MEKELLE UNIVERSITY

COLLEGE OF HEALTH SCIENCES SCHOOL OF NURSING

DEPARTMENT OF MATERNITY AND REPRODUCTIVE HEALTH NURSING

DETERMINANTS OF PREMATURE RUPTURE OF MEMBRANES AMONG PREGNANT MOTHERS ATTENDING PUBLIC HOSPITALS OF CENTRAL ZONE, TIGRAY, ETHIOPIA, 2024; UNMACHED CASE-CONTROL STUDY

BY: GEBREMARIAM KIFLE (BSc)

A RESEARCH THESIS SUBMITTED TO MEKELLE UNIVERSITY, COLLEGE OF HEALTH SCIENCES, SCHOOL OF NURSING DEPARTMENT OF MATERNITY AND REPRODUCTIVE HEALTH NURSING, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE MASTERS OF MATERNITY AND REPRODUCTIVE HEALTH NURSING.

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COLLEGE OF HEALTH SCIENCE SCHOOL OF NURSING DEPARTMENT OF MATERNITY AND REPRODUCTIVE HEALTH NURSING

Advisor's Approval Sheet

This is to certify that the research thesis entitled "determinants of premature rupture of membranes among pregnant mothers admitted to public hospitals of central zone, Tigray, Ethiopia 2024 G.C." with case control study. This research thesis is submitted in partial fulfillment of the requirements for the degree of MSc with specialization in "Maternity and Reproductive Health Nursing" to Mekelle University College of Health Science School of Nursing postgraduate program coordinator. This research thesis is carried out by: Gebremariam Kifle ID No: CHS/NMRH/004/13 under my supervision. Therefore, I recommend that the student has fulfilled the requirements and hence hereby can submit the research thesis to the Department.

Haftu Berhe (PhD, professor) _____ _____

Name of Primary Advisor Signature Date

Kibrom Berhanu (BSC, MSC, assistant professor) _____ _____

Declaration

I hereby declare that this MSc thesis is my original work and has not been presented for a degree in any other university and all sources of material used for this thesis have been fully acknowledged.

Name: G/mariam kifle

Signature: _____

Date: _____

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Examiners' Approval Sheet:

We, the undersigned, members of the Board of Examiners of the final open defense by G/mariam kifle have read and evaluated his thesis "determinants of premature rupture of membranes among pregnant mothers attending to public hospitals of central zone, Tigray, Ethiopia 2024 G.C." 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 "Maternity and Rh Nursing".

Name of Chairperson	Signature	Date
Name of Major Advisor	Signature	Date
Name of Internal Examiner	Signature	Date
Name of External Examiner	Signature	Date

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

Graduate Program Coordinator	Signature	Date

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 membranes among pregnant mothers admitted to public hospitals of central zone, Tigray, Ethiopia 2024 G.C.” by : G/mariam kifle.

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Acronyms and Abbreviations

ANC	Antenatal Care
AOR	Adjusted Odd Ratio
CI	Confidence Interval
CM	Centimeter
COR	Crude Odds Ratio
CS	Caesarean Section
DC	Data Collector
GA	Gestational age
GDM	Gestational Diabetes Mellitus
IPI	Inter pregnancy interval
MU	Mekelle University
MUAC	Mid upper arm circumference
NVD	Normal Vaginal Delivery
OR	Odds Ratio
PGC	Post Graduate Committee
PI	Principal Investigator
PROM	Premature Rupture of Membrane
SD	standard deviations
SPSS	Statistical Package for Social Sciences
STI	Sexually Transmitted Infections
UTI	Urinary Tract Infection
VIF	Variance Inflation Factors

Abstract

Background: Premature rupture of membranes is a condition in which the fetal membranes rupture before the onset of labor and after 28 weeks of gestational age. It complicates 5-10% of all pregnancy, and it is an important cause of perinatal, neonatal, and maternal morbidity and mortality both in developed and developing countries. Though some studies were conducted in Ethiopia on the determinants of premature rupture of membranes there was limited study in the Tigray region, particularly in the study area

Objective: To identify determinants of premature rupture of membranes among pregnant mothers admitted to public hospitals in the Central Zone, Tigray, Ethiopia,2024

Methods: A hospital based unmatched case-control study design was conducted from August 1 to September 30, 2024, in public hospitals of Central Zone of Tigray, Ethiopia. All cases admitted at the time of data collection were included until the desired sample size was met, and controls were selected by systematic random sampling. Data were collected using a structured and pre-tested questionnaire by trained midwives then data were entered into Epi Data Version 4.7 and exported to Statistical Package for Social Sciences Version 27. Logistic regression was employed to identify determinant variables. Variables with a p value of less than 0.05 with a 95% confidence interval were used as a statistically significant association in a multivariable logistic regression.

Result: A total of 363 participants (121 cases and 242 controls) were included in the study. Rural residence (AOR=2.17,95 % CI: 1.31-3.59, p-value=0.003), having multiple fetus (AOR=2.44,95% CI: 1.01-5.89, p-value=0.047), history of Premature rupture of membrane (AOR=2.76,95% CI: 1.42-5.38, p-value=0.003), and Mid-upper arm circumference <23cm (AOR=2.79,95% CI: 1.59-4.89, p-value=0.001) were identified as determinants of premature rupture of membrane.

Conclusion and recommendation: The identified determinants of premature rupture of membranes were rural residence, multiple gestation, history of Premature rupture of membrane, and Mid-upper arm circumference <23 cm. Therefore, pregnant women who live in rural areas, have multiple pregnancy and had history of premature rupture of membranes should be well followed up during pregnancy. Moreover, early nutritional screening, counseling and intervention should be strengthened during prenatal care.

Key words: Determinants, premature rupture of membrane, case-control study

Introduction

1.1. Background

Premature rupture of membranes (PROM) is a condition in which the fetal membranes rupture followed by the passage of watery fluid gush before the onset of true labor and after 28 weeks of gestational age(1). The fetal membrane is a thin tissue that surrounds and protects the developing fetus during pregnancy. It is composed of two layers: the chorion and the amnion(2). PROM can be classified based on gestational age into preterm PROM and term PROM. Preterm PROM refers to PROM that happens before 37 weeks of gestation, whereas term PROM refers to PROM that occurs after 37 weeks of gestational age. Prolonged PROM is any rupture of membranes that persists for more than 24 hours prior to the onset of labor(3).

The cause of PROM is unclear, it may be related to a structural defect in the membranes due to collagen deficiency or malformation, weakening of the membranes because of enzymatic destruction in inflammatory or infectious processes(4). The diagnosis of PROM is typically based a maternal history of sudden "gush" or intermittent or continuous leaking of clear or pale-yellow fluid from the vagina combined with observation of amniotic fluid coming out of the cervical canal or fluid pooling in the posterior vagina upon sterile speculum examination(5). it is supported by a basic pH test of vaginal fluid or ferning of dried vaginal fluid detected under microscopic evaluation and a decrease in amniotic fluid volume (AFV) of <5cm during an ultrasound examination(6).

PROM leads to significant perinatal morbidity and mortality, primarily due to factors such as prematurity, sepsis, cord prolapse, and pulmonary hypoplasia. In addition, there are risks associated with chorioamnionitis and placental abruption(7).

The specific management of PROM is dependent on factors such as gestational age and the presence of complicating factors like clinical infection, abruption placentae, labor, or abnormal fetal testing. Treatment of PROM includes: hospitalization, expectant management for preterm PROM, monitoring for signs of infection, giving corticosteroids for the mother that may help mature the lungs of the fetus, giving antibiotics (to prevent or treat infections(8).

1.2 Statement of the problem

PROM is a significant concern in pregnancy, with a global prevalence ranging from 5–10% of all pregnancies(9). However, the prevalence of PROM varies from country to country. In Bangladesh it accounts 9.3% (10), 7.4% in Egypt (11), 9.2 % in Ethiopia (12) and ,13.7% in Tigray of all pregnancy(13).

PROM is an important cause of maternal morbidity in both developed and developing countries (3). Pregnant women with PROM are at risk of complications such as a 30–40% increase in the chance of preterm delivery (7), 13-60% of the chance of chorioamnionitis (14), and 25% of the chance of prenatal bleeding (14). Additionally, various studies have reported that pregnant women with PROM may also experience complications such as oligohydramnios, cord prolapse, puerperal sepsis, endometritis, retained placenta, unfavorable cervix, and postpartum hemorrhage(15, 16).

PROM is also an important cause of perinatal and neonatal morbidity and mortality both in developed and developing countries(3). New-born deliveries from pregnant women with PROM suffer from prematurity, birth asphyxia (12.5%), fetal distress (5.05%), respiratory distress syndrome (18.75%), neonates hospitalized in neonatal intensive care units (23.80%), neonatal sepsis (6.25%), neonatal jaundice (10.42%), and neonatal mortality (5.35%)(17-20). In Tigray region, the neonatal mortality rate is 28.2 deaths per 1000 live births. Birth asphyxia (35%), prematurity (30%), and infection (12%) are the leading causes of neonatal death, more closely related with PROM (21).

PROM also has an impact on economic instability in the family, hospital, and country due to absences from the job, medication costs, hospital admissions, longer lengths of stay at hospitals, and the burden on health professionals. The costs of birth with PPROM are eight times higher than those without PPROM(14, 22, 23).

The factors that contribute to PROM are not fully understood, making it difficult to effectively prevent and manage them, but different studies have identified several determinants, such as: Maternal age less than 20 and greater than 35 years old, interpregnancy interval <2 years, previous abortion, previous preterm birth, prior PROM, history of caesarean section, gestational hypertension, gestational diabetes mellitus (GDM), abnormal vaginal discharge, urinary tract infections (UTI), polyhydramnios and lack of ANC (antenatal care) are the main contributing factors for premature rupture of membrane (14, 24, 25).

Many countries have implemented strategies to reduce maternal and child morbidity and mortality, focusing on preventing PROM- related maternal and neonatal complications. The American College of Obstetricians and gynecologist (ACOG) recommends for pregnant women with PROM (admission to hospital and close follow-up for maternal and fetal well-being , a single course of corticosteroids and antibiotic prophylaxis) to reduce perinatal complication(4). Similarly, Ethiopia has developed a protocol to address maternal and child complications related to PROM. Some of the important interventions include admission to the hospital and close follow-up for maternal and fetal well-being, as well as the use of corticosteroids and antibiotic prophylaxis for pregnant women with PROM to reduce adverse outcomes(1).

Even though some studies were conducted in Ethiopia on the determinants of PROM, there was limited study in the Tigray region, particularly in the study area. Therefore, this study was intended to identify the determinants of PROM using a case control study design among pregnant women attending in public hospitals in the Central Zone of Tigray, Ethiopia.

1.3 Significance of the study

This study was primarily aimed to investigate determinants of premature rupture of membrane in public hospitals of Central Zone of Tigray. The findings of this study may serve as significant input for policy makers, program managers and hospitals to design program and strategies to reduce occurrence of PROM and its consequence. In addition, healthcare providers could also utilize the findings for early identification of mothers at risk during antenatal care and can inform pregnant women about the determinants for PROM, ultimately improving the health of both mothers and newborns. Lastly, the findings of this study would be served as a valuable source of information for other researchers investigating the determinants of PROM.

2. Literature review

2.1 Sociodemographic related factors

According to a case control study conducted in Indonesia, mothers less than 20 years old and greater than 35 years old had a positive association with PROM compared to those aged 20-34 years (adjusted odds ratio (AOR): 2.57) (26). Another study in Uganda showed that pregnant women aged 30 to 39 years old were approximately three times more likely to experience PROM (AOR: 2.5) (27).

The occupational status of pregnant women is another socio-demographic risk factor for PROM. A study conducted in Indonesia demonstrated a significant association between employment in pregnant women and premature rupture of membranes(28).

A study conducted in Indonesia showed that, pregnant women with low level of education were approximately four times more likely to experience PROM compared to those with high levels of education (AOR:3.60) (26).

Study conducted in Egypt showed that rural residences were significantly associated with PROM (AOR:12.33) compared to urban residence(29). Similarly, study conducted in Ethiopia showed that pregnant women living in rural areas were approximately three times more likely to experience PROM compared to those residing in urban areas (AOR: 2.94)(30).

2.2 Past obstetrics related factors

Study conducted in Nigeria revealed that pregnant women with history of abortion were positively associated with the occurrence of PROM (31). A case control study conduct in southern Ethiopia showed that pregnant women with history of abortion were significantly associated with PROM (AOR :3.21) (32). Similarly, a study conducted in Ethiopia indicated that a history of abortion was significantly associated with PROM (AOR: 3.68) (33).

A research conducted in Libya showed that pregnant women with history of CS were significantly associated with PROM (34). In 2022, a case control study conducted in southern Ethiopia showed that pregnant women with history of caesarean delivery were risk for PROM compared to those who did not have the problem (AOR :3.57)(32).Similarly, study done in Ethiopia, found that that pregnant women with previous caesarian section were risk for PROM (AOR: 2.1) (33). Another study conducted in Tigray also showed that pregnant women with a history of caesarean section were at higher risk of PROM (AOR: 3.15)(35).

In Pakistan, a case-control study conducted on determinants for PROM showed that pregnant women with a history of PROM were 3.97 times more likely to experience PROM than women who did not have a history of PROM (AOR: 3.978) (36). Similarly, study conducted in Nigeria revealed that pregnant women with history of PROM were positively associated with the occurrence of PROM (31). In 2022, a case-control study conducted in southern Ethiopia indicated that pregnant women with a history of PROM were approximately four times more likely to experience PROM (AOR: 3.76) (32). Another study conducted in Tigray also indicated a history of PROM was positively associated with PROM (AOR:4.45) (35).

According to a case-control study conducted in Cameroon, having a history of preterm delivery was associated with PROM (AOR: 3.42) (37). Similarly, study conducted in Nigeria revealed that pregnant women with history of preterm delivery were positively associated with the occurrence of PROM (31). Another case control study done in southern Ethiopia indicated that having history of preterm delivery was associated with PROM (AOR :3.23)(32).

A study conducted in southern Ethiopia revealed that ever using contraceptive methods was associated with a protective effect against the development of PROM (AOR: 0.33) (32).

2.3 Current obstetrics related factors

A case-control study conducted in Indonesia showed that pregnant mothers with multiparity were positively associated with PROM (OR:1.97)(26). A similar study conducted in Uganda indicated that pregnant women with nulliparity were 2.1 times more likely to experience PROM compared to those who had delivered before (25).

The study conducted in Iran found that pregnant women with gestational diabetes mellitus had a significantly increased risk of PROM (38).

A case-control study conducted in Indonesia showed that malpresentation was a significant risk factor for PROM with (OR:2.96) (26). Another case-control study conducted in India among 200 pregnant women indicated that malpresentation significantly increases the risk of PROM (14% vs 5%, p-value of 0.004) (39). Similarly, a case-control study done in Ethiopia found that fetal presentation (breech) was a significant risk factor for PROM (OR:2.63) (2).

Research conducted in India among 200 pregnant women indicated that those with polyhydramnios had a significantly increased risk of PROM (6% VS 1.5%, p-0.035) (39). Another case-control study conducted in Pakistan found that polyhydramnios was a significant risk factor for PROM (OR: 2.5) (36).

A case-control study conducted in Indonesia showed that having multiple gestation was positively associated with PROM (OR:2.00) (26). Another case-control study conducted in India indicated that having multifetal gestation was a risk factor for PROM (7.5% vs. 2.5%, p-0.039)(39). Study conducted in Uganda reported that pregnant women with multiple gestations were more likely to experience PROM compared to pregnant women with singleton gestations (OR:3.4) (27). Similarly, study conducted in Ethiopia showed that pregnant women with multiple gestations were more likely to experience PROM compared to counterpart (OR:4.14) (40).

Research conducted in Indonesia suggests that pregnant women experiencing vaginal bleeding have an increased risk of developing PROM (AOR: 21.24) (41). Similarly, a case-control study conducted in Pakistan among 65 cases and 130 controls found that vaginal bleeding is a significant risk factor for PROM (AOR: 2.486)(36).

Research conducted in Indonesia demonstrated that preeclampsia was a significant risk factor for developing PROM (AOR:10.3) (41). A case-control study conducted in Ethiopia found that a history of pregnancy-induced hypertension was one of the determinant factors for PROM (AOR : 3.06)(2). Similarly, another study in Ethiopia found that pregnancy-induced hypertension is a risk factor for PROM (AOR:8.92)(42).

A case-control study done in southern Ethiopia showed that an inter-pregnancy interval greater than 2 years was a lower risk factor for PROM (AOR: 0.251) (42). Another study conducted in southern Ethiopia,2022 showed that pregnant women with short interpregnancy interval were 2.6 times risk for PROM(43).

According to the study conducted in Uganda, having 4 or more ANC visits was less likely to result in PROM (OR:0.2) (27). Similarly, a case-control study done in southern Ethiopia showed that pregnant women who were not attending ANC were 3.5 times more likely at risk for PROM than those pregnant women who were attending ANC (OR: 3.51) (6). A study conducted in Northern Ethiopia found that not attending ANC follow-up visits was a risk factor for PROM (AOR:4.78) (44).

A study conducted in Uganda found that pregnant women at 37 weeks or more gestation were less likely to experience PROM compared to women in early gestation at less than 34 weeks. (AOR: 0.3) (45). A study conducted in northeastern Ethiopia demonstrated that pregnant women with a gestational age less than 37 weeks were at higher risk for PROM compared to those with a gestational age greater than 37 weeks (40).

2.4 Medical and lifestyle related factors

Studies conducted to examine the relationship between maternal sleep duration and pregnancy outcomes in the United States have shown that short sleep duration ≤6 hours is significantly associated with spontaneous PROM) compared to sleep duration of 7-8 hours (46).

A study conducted among 129 pregnant women with PROM and 129 without PROM in Indonesia in 2019, showed that UTIs were significantly associated with PROM (AOR:3.16) (41). Another case control study carried out in Vietnam found that pregnant women with UTIs had a nearly three-fold increased chance of developing PROM compared to those without UTIs (OR:3.16) 3.16)(47). Similarly, a study conducted in Iran found a significant association between urinary tract infections during pregnancy and an increased risk of PROM (P<0.04) (38).

A case control study conducted in India among 200 pregnant women indicated that smoking during pregnancy was determinants for PROM (19% Vs 6.5%, p-0.001) (39). Another study conducted in Iran in 2023, smoking during pregnancy was significantly associated with an increased risk of PROM (P<0.04)(38). Additionally, a case-control study conducted on the determinants of PROM in southern Ethiopia showed that smoking was significantly associated with PROM(42).

A case-control study conducted in Indonesia in 2019 showed that abnormal vaginal discharge was significantly associated with PROM (AOR: 3.11)(41). Another case-control study conducted in Pakistan in 2022 found that pregnant women with abnormal vaginal discharge were 2.7 times more likely to develop PROM than those without abnormal vaginal discharge (AOR: 2.700)(36). A study conducted in Uganda found a significant association between abnormal vaginal discharge in pregnant women and PROM (AOR:4.4) (27).

A case-control study conducted in India among 200 pregnant women indicated that having sexual intercourse once or twice per week was associated with PROM (11% vs. 5%, p<0.043) (39).

According to a study conducted in India, pregnant women with a history of fall or abdominal trauma were significantly increased the risk of PROM (4.5% vs 1% P-0.0040)(39)..

According to a case-control study conducted in Jimma zone, Oromia region(Ethiopia), pregnant women with MUAC less than 23 cm were more likely to have PROM (AOR: 2.8) (2). Similarly, a case-control study done in southern Ethiopia showed that pregnant women with

MUAC <23 cm were 3.69 times more likely at risk for PROM than those pregnant women with MUAC >23 cm (AOR: 3.69)(6).

A study conducted in Ethiopia among 118 cases and 235 control pregnant women indicated that having chronic cough was risk factor for PROM (AOR: 4.23) (33).

2.5 Conceptual frame work

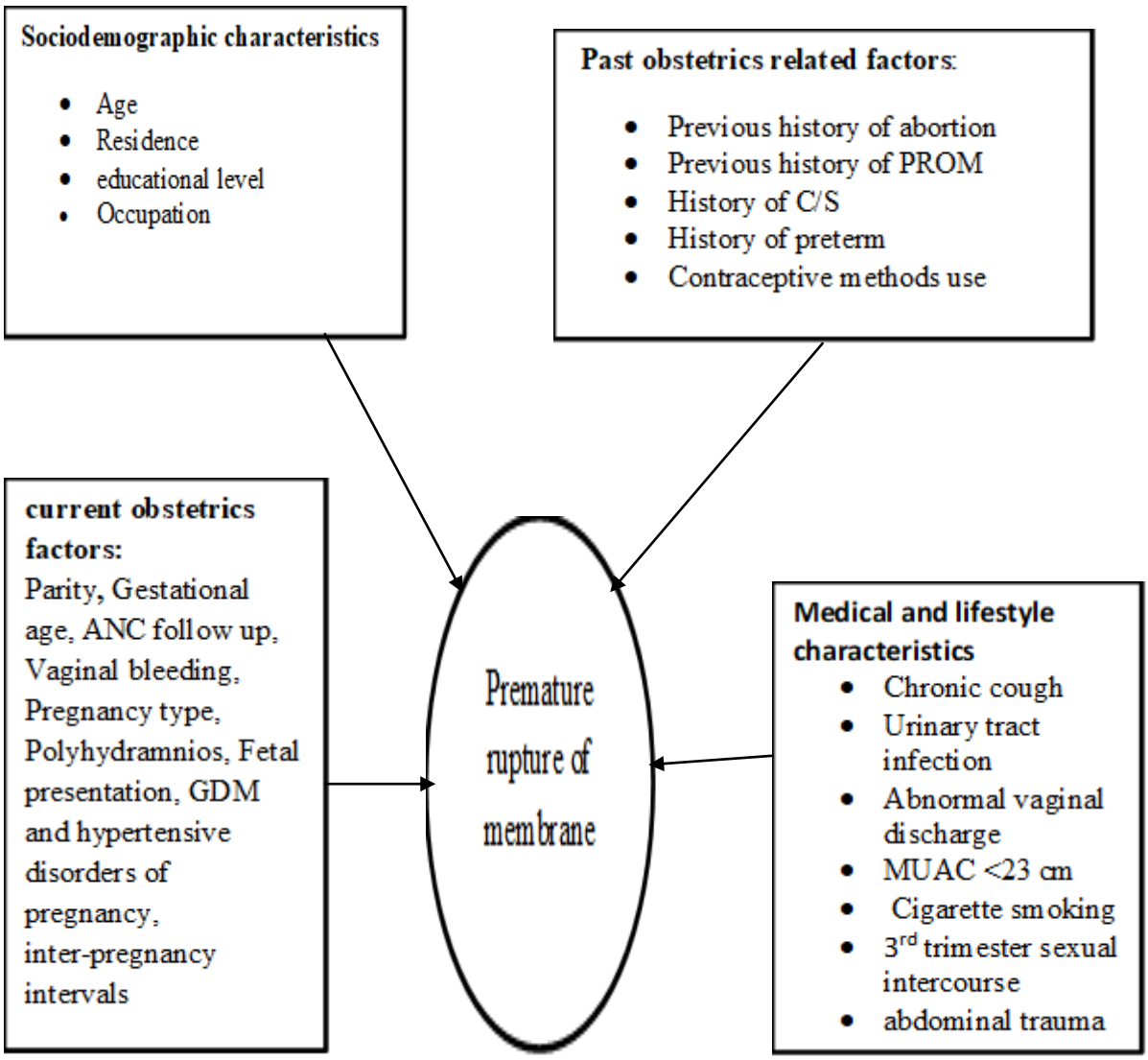

Figure 1:This is a conceptual framework showed that the relationship between dependent and independent variables adapted from different literatures (2, 6, 35, 36, 48).

3. Objective

To identify determinants of premature rupture of membrane among pregnant mothers admitted to public hospitals of Central Zone of Tigray Ethiopia 2024.

4. Methods and materials

4.1 Study area

This study was conducted in public hospitals of Central Zone Tigray, Ethiopia. Aksum town is the capital city of the central zone of Tigray, which is found 248 kilometers far from Mekelle, the capital city of Tigray regional state, and 1024 kilometers from Addis Ababa, the capital city of Ethiopia. The zone is bordered on the east by Eastern Zone Tigray, on the north by Eritrea, on the west by North Western Zone Tigray, and on the south-by-South Eastern Zone Tigray. This zone has a total population of 1,568,039, of whom 771,057 are men and 796,982 are women(49). The zone has 1 referral hospital and 3 general hospitals. The study was conducted in those four Hospitals, namely Abiy-adi Hospital, Adwa Hospital, Axum St. Marry Hospital, and Aksum university and comprehensive specialized hospital. All four hospitals provide maternal and child care services, including ANC service, delivery service, NICU, and management of obstetric complications. Based on the hospital report those hospitals are staffed with different health care providers, including gynecologists/obstetricians, general surgery, midwives and nurses who can correctly identify the presence or absence of premature rupture of membrane.

4.2 Study design and period

A hospital based unmatched case-control study design was conducted.

4.3 Study period

This study was from August 1 to September 30,2024.

4.4. Source of population

All pregnant women with a gestational age of above 28 weeks and admitted to labor and maternity wards in public hospitals of Central Zone, Tigray.

4.5 Study population

Study population for case: All pregnant women with a gestational age greater than 28 weeks who have been diagnosed with PROM by clinicians and admitted to hospitals during the data collection period.

Study population for control: All pregnant mothers with a gestational age of more than 28 weeks and who started labor with intact amniotic membrane diagnosed by clinicians and admitted to hospitals of Central Zone of Tigray during the data collection period.

4.6. Inclusion and exclusion criteria

4.6.1 Inclusion criteria for case

All pregnant women who have been diagnosed with PROM and above 28 weeks' gestational age.

4.6.2 Exclusion criteria for case

Pregnant women seriously sick during the data collection

Pregnant women with intrauterine fetal death

4.6.3 Inclusion criteria for control

All pregnant mothers with a gestational age of more than 28 weeks and who started labor with intact amniotic membrane diagnosed by clinician.

4.6.4 Exclusion criteria for control

Pregnant women seriously sick during the data collection

Pregnant women with intrauterine fetal death

4.7. Sample size determination

A sample size was calculated using the Epi Info version 7.2 statistical software using the double population proportion formula for an unmatched case-control study design. The f5ollowing assumptions were used: the power of the study was 80%, the confidence interval was 95%, the odds ratio (OR) was =2.11, the case to control ratio was 1:2, and the history of the cesarean section was taken as an exposure variable from a study done in governmental hospitals in the wollo zone, northeast Ethiopia. The percent of case exposed for History of cesarean section 40.4%, and percent of control exposed for history of cesarean section 22.6 % (44). Based on the above assumptions, the sample size becomes 330 (cases 110 and controls 220), and with adding 10% none response rate, the sample size becomes 363 (case 121 and 242control)(Table 1)

Table 1:Sample size calculation for determinants of premature rupture of membranes among pregnant women admitted to public hospitals of central zone Tigray, Ethiopia,2024

Variable	Reference	Percent of exposure		Case to control ratio	AOR	Sample size	Total sample size with 10% none response rate
		Case	Control				
History of CS	(44)	40.4	22.6	1:2	2.11	330	363
Chronic cough	(44)	22%	4.1%	1:2	4.23	264	290
UTI	(44)	55%	15.2%	1:2	3.14	168	185
History of PROM	(44)	55%	12%	1:2	3.89	134	147
MUAC<23CM	(44)	76.1%	60%	1:2	3.47	144	158

4.8. Sampling technique

There were three general hospitals and one tertiary hospital in the Central Zone of Tigray, and all the four hospitals were included in the study. Those hospitals, namely Axum University Referral Hospital, Abyi Adi Hospital, Adwa Hospitals, and St. Marry Hospital.

The calculated sample size was allocated to the study Hospitals proportionally based on the number of pregnant women admitted at each Hospitals. All pregnant women who have diagnosed with PROM before onset of labor and above 28 weeks' gestational age who full-fill the inclusion criteria for case was taken until the desire sample size met and Pregnant women who have diagnosed without PROM and above 28 weeks' gestational age who full-filled the inclusion criteria for control were selected using systematic random sampling technique every K interval. Kth was calculated by dividing the number control admitted to each Hospital of two month (N) by total sample size of controls(n). The first study participant was selected by lottery method from the list of control admitted and the rest study subjects was selected using the calculated K value(*Figure 2*).

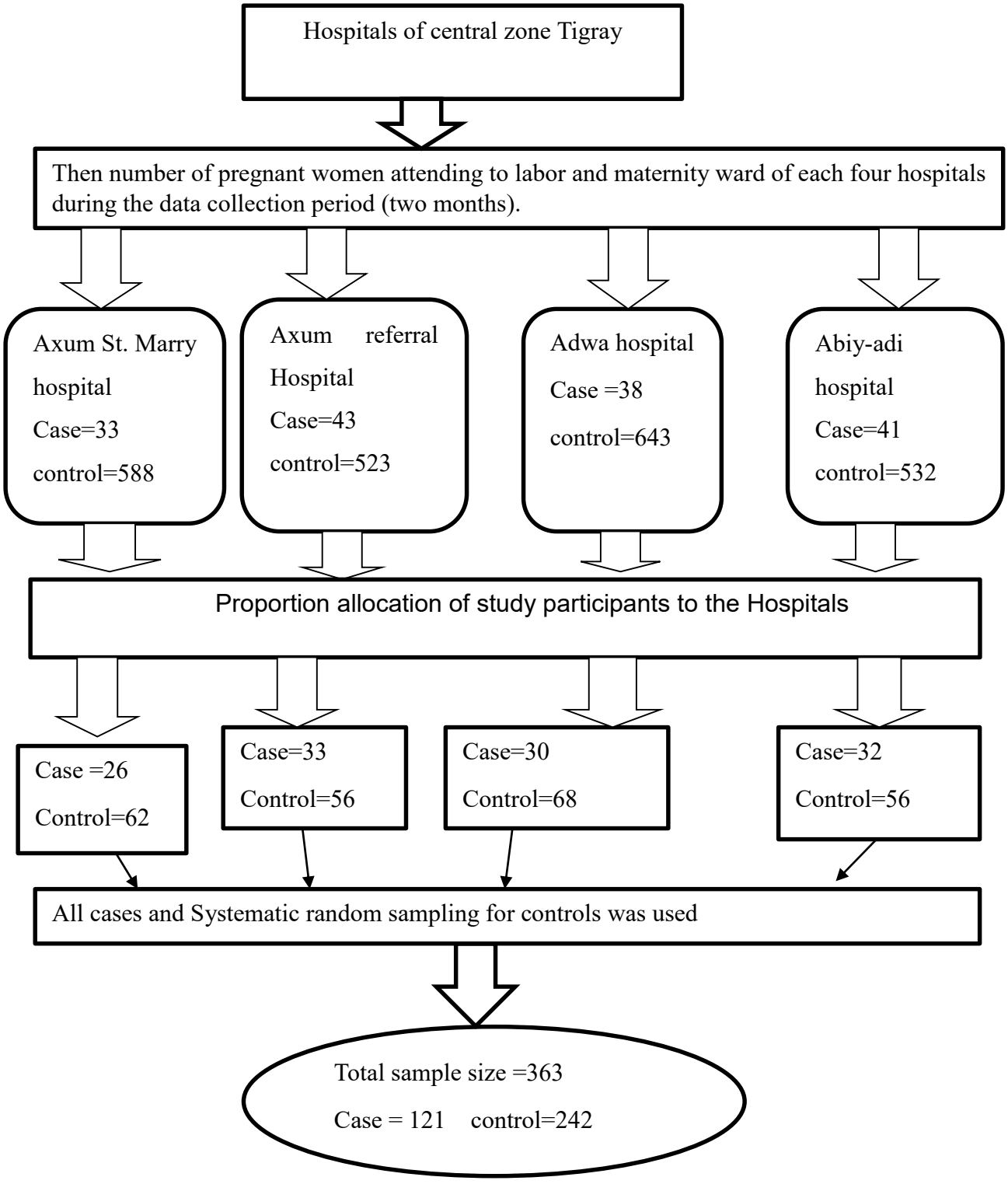

Figure 2:Schematic presentation of the sampling procedure

4.9. Data collection tools and procedures

A structured and pretested tool that Contains sociodemographic factors, current obstetrics, past obstetrics factors and medical and lifestyle factors was used for data collection. The questionnaire was developed after reviewing different literatures done related to premature rupture of membranes (2, 6, 33, 36). The study participants were interviewed face-to-face by trained data collectors (DC). The data was gathered in the labor and maternity wards of the study hospitals during client admission. Four midwives, one midwife in each hospital who communicates the local language Tigrigna was involved in data collection. First identifying the cases and controls was done, then the study participants informed consent was obtained to confirm willingness. Data that could not be addressed by interviews was collected from patients' medical records. A non-stretchable tape meter was used to measure the MUAC of each woman at the midpoint between the tips of the shoulder and elbow. The data was collected under close supervision by supervisors and the principal investigator.

4.10. Study variable

Dependent variable

Premature rupture of membranes

Independent variable

Socio-demographic factors: age, residence, educational level, occupation status, and marital status

Past obstetric factors: history of abortion, history of PROM, history of C/S, history of preterm and contraceptive methods use.

Current obstetric factors: parity, gestational age, ANC follow up, vaginal bleeding, pregnancy type, polyhydramnios, fetal presentation, GDM, and hypertensive disorders of pregnancy and interpregnancy intervals.

Medical and lifestyle factors: chronic cough, urinary tract infection, abnormal vaginal discharge, MUAC, cigarette smoking, 3rd trimester sexual intercourse, abdominal trauma, sleeping hours.

4.11. Operational definitions

Premature Rupture of Membrane: is define as rupture of fetal membrane and leakage of amniotic fluid or collection of fluid through vaginal fornix examined by speculum categorized before onset of true labor after 28 weeks of gestational age (4).

Interpregnancy interval: The interval between the most recent previous childbirth and the starting time of the current pregnancy was classified as short if it was below 2 years, optimal if it was ≥ 2 years(50).

MUAC: The MUAC of each pregnant woman were measured at the midpoint between the tips of the shoulder and elbow of the left arm using none-elastic, and the nutritional status of the mother were classified as poor nutritional status if MUAC <23 cm and good nutritional status if MUAC is above 23 cm (2).

Public Hospitals: In this study, it refers to those governmental general and tertiary hospital of central zone, Tigray.

4.12. Data processing and analysis

The collected data were coded and entered into Epi Data version 4.7, then exported to Statistical Package for Social Sciences (SPSS) version 27 for analysis. Frequencies and percentage for categorical variables and, means, Midian, standard deviation and interquartile range for continuous variable was used to describe the descriptive statistics of the data. Bivariable and multivariable logistic regression analysis was done to determine the association between dependent and independent variables. Variables with a p-value of less than 0.25 in bivariable were entered into the multivariable logistic regression model. Finally, multivariable logistic regression analysis was done to determine the determinant of PROM. Multicollinearity was checked using variance inflation factor (VIF), which was <5. The goodness of model fitness was checked by using the Hosmer-Lemeshow goodness of fit test at p value =0.62, which was insignificant, which indicates that the model was fitted. The odds ratio and 95% confidence level were used to assess the strength of the association between dependent and independent variables. Last but not least, predictor variables with a p-value of less than 0.05 in the multivariable logistic regression model were considered as statistically significant determinants for PROM. The result was presented in the form of text, tables, and figures.

4.13. Data quality assurance

The questionnaire was initially prepared in English then translated to local language (Tigrigna) then back again to English version to ensure consistency. Training was provided for DC and supervisor on the objective of the study, data collection tool, data collection technique and confidentiality of information and participants right for one day. The tool was pre tasted in 5% of the calculated sample size (6 case 12 control) in Suhual hospital (north west Tigray) before the actual data collection period. The tool was checked its clarity, understandability and simplicity to get the desire information. After the pretest the questionnaires was corrected and modified based on input and comment. Continuous close supervision was done by supervisors and the principal investigator.

4.14. Ethical considerations

Initially, an ethical clearance letter was obtained from the institutional review board of the College of Health Science at Mekelle University (Ref.No:MU-IRB 2269/2024). The official letter of cooperation was obtained from Mekelle University College of Health Science School of Nursing and submitted to the Tigray regional health bureau. Also, the official letter of cooperation was obtained from the Tigray regional health bureau and submitted to each hospital to get permission from the hospitals administrative. After getting permission from hospitals and before conducting the interview, informed written consent from each respondent was obtained after a detailed explanation of the main purpose of the study. The confidentiality of information of the respondent were maintained. Each respondent was informed that their participation was voluntary and they also had the right to withdraw from the study at any time during data collection.

4.15. Dissemination of finding

After completing this study, the result will be presented and submitted to Mekelle University, College of Health Science, School of Nursing, Department of Maternal and Reproductive Health Nurse. A copy will also be disseminated to the study area (abiy-adi hospital, Adwa hospital, St. Marry hospital, Aksum university, and comprehensive specialized hospital) and other concerned bodies. In addition, efforts will be made to present in seminars. Lastly, efforts will be made to publish in scientific journals.

5. Result

5.1: Socio-demographic characteristics of the study participants

A total of 363 study participants (121 cases and 242 controls) were involved in this study, with 100% response rate. The mean age for cases was 31.54 years (± 6.51 standard deviations (SD) and controls was 31.79 years (±6.85 SD). From a total participant ,75(62.2%) and 143(59.1%) cases and controls were in the age category 20-34 years old. Among the participants, 85 (70.2%) of cases and 122(50.4%) of controls were living in rural areas, and 42 (34.7%) of cases and 84 (34.7%) of controls had completed secondary school. Forty-eight (39.7%) cases and 112 (46.3%) controls were housewives. For marital status; 113 (93.4%) cases and 228 (94.2%) controls were married (*Table 2*).

Table 2:Socio-demographic characteristics of pregnant mothers admitted to public hospitals of Central Zone of Tigray, Ethiopia ,2024(n=363).

Variables	Categories	Cases(n=121) %	Controls(n=242) %	Total (363)
Age	<20	6(5)	13(5.4)	19(5.2)
	20-34	75(62.2)	143(59.1)	218(60.1)
	≥35	40(33.1)	86(35.5)	126(34.7)
Residence	Urban	36(29.8)	120(49.6)	156(43)
	Rural	85(70.2)	122(50.4)	206(57)
Educational status	No formal education	22(18.2)	37(15.3)	59(16.3)
	Primary school	35(28.9)	86(35.5)	121(33.3)
	Secondary school	42(34.7)	84(34.7)	126(34.7)
	Diploma and above	22(18.2)	35(14.5)	57(15.7)
Occupation	House wife	48(39.7)	112(46.3)	160(44.1)
	Farmer	41(33.9)	77(31.8)	118(32.5)
	Governmental employee	17(14)	19(7.9)	36(9.9)
	Merchant	9(7.4)	14(5.8)	23(6.3)
	Others*	6(5)	20(8.3)	26(7.2)
Marital status	Married	113(93.4)	228(94.2)	341(93.9)
	Others**	8(6.6)	14(5.8)	22(6.1)

*Others: student, daily worker **Others: single, divorced and widowed

5.2: Current pregnancy related characteristics of the study participants

Among the study participants; 25 (20.7%) of cases and 56(23.10%) of controls were primigravida and almost two-third, 83 (68.6%) of the cases and 161 (66.5%) of the controls, were multigravida (*Figure 3*).

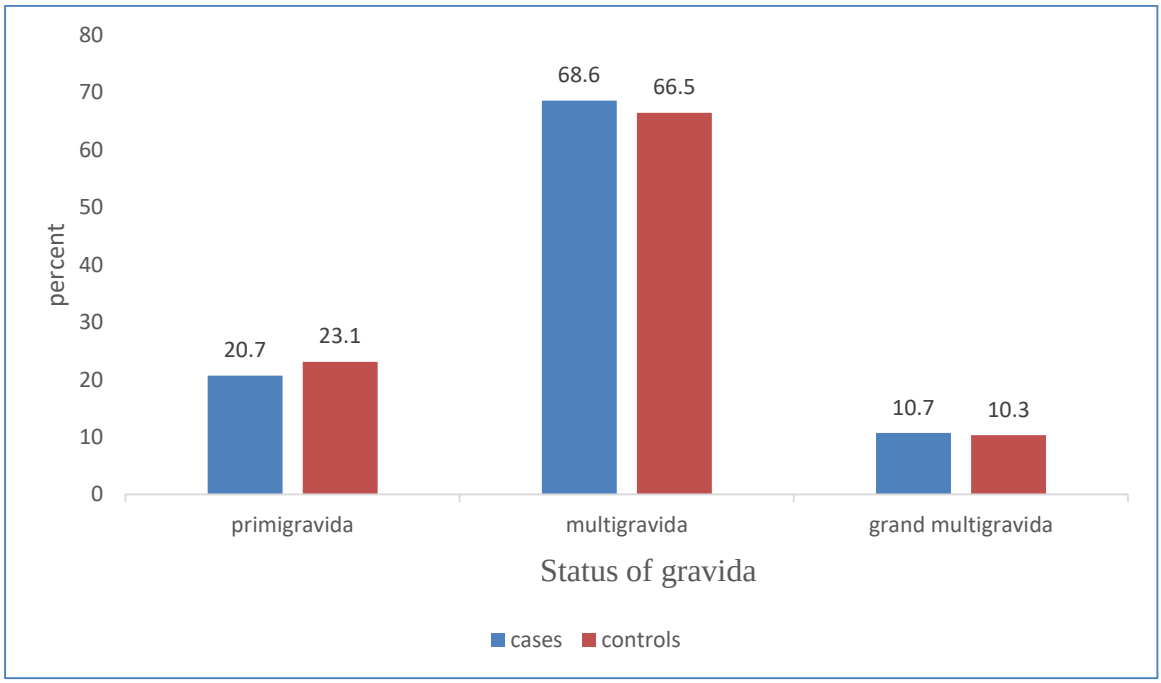

Figure 3: Status of gravida status among pregnant women admitted to public hospitals of Central Zone of Tigray, Ethiopia, 2024(n=363)

In this study, 57 (47.1%) of cases and 109(45%) of controls were multipara. Among the study participants, 37(39.4%) of cases and 61(33.9%) of controls were delivered at less than two years birth interval. The mean gestational age of cases and controls were 38.41±2.02 SD and 38.52±2.4SD respectively and 89 (73.6%) of cases and 175 (72.3%) of controls were found between 37-42 weeks of gestational age. Among the participants ,114 (94.2%) of cases and 225 (93%) of controls had ANC follow-up. Of these, 57(50%) cases and 138(61.3%) controls had 2-3 times ANC visit. Similarly, 26 (22.8%) cases and 55 (24.4%) of controls had initiated ANC follow-up at less than 12 weeks of gestational age.

This study showed that 6 (5%) of cases and 7 (2.9%) controls had antepartum hemorrhage. Similarly, 7(5.8%) of cases and 13(5.4) of controls had hypertensive disorder of pregnancy during this pregnancy. Of these, 4(57.1%) cases and 10(76.9%) controls were with pre-eclampsia. Besides, 11(9.1%) of cases and 12(5%) of controls had been diagnosed with polyhydramnios, and 4 (3.3%) of cases and 5 (2.1%) of controls had GDM. Breech presentation was found in 6 (5%) of cases and 13(5.4%) of controls (*Table 3*).

Table 3:Current pregnancy related characteristics of pregnant women admitted to public hospitals of Central Zone of Tigray, Ethiopia, 2024(n=363).

Variables	categories'	Cases(n=121) %	Controls (n=242) %	Total (363) %
Parity	Nullipara	27(22.3)	62(25.6)	89(24.5)
	Primipara	37(30.6)	71(29.3)	108(29.8)
	Multipara	57(47.1)	109(45)	166(45.7)
IPI (inter pregnancy interval)	< 2 years	37(39.4)	61(33.9)	98(35.8)
	≥2 years	57(60.6)	119(66.1)	176(64.2)
Gestational age(weeks)	<37	25(20.7)	54(22.3)	79(21.8)
	37-42	89(73.6)	175(72.3)	264(72.7)
	≥42	7(5.8)	13(5.4)	20(5.5)
ANC follow up	Yes	114(94.2)	225(93)	339(93.4)
	No	7(5.8)	17(7)	24(6.6)
Frequency of ANC	One	7(6.1)	16(7.1)	23(6.8)
	2-3	57(50)	138(61.3)	195(57.5)
	≥4	50(43.9)	71(31.6)	121(35.7)
Time of ANC initiation(weeks)	< 12	26(22.8)	55(24.4)	81(23.9)
	≥12	88(77.2)	170(75.6)	258(76.1)
APH	Yes	6(5)	7(2.9)	13(3.6)
	No	115(95)	235(97.1)	350(96.4)
Hypertensive disorder of pregnancy	Yes	7(5.8)	13(5.4)	20(5.5)
	No	114(94.2)	229(94.6)	343(94.5)
Type of hypertensive	PIH	2(28.6)	2(15.4)	4(20)
	pre-eclampsia	4(57.1)	10(76.9)	14(70)
	chronic hypertensive	1(14.3)	1(7.7)	2(10)
Polyhydramnios	Yes	11(9.1)	12(5)	23(6.3)
	No	110(90.9)	230(95)	346(93.7)
Diagnosed GDM	Yes	4(3.3)	5(2.1)	9(2.5)
	No	117(96.7)	237(97.9)	354(97.5)
Fetal presentation	Cephalic	115(95.0)	229(94.6)	344(94.8)
	Breech	6(5)	13(5.4)	19(5.2)

From the study participants, 16 (13.2 %) of cases and 12 (5%) of controls had multiple pregnancies (*Figure 4*)

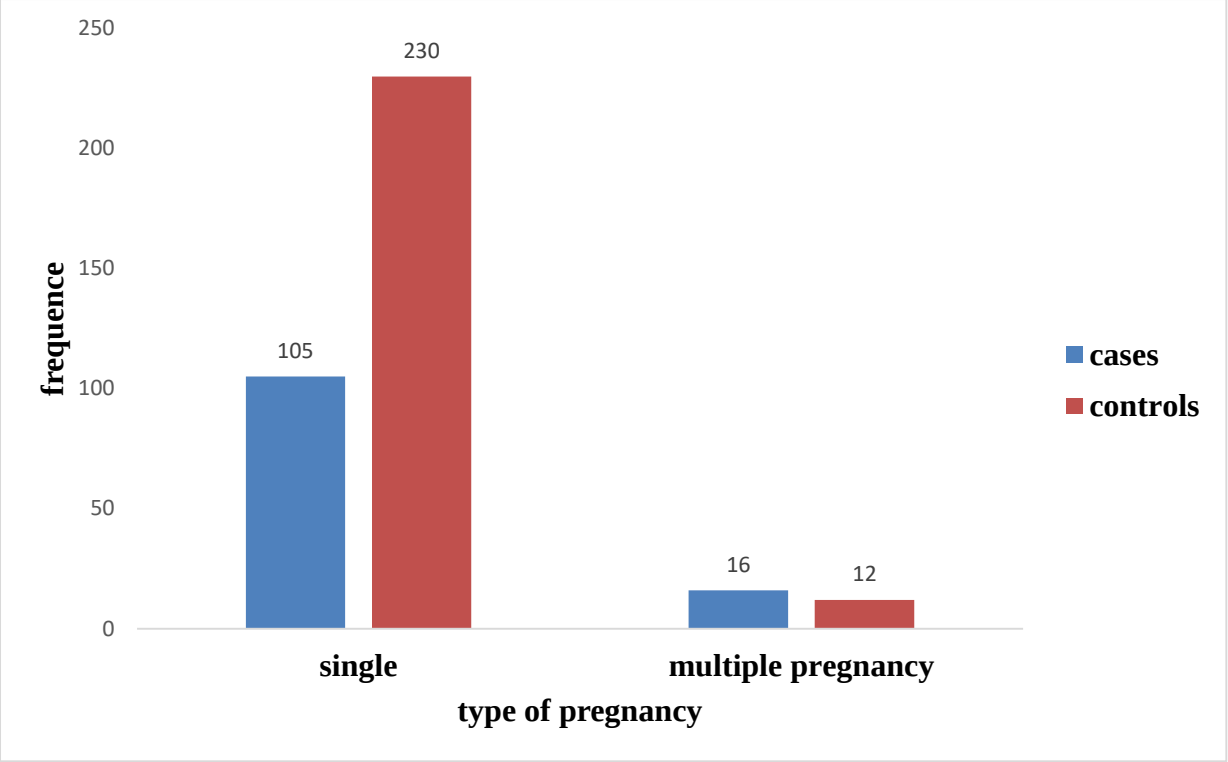

Figure 4: Type of pregnancy among pregnant women admitted to public hospitals of Central Zone of Tigray, Ethiopia, 2024(n=363)

5.3: Past obstetrics related characteristics of the study participants

This study revealed that 19 (15.7%) of cases and 28(11.6%) of controls had a history of abortion. Similarly,24 (19.8) of cases and 19(7.9) of controls had a history of cesarean section. Besides, 30 (24.8%) of cases and 22(9.1%) of controls had a history of PROM. Nineteen (15.7%) of cases and 21(8.7%) of controls had a history of preterm. Seventy-six (62.8%) of cases and 137 (56.6%) of controls were used modern contraceptives. Of these, 55(72.4%) of cases and 90 (65.7) of controls were used injectable (*Table 4*).

Table 4:Past obstetrics related characteristics of pregnant women admitted to public hospitals of Central Zone of Tigray, Ethiopia, 2024(n=363).

Variables	Categories	Cases(n=121) %	Controls(n=242) %	Totals (363) %)
History of abortion	Yes	19(15.7)	28(11.6)	47(12.9)
	No	102(84.3)	214(88.4)	316(87.1)
History of C/S	Yes	24(19.8)	19(7.9)	43(11.8)
	No	97(80.2)	223(92.1)	320(88.2)
History of PROM	Yes	30(24.8)	22(9.1)	52(14.3)
	No	91(75.2)	220(90.9)	311(85.7)
History of preterm	Yes	19(15.7)	21(8.7)	40(11)
	No	102(84.3)	221(91.3)	323(89)
Contraceptive use	Yes	76(62.8)	137(56.6)	213(58.7)
	No	45(37.2)	105(43.4)	150(41.3)
Type of contraceptive (n=213)	Pill	6(7.9)	17(12.4)	23(10.8)
	Injectable	55(72.4)	90(65.7)	145(68.1)
	Implanon	13(17.1)	27(19.7)	40(18.8)
	IUD	2(2.6)	3(2.2)	5(2.3)

5.4: Medical and lifestyle related characteristics of the study participants

Regarding medical conditions, 9 (7.4) of cases and 16 (6.6%) of controls were experienced with chronic cough. Furthermore, 14 (11.6%) of cases and 22 (9.1%) of controls were diagnosed with UTI. Eighteen (14.9%) cases and 23 (9.5%) controls had abnormal vaginal discharge during this pregnancy and 8(6.6%) of cases and 13(5.4%) of controls were passive smokers. Among the study participants, 10(8.3%) of cases and 12(5%) of controls had a history of fall during this pregnancy. The median duration of sleep for cases was 9 hours ± 3(IQR) Interquartile range and for controls 9 hours ±2.50 IQR and 26(21.8%) of cases and 42(17.4%) of controls sleep fewer than eight hours per day. Fifty-one (42.1%) of cases and 106(43.8%) of controls had history of sexual intercourse during the third trimester of the current pregnancy. The mean MUAC measurement for cases was 23.96 c.m (±2.56 SD) and for controls 24 c.m (±2.23 SD) and, 42 (34.7%) of cases and 39 (16.1%) of controls were measured MUAC at less than 23 c.m(*Table 5*).

Table 5:Medical and lifestyle related characteristics of pregnant women admitted to public hospitals of Central Zone of Tigray, Ethiopia ,2024(n=363).

Variables	Categories	Cases(n=121) %	Controls(n=242) %	Total (363) %
Having chronic cough	Yes	9(7.4)	16(6.6)	25(6.9)
	No	112(92.6)	226(93.4)	338(93.1)
UTI	Yes	14(11.6)	22(9.1)	36(9.9)
	No	107(88.4)	220(90.9)	327(90.1)
Abnormal vaginal discharge	Yes	18(14.9)	23(9.5)	41(11.3)
	No	103(85.1)	219(90.5)	322(88.7)
Passive smoking	Yes	8(6.6)	13(5.4)	21(5.8)
	No	113(93.4)	229(94.6)	348(94.2)
Falling in accident	Yes	10(8.3)	12(5)	22(6.1)
	No	111(91.7)	230(95)	341(93.9)
Duration of sleeping hour/day	<8	26(21.5)	42(17.4)	68(18.7)
	≥8	95(78.5)	200(82.6)	295(81.3)
3rd trimester pregnancy	Yes	51(42.1)	106(43.8)	157(43.3)
Sexual intercourse	No	70(57.9)	136(56.2)	206(56.7)
MUAC (c.m)	<23	42(34.7)	39(16.1)	81(22.3)
	≥23	79(65.3)	203(83.9)	282(77.7)

5.5: Determinants of premature rupture of membrane

Bivariable logistic regression analysis was performed for each independent variable to select candidate variables for multivariable regression. Variables like residence, polyhydramnios, type of pregnancy, history of PROM, history of C/S, history of preterm, having abnormal vaginal discharge, history of fall during pregnancy, and MUAC less than 23 centimeter had an association with premature rupture of membrane at p-value less than 0.25.

All variables significant (p-value < 0.25) in bivariable logistic regression analysis were transferred to a multivariable logistic regression model. Residence, type of pregnancy, history of PROM, and MUAC less than 23 cm. were found statistically significant determinants for PROM at p-value < 0.05.

In this study showed that pregnant women living in rural areas were 2 times more likely to have PROM compared to those in urban areas (AOR=2.17,95 % CI: 1.31-3.59, p-value=0.003). The study participant who had multiple fetus during this pregnancy showed a significant association with PROM. Pregnant women who had multiple fetus were over 2 times (AOR=2.44, 95% CI: 1.01-5.89, p-value=0.047) higher among those who had single fetus. Pregnant mothers with history of PROM were approximately 3 times (AOR=2.76,95% CI: 1.42-5.38, p-value=0.003) more likely to develop PROM than those who had not history of PROM. Similarly study participants with MUAC measurement <23 cm were nearly 3 times (AOR=2.79,95% CI: 1.59-4.89, p-value=0.001) more likely to develop premature rupture of membranes than participants with MUAC greater or equal to 23 cm. **(***Table 6***).**

Table 6:Bivariable and multivariable logistic regression analysis for determinants of premature rupture of membranes among pregnant women admitted to public hospitals of Central Zone of Tigray, Ethiopia, 2024(n=363).

Variables	Categories	Status of PROM		COR (95% CI)	AOR (95% CI)	P-value
		Case (n)%	Control(n)%			
Residence	Urban	36(29.8)	120(49.6)	1	1	
	Rural	85(70.2)	122(50.4)	2.32(1.46-3.69)	2.17(1.31-3.59)	0.003*
Polyhydramnios	Yes	11(9.1)	12(5.0)	1.91(0.82-4.48)	1.50(0.58-3.87)	0.40
	no	110(90.9)	230(95.0)	1	1	
Type of pregnancy	Single	105(86.8)	230(95.0)	1	1	
	Multiple	16(13.2)	12(5.0)	2.92(1.33-6.39)	2.44(1.01-5.89)	0.047*
History of PROM	Yes	30(24.8)	22(9.1)	3.30 (1.80-6.01)	2.76(1.42-5.38)	0.003*
	No	91(75.2)	220(90.9)	1	1	
History of C/S	Yes	24(19.8)	19(7.9)	2.90(1.52-5.55)	1.51(0.69-3.31)	0.29
	No	97(80.2)	223(92.1)	1	1	
History of preterm	Yes	19(15.7)	21(8.7)	1.96(1.01-3.80)	1.28(0.59-2.78)	0.53
	No	102(84.3	221(91.3)	1	1	
Abnormal vaginal discharge	Yes	18(14.9)	23(9.5)	1.66(0.86-3.21)	1.78(0.87-3.65)	0.11
	No	103(85.1)	219(90.5)	1	1	
Falling in accident	Yes	10(8.3)	12(5.0)	1.72(0.72-4.11)	0.84(0.29-2.39)	0.75
	No	111(91.7)	230(95)	1	1	
MUAC	<23	42(34.7)	39(16.1)	2.76(1.67-4.6)	2.79(1.59-4.89)	0.001*
	≥23	79(65.3)	203(83.9)	1	1	

1=reference group
*=variables with statistically significance association at p-value <0.05

6. Discussion

The aim of the study was to identify the determinants of PROM in public hospitals of central zone Tigray, Ethiopia and in this study rural residence, having multiple fetus, history of PROM and MUAC <23 cm. was determinants of PROM.

Rural residence was determinants for the occurrence of premature rupture of membrane. In this study the odds of developing PROM were 2.17 times higher among pregnant women living in rural areas compared to those who live in urban areas. This finding is consistent with study conducted in Egypt in 2018 (29) and Ethiopia(30). This might be due to women in rural areas may have less access, availability, and utilization of healthcare services than women in urban areas. Additionally, women in rural area are less likely to be exposed to the media, which is commonly used to promote health and deal with pregnancy-related issues on a regional and national levels(51, 52).

Having multiple gestations was also other determinants of premature rupture of membranes. Pregnant women who had multiple fetus were 2.44 times higher odds of developing premature rupture of membranes compared to those who had single fetus. This result is supported by study conducted in Indonesia(26), India (39) and Uganda (27). This might be because, pregnant women with multiple fetus increase, polyhydramnios, malpresentation and the uterus and fetal membranes become overstretched results increase intraamniotic pressure ,this increase the risk of premature rupture of membrane (14).

Similarly, history of PROM was determinants of premature. The odds of developing PROM were 2.76 times higher among pregnant mothers with history of PROM than those who had not history of premature rupture of membrane. This study is consistent with study conducted in Pakistan(36), Iran (38),Nigeria(31) and southern Ethiopia (32) and Mekelle city (Tigray) (35). This might be because, abnormal anatomically structure of the uterus and cervix and untreated reproductive system infection(24).

This study demonstrates that pregnant mothers with MUAC measurement <23 cm were 2.79 times higher to develop premature rupture of membranes than pregnant mothers with MUAC greater or equal to 23 cm. Similarly study done in Oromia (2),southern Ethiopia (6) support this study. This might be because, pregnant mothers with MUAC measurement less than 23 cm

shows undernutrition. Nutritional deficiencies, especially micronutrient deficiencies such as vitamin C, affect the production of collagen, which affects the fetal membrane's integrity and structure and can impair the body’s ability to defend itself from degenerative processes caused by oxidative stress, which could lead to easy breakage of the membrane(9).

7.Limitations

In this study recall bias might be consider because women were asked events that happened before study period so participants might not have remembered and reported past events correctly. In addition, participants might be prone to social desirability bias because some of the responses were based on self-report.

8. Conclusion and recommendation

8.1. Conclusion

Findings from this case control study showed that rural residence, having multiple fetus, history of premature rupture of membranes and MUAC <23 cm. were determinants of premature rupture of membranes. These determinants indicate crucial areas for targeted intervention to reduce complications associated with PROM in this area.

8.2. Recommendations

Premature rupture of membranes has a great effect on maternal and perinatal health. Based on the study findings the following recommendations are forwarded:

For policy makers and program managers:

Strengthen maternal nutrition programs targeting pregnant women particularly in rural areas and promote regular and early ANC visit focusing on identifying and managing high risk pregnancy such as multiple pregnancies, history of PROM.

For hospitals

Hospitals should work on improving maternal nutritional status during pregnancy via proper nutrition screening, counseling, and interventions. I also recommended to provide education for pregnant women to take preventive measures for the identified determinants of PROM.

For health professionals:

Healthcare providers should strengthen routine assessment of risk factors for premature rupture of membranes such as multiple pregnancies, a history of PROM, and low MUAC during prenatal visits and it is better to provide special emphasis on mothers with those problems.

For researcher

Finally, I recommend other researchers to conduct large-scale studies over an extended period to determine other determinants of PROM.

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10.Annexes

Annex I: Information sheet (English version)

Mekelle University college of Health Science School of Nursing Department of Maternity & Reproductive Health Nursing

My name is _____. I am working with G/mariam kifle who is doing research for the partial fulfillment of Master's Degree in Maternity and RH nursing at Mekelle University. I am here to study determinants of premature rupture of membrane among pregnant mothers admitted to public hospitals of central zone Tigray Ethiopia. The result of the study will be helpful for identifying the determinants of premature rupture of membrane and the finding of the study also help as significant input for policymakers, program managers and other stakeholders to design programs and strategies to prevent neonatal and maternal complications related premature rupture of membranes It will also serve for principal investigator as a partial fulfillment for a Master's degree in maternal and RH nursing. I am going to ask you questions to be responded by you. Some of the questions are very personal questions that some people find them difficult to answer. Your answers are completely confidential. Your name will not be written on this form, and will never be used in connection with any of the information you tell me. Participation by answering the questions that I am going to provide you is strictly on voluntary base. However, your honest answer to the question will help me for better understanding of the determinant of premature rupture of membrane. Being study participant in this study will not get you any direct benefit and your involvement in the study will not give you any risk. Your right not to involve at first place or to withdraw at any time is respected. I would greatly appreciate your cooperation and help in response to this study. The interview will take about 15-20 minutes.

If you would like to know more, please contact:

Principal investigator G/mariam kifle

Phone number +251909413850 or email gmariamkifle6@gmail.com

Are you willing to participate? Yes_____ No_____

Annex: Consent form of participant

I the undersigned, am told that the researcher is going to conduct the study, to identify determinant of premature rupture of membrane among pregnant mothers admitted to public hospitals of central zone Tigray Ethiopia. I have been told that the research will benefit the community in general including me, the respondent, and that the research will not inflict any harm to me. I have been told that I have full right I have enough time to understand and then take part in the study on the basis of my interest besides; I am briefed that I will be interviewed for not more than 20 minutes. Moreover, am notified that my participation in the study is entirely volunteer, and that I can quite from the study any time I want. I will not be subject to any form of punishment following my failure to participate in the study. In the same way am told that the information collected will not be disclosed by any means to any people other than those participating in the study unless obtained permission from me. Equally, am told that I can ask them question I found difficulty or any type. I agree to participate in the research voluntarily

Signature _____ Date_____

Interviewer name _____ signature _____

Date of interview _____Time started _____Time-finished _____

Supervisor name _____ Signature_____

Annex: Questioner in English version

1. Name of health facility/hospitals/ ----------
2. **Code no_____**

☐ Case (with PROM) ☐ Control (without PROM)

Part 1: socio demography characteristics of participants			
S.no	Question	Response	Remark
101	Age of the mother?	1 ------years	
102	Where you live?	1) Urban 2) Rural	
103	What is your educational status?	1) No formal education 2) Primary school 3) Secondary school 4) Diploma and above	
104	What is your occupation?	1) House wife 2) Farmer 3) Governmental employment 4) Private employment 5) Daily worker 6) Merchant 7) Others(specify)-----	
105	What is your marital status?	1) Single 2) Married 3) Divorced 4) Widowed	
Part 2: Current obstetrics characteristics of participants			
201	How many times have you been pregnant including this one?	_____	
202	How many times did you deliver?	_____	

203	When was your last menstrual period (LNMP)?	_____/_____/___dd/mm/ year	
204	Gestational age of the fetus?	_____	Calculate based Q 203 or U/S
205	Duration from the most recent previous child birth to the current LNMP?	_____months	
206	Did you have ANC follow up?	1) Yes 2) No	If no skip to Q 208
207	If yes, how many follow up did you have?	----------	
208	Time of ANC initiation?	_____weeks	
209	Did you have diagnosed vaginal bleeding?	1) Yes 2) No	
210	Do you have diagnosed hypertensive disorder of pregnancy	1. Yes 2) No	See patient chart If no go to Q 212
211	If yes what type of hypertensive disorder of pregnancy do you have?	1. pregnancy induced hypertension 2. pre-eclampsia 3. eclampsia 4. chronic hypertension	
212	Do you have diagnosed polyhydramnios?	1) Yes 2) No	See patient chart
213	Do you have Diagnosed DM?	1) Yes 2) No	See patient chart, if no skip to Q 215
214	If yes, what type of DM do you have?	1) Preexisting DM 2) GDM	
215	What is the fetal presentation?	1) Cephalic 2) Breech 3) Others ……	See patient chart
216	Type of pregnancy?	1) single 2) multiple	See patient chart
Part 3: Past obstetrics characteristics of participants			

301	Did you have a history of abortion?	1) Yes 2) No	If no skip to Q 303
302	Did you have a history of cesarean section?	1) Yes 2) No	
303	Did you have a history of PROM?	1) Yes 2) No	
304	Did you have a history of preterm delivery?	1) Yes 2) No	
305	Did you use contraceptive before becoming pregnant?	1)Yes 2) No	
306	If yes, which type of contraceptive did you ever used?	1) Oral contraceptive 2) Injectable 3) Implants 4) IUD 5) Other(specify)_____ ___	
Part 4: Medical and lifestyle related factors			
401	Have you experienced a cough lasting more than 8 weeks during this pregnancy?	1) Yes 2) No	
402	Do you have diagnosed urinary tract infection during the current pregnancy?	1. Yes 2. No	See patient chart
403	Do you have diagnosed abnormal vaginal discharge?	1. Yes 2. No	See patient chart
404	Did you smoke cigarette during this pregnancy?	1. Yes 2. No	
405	Have you any one who smoke cigarette in your family?	1) Yes 2) No	
406	Did you have history of fall/ abdominal trauma in this pregnancy?	1) Yes 2) No	
407	How many hours did you sleep per day?	_____hours	

408	Have you engaged in sexual intercourse during your 3rd trimester of pregnancy?	1.Yes 2. No	
409	MUAC of the pregnant mother?	_____cm	

Thanks for your participation Ị

ልጋብ ብትግርኛ

ልጋብ ፩: መብርሂ ቅድመ ቃለ መጠይቅ (ብትግርኛ ክፍል)

ዩንቨርሲቲ መቐለ ኮሌጅ ጥዕና ሳይንስ ነርሲንግ ቤት ትምህርቲ

ጥዕና ይሃበለይ አነ _____ ይባሃል አነ ዝሰርሕ ዘለኩ አብ መቀለ ዩኒቨርስቲ ክፍሊ ት/ቲ ነርሲንግ ናይ ካልኣይ ዲግሪ መማልኢ ፅንዓታዊ ፁሑፍ ምስ ዘካይድ ዘሎ ተመሃራይ ገብረማርያም ክፍለ እንትከውን ዕላማ ናይዚ መፅናዕቲ(determinants of premature rupture of membrane among pregnant mothers admitted to public hospitals of Central Zone of Tigray Ethiopia 2024.) ኣብ ማእከላይ ዞባ ኣብ ዝርከባ ሆስፒታላት ቅድሚ ሕርሲ ምጅማሩ ማንታ ርእሲ ምፍሳስ ከምፅኡ ዝክእሉ ነገራት ንምፅናዕ እዩ። እቲ ዝእከብ ሓበሬታ ንሕብረተሰብ ንምምሃርን ካሎኦት ስራሓቲ ንምስራሕን ከምኡዉን ብሰንኪ ናይ ቅድሚ ሕርሲ ማንታ ርእሲ ምፍሳስ ዝመፁ ፀገማት ንምቕናስ ይሕግዝ እዩ ተባሂሉ ስለዝእመነሉ እዩ። ብተወሳኺ ነቲ ዋና ኣፅናዓይ ንካልኣይ ዲግሪ መማልኢ ፅሑፍ ከገልግሎ እዩ። ነዚ መፅናዕቲ ንምክያድ ዝተፈላለዩ ሕቶታት ክህልዉና እዮም። ትክክለኛ ሓበሬታ ክትህብኒ ድማ ብትሕትና እሓትት። እተን ሕቶታት ካብ 15 ክሳብ 20 ደቒቓ እየን ዝወስዳ። ኣብዚ መፅናዕቲ ብምስታፍኪ ቀጥታዊ ዝኾነ ጥቅሚ ዘይክትረኽቢ ትኽእሊ እኪ። ኮይኑ ግና እቲ ዝእከብ ሓበሬታ ነዚ ፀገም ንምክልኻል ኣብ ዝሕንፀፅ ትልሚ ግደ ክህልዎ እዩ። ኣብዚ መፅናዕቲ ብምስታፍኪ ምንም ዓይነት ሳዕቤን ኣባኺ ኣይበፅሕን።ናይ ውልቀ ሰባት መልሲ ዝትሓዝ ብዝወሃብ ኮድ ቁፅሪ ክኸውንከሎ ናይ ውልቀ ሰብ ሽም ይኹን አድራሻ አይተሓዝን። ብዘይካ ናይቲ መፅናዕቲ ኣባላት ካሊእ ማንም ሰብ ኣይረኦን። ውፅኢት እውን ዝግለፅ ብጥቅሉል እምበር ናይ ውልቀ ሰባት ዝግለፅ አይኮነን፡ ንዘም ሕቶታት ምሉእ ብ ምሉእ ወይ ድማ ብኽፋል ናይ ዘይምምላስ መሰልኪ ሕልዉ እዩ። እዚ ድማ አብ ዘድልየኪ ግልጋሎት ዝፈጥሮ ምንም ዓይነት ፅዕንቶ የለን።

ተወሳኺ ሓበሬታ እንተድልይኪ ብዝስዕብ ኣድራሻ ምጥያቕ ትኽእሊ ኢኺ።

ሽምን ኣድራሻን በዓል ዋና እቲ መፅናዕቲ፡ ገ/ማርያም ክፍለ ስልኪ ቁፅሪ +251909413850

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ልጋብ፪ ናይ ስምምዕነት ቀጥዒ (ብትግርኛ ክፍሊ)

አነ ከም ዝተነገረኒ እቲ መፅናዕቲ ብዛዕባ ናይ ቅድሚ ሕርሲ ማንታ ርእሲ ምፍሳስ ከምፅኡ ዝክእሉ ነገራት ንምፅናዕ ኣብ ማእከላይ ዞባ ኣብ ዝርከባ መንግስታዊ ሆስፒታላት ዝግበር መፅናዕቲ እዩ። ብተወሳኺ እዉን ካብቲ መፅናዕቲ ዝተረኸበ ዉፂኢት ንመንግስቲ፣ ንዞባናን ብጠቅላላ ንሕብረተሰብ ንዓይ ሓዊሱ፣ ንኹሉ ተሳታፊ እዚ መፅናዕትን ከምዝጠቅም ተነጊሩኒ ኣሎ። ካሊእ ድማ እዚ መፅናዕቲ እዙይ ብዝኾን ይኹን መንገዲ ንዓይ ከም ዘይጎድእ ተነጊሩኒን ፈሊጡ ኣለኹ። ብተወሳኺ ዕላማ እዚ መፅናዕቲ ንምግንዛብ እኹል ግዜ ከም ዝተዋሃበኒ ከምኡ እዉን ንምስታፍ ወይ እዉን ንዘይምስታፍ ምሉእ መሰል ከም ዘለኒ ተረዲአ ኣለኹ። ቃለመጠይቅ ኣብዝግበረለይ ግዜ ኣብ ቃለመሕትት ዝፀንሓሉ ግዜ ካብ 15 ክሳብ 20 ደቒቓ ዘይበልፅ ምኺኑ ፈሊጡ እየ። ካሊእ ድማ ኣብዚ መፅናዕቲ ወይ ቃለ መሕትት ንምስታፍ ኣብ ድሌት ዝተመስረተ ምኺኑ ኣብ ዝኾነ ይኹን ግዜ ካብቲ መፅናዕቲ ወይ ቃለ-መሕትት ናይ ምዉፃእ ምሉእ መሰል ከም ዘለኒ ተነጊሩኒ ፈሊጡ ኣለኹ። ብተወሳኺ ኣብዚ ቃለመሕትት ብዘይ ምስታፈይ ዝኾነ ይኹን ተፅዕኖ ከም ዘይበፅሓኒ ኣረጋጊፀ ኣለኹ። ብካሊእ ወገን ድማ እቲ ዝተኣከበ ሓበሬታ ብዘይ ናተይ ፍቓድ ናብ ካሊእ ከም ዘይወፅእ ተነጊሩኒ እዩ። ብተወሳኺ ዝኾነ ይኹን ዘይበረሀለይ ነገርን ኽሓትት ምሉእ መሰልከም ዘለኒ ተነጊሩኒ ኣሎ።

ፌርማ _____ ዕለት _____

ሽም ሓታታይ ፊርማ_____ ዕለት_____

ዝተሓተተሉ ዕለት----------ዝተጀመረሉ ሰዓት----------ዝተወደአሉ ሰዓት_____-

ሽም ተቆፃፃሪ---------- ፊርማ----------

ልጋብ፫: ቃለመጠይቅ ቀጥዒ (ትግርኛ ክፍሊ)

1) ሽም ጥዕና ትካል _____

2) Code no_____

☐ case (with PROM) ☐ Control (without PROM)

ቃዳማይ ክፋል: **ናይ አዶ ማሕበራዊ ኩነታት**

ተ ቁ	ሕቶታት	መልሲ	መብርሂ
101	ናይ አዶ ዕድመ?	……ዓመት	
102	ትነብርሉ ቦታ?	1. ከተማ 2. ገጠር	
103	ናይ ኣዶ ደረጃ ትምህርቲ?	1. ስሩዕ ትምህርቲ ዘይተማሃራ 2. ቀዳማይ ብርኪ 3. ካልኣይ ብርኪ 4. ኮሌጅን ልዕሊኡን	
104	ስራሕ አዶ?	1. ሙሉእ እዋን ኣብ ገዛ 2. ገባር/ሓረስታይ / 3. ሰራሕተኛ መንግስቲ 4. አብ ግሊ ተቆጽራ ትስርሕ 5. መዓልታዊ ስራሕተኛ 6. ነጋዲት 7. ካሊእ(ይግለፅ)_____	
105	ኩነታት ሓዳር?	1. ዘይ ተመርዓወት 2. ባዓልቲ ሓዳር 3. ዝተፋተሐት 4. በዓል ገዝኣ ዝሞታ	
ካልኣይ ክፋል: ኩነታት ናይ አዚ ጥንሲ			
201	ንመበል ክነደይ ግዜ እዩ ጥንሰኪ?	_____	
202	ክንደይ ቆልዑ ወሊድኪ?	_____	

203	ናይ መወዳእታ ወርሓዊ ፅግያት ዝራእክሉ መዓዝ ነይሩ?	_____ዕለት /ወርሒ /ዓ/ም	
204	ዕድመ ናይ እዚ ጥንሲ/ ዕሸል/ ክንደይ ገይሩ ብ ሰሙን?	_____ሰሙን	ብመሰረት ቁ 203 አስልሕዎ
205	አብ ክንደይ ወርሒ ወይ ዓመት አፈላላይ እኪ ንዚ ጥንሲ ጠኒስከዮ?	_____	ንዘይወለደት አይሕተትዋ
206	ቅድመ ወሊድ ክትትል/ምርመራ/ ትገብሪ ዶ ነይርኪ?	1. እወ 2) አይፋሉን	አይፋሉን እንተኮይኑ ናብ ቁ 208 ይቀፅሉ
207	እወ እንተኮይኑ ክንደይ ግዜ ክትትል ገይርኪ?	_____	
208	አብ ክንደይ ሰሙንክን (ዕድመ ናይ እዚ ጥንሲ) ክትትል ጀሚርክን?	_____ ሰሙን	
209	አብዚ ናይ ሕዚ ጥንስኪ ናይ ማህ'ፀን መድመይቲ አጋጥሙኪ ነይሩ ድዩ?	1. እወ 2. አይፋሉን	
210	አብዚ ናይ ሕዚ ጥንስኪ ምስ ጥንሲ ዝተተሓሓዘ ልዑል ፀቅጢ ደም አጋጥሙኪ ድዩ?	1. እወ 2. አይፋሉን	አይፋሉን እንተኮይኑ ናብ ቁ 212 ይቀፅሉ
211	እወ እንተኮይኑ እንታይ ዓይነት?	1. pregnancy induced hypertension 2. pre-eclampsia 3. eclampsia 4. chronic hypertension	ካርዲ ይራእዩ

212	ብሕክምና ዝተረጋገፀ ናይ ቆልዓ መሐመሲ መጠን ፈሳሲ ምውሳክ አለኪ ተባሂልኪ ድኪ?	1. እወ 2. አይፋሉን	ካርዲ ይራእዩ
213	ብሕክምና ዝተረጋገፀ ሕማም ሽኮርያ አለኪ ድዩ?	1. እወ 2. አይፋሉን	ካርዲ ይራእዩ አይፋሉን እንተኮይኑ ናብ ቁ 215 ይቀፅሉ
214	እወ እንተኮይኑ እንታይ ዓይነት ሕማም ሽኮርያ እዩ ዘለኪ?	1. ዝፀነሐ ሕማም ሽኮርያ ዩ 2. ንመጀመርያ ግዜ አብ ናይዚ ጥንሲ ዝተረከበ ሕማም ሽኮርያ ዩ	
215	አቀማምጣ ቆለዓ ከመይ አሎ?	1. ብርእሱ 2. ብመቅመጭኡ 3. ብካሊእ	ካርዲ ይራእዩ
216	ክንደይ ዕሸላት ድዮም አብ ውሽጢ ማህፀነኪ ዘለውኪ?	1. ሓደ 2. ክልተን ልዕሊኡን	ካርዲ ይራእዩ
ሳልሳይ ክፋል :ድሕረ ባይታ ናይ ጥንስን ሕርስን			
301	ምቁራፅ ጥነሲ አጋጢሙኪ ዶ ይፈልጥ(ትሕቲ 28 ሰሙን)?	1. እወ 2. አይፋሉን	
302	ቅድሚ ሕርሲምጅማሩ ማንታ ርእሲ ምፍሳስ አጋጢሙኪ ዶ ይፈልጥ?	1. እወ 2. አይፋሉን	
303	ብመጥባሕቲ ወሊድኪ ትፈልጢ ዶ?	1. እወ 2) አይፋሉን	
304	ጥንስኪ 9 ወርሒ አብ ዘይመላእሉ ወሊድ አጋጥሙኪ ዶ ይፈልጥ ?	1. እወ 2) አይፋሉን	

305	መከላከሊ ጥንሲ ትጥቀሚ ዶ ነይርኪ?	1. እወ 2) አይፋሉን	
306	እወ እንተኮይኑ እንታየ ዓይነተ መከላከሊ ትጥቀሚ ነይርኪ?	1) ኪኒን 2) ብመርፍእ ዝውጋእ 3) አብ ትሕቲ ቆርበት ዝቅበር 4) አበ ውሽጢ ማህፀን ዝአቱ 5) ካሊእ	
ራበዓይ ክፋል ምስ ኩነታት ጥዕናን ልምድታትን ዝተተሓሓዘ			
401	ዝፀነሐ ሕማመ ሳዓል አለኪ ድዩ?	1) እወ 2) አይፋሉን	
402	አብ እዋን እዚ ጥንስኪ ረክሲ ኮላሊት አጋጥሙኪ ነይሩ ድዩ?	1. እወ 2) አይፋሉን	
403	ዘይንቡር ናይ ማህፀን ፈሳሲ አለኪ ድዩ?	1. እወ 2) አይፋሉን	
404	ሽጋራ ተትክኪ ዶ?	1. እወ 2) አይፋሉን	
405	ምሳኪ ዝነብሩ ቤተሰብ ዘመድ ሽጋራ ዘትክኩ አለዉ ድዮም ?	1) እወ 2) አይፋሉን	
406	አብ እዋን ጥንስኪ መጉዳእቲ ከብዲ በፂሕኩ ነይሩ ድዩ	1) እወ 2)አይፋሉን	
407	እብ መዓልቲ ንክነደይ ሳዓት ትድቅሲ	----------	
408	አብ እዋን ጥንስኪ ብፍላይ ድማ ጥንስኪ ድሕሪ 7 ወርሕ ምብፅሑ ፆታዊ ርክብ ትፍፅሚ ነይርኪ ዶ?	1) እወ 2) አይፋሉን	
409	ዓቀን MUAC	_____	