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Determinants of Premature Rupture of Membrane Among Pregnant Women Admitted at Public Hospitals in Bahir Dar City, North West Ethiopia.

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BAHIR DAR UNIVERSITY

COLLEGE OF MEDICINE AND HEALTH SCIENCE

SCHOOL OF PUBLIC HEALTH

DEPARTMENT OF REPRODUCTIVE HEALTH AND POPULATION STUDIES

**DETERMINANTS OF PREMATURE RUPTURE OF
MEMBRANE AMONG PREGNANT WOMEN ADMITTED
AT PUBLIC HOSPITALS IN BAHIR DAR CITY, NORTH
WEST ETHIOPIA.**

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Abstract

Background: Premature rupture of membranes (PROM) is a rupture of the membranes one hour before the onset of labor. PROM occurs in about 10 percent of all pregnancies. It estimated to cause of 50% preterm births with a fourfold increased risk of fetal mortality. and 80% maternal infection world wide. and with a relatively higher prevalence in Africa. Premature rupture of membrane (PROM) is linked to significant maternal prenatal mortalities and morbidity. In Ethiopia, Little is known regarding the determinant of PROM in Ethiopia and previous studies on risk factors of PROM were utilized secondary data from health institution which are subjected to miss important variable like frequency of ANC visits. Then this study will narrow the evidence gap, and it may show findings for responsible bodies of health care system, and to prevent determinants of PROM.

Objective: To identify the determinants of Premature rupture of membrane among laboring women in public hospitals at Bahir Dar City, Northwest Ethiopia

Methods: An institutional based casecontrol study design was implemented among 284 participants (213 controls, 71 cases). Women with PROM were recruit consequently as cases and women without PROM admitted following the cases was selected using systematic random sampling technique as controls. Data was collected by using interviewer administered structured questionnaire and checklist. Data were entered to EPI data version 4.6 and export to SPSS version 23 for analysis. Binary logistic regression model was used to see the association between independent and dependent variable. P-value < 0.2 in bi-variable analysis were candidates for multivariable analysis and P-value < 0.05 was used to declare as statistically significant. The odds ratio (OR) with 95% confidence interval (CI) was used to measure the strength of association.

Results: Multivariable analysis showed that history of urinary tract infection [AOR 7.3(CI: 2.736,19.501)], Anemia [AOR3.213(CI:1.428,7.230)], History of premature rupture of membranes [AOR10.462(CI:2.449,44.693)], and less than four ANC visits [AOR4.554 (CI: 2.010,,10.320)] were positively associated with premature rupture of membranes.

Conclusions: Urinary tract infection, previous history of PROM ,Anemia and Ante natal care visits are diterminat factors for Premature rapture of memberane. Strengthen focused ANC follow up, diagnose, screening and early initiations of treatment of urinary tract infections, anemia and provide iron folate with more than 90 tablets during pregnancy will reduce PROM.

Keywords: Premature rupture of membrane, Determinants, Case–control study Ethiopia

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ACRONYMS

ANC:	Ante Natal Care
AOR:	Adjusted Odds Ratio
APH:	Ant Partum Hemorrhage
CI:	Confidence Interval
MUAC:	Mid Upper Arm Circumference
PPROM:	Preterm Premature Rupture of Membran
PROM:	Premature Rupture of Membrane
RH:	Reproductive Health
SVD:	Spontaneous Vaginal Delivery
UTI:	Urinary tract infection

1. INTRODUCTION

1.1. Background of the study

Premature rupture of membranes refers a laboring women who is beyond 37 weeks' gestation and has presented with rupture of membranes prior to the onset of labor. Preterm premature rupture of membranes is prior to 37 weeks' gestation(1).

Based on gestational age PROM is classifying into three major categories: Term PROM It is the rupture of membranes before the onset of labor but when the pregnancy is at-term, during the gestational age of 37-42 weeks. Pre term PROM it is the rupture of membranes before the onset of labor but when the pregnancy is preterm, which is during the gestational age of 28-36 weeks. (2).

Signe and symptoms of PROM may present with one or more of the following: unless complications occur, the only symptom of PROM is leakage or a sudden gush of fluid from the vagina. Fever, heavy or foul-smelling vaginal discharge, abdominal pain, and fetal tachycardia, particularly(3).

The diagnosis of PROM thorough history, physical examination, and in some cases selected laboratory studies. Patients often report a sudden gush of fluid with continued leakage. Evidence of fluid pooling in the vagina or leaking from the cervical when the patient coughs or when fundal pressure is applied will confirm PROM. In doubtful cases, additional tests can be done for confirmation. These include the nitrazine test, fern test, litmus test, and use of Nile blue sulphate(4).

PROM is a major complication of pregnancies and an important cause of perinatal morbidity and mortality. Currently, there is no effective way of preventing spontaneous rupture of fetal membranes. However, it is important that women be well informed regarding maternal, fetal and neonatal complications. Early presentation to the hospital and interventions will improve neonatal outcomes of patients with PROM (5).

The management of pregnancies complicated by PROM is based upon consideration of several factors, which are assessed upon presentation: gestational age, availability of neonatal intensive care, presence or absence of maternal/fetal infection, presence or absence of labor, fetal presentation, fetal heart rate (FHR) likelihood of fetal lung maturity.(6)

The management of pre-labour rupture of membranes (PROM) has been a challenging problem for decades in Obstetrics. The pregnancy complications are increased before term because of the increased risk of infection, preterm labour and prematurity. Although PROM is associated with a complications, PPRM may lead to significant neonatal and maternal morbidity(7).

1.2 Statement of the problem

PROM generally affects between 5 and 15% of all pregnancies worldwide with a relatively higher incidence in Africa. About 30-40% of preterm deliveries and is the leading identifiable cause of preterm delivery(8, 9) and Up to 50% preterm births and 80% maternal clinical and subclinical infections have been associated with PROM worldwide with a fourfold increased risk of fetal mortality(10).

Premature rupture of membranes (PROM) is the leading cause of perinatal morbidity and mortality in developed as well as in underdeveloped countries. In one third of the patients with preterm labour there is associated premature rupture of membranes.(11)

Preterm premature rupture of membranes (PPROM) complicates only 2% of pregnancies but is associated with 40% of preterm deliveries and can result in significant neonatal morbidity and mortality. The three causes of neonatal death associated with PPRM are prematurity, sepsis and pulmonary hypoplasia. Women with intrauterine infection deliver earlier than non-infected women and infants born with sepsis have mortality four times higher than those without sepsis In addition there are maternal risks associated with chorioamnionitis(12)

Preterm PROM is associated with a 4-fold increase in perinatal mortality and a 3-fold increase in neonatal morbidity, including respiratory distress syndrome (RDS), which occurs in 10% to 40% of women with preterm PROM and is responsible for 40% to 70% of neonatal deaths(13)

premature rupture of membranes that occurs preterm complicates approximately 2-3% of all pregnancies in the United States, representing a significant proportion of preterm births, whereas term PROM occurs in approximately 8% of pregnancies(14).

Premature rupture of membranes (PROM) is a frequent phenomenon that occurs in about 4% - 7%. However, the associated sequent problems are proportionally high. Almost two thirds of PROM are spontaneous, common risk factor, multiple pregnancy, genital tract infection, previous preterm delivery. The complications range from induction of labour, caesarean section, fetal pulmonary morbidity and even mortality (15).

A study conducted in Tigay indicated that premature rupture of membranes ranges from about 5% to 10% of all deliveries. A woman with premature rupture of membranes is at risk of intra-amniotic infection, postpartum infection, endometritis, and death. A neonate born from mother who had premature rupture of membranes is at high risk of respiratory distress syndrome, sepsis, intraventricular hemorrhage and death (16).

PROM is a significant cause of perinatal morbidity and mortality. The burden of PROM ranges from maternal and neonatal mortality and morbidity to national economic loss due to drug expense, hospitalization, absence from the workplace and expense to the health professionals(17).

Preterm premature rupture of membrane (PPROM) occurs in 3 percent of pregnancies and associated with around one third of preterm births, while term premature rupture of membrane (TPROM) complicates approximately about 8-10% of all pregnancies globally(18).

Worldwide, in 2015 an estimated 303000 women died due to maternal related causes. Almost all of these maternal deaths around 99% occurred in low and middle income countries, with two thirds (64%) taking place in developing countries like Sub- Saharan Africa(19).

study in Serbia revealed that the major risk is infection, namely chorioamnionitis, which occurs in about 35% cases(20). Another study in Nigeria revealed that maternal chorioamnionitis rate was 8.3% and neonatal sepsis 13.0 % were recorded(21).

According to National Library of Medicine, the most significant maternal complication of PPRM is infection; intra-amniotic infection or chorioamnionitis is 13-60% of pregnant women and postpartum infection is 2-13%(22).

Although the determinants of PROM were well studied in high-income countries, there is a limited information in Ethiopia, particularly in the study area. Therefore, this study aimed to determine the determinants of premature rupture of membrane among pregnant women admitted in Bahir Dar city public Hospital, North West Ethiopia.

1.3. Significance of the Study

The finding of this study will provide for governmental and non-governmental organizations which are working on health promotion activity especially on MCH activity. It can be an input on planning and implement targeted health education to the community or to any women who come to the health facilities. It will also use as a source of information to look for possible alternative solutions to maternal and neonatal health care service delivery in the hospitals. It may also help researcher in the field to investigate more in the future.

2. LITERATURE REVIEW

2.2 Determinants of PROM

2.2.1 Socio -demographic and Economic factors

Women's age >29 years was positively associated with PROM(23, 24). However in another study adolescent pregnant women positively associated with PROM(25, 26).where as maternal age have no significant association with the occurrence of premature rupture of membranes(22).

Studies from Brazile and South Ethiopia, reported that low socioeconomic status of the mother was statistically significant with PROM.(27-29).

Study shows in America a correlation between low socio-economic status and defects in the amniotic membrane. The factors that lead to PPROM in low socio-economic status include poor hygiene, malnutrition, anemia, stress, over exertion, high parity, and recurrent genitourinary infections(27).

A study in Southern Ethiopia in 2017 indicated that mothers with very rich wealth index were 90% less likely to experience PROM than mothers who had very poor wealth index(29).

Study in Jimma reported that women who come from a rural area had an increased risk of unfavorable maternal outcome 4.2 times higher than those from an urban area(30).

2.2.2 Gynecological and Obstetric factors

A study conducted in Adis Ababa at Tikur Anbesa Hospital on feto-maternal outcome found the prevalence of PROM was 1.4%. Intraamniotic infection was found in 31.5% of the women. Regarding perinatal outcome, 23.6% of them were delivered by c/s, whereas 12 perinatal deaths occurred(31).

Study in Uganda and Tigray,Ethiopia showed that pregnant woman with history of abortions were positively associated with premature rupture of membranes(16, 32).

Study in Ethiopia indicated that mothers who had two and above year's interbirth interval were 75% lower to have PROM than mothers who had below 2 years inter birth interval. On the other hand, hypertension during pregnancy were the positive predictors of term PROM(29).

Study in Debre Tabor indicated that abnormal vaginal discharge and pregnant women who had history of PROM was posetivrlly associated among pregnant women with PPROM (33). Similar

study in Tigray showed that history of PROM, history of caesarean section and abnormal vaginal discharge in the index pregnancy were positively associated with premature rupture of membranes(16).

Study was done in Nigeria shows that 16.2% of the babies with PROM had birth asphyxia, while 8.3% had neonatal death. Fetal complications of PROM were more among preterm PROM with neonatal jaundice, birth asphyxia and neonatal sepsis the commonest(34).

2.2.3 Medical Factor

According to Macedonian Journal of Medical Sciences 40% of women with PROM had predisposing factors and previous rupture of membranes; and UTI within pregnancy were diagnosed as the most common factors(35).

Multiple factors have been associated with increased risk of PROM low socioeconomic conditions (as women in lower socioeconomic conditions are less likely to receive proper prenatal care) Sexually transmitted infections, such as Chlamydia and Gonorrhoea Vaginal bleeding Cigarette smoking during pregnancy(36).

Studies from China and Thailand indicated that gestational hypertension was positively associated with PROM(37, 38).

A Study in Uganda reported that history of urinary tract infections were the independent predictors of premature rupture of membranes among pregnant women above 28 weeks of gestation(32). Similar study in Debre Tabor indicated that pregnant women with history of UTI in current pregnancy were positively associated to developing preterm PROM than those who didn't have UTI (33).

A study conducted in Indonesia in 2017 indicated that mothers who consume iron tablets <90 tablets during pregnancy are at risk of experiencing PROM of 0.7 times lower than mothers who consume iron tablets \geq 90 tablets during pregnancy(39).

A study in Thailand showed that diabetes mellitus, poor weight gain and history of previous preterm birth were the factors that significantly associated with PPROM(40-42).

Maternal and fetal outcomes of 73 single- pregnancies with PROM (16 to 26 weeks).the prevalence of sepsis was 42.1%. Similar study in Ethiopia sepsis is the most common cause of

maternal morbidity and mortality about 33.5% of neonates experienced unfavorable outcomes (30, 43).

2.2.4 Health service and Nutritional status factors

Study on Debre Tabor indicated that pregnant women whose MUAC less than 23cm were positively associated with preterm PROM than those greater or equal to 23cm(33).

In a study conducted in Jimma and Uganda Antenatal care less than two follow up was found associated with PROM(26, 30).

3. Conceptual framework

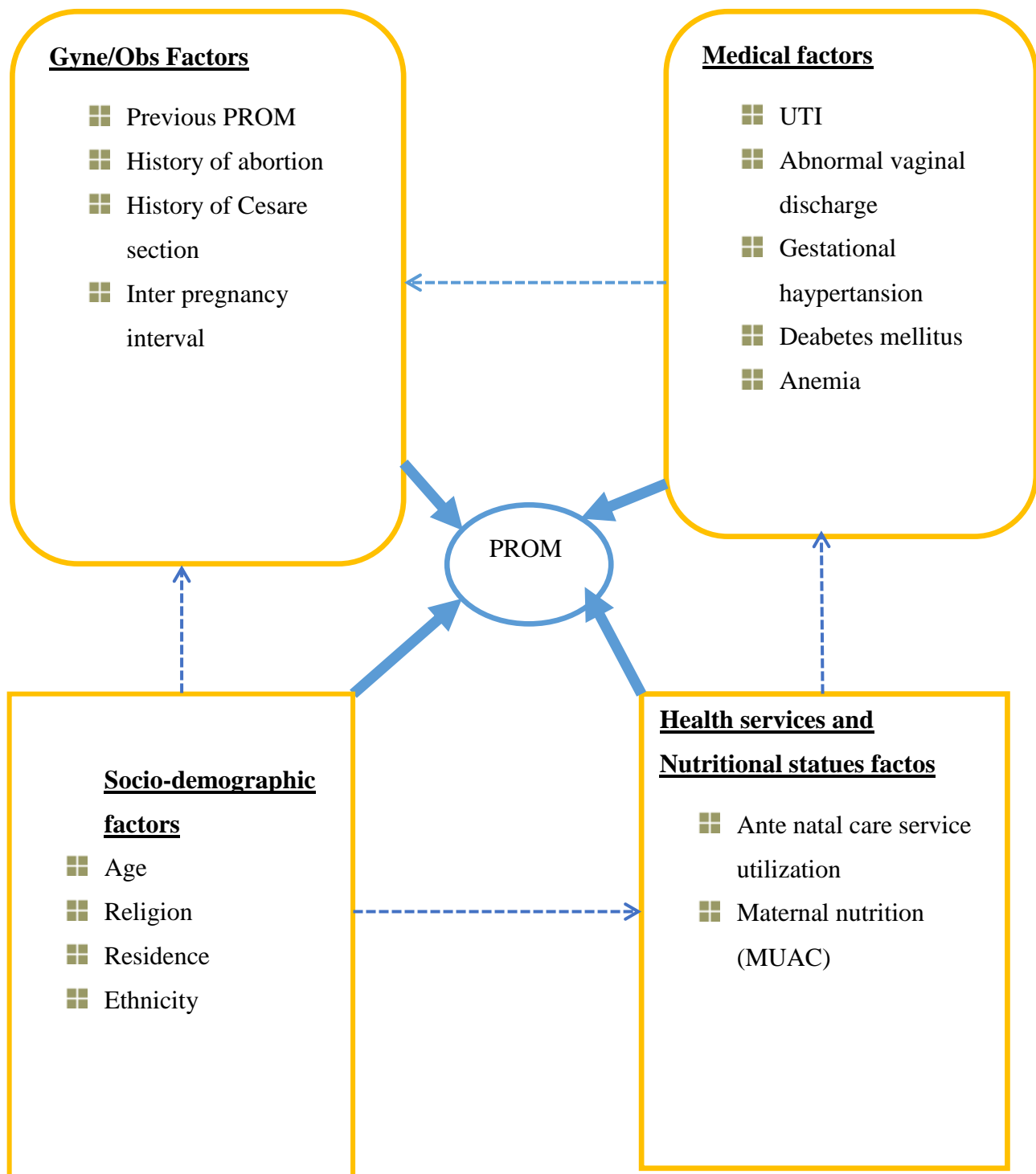


Figure 1. conceptual framework that shows the relationship between outcome variable (PROM) and independent variable.

4. OBJECTIVES OF THE STUDY

Objective: To assess determinants of premature rupture of membrane (PROM) among pregnant women admitted to Public hospitals in Bahir Dar City, Northwest Ethiopia 2020

5. Materials and Methods

5.1 Study area and period

The study was conducted in public hospitals at Bahir Dar city. Bahir Dar is the capital city of Amhara National Regional State, located 565 Km North West Addis Ababa. There are three public hospitals in Bahir Dar city. All the hospitals are providing gynecological and obstetric care. According to Bahir Dar city Administrative zonal health department there are about 9853 deliveries per year in public hospitals, among these 3461 are caesarian deliveries. The hospitals are used as main referral hospital for mainly population coming from Bahir Dar town, South Gondar, Awi, West and East Gojjam as well some extent from Benishangul Gomez and others. The study were conduct from November to December 2020.

5.2 Study design

A facility based unmatched case control study design was conducted

5.3 Source population

The source population of the study was a delivered women whos membrane rupture after the onset of laboring in public hospitals at Bahir Dare City.

5.4 Study population

The study population was pregnant women who came to labour ward at public hospitals in Bahir Dar city and stay for six hours after delivery during the data collection period. Cases were pregnant women who were experience PROM before onset of labour Controls were pregnant women with no PROM before on set of labour

5.5 Eligibility criteria

5.5.1 Inclusive criteria

Laboring women who came to labour ward at public hospitals in Bahir Dar city and stay for six hours after delivery during the data collection period.

Cases: pregnant women who were experience premature rupture of membrane

Controls : pregnant women with no premature rupture of membrane

5.5.2 Exclusive criteria

Women who was unable to communicate were excluded.

5.6. Sample size determination

The sampling size was using sample size determination Epi Info version 7 it was determined using case control. The sample size was determined using the following assumptions 95% CI, power 80%, case to control ratio, 1:3 and Exposure level previous abortion in control group is 10.6% to find a minimum odd ratio 3.06, which make large sample size on recent study in Tigray (16). The final calculated sample size was 284.

$$n_1 = \frac{\left[Z_{\frac{\alpha}{2}} \sqrt{\left(1 + \frac{1}{r}\right) p(1-p)} + Z_{\beta} \sqrt{p_1(1-p_1) + \frac{p_2(1-p_2)}{r}} \right]^2}{(p_1 - p_2)^2}$$

n_1 = the maximum Number of sample size

r = Ratio of control to cases

P_1 = Percent of cases exposed for premature rupture of membranes = 26.6%

P_2 = Percent of control with exposed for premature rupture of membranes = 10.6%

= 95% degree of confidence interval; $\alpha = 0.05$

= 80% power of the study; $\beta = 0.84$

Case: control ratio = 1: 3

By considering the above assumption the sample size determined using double population formula. The sample size was 71 cases and 213 controls are calculated and 10% none response rate was added both for cases and controls; finally a total of 284 study participant was included.

Table 1: Sample size calculation for determinantes of premature rupture of membranes *in public hospitals in Bahir dar city administration, Ethiopia, 2020*

Variables	CI	Powe r	Ratio of control to case	% of controls exposed	AOR	Calculated sample size	Total sample size with 10% non respondant
Previous abortion	95	80	3	10.6	3.06	258	284
Vaginal bleeding	95	80	3	30.7	2.58	215	237
Abnormal vaginal discharge	95	80	3	15.6	3.31	174	192

Since 284 is the largest sample size, it is taken as the final sample size for this study

5.7. Sampling technique and procedures

There are three public hospitals in Bahir Dar city. The sample size was allocated to the study hospitals proportionally based on a case flow in the preceding two months. Women with premature rupture of membranes who met the inclusion criteria were recruited consequently until the sample size was obtained. Women without premature rupture of membranes who met the inclusion criteria and admitted following the cases were selected using systematic random sampling technique as controls and interviewed in the study period. The average number of pregnant women who were admitted at labor, maternity, and high-risk wards in three hospitals based on the previous two-months (November to December, 2020) Felege Hiwot = 108 controls, 36 case, Tibebe Gion = 49 control, 16 case and Addis-Alem = 56 controls, 19 case)

The first women selected randomly then continued every 6th intervals since $k = 1622/284 = 6$

Diagrammatic sampling procedure

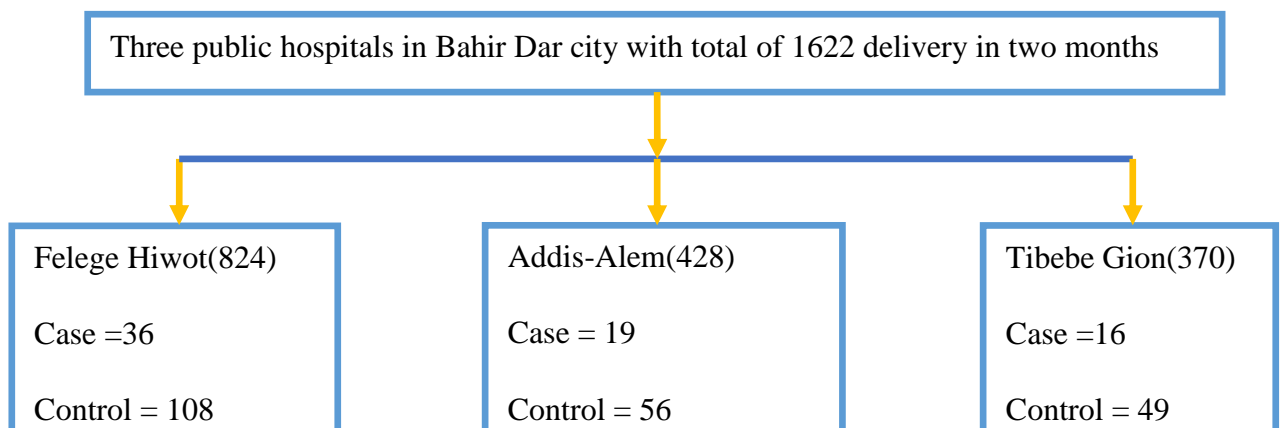


Figure 2. Sampling procedure and techniques to select study subjects laboring mothers admitted in delivery ward.

5.8. Data collection procedures and tools

The tools were developed from different literatures to gather the desired information from the sample population(16). The questionnaires were initially prepared in English language and translated into Amharic (local language) and again retranslated back to English language to ensure consistency. The data was collected through face-to-face interviews using a structured questionnaire. Two days of training were given to three data collectors (Midwives) and three supervisors (BSC Nurse) prior to the beginning of data collection. Data collectors collected the data from the mother by using interviewer-administered Amharic version questionnaires and a checklist that contains detailed questions comprising all the variables of the study.

5.9. Operational definition and definition of terms

PROM is a women experience rupture of membrane before the onset of labor after 28 weeks of gestational age.

Term PROM- is a women experience rupture of the membranes prior to the onset of labor at or beyond 37 weeks of gestation.

PPROM- is a women experience rupture of the membranes prior to the onset of labour < 37 weeks of gestation.

Anemia, A pregnant women whose heamoglobin level <11 g/dl was considered as anemic(34).

Maternal obstetric and medical problems such as abnormal vaginal discharge,GHT, GDM, UTI, and anemia were diagnosed by physicians during routine examination and were documented on the maternal medical chart.

5.10. Variables on the study

Dependent variable

Premature rupture of membrane (PROM) → Yes

Independent variables

→ No

- Socio-economic and demographic variables (age, ethnicity, religion and residence)
- Gyne/Obs factors (Previous PROM, abortion, cesarean section, multiple pregnancies. And Abnormal vaginal discharge)
- Medical factors (Urinary tract infection, Gestational hypertension, Diabetes mellitus, Sepsis, and Anemia)
- Health service and Nutritional status factors (ANC service utilization and examination, Maternal nutrition (MUAC))

5.11.Data quality managements

Prepare of a questionnaires in English and translating to Amharic, a pre-test of tool at Felege Hiwot hospital, two days intensive training of data collectors, continues supervision of data collection process, and carefully checking of collected data on daily the major techniques that were used for keeping of data quality

5.12. Data processing and management

The collected data were entered, cleaned and analyzed using EPI data version 4.6 and export to SPSS version 23. Frequency distribution for selected variables was performed. Cleaning of the

data was performed before analysis. To check the statistical significance between the dependent and independent variables, Chi square test was performed. For analysis bivariate and multivariable binary logistic regression analysis were performed to identify factors associated with premature rupture of membrane. With $P < 0.20$ from the bivariate analysis were considered for binary logistic regression. Logistic regression analysis was performed to see the association between predictor and outcome variables. Adjusted odds ratio (AOR) with 95% CI was calculated for each independent variable to check the adjusted association between independent variables and PROM. The statistical significance was set at $P < 0.05$.

5.13. Ethical consideration

The study was undertaken after the proposal approved by the institute review Board College of Medicine and Health Science of Bahir Dar University and Amhara Public Health Institution (APHI) before the start of the study. Further approval was also granted from Bahir Dar city health office and respective health facilities, informed consent was obtained from each study participants. All information collected from participant was kept strictly confidential and names of patients did not include in the checklist. To keep confidentiality, all collected data were coded and entered in to a computer with personal password.

6.Results

6.1.Socio-demographic profile of participant

In this study 71 cases and 213 controls total 284 study participant were enrolled for this study in three hospitals.Sixty-three (88.7%) the case and 189 (88.7) the controls were in the age range of 20–34-years, regarding educational level, above one-fourths (29.6%), the case and above a third (35.3%) the controls were diploma or above. One third (32.7%) of women were housewives. two hundred and ten (73.9%) of respondents where urban residence. about 5% participants'their mid upper arm circumference measurement was below 23 cm.(table 1)

Table 2: Socio-demographic characteristics of laboring women attending in public hospitals at Bahir dar city, Ethiopia, 2020

Variables	category	Cases	Controls	Total
Age	15 – 19	3(4.2)	11(5.1)	14(4.9)
	20 - 34	63(88.7)	189(88.7)	252(88.7)
	35 - 49	5(7)	13(6.1)	18(6.3)
Residence	Urban	58(81.7)	152(71.4)	210(73.9)
	Rural	13(18.3)	61(28.6)	74(26.1)
Mothers occupation	Civil servant	18(25.4)	71(33.3)	89(31.3)
	Self-employ	9(12.6)	23(10.8)	32(11.3)
	Merchant	9(12.6)	28(13.1)	37(13)
	Farmer	6(8.6)	27(12.7)	33(11.6)
Educational status	Housewife	29(40.8)	64(30)	93(32.7)
	Not educated	15(21.1)	27(12.7)	42(14.8)
	Primary	16(22.5)	49(23)	65(22.9)
	Secondary	19(26.8)	61(28.6)	80(28.2)
Religion	Diploma and more	21(29.6)	76(35.7)	97(34.1)
	Orthodox	56(78.9)	153(71.8)	209(73.6)
	Muslim	15(21.1)	53(24.9)	68(23.9)
MUAC	Protestant	0(0)	7(3.3)	7(2.5)
	≥ 23	59(83.1)	211(99.1)	270(95.1)
	< 23	12(16.9)	2(0.9)	14(4.9)

6.2. ANC utilization among respondents in public hospitals at Bahir-Dar city administration.

All participants had at least one antenatal care visits at hospital and health center of whom above two-third (76.5%) the controls and 36 (50.7%) the case were had four and above antenatal care visits, nearly one- third (31%%) the case and 95 (44.6%) the controls were initiated antenatal care visit at or before four month. Almost all participants (94%) provide the service by Nurse/midwife.(Table2)

Table 3: ANC utilization among respondents in public hospitals at Bahir dar city administration, Ethiopia, 2020

Variables	category	Cases N =(71%)	Controls N =(213%)	Total N =(284%)
Place of ANC utilization	Hospital	20(28.2)	91(42.7)	111(39)
	Health center	49(69)	119(55.9)	168(59.2)
	Health post	2(2.8)	3(1.4)	5(1.8)
Number of ANC visit	Four or more visit	36(50.7)	163(76.5)	199(70.1)
	Below four visit	35(49.3)	50(23.5)	85(29.9)
Time of ANC initiation	At or before 16 weeks	22(31)	95(44.6)	117(41.2)
	After 16 weeks	49(69)	118(55.4)	167(58.8)
Provider of ANC	Doctor	2(2.8)	10(4.7)	12(4.2)
	Nurse/Midwife	67(94.4)	200(93.9)	267(94)
	HEW	2(2.8)	3(1.4)	5(1.8)
Gestational hypertension current pregnancy	Yes	9(12.7)	14(6.6)	23(8.1)
	No	62(87.3)	199(93.4)	261(91.9)
Inter pregnancy interval	2-5 years	46(64.8)	153(71.8)	199(70.1)
	<2 years	25(35.2)	60(28.2)	85(29.9)

6.3.Gynecological/Obstetrics and Medical characteristic of pregnant women admitted to labour ward at public hospitals

Nearly above a third (36.6%) of cases and 20.7% of controls had an abortion history. In the women who had an abortion history, 19.7% case and 1.4% controls at least two abortion history. Three (1.4%) of controls and 26.8% of cases had a history of PROM. (table 3)

Table 4: Gynecological, Obstetrics and Medical characteristics of pregnant women attending in public hospitals in Bahir dar city administration, Ethiopia, 2020

Variables	category	Cases No.(%)	Controls No.(%)	Total
Abortion history	Yes	26(36.6)	44(20.7)	70(24.6)
	NO	45(63.4)	169(79.3)	214(75.4)
Number of abortion	1	13(18.3)	40(18.8)	43(15.1)
	2	14(19.7)	3(1.4)	17(6)
	3 and more	0(0)	4(1.9)	4(1.4)
Type of abortion	Spontaneous	16(22.5)	41(19.2)	57(20)
	Induced	7(9.9)	3(1.4)	10(3.5)
	Both	5(7)	1(0.47)	6(2.1)
PROM history	Yes	19(26.8)	3(1.4)	22(7.7)
	No	52(73.2)	210(98.6)	262(92.3)
Previous caesarean section	Yes	15(21.1)	17(8)	32(11.3)
	No	56(78.9)	196(92)	252(88.7)
Fetal presentation	Cephalic	64(90)	189(88.7)	253(89.1)
	Face	4(5.6)	15(7)	19(6.7)
	Breech	3(4.2)	5(2.3)	8(2.8)
	Others	0(0)	4(1.9)	4(1.4)
Mode of delivery current pregnancy	Spontaneous	22(31)	142(66.7)	164(57.7)
	Caesarian section	49(69)	67(31.5)	116(40.8)
	Instrumental	0(0)	4(1.9)	4(1.4)

Determinants of PROM

On bivariate analysis history of abortion, below four ANC visit, anemia, UTI, and previous history of PROM, history of C/S and Residence were significantly associated with PROM at the P-value less than 0.2. On multivariable analysis UTI, anemia, less than four ANC visit and previous history of PROM were associated with PROM.

The odd of being experienced PROM among women who had a history of UTI was 7.3 times higher as compared to women didn't have a history of UTI (AOR:7.30,95% CI(2.73,19.50) The odd of being experienced PROM among women who had anemia was 3.2 times higher as compared to women with no anemia AOR:3.213,95% CI(1.428,7.230)

Previous PROM was the strongest association risk factor than the other. The odds of developing premature rupture of membranes among women who had previous PROM was 10.46 times higher than who had not history of PROM. AOR:10.46,95% CI(2.44,44.69)

Further more women who had less than four ANC visit 4.5 times higher than women who had four or more ANC visits AOR: 4.55,95% CI (2.01,10.32) (table 4)

Table 5: Determinants of PROM among pregnant women in Bahir Dar city Ethiopia, 2020 (n284)

Variables	Response	Case	Controls	COR (95% CI)	AOR (95% CI)
UTI history	Yes	25(35.2%)	8(3.8%)	13.92(5.90,32.84)	7.30(2.74,19.50)**
	No	46(64.8%)	205(96.2%)	1	1
Abortion history	Yes	26(36.6%)	44(20.7%)	2.21(1.23,3.98)	1.043(0.46,2.36)
	No	45(63.4%)	169(79.3%)	1	1
PROM history	Yes	19(26.8%)	3(1.4%)	25.57(7.29,89.71)	10.46(2.44,44.69)**
	No	52(73.2%)	210(98.6%)	1	1
Anemia	<11g/dl	21(29.6%)	23(10.8%)	3.47(1.77,6.77)	3.21(1.42,7.23)**
	>11g/dl	50(70.4%)	190(89.2%)	1	1
Residence	Urban	58(81.7%)	152(71.4%)	1	1
	Rural	13(18.3%)	61(28.6%)	0.55(0.28,1.1)	0.29(0.11,0.76)
History of C/S	Yes	15(21.1%)	17(8%)	3.08(1.45,6.57)	1.24(0.40,3.86)
	No	56(78.9%)	196(92%)	1	1
Number of ANC visit	Four or more visit	36(50.7)	163(76.5)	1	1
	Below four visit	35(49.3)	50(23.5)	3.16(1.80,5.56)	4.55(2.01,10.32)**

P-Value ≤ 0.05 **

7. Discussion

This study identified that history of urinary tract infection, history of premature rupture of membranes, less than four antenatal care visits and anemia to be significantly associated with the experience of PROM.

Women who had a history of urinary tract infection during pregnancy were more likely to experience PROM. This finding supported with previous study from Debre Tabor, Ethiopia, Uganda, Libya. Iran (15, 32, 33, 44).

Elevations of inflammatory mediators such as prostaglandins, cytokines, and proteinases in the local tissue play a causative role in disruption of fetal membrane integrity and in triggering uterine contractility. They are produced as a part of physiologic maternal defense mechanism in response to pathogens' invasion. The inflammatory mediators and production of matrix degrading enzymes and Tumor necrosis factors are involved in mechanisms of PROM (45).

Beside women who had a history of PROM were more likely to experience PROM. This study supported by Debre Tabor, Tigray, Nigeria and Iran (16, 23, 34, 46). This might be due to untreated genitourinary infection and a short cervical length (cervical incompetence). In addition obstetric problems are recurrent by nature (33).

Literature from Indonesia, Bangladesh and Canada revealed that anemia was a significant risk factor for premature rupture of membranes. (47-49). Our study also found women who had anemia more odds of developing PROM compared to non anemic. This is in line with a study conducted in Indonesia (46). The decrease in hemoglobin or anemia causes a decreased amount of oxygen transported to the tissues, potentially increasing the risk of premature rupture of membranes due to hypoxia in the tissues. Anemia can lead to hypoxia in the tissues, and anemia of iron deficiency may increase serum concentrations of norepinephrine, causing maternal and fetal stress. The incidence of anxiety in pregnancy will stimulate the synthesis of hormone Corticotrophin Releasing Hormone (CRH). The presence of elevated CRH concentrations can lead to premature rupture of membranes (50).

The present study also indicated that women who had less than four ante natal care visits had more odds of developing PROM as compared to participant who had four or more ante natal care

visits. This finding is in agreement with the study by Choudhary M et al, India (51). During ante natal care visits there is a period for counseling and health education. This component may help pregnant women to keep their personal hygiene and avoid risky habits.

8.Limitation

This research might be subjected to recall bias since participant might not remember and report past event and

PROM are declared by Physician it may have miss diagnosed and documentation issues.

9.Conclusion

In conclusion, this study found that past obstetric history and factors in the index pregnancy have association with premature rupture of membranes. The study revealed previous history of premature rupture of membranes, urinary tract infection, less than four ante natal care visits and anemia in the index pregnancy to be a risk factors for premature rupture of membranes.

10.Recomendation

For hospitals

- Avail all the necessary materials for early identify, screen and treat hiegh risk mothers
- Health care provider provide well organized information for vernelable mothers like premature rupture of membranes, urinary tract infection and anemic mothers about focused ante natal care follow up, hygiene, Iron folat supplementation and prevent intestinal worms

For Bahir Dar city administration health office and regional health Bureau

- Capacitating the health institution by financial, druges and diagnostic materialst.
- Provide onsite training and integrated supportive supervision.

For researchers

- Conduct holistic and comprehensive maternal and child health research to improve MCH service.

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APPENDICES

Annex I. Information sheet and consent form

Title of the Research Project: Determinants of PROM among pregnant women.

Name of Principal Investigator: Yohannes Abebaw

Name of Organization: Bahir Dar University

Information sheet and consent form prepared for study participants in Bahir Dar City to participate to this Research Project.

Hello, my name is -----

I am one of the members of the research team. The purpose of this questionnaire is to assess the determinants of PROM and associated factors among pregnant women. You are selected as a study participant hoping that you would be willing to help me by providing some information. I would like to ask you to fill this questionere that take 15 to 20 minutes of your time. No harme is imposed to you except the time you commit for interview, some of the question may look too personal but it is healpful for the study.In addition, there is no payment for participation even though the result of the study may benefit as a citizen. You have to the right to refuse or with draw from the study at any time for any reason without penalty. All your information will be kept confidential and your name and address will not be included. Only honest answer would contribute to the identification and prevention of the problem. Your role for success of the research is crucial & I appreciate your contribution. Would this be with you?

I understood the advantage of the research and the role I will have in the research. I have agreed to participate in the research.

- A. Yes
- B. No
- C. If the respondent agrees to be interviewed, please fill.

Starting time: ----- End time: -----Date of data collection: -----

Name of data collector: -----signature: -----

AnnexII: English version questionnaire

SN	Socio-economic and demografic factors		Response	Code
1	Age (in year)	-----		
2	Religion	1.Ortodox 2.Muslim 3.Protestant 4.catholic 5.Others--		
3	Ethnicity	1.Amhara 2.Oromo 3.Tigray 4. Others		
4	Residence	1.Urban 2.Rural		
5	Occupation status of the mother	1.Civil servant 2.Self employed 3.Merchant 4.Farmer 5.Others-----		
6	Educational status of the mother	1.Not educated 2.primary schools(1-8) 3.secondary school(9-12) 4.Diploma and above		
7	Average monthely Income in birr	-----		
8	Marital status of the mother	1.single 2.married 3.divorced 4.widowed 5.separated		

9	Partner occupation	1.merchant 2.ceivel servant 3.daily labor 4.Student 5.Others specify		
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Gyne/Obs ,Medical , Heaith services and Nutrational risk factors

SN	Gyne/Obs		Response	Code
10	Parity	-----		
11	Gravidity	-----		
12	UTI	1. Yes 2. No 3. Unknown		
13	History of abnormal vaginal discharge	1.Yes 2.No		
14	History of Abortion	1.Yes 2.No		
14.1	If yes for question 14 Number of abortion	1. One 2. Two 3. Three and above		
14.2	Type of abortion	1. Spontaneous 2. Induced 3. Both		
15	History of PROM	1.Yes 2.No		
16	Duration of labour	-----		

17	History of C/s	1.Yes 2.NO		
18	History of Trauma	1.Yes 2.No	response	Code
19	Alcohol intake	1. Yes 2.NO	response	Code
20	Cigarette smoking	1.Yes 2. No		
21	Ant partum hemorrhage	1.Yes 2. No		
22	History of Haypertension	1.Yes 2.No		
23	History of DM	1.Yes 2.NO		
24	History of multiple pregnancies	1.Yes 2.No		
25	Inter-birthinterval	-----		
26	No. of sexual partener	-----		
27	Have sexual relation with in the past 24 hours	1.Yes 2.No		

28	Lifting heavy object	1.Yes 2. NO		
29	Utilization of ANC services	1.Yes 2. No		
29.1	If yes for question 29 Place of ANC utilization	1.Hospital 2.Health center 3. Health post		
29.2	Number of ANC visit	1. One 2. Two 3. Three 4. Four and above		
29.3	Time of ANC initiation	1. 16 weeks and below 2. After 16 weeks		
29.4	Providers of ANC	1.Doctor 2.Nurse/Midwifery 3.Health extention		
30	Modern contraceptive use	1.Yes 2. No		
30.1	If yes for question 30 Contraceptive type	1.IUCD 2.Pill 3.injectable 4.implant		

Checklist

S/N	Variables	Response	code
1	PROM	1.Yes 2.No	
2	Number of per vaginal examination during labour	-----	
3	Weight gain during pregnancy	-----	
4	Sepsis	1.Yes 2.No	
5	MUAC	-----	
6	Mode of delivery(last pregnancy)	1.Spontaneous vaginal delivery 2.Caesarian section 3.Instrumental delivery	
7	Polyhydraminous	1.Yes 2.No	
8	Gestation age in weeks at birth	-----	
9	Neonatal birth weight at birth	-----	
10	VDRL test result	1.Reactive 2.Non-reactive 3.Unknown	
11	History of intra-amniotic infections(Chorioamnionitis)	1.Yes 2.No 3.Unknown	
12	Anemia	-----	
13	Fetal presentation	-----	
14	Iron supplementation	1.>90 tabs 2.<90 tabs	
15	Preclampsia/eclampsia	1.Yes 2.No	
16	Gestation	1. Singleton 2. Multiple	

AnnexIII: Participant information sheet and information consent form(Amharic version)

አማርኛ መጠይቅ

ባህርዳር ዩኒቨርሲቲ በህክምናና ጤና ሳይንስ ኮሌጅ የስነ-ተዋልዶ ጤና ት/ክፍል፡

የንሽርት ውሃ ቀድሞ በፈሰሳችው የነፍሱ-ጡር ሴቶች ፤ የሚሞላ የጥናትና ምርምር መጠይቅ፤ በባህርዳር ከተማ አስተዳደር ስር ባሉ የመንግስት ተቋማት የንሽርት ውሃ ቀድሞ የሚፈሰሱትን የነፍሱ-ጡር እናቶች እና ተያያዥ ምክኒያቶች በተመለከተ ለመዳሰስ የተዘጋጀ መጠይቅ ። ስለዚህ ውድ እናቶች የጥናቱን አላማ ስኬታማ ለማድረግ ለሚጠየቁት ጥያቄዎች ተገቢውን መልስ እንድትሰጡን በትህትና እንጠይቃለን። ጥናቱ በፍቃደኝነት ላይ የተመሰረተ ሲሆን ማንኛውም ተሳትፎ በጥናቱ ላይ ትልቅ ድርሻ እንዳለው እንድትገነዘቡልን እንፈልጋለን። በመሆኑም ይህን መጠይቅ ለመሙላት ጥቂት ደቂቃዎችን መስዋዕት እንድታደርጉልን እንጠይቃለን። ስለትብብርዎ በቅድሚያ እናመሰግናለን።

በጥናቱ ለመሳተፍ ፈቃደኝነዎት ?

ሀ.አዎ ለ.አይደለሁም

AnnexIV:Amharic version questioner

ክፍል አንድ፡- የእናቶች አጠቃላይ ማህበራዊ መረጃዎች

ተ ቁ	ጥያቄዎች	መልስ	ኮድ
1	እድሜ(በአመት)	-----	
2	ሀይማኖት	1. ኦርቶዶክስ 2. ሙስሊም 3. ፕሮቴስታንት 4. ካቶሊክ 5. ሌላ ካለ ይገለፅ-----	
3	ብሄር	1. አማራ 2. ኦሮሞ 3. ሌላ	
4	አድራሻ	1. ከተማ 2. ገጠር	
5	የስራ ሁኔታ	1. የመንግስት ሰራተኛ 2. የግል ድረትጅት ሰራተኛ 3. ነጋዴ 4. ገበሬ 5. ሌሎች -----	
6	የእናት የትምህርት ዝግጅት	1. ማንበብና መጻፍ የማትችል 2. የመጀመሪያ ደረጃ ትምህርት (1-8) 3. ሁለተኛ ደረጃና ከዚያ በላይ(9-12) 4. ዲፕሎማና ከዛ በላይ	
7	አማካኝ የወር ገቢ በብር	-----	
8	የጋብቻ ሁኔታ	1.ያላገባች 2.ያገባች 3.ከባላየተፋታች 4.ባላየሞተባት 5.ከባላጋርተለያይተው የሚኖሩ	

9	የቤተሰብ የስራ ሁኔታ	<ol style="list-style-type: none"> 1. የመንግስት ሰራተኛ 2. የግል ድረት-ጅት ሰራተኛ 3. ነጋዴ 4. ገበሬ 5. ሌሎች 	
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ክፍል ሁለት፡- ከወሊድና የተለዩ ህመሞች ጋር የተያያዙ ጥያቄዎች

10	እስካሁን ስንት ልጅ ወልደዋል	-----	
11	ስንተኛ ርግዝናዎት ነው	-----	
12	ከዚህ በፊት የኩላሊት ሽንት ሲገባ ብክለት ነበረብዎት	<ol style="list-style-type: none"> 1. አዎ 2. የለም 	
13	ባለፈው የእርግዝና ወይም ወሊድ ወቅት መጠኑ ክፍያ ለ ፈላሽ በማህፀንዎት ይፈስ ነበር	<ol style="list-style-type: none"> 1. አዎ 2. የለም 3. አይታወቅም 	
14	ከዚህ በፊት ፅንሰ የማቋረጥ ችግር ገጥሞዎት ያውቃል	<ol style="list-style-type: none"> 1. አዎ 2. የለም 	
14.1	ለጥያቄ 14 መልሱ አዎ ከሆነ ለምን ያክል ጊዜ የፅንሰ መቋረጥ ገጠመዎት	<ol style="list-style-type: none"> 1. አንድ ጊዜ 2. ሁለት ጊዜ 3. ሶስት ጊዜና ከዛ በላይ 	
14.2	ፅንሱ የተቋረጠበት ሁኔታ	<ol style="list-style-type: none"> 1. በተፈጥሮ 2. በፍላጎት 3. በሁለቱም 	
15	ከዚህ በፊት ምጥ ከመጀመሩ በፊት የእንሽርት ውሃ ቀድሞ ፈሶዎት ነበር	<ol style="list-style-type: none"> 1. አዎ 2. የለም 3. አይታወቅም 	
16	በመጨረሻው የወሊድ ወቅት ምጥ ላይ ሆነው ለምን ያክል ሰዓት ቆዩ	-----	
17	ከዚህ በፊት ለምን ያክል ጊዜ በቀዶ ጥገና ተገላግለዋል	-----	
18	አካላዊ ጉዳት ደርሶብዎት ነበር	<ol style="list-style-type: none"> 1. አዎ 2. የለም 	
19	አልኮል ይጠጣሉ	<ol style="list-style-type: none"> 1. አዎ 2. የለም 	
20	ሲጋራ ያጨሳሉ	<ol style="list-style-type: none"> 1. አዎ 	

		2. የለም	
21	ከመውለድዎት በፊት በማህፀን የደም መፍሰስ ገጥሞዎት ነበር	1. አዎ 2. የለም 3. አይታወቅም	
22	ከዚህ ቀደም የደም ግፊት በሽታ አለብዎት	1. አዎ 2. የለም 3. አይታወቅም	
23	ከዚህ ቀደም የስኳር በሽታ አለብዎት	1. አዎ 2. የለም 3. አይታወቅም	
24	ሁለትና ከዛ በላይ እርግዝና ገጥሞዎት ያውቃል	1. አዎ 2. የለም 3. አይታወቅም	
25	የመጨረሻ ልጅዎን ከወለዱ እስኪያረግዙ ምን ያክል ጊዜ ቆዩ	-----	
26	ምን ያክል የወሲብ አጋር አለዎት		
27	ባለፈው ሀያራት ሰዓት ውስጥ የወሲብ ግንኙነት ነበረዎት	1. አዎ 2. የለም 3. አይታወቅም	
28	ከባድ እቃ አንስተው ነበር	1. አዎ 2. የለም	
29	በመጨረሻው እርግዝና ወቅት የቅድመ ወሊድ ክትትል አድርገዋል	1. አዎ 2. የለም	
29.1	ለተራ ቁጥር 29 መልሱ አዎ ከሆነ አገልግሎቱን ያገኙበት ተቋም	1. ሆስፒታል 2. ጤና ጣቢያ 3. ጤና ኬላ	
29.2	ለምን ያክል ጊዜ ጉብኝት ነበረዎት	1. አንድ ጊዜ 2. ሁለት ጊዜ 3. ሶስት ጊዜ 4. አራትና ከዛ በላይ	
29.3	ቅድመ ወሊድ ክትትል የጀመሩበት ጊዜ	1.16 ሳምንትና ከዛ በታች ባለ ጊዜ 2.16 ሳምንት በኋላ	
29.4	አገልግሎቱን የሰጠው የባለሙያ አይነት	1. ሀኪም 2. ነርስ/ሚድሞይፈሪ	

		3. የጤና ኤክስፔንሽን	
30	ዘመናዊ የቤተሰብ እቅድ አገልግሎት ይጠቀማሉ	<ol style="list-style-type: none"> 1. አዎ 2. የለም 	
30.1	ለተራ ቁጥር 30 መልሱ አዎ ከሆነ የሚጠቀሙት የቤተሰብ እቅድ ምን አይነት ነው	<ol style="list-style-type: none"> 1. በማህፀን ጫፍ (አይ.ዩ.ሲ.ዲ) 2. በአፍ የሚወሰድ (ፒል) 3. በመርፌ 4. በክንድ ስር የሚቀመጥ 	

AnnexV: Declaration

The undersigned agrees to accept responsibility for the scientific, ethical and technical conduct of the research and for provision of required progress reports as pre-terms and conditions of research publication office of Bahir Dar University.

Name of the student: Yohannes Abebaw

Date -----signature-----

Approval of advisors

Advisors Name

- 1. Mr Dabere Nigatu ((Mph/RH assistant professor)

Signature ----- Date-----

- 2. Mr Melash Belachew (Mph in RH)

Signature ----- Date-----

Examiner's approval form

Approval of Dissertation/thesis for defense result

We here by certify that we have examined this thesis entitled Determinantes of premature rupture of membrane by *Yohannes Abebaw*. We recommend and approve the thesis a partial fulfillment of the requirement for the degree of master of public health in Reproductive health

Board of Examiners

_____	_____	_____
External examiner's name	Signature	Date
_____	_____	_____
Internal examiner's name	Signature	Date
_____	_____	_____
Chair person's name	Signature	Date