ቶ ታ ት ብ ቀ ደ ም ሰ ዓ ብ ብ ም ሕ ታ ት መ ል ሲ ክ ን ረ ክ ብ ኢ ና ፡ ፡

ኣብዚ መፅናዕቲ ብምስታፍክን እንታይ ጥቅሚ ይረክባ

ምስ እዚ መፅናዕቲ ዝተታሕዘ ንተሳተፍቲ ዝኽፈል ቀጥታ ክፍሊት ከምዘይህሉ ክንገልፅ ንፈቱ።ኮይኑ ግና ካብዚ መ ፅ ና ዕ ቲ ብ ዝ ር ከ ብ ሓ በ ሬ ታ መ ሰ ረ ት ኣ ብመፅናዕቲቅድሚ ሕርሲ ቀሽቲ ኣነሽቲ ምፍሳስ ከምፅኡ ዝኽእሉ ነገራት ን ከ ይ ድ ታ ት ን ፣ ክ ት ት ላ ት ን መ ስ ተ ካ ከ ሊ

ስ ጉ ም ቲ ታ ት ን ከ ም ዉ ል ቀ ሰ ብ ኮ ነ ከ ም ዓ ዲ ተ ረ ባ ሕ ቲ እ የ ን ኢ ል ና

ን ኣ ምን ፡ ፡ኣድራሻ/ ቀበሌ---------- ቁፅሪመሕትት----------ስምጥዕናትካል----------

ኣብዚ መፅናዕቲ ብምስታፈይ እንታይ ጉደኣት ክበፅሐኒ ይኽእል

እዚ መፅናዕቲ ናይ ተሳተፍቲ ድሕንነት፣ክብርን መሰልን ብዝለዓለ ደረጃ ብዘረጋገፀ ከይዲ ንክፍፀም ዓብዪ ጥንቃቃbክ ን ግ ብ ር ኢ ና ፡ ፡ ብ ስ ሩ ግ ን ኣ ብ ዚ መ ፀ ና ዕ ቲ ን ተ ሳ ተ ፍ ቲ ጉ ዳ ኣ ት ዘ ብ ፅ ሕ ወ ይ ከ ዓ ና ብ ሓ ደ ጋ ዘ ጋ ል ፅ ተ ግ ባ ር የ ለ ን ፡ ፡

እዚ መፅናዕጢ ከቓርፆ ይክእል ዶ

ቅድም ኢሉ ከም ዝተገለፀ እብዚ መፅናዕቲ ምስታፍ ሙሉእ ብሙሉእ ኣብ ሰናይ ድሌት ተሳተፍቲ ዝ ተ መረ ኮ ሰ ስ ለ ዝ ኮ ነ ምቁ ራ ፅ ይ ከ ኣ ል እ ዩ ፡ ፡ ስ ለ ዘ ቓ ረ ፀ ኦ ዝ ኮ ነ ዓ ይ ነ ት ክ ፍ ሊ ት ወ ይ ቅ ፀ ዓ ት ኣ ይ ህ ሉ ን ፡ ፡

ካብ ተሳተፍቲ እንወስዶ ሓበሬታ ምስጥራዊነት ብዘምልከት

ነዚ መፅናዕቲ ካብ ተሳተፍቲ እንወስዶ ሓበሬታ ናይ እዚ መፅናዕቲ ዓላማ ን ምስ ካ ዕ ጥ ራ ሕ ን ሳ ል ሳ ይ ወ ገ ን ክ ን ህ ብ ን ክ እ ላ ኢ ና እ ዙ ይ ግ ና እ ቲ ሓ በ ሬ ታ ና ይ መን መኻ ኑ ብ ዘ ይ ፍ ለ ጥ መን ገ ዲ እ ዩ ክ ፍ ፀ ም ፡ ፡

ምዝርጋሕ ዉፂኢት ናይዚ መፅናዕቲ ዝምልከት

ዉፂኢት ናይ እዚ መፅናዕቲ ብመልክዕ ሕታም ወይ ኣብ ኮንፈረንስታት ብምቅራብ ክዝርጋሕ እዩ።ከከም ኣ ድ ላ ይ ነ ቱ ካ ል ኦ ት ሜላ ታ ት እ ና ተ ጠቀ ምካ እ ቲ ዉፅ ኢ ት ና ይ ምዝ ር ጋ ሕ ስ ራ ሓ ቲ ክ ካ የ ድ እ ዩ ፡ ፡

ንመን ክረክባ ይደልያ

ተወሳኺ ሓበሬታ እንተደልየን ካብ ዋና መተሓባበሪ ናይ እዚ መፅናዕቲ ጀሚሩ በቲ ዝተጠቀሰ ኣድራሻ ክ ት ረ ክ ባ ት ክ እ ላ ኢ ክ ን ፡ ፡

ኣብ ኣፍልጦ ዝተመስረተ ናይ ተሳታፋይነት ስምምዕነት

መምርሒ- ካብቶምዝተውሃቡመማረፅታትይሕረያ

ዝርዝር ብዛዕባ ንተሳተፍቲ ዝተዋህበ ሓበሬታ ፅሑፍ ኣንቢበን ተረዲኤን ዘይበረሃለን ሕቶ ናይ ምሕታት እኹል ዕድል ዝ ተ ዋ ህ ን እ ን ተ ኸ ዉን እ ኹል መል ሲ እ ዉን ተ ዋ ሂ በ ኒ አ ዩ ፡ ፡

ቐዳማይክፋል፡ ማሕበራዊንኢኮኖሚያዊንኩነታት

ተ.ቁ	ሕቶ	መልሲ	መብርሂ
1	ዕድመ	----------	
2	ኩነታት ሓዳር	1. ዘይተመርዐወት 2. ባዓልቲሓዳር 3. ዝተፋተሐት 4. በዓልገዝኣዝሞታ	
3	ኩነታት ትምህቲ	1. ዘይተመሃረት 2. 1ይብርኪዘጠናቀቀት 3. 2ይብርኪዘጠናቀቀት 4. ኮልጅንልዕልኡን	
4	ትነብርሉ ቦታ?	1. ከተማ 2. ገጠር	
5	ወርሓዊ እቶት?-----	----------	

ካልኣይ ክፋል: ሕሉፍኩነታት ጥዕናን ስነተዋልዶን ታሪክ

6	እዚ ጥንሲ መበልክንደይ እዩ?	--------	

7	ክሳብ ሐዚ ክንደይ ወሊድኪ?	---------	
8	ካብ ናይ መጨረሻ ዝወለድክዮ ህፃን ከብ ትወልዲ ክንደይ ወርሒ ገይርኪ?	----------	
9	ዕድመ ጥንሲ	--------	
10	ክትትል ጥንሲ ነይሩኪ ዶ	1 እወ 2ኣይፋል	ኣይፋለይ እንተኮይኑ ናብ ሕኖ ቁፅሪ 12 ሕለፍ
11	መልሲተ.ቁ 10 እወ እንተኾይኑክንደይግዘ?	----------	
12	ድሕሪ 7 ወርሒ መድመይቲ ኣገጢምወን ድዩ	1 እወ 2ኣይፋል	
13	ኣብዚ ናይ ሐዚ ጥንሲ ናይ ሽንቲ ቱቦ ረክሲ ነይሩኪ ድዩ	1 እወ 2ኣይፋል	
14	ብሰንኪ ጥንሲ ዝመፅእ ፀቅጢ ደም ኣለዋ ዶ	1 እወ 2ኣይፋል	
15	ኣብዚ ናይ ሐዚ ጥንሲ ናይ ሕማመ ሽኮር ኣለዋ ዶ	1 እወ 2ኣይፋል	
16	ዋሕዲ ደም ኣብዚ ናይ ሐዚ ጥንሲ ኣለዋ ዶ	1 እወ 2ኣይፋል	
17	ዘይ ንቡር ብማህፀን ዝፈስስ ፈሳሲ ነይርዋ ድዩ	1 እወ 2ኣይፋል	
18	ቅድሚሕዚሕርሲናይቀሽቲኣነሽቲምፍሳስኣገጢሙኪይፍልጥ ዶ ?	1 እወ 2ኣይፋል	
19	ቅድሚ ሐዚ ናይ ጥንሲምዉራድኣገጢሙኪይፈልጥ ዶ?	1 እወ 2ኣይፋል	
20	ቅድሚ ሐዚ ቄሳራዊ መጥባሕቲ ገይርኪ ትፈልጢ ዶ	1 እወ	

		2ኣይፋል	
21	ትሕቲ 37 ሰሙንወሊድኪትፈልጢ ዶ?	1 እወ 2ኣይፋል	
22	ሕዱርሰዓልነይሩኪ ዶ?	1 እወ 2ኣይፋል	

ራብዓይ ክፋል :ኩነታት ኣመጋግባን ልምድን ብ እዋን ጥንሲ

23	ኣብዚ ናይ ሐዚ ጥንሲ ጫት ትጥቀሚ ዶ ነይርኪ	1 እወ 2ኣይፋል	
24	ኣብዚ ናይ ሐዚ ጥንሲ ሲጋራ ዶ ተትክኺ ነይርኪ?	1 እወ 2ኣይፋል	
25	ኣልኮሆል ትጥቀሚ ዶ ነይርኪ	1 እወ 2ኣይፋል	
26	ካብ 7 ወርሒጀሚሩፆታዊርክብፈፂምኪኔርኪዲኪ?	1 እወ 2ኣይፋል	
27	ሓደጋ ኣጋጢሙኪይፈለጥዶ?	1 እወ 2ኣይፋል	
28	መጠን ላዕላይ ጭዋዳ ኢድ	----------ሴሜ	

5ይ ክፋል ኩነታት ዕሸል

29	በዝሒ ዕሸል	1 ሓደ 2 ክልተን ልዕሊኡን	
30	ኣቀማምጣ ዕሸል	1 ሱሩዕ 2 ዘይሰሩዕ	
31	ዝተረጋገፀ ካብ መጠን ንላዕሊ ፈሳሲ ቃሽታ ኣንስቲ	1 እወ 2ኣይፋል	