WOLKITE UNIVERSITY

COLLEGE OF MEDICINE AND HEALTH SCIENCES

DEPARTMENT OF MIDWIFERY

PREVALENCE OF PRETERM PREMATURE RUPTURES OF MEMBRANE AND ASSOCIATED FACTORS AMONG PREGNANT WOMEN ADMITTED IN WOLKITE UNIVERSITY SPECIALIZED HOSPITAL, GURAGHE ZONE, SOUTHERN ETHIOPIA, 2021

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Declaration

The undersigned agrees to accept responsibility for the scientific, ethical and technical conduct of the research project and for provision of required progress reports as pre terms and conditions of the research and publications office of the Wolkite University.

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Table of contents

Contents

List of tables

List of figures

Acronyms and abbreviations

ANC	Antenatal Care
AOR	Adjusted Odd Ratio
CI	Confidence Interval
ETB	Ethiopian Birr
GDM	Gestational Diabetes Mellitus
MUAC	Mid Upper Arm Circumference
PPROM	Preterm Premature Rupture Of Membrane
SPSS	Statistical Package for Social Science

Abstract

Background: Preterm premature rupture of the membrane is defined as loss of amniotic fluid before the onset of labor in pregnancies before 37 weeks of gestation, which is characterized as a painless flow of fluid that escapes out of the vagina. It complicates approximately 3 percent of pregnancies and leads to one third of preterm births. It increases the risk of prematurity and leads to a number of other perinatal and neonatal complications, including a 1 to 2 percent risk of fetal death. Although the prevalence and associated factors of preterm premature rupture of membrane were well studied in high-income countries, there is a scarcity of evidence in Ethiopia, particularly in the study area.

Objective: The main objective of this study was to assess the prevalence of preterm premature rupture of membrane and associated factors among pregnant women admitted in Wolkite University Specialized Hospital, Southern Ethiopia, 2021.

Methods: Hospital based cross-sectional study design was conducted from 1st June to 31st June 2021 in Wolkite University specialized hospital. A total of 199 women were included and these study subjects were selected by systematicrandam sampling technique. Data were collected using structured interviewer administered questionnaire. Five data collectors and two supervisors wereparticipated in data collection process. Descriptive statistical analysis and some of the statistical tests like the odds ratio were carried out.Both bivariable and multivariable logistic regression analysis were conducted. Statistical significant tests were declared at a level of P value < 0.05.

Result: The prevalence of preterm premature rupture of membrane was 6.6%. Having gestational DM [AOR=5.99 (95%CI: 1.01, 32.97]and previous history of abortion [AOR= 5.31(95%CI: 1.06, 26.69]were found to be significantly associated with preterm premature rupture of membrane.

Conclusion and recommendations: The prevalence of preterm premature rupture of membrane was low as compared with the previous studies conducted across the world. Similarly, having gestational DM and having previous history of abortion were independent factors associated with preterm premature rupture of membrane. Therefore, the government especially Wolkite University specialized hospitalshould strengthen the health service intervention in conducting community service in reducing the preterm premature rupture of membrane.

Key words: Preterm,PROM, Pregnant women, Wolkite University specialized hospital

1. Introduction

1.1. Background

Preterm premature rupture of the membrane (PPROM) is defined as loss of amniotic fluid before the onset of labor in pregnancies before 37 weeks of gestation, which is characterized as a painless flow of fluid that escapes out of the vagina (1). It can lead to significant perinatal morbidity, including respiratory distress syndrome, neonatal sepsis, umbilical cord prolapse, placental abruption and fetal death(2). PPROM also leads to significant maternal complications such as puerperal infections, disseminated intravascular coagulopathy, operative delivery, chorioamnionitis and psychological and lactation problems (3-5).

Preterm PROM complicates approximately 3 percent of pregnancies and leads to one third of preterm births(6). It increases the risk of prematurity and leads to a number of other perinatal and neonatal complications, including a 1 to 2 percent risk of fetal death(7).The exact cause of PPROM is unknown. However, different findings revealed that maternal ethnic origin, previous adverse pregnancy outcome, uterine over distention, smoking, low body mass index, genitourinary tract infection, maternal depression, pre-pregnancy stress, poor diet, assisted fertility and periodontal diseases are the major contributing factors for PPROM (1, 8-10).

The burden of PPROM ranges from maternal and neonatal mortality and morbidity to countrywide economic loss due to drug expense, hospitalization, absenteeism from the work and expense to the health professionals(1, 11). PPROM is the primary cause of preterm deliveries and 90% of neonatal death(12, 13). It also increases the risk for neonatal resuscitation and intraventricular hemorrhage(14, 15).

Among the socio-behavioral and demographic risk factors of PPROM are poor socio-economic status and low level of education, smoking, difficult working conditions, and African ethnicity(16, 17). Other factors have been proposed, such as maternal age and increased or decreased body mass index (BMI)(17-19). Also, a history of PPROM, a history of prematurity, or multiple pregnancies are predominant considered risk factors(20, 21). Other factors such as nulliparity, the interval between pregnancies (<6 or >60 months), cervico-isthmic abnormalities, genital infections and hydramnios have also been reported(18, 21).

Its Management is influenced by gestational age and the presence of complicating factors such as clinical infection, abruptio placentae, labor, or non-reassuring fetal status(22). Preterm premature rupture of membrane without chorioamnionitis is managed expectantly until 37 weeks of gestation. During expectant management, the patient will be admitted at hospital and followed closely. Vaginal examination will be avoided. In case of PPROM with chorioamnionitis, the pregnancy will be terminated regardless of gestational age (8, 23).

In Ethiopia, training manuals and guidelines were prepared to make health professionals experienced in managing and referring a woman with obstetric emergencies including PPROM (9). Pregnant woman with PPROM is referred to hospital in which neonatal intensive care unit is available. The treatment of PPROM depends on the gestational age, presence of infection, and condition of the fetus.

1.2. Statement of the problem

Preterm premature rupture of membrane affects 3–4.5% of pregnancies globally with a relatively higher incidence in Africa(12, 24). About 3% of the pregnancies are complicated with preterm premature rupture of membranes(25, 26).For several years, PROM has been the subject of several clinical and epidemiologic studies and is considered one of the great obstetrical syndromes responsible for spontaneous preterm birth and its related complications such as respiratory distress syndrome, intraventricularhaemorrhage and necrotizing enterocolitis with associated high perinatal mortality rates(27).

Term and preterm PROM complicates approximately 8% and 2% of pregnancies, respectively. Preterm PROM is associated with 40% of preterm deliveries and 18–20% of perinatal deaths(28). Evidences also discovered that PPROM accounts 3.1% in Brazil (29), 2.2 % in Manipur, India (24), 19.2% in China (12), 5.3% in Egypt (30), 3.3% in Nigeria(31), and 7.5 % in Uganda (32).

Several studies have shown that the occurrence of PROM is strongly associated with low family income, smoking during pregnancy, coffee drinking, surgery, multiple gestations, poly-hydramnios, gestational hypertension and diabetes mellitus(33, 34). For instance, the study by Gahwagi et al. in Libya highlighted that maternal infection, as well as smoking of the pregnant women and Cocaine intake, were the most frequent cause of PROM(35).

Although the prevalence and associated factors of PPROM were well studied in high-income countries, there is a scarcity of evidence in Ethiopia, particularly in the study area. Ethiopia and other five countries contribute to about 50% of the maternal deaths in the globe. Ethiopia has designed a number of policies and strategies to improve maternal health and reduce child mortality. However, Ethiopia still has the higher number of maternal mortality in the world. This poses the greatest challenge to attain the goal for maternal health(36). Therefore, this study was aimed to determine the prevalence and associated factors of preterm premature rupture of membrane among pregnant women admitted in Wolkite University Specialized Hospital, Southern Ethiopia.

1.3. Significance of the study

In Ethiopia accelerated reduction in the occurrences of preterm premature rupture of membrane is increasingly critical for progress towards sustainable developmental goals. To do this, determining the prevalence of PPROM and identifying associated factors at the local context is very crucial and timely issue. Since its occurrences vary by country and with the availability and quality of health care, understanding prevalence of PPROM in relation to these factors is crucial.

The finding of the study will be used for the patients presenting with PPROM and hospital for the determination of the prevalence of PPROM. In addition the result of the study will also be used as an input for local program implementers at hospitals, Woreda and Zonal administration to design evidence based intervention strategies to identify the associated factors and appropriate intervention strategies for reduction of PPROM in the study area.

2. Literature review

2.1. Prevalence of preterm premature rupture of membrane

Prevalence of PPROM in Ayub teaching hospital was 16%. Other studies conducted at different parts of the world reveals similar findings. The prevalence of PPROM at Brazil was 3.1%(12). A similar study conducted at tertiary hospital in India revealed that, the prevalence of PPROM was 2.01%(5). The prevalence of PPROM at Rural Uganda was 13.8%(37). Another study conducted at South Karala, India revealed that, the prevalence of PPROM was 0.8%(38).

The same cross sectional study conducted at Egypt showed that, the prevalence of PPROM was 5.3%(30). Another cross sectional study conducted at tertiary care center in Nigeria indicated that, the prevalence of PPROM was 3.3%(31). Similarly, the same cross sectional study conducted at Kampala international University teaching hospital in Uganda showed that, the prevalence of PPROM was 7.5%(30).

Similarly, the prevalence of PPROM at CHU de Québec-Université Laval was 2.8%(39).A similar study conducted at Debre Tabor General Hospital indicated that, the prevalence of PPROM was 13.7%(40).

2.2. Factors associated with preterm premature rupture of membrane

Numerous risk factors are associated with preterm PROM. Black patients are at increased risk of preterm PROM compared with white patients (41). Other patients at higher risk include those who have lower socioeconomic status, are smokers, have a history of sexually transmitted infections, have had a previous preterm delivery, have vaginal bleeding, or have uterine distension (e.g., polyhydramnios, multifetal pregnancy)(41).

Procedures that may result in preterm PROM include cerclage and amniocentesis. There appears to be no single etiology of preterm PROM. Choriodecidual infection or inflammation may cause preterm PROM(42). A decrease in the collagen content of the membranes has been suggested to predispose patients to pre-term PROM(43). It is likely that multiple factors predispose certain patients to preterm PROM.

2.2.1. Socio demographic factors

A cross sectional study conducted in Uganda showed that women who have age less than 20 were four times more likely to develop preterm premature rupture of membrane as compared with those who have age >35 years and above(17). A similar facility based cross sectional study conducted in Brazil indicated that, the odd of the likelihood of the development of preterm premature rupture of membrane among women who have age less than 20 was two time higher as compared with those who had age more than 35 years and above(19). A facility based cross sectional study conducted at Ayub teaching hospital showed that, it was seen to be common among patients who were young (15-25 years) 58.8%, with low socioeconomic status (68.2%), and with an educational status of primary to middle (71.7%)(44).

A facility based cross sectional study conducted at CHUde Quebec-Universitelaval revealed that, women who had low level of education had three times more likely to have preterm premature rupture of membrane as compared with those who studied college and above(39). Another facility based cross sectional study conducted in rural India revealed that rural residents were two times more likely to develop PPROM as compared with the counterparts, urban residents(16).

A facility based cross sectionalstudy conducted at CHU de Québec-Université Laval indicated that, women who had body mass index (BMI) <18.5 kg/m^2 had two times more likely to have preterm premature rupture of membrane as compared with those who had BMI >18.5kg/m^2(39). Another facility based cross sectional study conducted at Kankar tertiary hospital in England revealed that, women who had body mass index less than <18.5 kg/m^2 were more likely to develop preterm premature rupture of membrane as compared with those who had body mass index >24.9kg/m^2(18).

A facility based cross sectional study conducted at rural residents in India indicated that, the odd of the likelihood of the occurrences of preterm premature rupture of membrane among women who have a habit of smoking was five times more likely as compared with those who did not a habit of smoking(16). Another facility based cross sectional study conducted at Southern Ethiopia 2017 showed that, women who have a habit of smoking were 17 times more likely to

have the occurrences of preterm premature rupture of membrane as compared with the counterparts who have no habit of smoking(45).

2.2.2. Obstetrics related factors

A facility based cross sectional study conducted at Ayub General Hospital revealed that, normal vaginal delivery occurred in (65.86%), while instrumental delivery rate in PPROM was 20% and caesarean section rate was 14%(44). Another facility based cross sectional study conducted in Mekele city, Tigray indicated that women who have a history of cesarean section were 3 times more likely to have the occurrences of preterm premature rupture of membrane as compared with the counterparts who have no cesarean section history(46).

Another facility based cross sectional study conducted at Debre Tabor general hospital indicated that, women who have a previous history premature rupture of membrane were 3 times more likely to develop preterm premature rupture of membrane as compared with the counterparts who did not have a history of preterm premature rupture of membrane(40).

A facility based cross sectional study conducted at CHU de Québec-Université Laval indicated that, women who have previous history of preterm premature rupture of membrane have two times higher risks of occurrences of PPROM on the recent pregnancy as compared with those who have no previous history of preterm premature rupture of membrane(39). Similar facility based cross sectionalstudy conducted at Mekele city, Tigray revealed that, women who have previous history of PPROM were 4 times more likely to have the occurrences of PPROM as compared with the counterparts (46).

A facility based cross sectional study conducted at Debre Tabor general hospital indicated that, the odd of the likely hood of the occurrences of preterm premature rupture of membrane among women who have a vaginal bleeding were two times higher as compared with those who had not yet developed vaginal bleeding(40).

Postnatally 16.47% patients developed infection while 24 (28.2%) babies developed infection and required antibiotics. Majority of babies born to patients with PPROM were low birth weight (62.3%), and 30.5% babies required neonatal intensive care(44).A facility based cross sectional study conducted in rural Uganda indicated that, women had gestational age of 37 weeks or

more were70% less likely to have the occurrences of preterm premature rupture of membrane as compared with those who have gestational age less than 36 weeks(37).

A facility based cross sectional similar study conducted at Debre Tabor General Hospital revealed that, Pregnant women with abnormal vaginal discharge were five times more likely to develop preterm premature rupture of membrane as compared with those who have no abnormal vaginal discharge(40). Anotherfacility based cross sectionalstudy conducted at Mekele,Tigrayshowedthat,women who have an abnormal vaginal discharge were 3 times more likely to have PPROM as compared with those who have no abnormal vaginal discharge(46).

2.2.3. Maternal medical related factors

A facility based cross sectional study conducted at Debre Tabor General Hospital showed that, women who had urinary tract infection were two times more likely to develop preterm premature rupture of membrane as compared with those who have no urinary tract infection(40). Another facility based cross sectionalstudy conducted at Uganda indicated that, women who have no history of urinary tract infection in the month preceding enrollment in to the study were 50% less likely to have the occurrences of preterm premature rupture of membrane as compared with those who have urinary tract infection(37).

A facility based cross sectional study conducted at Debre Tabor General Hospital revealed that, womenwhohad mid-upper arm circumference <23 cm were six times morelikely to develop preterm premature rupture of membrane as compared with those who have >3cm(40).

The odd of the likelihood of the occurrences of preterm premature rupture of membrane among women who had a history of 3 or more abortions were 13 times higher as compared with those who have no history of abortion(37). Another facility based cross sectionalstudy conducted in Mekele town, Tigray showed that, women who have a history of abortion were 3 times more likely to have the occurrences of PPROM as compared with the counterparts(46).

Similarly, another facility based cross sectionalstudy conducted at CHU de Québec-Université Laval indicated that, the odd of the likelihood of the occurrences of preterm premature rupture of membrane among women who have gestational diabetes were two times more likely to develop preterm premature rupture of membrane(39).A facility based cross sectional study conducted at

Southern Ethiopia showed that, women who have a history of hypertension were 8 times more likely to have preterm premature rupture of membrane as compared with those who have no hypertension(45).

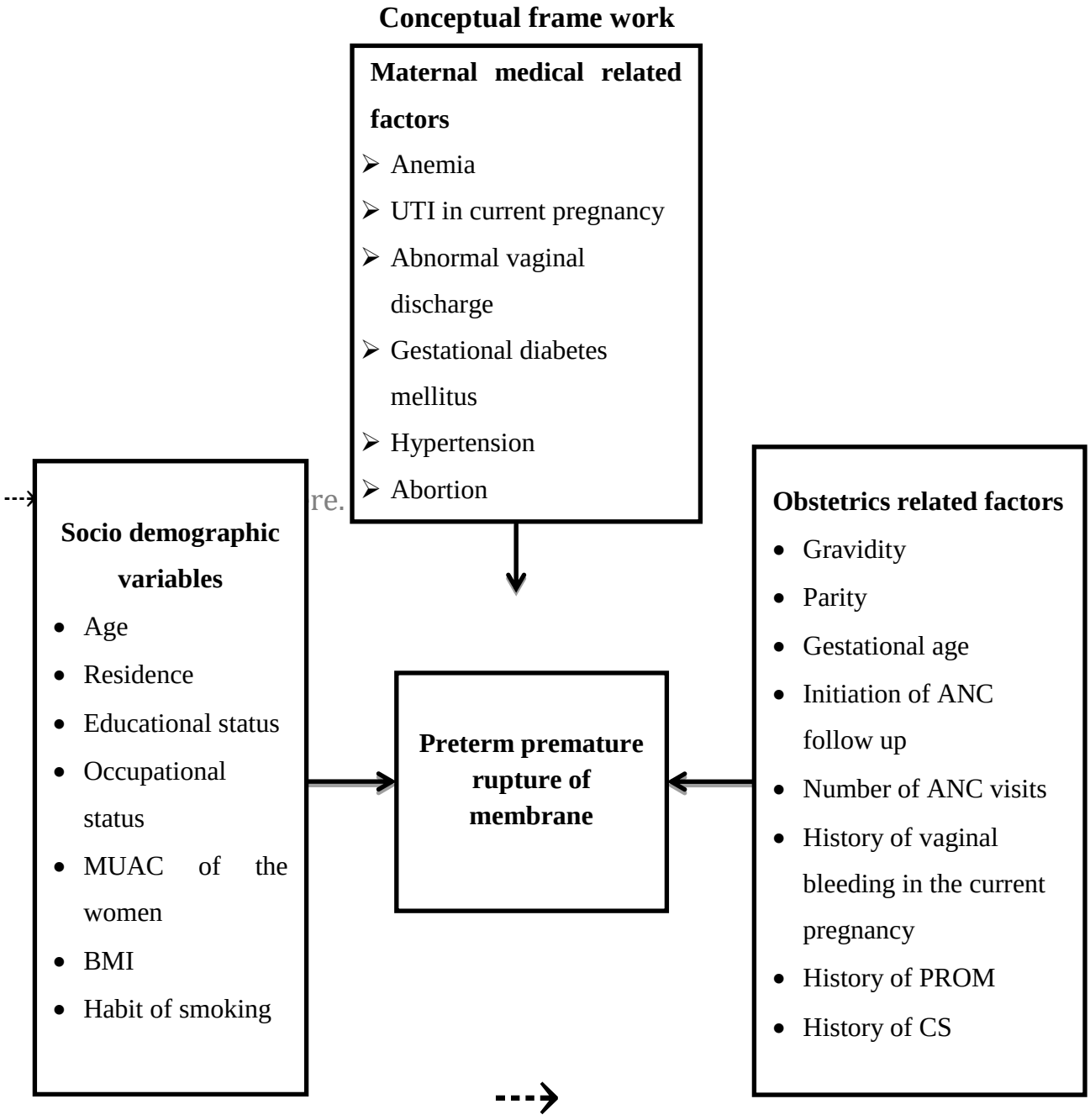

Figure 1: Conceptual framework developed for the study on prevalence of PPROM and associated factors among women admitted in maternity ward in Wolkite University comprehensive specialized hospital, Guraghe Zone, Southern Ethiopia, 2021[17,40,44,46]

3. Objective

3.1. General objective

- To assess the prevalence of preterm premature rupture of membrane and associated factors among pregnant women admitted in Wolkite University Specialized Hospital, Southern Ethiopia from 1st June to 31st June, 2021.

3.2. Specific objectives

- To determine the prevalence of preterm premature rupture of membrane among pregnant women admitted in Wolkite University Specialized Hospital, Southern Ethiopia from 1st June to 31st June, 2021.
- To identify the factors associated with preterm premature rupture of membrane among pregnant women admitted in Wolkite University Specialized Hospital, Southern Ethiopia from 1st June to 31st June, 2021.

4. Methods and materials

4.1. Study area and period

The study was conducted at Wolkite University specialized hospital. The hospital is located at Wolkite town, Gubre sub city, which is 155km far from Addis Ababa, the capital city of Ethiopia.The Hospital is a University based hospital conducts medical, surgical, obstetrics and Gynecology and pediatrics ward. There are 5 obstetrics and gynecologists, 9 general practioners, 19 BSc midwifes and 8 diploma midwifes. Annually, around 1856 mothers give birth with in the hospital. The study was conducted from June 01 to June 30 2021.

4.2. Study design

Institution based cross sectional study was conducted.

4.3. Populations

4.3.1. Source populations

All pregnant women who were admitted in the maternity wards of Wolkite University specialized hospital.

4.3.2. Study populations

All pregnant women who were admitted to the maternity wards of WolkiteUniversity Specialized hospitalduringthe study period

4.4. Inclusion and exclusion criteria

4.4.1. Inclusion criteria

All pregnant mothers who were admitted to the obstetrics ward at Wolkite University Specialized Hospital

4.4.2. Exclusion criteria

who are seriously ill and unable to communicate were excluded from the study.

4.5. Sample size determination and sampling procedure

4.5.1. Sample size determination

The sample size was calculated using single proportion formula taking the following assumptions.

- ”p” is proportion level, 13.67% has been taken (40).
- 95% confidence level and 5% degree of precision
- d=margin of error (0.05)
- Z±α/2 the standard normal value at 95% confidence level (1.96)

Fitting in to the formula the final sample size was

$$n = \frac{(\mathbf{Z\alpha/2})^{\mathbf{2}}\mathbf{P(1-P)}}{d^2}$$

$$n = \frac{(\mathbf{1.96})^{\mathbf{2}}\mathbf{0.1367(1-0.1367)}}{(0.05)^2}$$

n= 181

Adding 10% for non-response rate the final sample size was 199.

4.5.2. Sampling Procedures

Systematicrandam sampling methodwas applied to select study participants from maternity, wards. Based on the past three month’s statistics, the estimated average number of pregnant women who were admitted to the labor, maternity and high-risk wards of Wolkite University specialized Hospital is412. The sampling interval (k^{th} unit) was obtained by dividing the entire pregnant women (the total number of pregnant women who were admitted in three months) (412) by the desired sample size (total number of sample size (199) and it is approximately 2. The first woman was randomly selectedby using the lottery method and then every second woman who was admitted in the ward were recruited for the study.

4.6. Variables

4.6.1. Dependent variable

Preterm premature rupture of membrane (1: Yes, 2: No)

4.6.2. Independent variables

Socio demographic variables

- Age
- Residence
- Educational status
- Occupational status
- Smoking
- MUAC of the women

Obstetrics related factors

- Gravidity
- Parity
- Gestational age
- Initiation of ANC follow up
- Number of ANC visits
- History of vaginal bleeding in the current pregnancy
- History of PROM
- History of preterm birth

Maternal medical related factors

- Anemia
- UTI in current pregnancy
- Abnormal vaginal discharge
- Gestational diabetes mellitus
- Hypertension
- Abortion

Operational Definition

- *Preterm Premature Rupture of Membrane (PPROM)*In Ethiopia, *PPROM* is defined as loss of amniotic fluid before the onset of labor in pregnancies after fetal viability (>28weeksofgestation)butbefore37weeksofgestation[2].
- *PPROM*isclassifiedintoearlyPPROM(29–33+6weeks)and late PPROM (34–36+6 weeks). The diagnosis of PPROM was confirmed by clinicians through visualization of amniotic

fluid passing from the cervical canal and pooling in the vagina or by using a basic pH test of vaginal fluid or ferning of dried vaginal fluid identified under microscopic evaluation.

- *Anemia*A pregnant women whose hemoglobin level <11g/dl was considered as anemic.
- *Gestational age* was estimated using 1st or 2nd trimester (up to 24 weeks) ultrasound report and last normal menstrual period.
- *Mid-Upper Arm Circumference (MUAC)*MUAC of eachwomanwasmeasuredatthemidpointbetweenthetips of the shoulder and elbow of the left arm using nonelastic MUAC tapes. In this study, poor nutritional status of the mother was defined as MUAC<23cm.

4.7. Data collection tool and procedures

The questionnaire was first prepared in English then translated to local language (Amharic) and retranslated back to the original one to evaluate its consistency. Interview and chart review were used to collect the data. Five midwives (the investigators) and two supervisors (advisors)were used for data collection and supervisory activity, respectively. Structured interviewer-administered data collection formats were adapted and modified from different kinds of previously conducted literature. The data collection tool wascategorized into sociodemographic factors, obstetric factors, medical history, and behavioral factors. Data on respondent's specific questionnaires was collected by reviewing medical records and through interviewing the respondents.

4.8. Data quality assurance

Data collectors were trained for the necessary approaches, questioners was checked for completeness, supervisors were taken a role to assure the reliability of the data collected by data collectors, the collected data were coded appropriately. The data were cleaned and analyzed appropriately. Pretest was conducted on 5% in amount of the study participants at Atat Hospital prior to the data collection period.

4.9. Data processing and analysis

Data were cleaned, coded and entered in to SPSS version 21 statistical Software's for Entry and analysis. Descriptive statistics was done to assess basic client characteristics. Bivariable analysis using logistic regression technique was done to see the crude association between the independent variables and the dependent variable.

Factors that show association in bivariable analysis and which has P-value less than 0.25 were entered in to multivariable logistic regression models for controlling confounding factors and to identify significant factors. The strength of statistical association was measured using adjusted odds ratios, 95% confidence intervals, and P-value <0.05 was considered as significant.

4.10. Ethical consideration

Permission letter was obtained from Wolkite university college of Medicine and Health sciences, Department of Midwifery. Communication with the hospital administrator was made through formal letter obtained from the University.

Verbal consent was obtained from each participant to ensure their voluntariness to participate in the study and they was told that all have a right to withdraw at any time if they are not comfortable to participate in the study or to put an end for single question, segment of questions or refuse to participate at all.

In order to keep confidentiality of any information provided by study subjects, the data collection procedure was maintained by excluding their names as identification in the questionnaire and by keeping their privacy during the interview by interviewing them alone.

5. Result

5.1. Sociodemographic related characteristics

In this study a total of 197 respondents were involved, which yields a response rate of 98.99%. The minimum and maximum age of the respondents was 18 years and 39 years with a mean of 27.63 and a standard deviation of 5.64. The minimum and maximum amount of the estimated monthly income of the mothers was 750ETB and 20000ETB with a mean of 4982.2 and with a standard deviation of 3943.8 ETB (Table 1).

Table 1: Socio-demographic characteristics of the mothers in Wolkite University specialized hospital, Guraghe Zone, Southern Ethiopia, 2021

Variables	**Category**	**Frequency**	**Percentage**
Age (in completed years)	18- 20	15	7.6
	20-34	153	77.7
	34-39	29	14.7
Residence	Urban	123	62.4
	Rural	74	37.6
Educational status	Unable to read and write	78	39.6
	Only read and write	45	22.8
	Primary	44	22.3
	Secondary	20	10.2
	College and above	10	5.1
Occupational status	Housewife	95	48.2
	Student	8	4.1
	Farmer	59	29.9
	Merchant	13	6.6
	Private employee	4	2.0
	Government employee	18	9.1
Marital status	Single	8	4.1
	Married	182	92.4
	Divorced	4	2.0
	Widowed	3	1.5

Current habit of smoking	Yes	16	8.1
	No	181	91.9
Estimated monthly income (in ETB)	750-4982	123	62.4
	4983-20,000	74	37.6

5.2. Behavioral and work related characteristics

The minimum and maximum weight of the mothers was 48kg and 76 kg respectively with the mean of 60.94kg and with the standard deviation of 8.03kg. Among the respondents, 128(65%), 56(28.4%) and 13(6.6%) of the respondents had BMI 18-24.9kg/m^2, 25-29kg/m^2 and >29kg/m^2 respectively. Similarly, 123(62.4%) of the respondents have no a history of lifting.

5.3. Obstetrics and related characteristics

Among the respondents, 114(57.9%) have first instances of pregnancy. Among the mothers, 161(81.7%) were initiated antenatal care. Of those who initiated ANC, 81(41.1%) have onevisit. Among the mothers, 21(10.7%) have a history of vaginal bleeding and 14(7.1%) have gestational DM. Of the mothers, 16(8.1%) have a history of UTI and 13(.6%) of the mothers have face anemia. Among the respondents 31(15.7%) have hypertension and 19(9.6%) of them have a history of abortion (Table 2).

Table 2: Obstetrics related characteristics of the mothers in Wolkite University specialized hospital, Guraghe Zone, Southern Ethiopia, 2021

Variables	Category	Frequency	Percentage
Gravidity	One	114	57.9
	2-4	48	24.4
	≥5	35	17.7
Parity	One	114	57.9
	2-4	48	24.4
	≥5	35	17.7
ANC initiation	Yes	161	81.7
	No	36	18.3
Number of visits (n=161)	One	81	50.3
	Two	42	26.1
	Three	21	13.0
	Four and above	17	10.6
Abnormal vaginal bleeding	Yes	21	10.7
	No	176	89.3
Gestational DM	Yes	14	7.1
	No	183	92.9
UTI	Yes	16	8.1
	No	181	91.9
Anemia	Yes	13	6.6
	No	184	93.4
Hypertension	Yes	31	15.7
	No	166	84.3
Previous history of Abortion	Yes	19	9.6
	No	178	90.4

5.4. Prevalence of preterm premature rupture of membrane

In this study, a total of 13(6.6%) (95%CI: 95%CI: 3.0, 10.2) of the mothers face rupture of membrane before 37 completed weeks of gestation and 184(93.4%) did not face rupture of membrane before 37 weeks of gestation.

5.5. Factors associated with PPROM

6. Table 3: Bivariable analysis of the factors associated with PPROM

Variables	Category	Status		COR (95%CI)	P-value
		Have PPROM	Not have PPROM		
Age	Below average	8	103	1	
	Above average	5	81	0.38(0.10, 1.43)	0.253
Residence	Urban	8	115	1	
	Rural	5	69	1.04(0.33, 3.31)	0.945
Estimated monthly income (ETB)	Below the average	7	116	0.68(0.22, 2.12)	0.510
	More than the average	6	68	1	
Marital status	Single	3	5	1	
	Married	8	167	0.08(0.02, 0.38)	0.002
	Divorced	1	7	0.56(0.04, 8.09)	0.667
	Widowed	1	5	0.83(0.05, 13.63)	0.898
History of lifting	Yes	9	65	4.12(1.22, 13.89)	0.02
	No	5	119	1	
Gravidity	One		107	0.62(0.17, 2.86)	0.617
	2-4	6	42	0.71(0.14, 3.75)	0.711
	5 and above	5	30	1	
Parity	One			2.22(0.26, 18.73)	0.462
	2-4			3.95(0.44, 35.45)	0.269
	5 and above			1	
Having ANC	Yes	7	157	1	

visits	No		27	13.1(3.76, 45.51)	0.0001
Vaginal bleeding	Yes	5	16	6.56(1.92, 22.44)	0.003
	No	8	166	1	
Gestational DM	Yes	6	11	4.72(1.13, 19.66)	0.033
	No	7	173	1	
UTI	Yes	5	11	9.83(2.75, 35.09)	0.0001
	No	8	173	1	
Anemia	Yes	5	10	5.22(1.23, 22.01)	0.024
	No	8	172	1	
Hypertension	Yes	6	25	5.45(1.69, 17.55)	0.004
	No	7	159	1	
History of abortion	Yes	5	14	7.59(.19,6.31)	0.001
	No	8	170	1	

In this study, variables which have p-value less than 0.25 in bivariate analysis were considered as candidate and entered in to multivariable analysis. Hence, vaginal bleeding, gestational DM, anemia, hypertension, history of abortion and current habit of smoking were candidate variables for the multivariable analysis. Among those candidate variables having gestational DM and having a history of abortion were statistically significant in multivariable logistic regression model.

The odd of having preterm premature rupture of membrane among mothers who have gestational DM was nearly six times higher as compared with those who did not have GDM [AOR: 5.99; 95%CI: 1.01, 32.97]. the odd of having preterm premature rupture of membrane among mothers who have history of abortion was five times higher as compared with those who did not have a history of abortion [AOR: 5.31; 95%CI: 1.06, 26.69] (Table 3).

Table 3: Factors associated with preterm premature rupture of membrane among mothers at Wolkite University Specialized Hospital, Guraghe Zone, Southern Ethiopia, 2021

Variables	**Category**	**PPROM**		**COR (95%CI)**	**AOR (95%CI)**
		Yes	No		
Vaginal bleeding	Yes	5	16	6.56(1.92, 22.44)*	2.07(0.28, 15.06)
	No	8	166	1	1
Gestational DM	Yes	5	11	4.72(1.13, 19.66)*	5.98(1.01, 32.97)**
	No	8	173	1	1
Anemia	Yes	5	10	5.22(1.23, 22.01)*	1.41(0.12, 16.33)
	No	10	172	1	1
Hypertension	Yes	6	25	5.45(1.69, 17.55)*	2.12(0.43, 10.38)
	No	7	159	1	1
History of abortion	Yes	5	14	7.59(.19,6.31)*	(5.31;1.06, 26.69)**

NB: * indicates variables having p-value<0.25 in bivariate analysis and ** indicates variables having p-value <0.05 in multivariable analysis

7. Discussion

In this study the prevalence of preterm premature rupture of membrane was 6.6% [95%CI: 3.0, 10.2]. This study finding was less than the study conducted in Ayub teaching hospital (16%)(44),Kampala international University teaching hospital (7.5%)(30)and Rural Uganda (13.8%)(37).In addition, this study finding was greater than the study conducted in Brazil (3.1%), tertiary hospital in India (2.01%)(5), Egypt (5.3%)(30), Nigeria (3.3%)(31),CHU de Québec-Université Laval (2.8%)(39)and South Karala, India (0.8%)(38).

This difference might be related to the variation on socio demographic characteristics, socio economic characteristics, difference in the type of population and difference in the government intervention strategies across countries. In addition, it might be related to the habit related disease of the pregnant mothers across a globe, where most of the mothers across the developed countries have developed chronic diseases.

Among the studies conducted in Ethiopia, which was less than the study conducted in Debre Tabor General Hospital indicated that, the prevalence of PPROM was 13.67%(40).Recent studies indicated the highest government and other non-governmental organizations effort towards the reduction of maternal mortality and the intervention towards the achievements of sustainable development goals.

Having a gestational diabetes mellitus was found to be a significantly associated factor for preterm premature rupture of membrane. The odd of having preterm premature rupture of membrane among mothers who have gestational DM was nearly six times higher as compared with those who did not have GDM. This study finding was in line with the study conducted in CHU de Québec-Université Laval(39). In addition, this finding was inline with a case control study that showed that diabetes mellitus, without distinction between pre pregnancy diabetes and gestational diabetes were associated with preterm premature rupture of membrane(47). This might be related to the effect of gestational diabetes mellitus in the promotion of the production of advanced glycerin end products, ligands of RAGE, a receptor implicated in this pathway(48).

Similarly, having a history of abortion has become a significantly associated factor for preterm premature rupture of membrane. The odd of having preterm premature rupture of membrane among mothers who have history of abortion was five times higher as compared with those who

did not have a history of abortion.This study was consistent with the study conducted in Rural Uganda, which revealed that, the odd of the likelihood of the occurrences of preterm premature rupture of membrane among women who had a history of 3 or more abortions were 13 times higher as compared with those who have no history of abortion(37). Similarly a study conducted in Mekele town, Tigray showed that, women who have a history of abortion were 3 times more likely to have the occurrences of PPROM as compared with their counterparts(46). This might be related to the weakening of the membranes secondary to the trauma lied on the uterine wall. In addition, it may be caused by the underlying infections or vascular complications which raised secondary to the abortion.

8. Limitations of the study

Since the study was conducted in health facility, it may not be generalized to the mothers who have not visited the health facility.

9. Conclusion

Even though the prevalence of PPROM was lower than the studies conducted in Ethiopia, significant number of mothers were still developed preterm premature rupture of membranes. In addition, having gestational DM and having previous history of abortion were independent factors associated with preterm premature rupture of membrane.

10.Recommendations

Mothers should prevent having an induced abortion and immediately seek health facility if they face a spontaneous abortion.

Pregnant mothers should have frequent visit to the health facilities if they have diagnosed gestational DM

Health professionals should encourage and train mothers to have frequent ANC visits.

Wolkite Universityspecialized hospital should organize and conduct community service activities to alleviate the preterm premature rupture of membrane through awareness creation.

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Annexes

Annex 1: English version Questionnaire

Good morning/afternoon dear participant! My name is _____. I am working as a data collector for the study being conducted in Wolkite University Specialized Hospital on Prevalence of preterm premature ruptures of membrane and associated factors among pregnant mothers in Wolkite University specialized hospital, who are studying for theirBachelor degree in Midwifery at Wolkite University, college of Medicine and Health sciences. I kindly request you to lend me your attention to explain about the study and being you selected as the study participant.

The purpose of the study is to assess Prevalence of preterm premature ruptures of membrane and associated factors among pregnant mothers in Wolkite University specialized hospital.Findings from the study can be used by the district health office to design and develop locally appropriate plan to tackle problems related with recommended postnatal care service utilization.This may take 30-40 minutes. All the information that you are going to provide me will remain confidential and you don't need to mention your name. For this reason, I kindly request you to give me your sincere and truthful answer.

All of your participation is completely on voluntary bases and you have the right to refuse from participation. Participation or non-participation and refusal to answer questions will have no effect on your life. If you have further questions or would like to know the results of this study, please feel free to contact the principal investigator; with the following address.

Consent Form English Version

I have read all the process and the objective of the study and I have understood the same as written that includes informed about the purpose, advantage, and disadvantage of this study titled, preterm premature ruptures of membrane and associated factors among pregnant mothers in Wolkite University specialized hospital. I also understood that the research imposes no risk and no composition would be provided to me. I have been told that if I fill discomfort to respond to any of the question, I fill free to drop it any time I wish to do so. I have understood the information given and the participation is completely voluntary based.

I have been told that my answers to the questions will not be given to anyone and not expect to write my name. Now I am giving my consent to participate in the study voluntarily.

Could I have your permission to continue?

1. Yes_____2. No_____, Stop and thank the respondent.

Witness: Signature_____ Date_____

Data collector: Name_____ Signature _____ Date_____

Questionnaire on prevalence of preterm premature ruptures of membrane and associated factors among pregnant mothers in Wolkite University specialized hospital

Code	Variable	Categories	Skip
Part I; Socio demographic and socio economic characteristics of the women			
101	How old are you (in completedyear)?	_____ years old	
102	Residence	1. Urban 2. Rural	
103	What is your educational level	1. Unable to read and write 2. Read and write 3. Primary 4. Secondary 5. College and above	
104	What is your occupation?	1. House wife 2. Student 3. Farmer 4. Merchant 5. Private employee 6. Government employee	
105	What is your marital status?	1. Single 2. Married 3. Divorce 4. Widowed	
106	What is your estimated monthly		

	family income?	_____ (Birr)	
107	Weight of the women	_____kg	
108	Height of the Women	_____m	
109	Body mass index of the women	_____kg/m^2	
110	Did you have a history of lifting heavy objects?	1. Yes 2. No	
Part II: Obstetrics related characteristics of the women			
201	How many times have you been pregnant? (Gravidity)	_____	
202	How many times have you been delivered alive births? (Parity)	_____	
203	What is your gestational age for this pregnancy?	_____ weeks	
204	Did you initiate ANC follow up?	1. Yes 2. No	If 2, skip to 206
205	How many visits did you attend?	1. 1 2. 2 3. 3 4. ›4	
206	Did you have face a history of vaginal bleeding in the current pregnancy?	1. Yes 2. No	
207	Did you have birth a previous history of PPROM?	1. Yes 2. No	
Part III: Maternal medical and behavioral related factors			
301	Did the mother have history of abnormal vaginal discharge?	1. Yes 2. No	
302	Did the mother have gestational diabetes mellitus?	1. Yes 2. No	
303	Did the mother have urinary tract	1. Yes	

	infection?	2. No	
304	Did the mother have Anemia	1. Yes 2. No	
305	What is the mother's blood pressure level?	----------mmHg	
306	Did the mothers have hypertension?	1. Yes 2. No	
307	Did the mother have a history of abortion?	1. Yes 2. No	If 2, skip to 309
308	If yes, how many times?	_____	
309	Do you have a habit of smoking?	1. Yes 2. No	
Part IV: PPROM related characteristics			
401	Did you face a rupture of membrane	1. Yes 2. No	If 2, completed.
402	If yes, in which gestational age do you face ROM	_____ weeks	

Annex 2: Amharic version questionnaire

1. የመረጃቅጽ

ሰላምታ፡-ጤናይስጥልኝ!!

እኔ_____እባላለሁ፡፡ይህጥናትየሚካሄደውበወልቂጤዩኒቨርሲቲህክምናናጤናሳይንስኮሌጅተማሪሲሆንበዩኒቨርሲቲውሙሉፈቃድታግዘውየመጀመሪያዲግሪያቸውመመረቂያጽሁፍበዩኒቨርሲቲዉሆስፒታልክትልበሚያደርጉእናቶችላይይሰራል፡፡ከጥናቱየሚገኘውውጤት/ግኝትበከተማዉየሚሰጠውየመጀመሪዉሳምንትየድህረወሊድአገልግሎትአፈጻጸምለማሻሻልየሚረዳሲሆንበተጨማሪምየጥናቱባለቤትበዩኒቨርሲቲውሚድዋይፈሪትምህርትክፍልየመጀመሪያዲግሪያቸውንለማግኘትእንደማሟያፅሑፍበመሆንይረዳል፡፡

ይህንመጠይቅለመሙላትከ30 እስከ 40 ደቂቃየሚወስድሲሆንበዚህቃለመጠይቅፈቃደኛካልሆኑያለመሳተፍመብትዎየተጠበቀነው፡፡እርስዎበዚህጥናትተሳታፊበመሆንዎበቀጥታሊያገኙየሚችሉትነገርላይኖርይችላል፤ነገርግንየእርስዎተሳትፎበአገልግሎቱአጠቃቀምእናምክንያትዙሪያያሉችግሮችወይምክፍተቶችለማሳየትእናትክክለኛየመፍትሔአቅጣጫለመጠቆምእጅግአስፈላጊነው፡፡

ጥናቱውጤታማሊሆንየሚችለውእርሶበሚሰጡትትክክለኛመልስላይየተመረኮዘበመሆኑ፤ጥያቄዎቹን በጥንቃቄእንዲመልሱልንፍቃደኝነትዎንበትህትናእንጠይቃለን፡፡በተጨማሪምየሚሰጡትመረጃከተባለለትጉዳይውጪእንደማይውልእናሚስጥራዊነቱየተጠበቀእንደሚሆንአረጋግጣለሁ፡፡በቃለመጠይቅወቅትለእርስዎግልጽያልሆነነገርካለመጠየቅይችላሉ፡፡ለመመለስፈቃደኛያልሆኑበትጥያቄካለምማለፍይችላሉ፡፡በየትኛዉምምክንያትበመጠይቁመሃልማቋረጥቢፈልጉጥያቄዉንየማቋረጥመብትአለዎት፡፡ እርሶምበዚህጥናትበመሳተፎከልብእናመሰግናለን!!!!!!

የስምምነትቅጽ

ከላይየተባፈውንየመረጃቅፅአንብቤየጥናቱንአላማናጥቅምበግልጽተረድቻለሁ፡፡በዚህምመሰረትያለጥናትቡድኑአባላትተፅእኖበሙሉፈቃደኝነትበዚሁጥናትበመሳተፍየሚጠበቅብኝንአስተዋፅኦለማበርከትመወሰኔንበፊርማዬአረጋግጣለሁ፡፡

የተሳታፊውቁጥር _____ፊርማ_____ቀን_____

የመረጃሰብሳቢሥም _____ፊርማ _____

መረጃየተሰበሰበበትቀን_____የተጀመረበትሠዓት _____ያለቀበትሰዓት _____

የተቆጣጣሪሥም _____ፊርማ_____ ቀን_____

የተጠያቂዉመለያቁጥር፡ ---------

መለያቁ	ጥያቄ	አማራጭ	እለፍ
ክፍል 1፡ስለማህበራዊእናኢኮኖሚያዊመጠይቅ			
101	እድሜዎስንትነዉ	---------- አመት	
102	መኖሪያዎየትነዉ;	1. ከተማ 2. ገጠር	
103	ትምህርትደረጃዎእስከስንትነዉ	1. ማንበብእናመጻፍየማይችል 2. ማንበብእናመጻፍብቻየሚችል 3. የመጀመሪያደረጃ 4. ሁለተኛደረጃ 5. ኮሌጅእናከዚበላይ	
104	ስራዎምንድንነዉ;	1. የቤትእመቤት 2. ተማሪ 3. ግብርና 4. ንግድ 5. የግልቅጥረኛ 6. የመንግስትቅጥረኛ	
105	የትዳርሁኔታዎምንይመስላል	1. ያላገባ 2. ባለትዳር 3. የፈታ 4. የሞተበት	
106	አማካይየቤተሰብየወርገቢዎስንትነዉ	---------- ብር	
107	ክብደትዎስንትነዉ	----------ኪ.ግ	
108	ቆመትዎስንትነዉ	----------ሜ	

109	BMI ስንትነዉ	---------ኪ.ግ/ሜ^2	
110	ክብደትያላቸዉንእቃዎችአንስተሸታዉቂያለሽ?	1. አዎን 2. አይ	
ክፍልሁለት፡እርግዝናናተያያዥጉዳዮች			
201	ይህስንተኛእርግዝናዎነዉ	----------	
202	ስንትጊዜበህይወትያለልጅወልደዋል	----------	
203	ይህኛዉእርግዝናስንተኛሳምንቱነዉ	-------- ሳምንት	
204	የቅድመወሊድክትትልጀምረዋል	1. አዎን 2. አልጀመርኩም	መልስዎ 2 ከሆነወደ 206 ይለፉ
205	ስንትጊዜክትትልአድርገዋል	1. አንድ 2. ሁለት 3. ሶስት 4. አራትእናከዚበላይ	
206	በዚህኛዉእርግዝናከማህፀንደምየመፍሰስችግርገጥሞትያዉቃል	1. አዎ 2. አይ	
207	ከልክያለፈየሽርትዉሀአላት	1. አዎን 2. አይ	
ክፍል 3፡የእናትየዉየዉስትደዌ (ህመም) በተመለከተ			
301	እናትየዉአላስፈላጊየሆነከማህፀንየሚወጣፈሳሽአላት	1. አዎን 2. አይ	
302	እናትየዉከእርግዝናየተያያዘየስካርበሽታአላት	1. አዎን 2. አይ	
303	እናትየዉየሽንትባንባኢንፌክሽንአላት	1. አዎን 2. አይ	
304	እናትየዉየደምማነስበሽታአላት	1. አዎን	

		2. አይ	
305	የእናትየዉየደምግፊትስንትነዉ	----------ሚሊሜትርሜርኩሪ	
306	እናትየዉየደምግፊትአላት	1. አላት 2. የላትም	
307	ከዚህበፊትየማስወረድታሪክአለሽ	1. አዎን 2. የለኝም	2 ከሆነ ወደ 309 ይለፉ
308	መልስዎአዎንከሆነስንትጊዜ	----------	
309	ሲጋራየማጨስልምድአለዎት	1. አዎን 2. የለኝም	
ክፍልአራት፡ጊዜዉሳይደርስየታየየሽርትዉሀመፍሰስበተመለከተ			
401	የሽርትዉሀመፍሰስችግርገጥሞዎታል	1. አዎን 2. አይ	
402	በስንተኛሳምንትዎነዉየገጠመዎት	------ ሳምንት	