

Prevalence of Preterm Premature Rupture of Membrane and Associated Factors Among Pregnant Women Admitted To Health Facilities in Ambotown, Ethiopia, 2021.

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Abstract

Background: Preterm pre-labor rupture of the membrane is a major cause of perinatal, neonatal, and maternal morbidity and mortality both in high- and low-income countries. A woman with premature rupture of membranes is at risk of complications like intra-amniotic infection, postpartum hemorrhage, and death. Little is known about the problem in the study area, therefore, this study was designed to determine the prevalence of preterm premature rupture of membrane and its associated factors among pregnant women admitted to health facilities in ambo town.

Methods: Hospitals based cross sectional study was conducted on 391 pregnant women who were admitted to the Hospitals in Ambo town from July 05/2021-August 30/2021.

The data were collected through face-to-face interviews by a structured questionnaire. Descriptive analyses were performed using frequencies, percentages, binary logistic regression by adjusting for confounding factors.

Results: The prevalence of preterm premature rupture of membrane was found to be 22.6%. Preeclampsia (AOR=3.2, 95% CI=0.69-0.57), Economic status (AOR = 2.64 (95% CI = 1.99–6.01), current urinary tract infection (AOR = 2.42, 95% CI = 1.32–5.19), previous history of premature rupture of membrane (AOR = 2.31, 95% CI = 1.02–6.27), and anemia (AOR = 1.85, 95% CI = 0.65–4.56) were factors associated with preterm premature rupture of membrane.

Conclusions: The prevalence of preterm premature rupture of membrane in the study area was high. Based on the predisposing factors identified early screening and treatment as well as health promotion is important to reduce the risk of preterm premature rupture of membrane.

Background

Preterm premature rupture of membrane (PPROM) is defined as rupture of the membrane before the beginning of labor in pregnancies that are between 28 and 37 weeks of gestation (1). It is distinguished by a painless liquid flow and other investigations like the ferning and pooling test. The lower limit of gestational age to describe Preterm in Ethiopia is a pregnancy that is > 28 weeks of gestation and < 37 weeks of gestational age(2, 3). Membrane or bag of water is the sac that maintains amniotic fluid which covers the developing baby. This fluid is important for nutrition, in defending the fetus against infection, fetal trauma, and compression of the umbilical cord(1).The magnitude of PPRM differs across the world from country to country and the population. For instances evidences shows that PPRM accounts 2.2% in Manipur, India, 3.1% in Brazil, 2.3% in Canada, 19.2% in China, 3.3% in Nigeria and 7.5% in Uganda(4–9). In Ethiopia According to research conducted at Debre Tabor and Tikur Anbesa hospital, the prevalence of PPRM was 13.67% and 1.4% respectively(10–12). Even though the exact cause of PPRM is unknown; a structural defect in the membrane, maternal ethnic origin, previous preterm delivery, intrauterine infection at an early gestational age, low socioeconomic status of the women, inadequate prenatal care, smoking, UTI during pregnancy, maternal nutritional status, abnormal vaginal discharge,

and maternal depression are considered as risk factors (13). The effect of PPRM ranges from maternal and neonatal morbidity and mortality (14). It complicates 3-4.5% of pregnancies worldwide (4, 15). Among women with preterm PROM, clinically evident intra-amniotic infection occurs in approximately 15–25%, and postpartum infection occurs in approximately 15–20% of the cases (16). The incidence of infection is higher at earlier gestational ages, and life-threatening maternal infections complicate expectant management of preterm PROM (13, 17). The primary complication for the mother is infection which can lead to chorioamnionitis, placental abruption, psychological effect, lactation problem, disseminated intravascular coagulopathy, metritis after delivery, increase the need for operative delivery and economic and resource wastage (18). PPRM raises perinatal mortality by four times and neonatal morbidity by three times (19, 20). The longer the time between rupture of the membrane and delivery, the higher the risk of maternal and fetal morbidity and mortality (21). Prematurity is responsible for 80–90% of perinatal mortality due to complications like Respiratory distress syndrome, Birth injury, Intraventricular hemorrhage, Hypocalcaemia, hypoglycemia, Hypothermia, Hyperbilirubinaemia and Infection (11, 22, 23). It also increases neonatal resuscitation, cord compression which leads to fetal distress and neonatal sepsis (24, 25). In low-income countries, more than 90% of extremely preterm newborns (less than 28 weeks of gestation) die during the first few days of life; in high-income countries, less than 10% of extremely preterm babies die within the first few days of life (26, 27). PPRM which is remote from term should only be cared for in facilities where a Neonatal intensive care unit (NICU) is available and capable of caring for the premature neonate. This is a challenge particularly in developing countries like Ethiopia where most of the health facilities are not well equipped. This study aims to identify the related factors and helps to establish the comprehensive plan to assist the country in reducing the prevalence of PPRM. It also offers the community about the severity of the problem and informs them about how they may prevent the problem and act carefully to make it less difficult than predicted. In addition, the study may be useful to other researchers as a reference material for future studies on similar issues. Even if few studies with fewer variables have been conducted in some parts of Ethiopia, there is no study carried out in the study area. So, this study plans to assess the prevalence of preterm premature rupture of membrane and associated factors among admitted pregnant mothers in Ambo Health facilities. The result of this study is important in improving maternal health and community awareness, as well as its treatment and prevention.

Methods

Study area and design

An institution-based cross-sectional study was conducted in Ambo town, Oromia Regional state, from July 05/2021-August 30/2021. The town is located 114 kilometers from Addis Ababa the capital city of Ethiopia. The total population of this town is estimated to be 83,053 of whom 41,692 are men and 41,361 women according to the 2007 census. The town has four governmental health institutions. These include Ambo University referral hospital, Ambo general hospital, Awaro health center, and Ambo health center. Ambo University referral hospital and Ambo general hospital are included in the study. Since its establishment in July 1999 Ambo General Hospital is providing obstetrics and gynecology department in

addition to other services. The department has 19 beds with 3 delivery Kochs. Ambo University referral hospital was established in 2006 and currently provides Gynecology, labor, and delivery in addition to other services with 38 beds (14 labor and delivery ward, 24 gynecology wards) and 4 deliveries Koch's. The Selected pregnant women who were admitted in obstetrics wards of AGH and AURH at their gestation between 28 and 36 + 6weeks were the study population.

Sample size and Sampling technique

The Sample size was calculated by using a single population proportion formula by considering $P = 0.137$; taken from previous Research done at Debre Tabor (11), 95% confidence level, 5% desired degree of accuracy. By adding a 10% non-response rate and using a design effect of 2, the final calculated sample size was found to be 391. Systematic random sampling was used to select study participants. The average number of pregnant women who were admitted in Ambo General Hospital and Ambo University Referral Hospital during the data collection period was estimated based on the previous admission, which was obtained by referring to a six-month registration book/record before data collection. Around 755 pregnant women were admitted in labor, maternity, and high-risk wards in six months. The sampling interval (kth unit) was obtained by dividing the entire total pregnant women admitted in six months (755) by the desired sample size (391) and it was approximately 2. The first woman was randomly chosen for the survey by the lottery method, and then every second woman who was admitted in the ward was selected for the study.

Study variables

Dependent variable

- Preterm Premature rupture of membrane

Independent variable

- Socio demographic status, Past and current obstetric characteristics and Medical and behavioral characteristics.

Data collection tools, procedure, and quality control

The questionnaire was initially prepared in English version by reviewing different related literature (5, 10-13). Then the questionnaire translated to Afan Oromo an area language and then translated back to English by language experts by maintaining consistency. The questionnaire includes Socio-demographic characteristics, historical and current obstetrical gynecological history, medical history, and behavioral factors. Medical and obstetric data that could not be accessed by interviews, such as gestational age, diagnosis of PPRM, urinary tract infections, STIs, and anemia were collected from patient medical

records and charts. In addition, each woman's MUAC was measured using nonelastic and non-stretchable MUAC tapes at the midpoint between the tips of her shoulder and elbow on her left arm. Data were collected through face-to-face interviews by using structured pretested questionnaires from women. The data collection was carried out by five trained degree holders' health care providers and supervised by 1 Master holder. Two-days training were given for the data collectors. The collected data were reviewed and checked for consistency, clarity; completeness, and accuracy throughout the data collection process.

DATA PROCESSING AND ANALYSIS

The collected data were entered into Epi data version 3.3.1 software after coding and checking the completeness and exported to statistical package for social science SPSS version 20 for analysis. Descriptive analysis using frequencies, means, percentage, and standard deviations were done and presented in text and tables. Logistic regression analyses adjusting for potential confounding factors were used to see the association between the preterm premature rupture of membrane and the explanatory variables which had a P-value less than 0.25. Finally, the strength of association was weighed using an odds ratio at 95% confidence interval and P-value < 0.05.

OPERATIONAL DEFINITIONS

- **Preterm Premature rupture of membrane (PPROM)**-Preterm premature rupture of membrane (PPROM) is defined as membrane rupture before the beginning of labor in pregnancies that are less than 37 weeks of gestation.
- **Preterm**-Preterm or premature birth describes neonates who are born too early.
- **PROM**-is rupture of fetal membranes at least an hour before the onset of labor
- **Preterm labor**- Labor occurring after 28 weeks of gestation but before 37 completed weeks of gestation.
- **Anemia:** A pregnant woman whose Hemoglobin level is <11 gm/dl.

ETHICAL CONSIDERATION

Ethical clearance has been obtained from the department of midwifery Ambo university research and community service coordinator. Letter of permission was sought from the West Shoa Zonal health department and from each health institution. Verbal consent was taken from the participants after the data collectors clarified the objectives of the study, processes, and their right to refuse not to participate at any time. Furthermore, the confidentiality of the study participants was assured.

DISSEMINATION OF THE RESULTS

The final result of the study was submitted to Ambo University College of medicine and health science, department of midwifery and for the AGH and AURH after it was completed and presented to the department of midwifery by hard copy and soft copy.

Results

A total of 391 selected pregnant women participated in the study. The mean age of respondents was 25.23 (SD + 4.05). The majority of the participants (95.2) were married and almost all (98.1%) were Oromo and 331(84.8%) respondents were in the age range of 20–30-years. The majority (41.9%), of the participants, were attended secondary school and above. Regarding the occupational status 102 (26.0%) women were governmental employers, 299(69.0%) participants' mid-upper arm circumference measurements were greater than or equal to 23 cm (Table 1).

Table 1

Socio-demographic Characteristics of the respondents on the prevalence of preterm premature rupture of membrane and its associated factors among pregnant women attending health facilities in West Shoa Zone, Ethiopia, 2020. (n = 391).

Variables		Frequency	(%)
Respondents Age (years)	< 20	33	8.4
	20–30	331	84.8
	31+	27	6.8
Marital Status	Single	8	1.9
	Married	372	95.2
	Divorced	9	2.3
	Widowed	2	0.6
Ethnicity	Oromo	383	98.1
	Amhara	2	0.6
	Others*	6	1.3
Religion	Orthodox	187	47.7
	Muslim	79	20.3
	Protestant	110	28.1
	Others**	15	3.9
Educational Status	No formal education	135	34.5
	Primary education	92	23.5
	Secondary and above	164	41.9
Occupational status	governmental employer	102	26.0
	self-employment	82	20.9
	Daily labor	98	25.0
	house wife	86	22
	Students	23	5.8
Monthly income	<= 1000.00	150	38.3
Others*-Tigre, SNNP.			
Others**- (wakefata and adventist)			

Variables		Frequency	(%)
	1001.00–3000.00	161	41.2
	3001.00+	80	20.5
MUAC	< 23	92	31.0
	≥ 23	299	69.0
Residence	Urban	246	62.9
	Rural	145	37.1
Others*-Tigre, SNNP.			
Others**- (wakefata and adventist)			

Reason for Admission of the participants.

Nearly one-fourth (108 (27.6%)) of respondents were admitted due to pre-eclampsia/eclampsia, 91 (23.2%) and 89(22.6%) of respondents were admitted for the indications of oligohydraminous and PPRM respectively (Fig. 1).

Past and current obstetric characteristics

The majority of the participants (45.8%) were Multigravida, regarding gestational age 319(81.6%) were between 34–36 weeks and nearly all of the respondents (97.4%) were had ANC follow up, 72(23.2%) respondents had the previous history of PROM and 68 (21.9%) had a past history of preterm delivery. From the selected participants 251 (64.2%) of the current presentation was cephalic, 63 (16.1%) have had urinary tract infection currently while 53(13.5%) have vaginal discharge (Table 2).

Table 2

Past and current obstetric characteristics of respondents on the prevalence of preterm premature rupture of membrane and its associated factors among pregnant women attending health facilities in West Shoa Zone, Ethiopia, 2020. (n = 391).

Variables		Frequency	(%)
Gravidity	Primigravida	145	37.1
	Multigravida	179	45.8
	Grand multigravida	67	17.1
Gestational age (in weeks)	29–33	72	18.4
	34–36	319	81.6
ANC follow-up	Yes	381	97.4
	No	10	2.6
History of previous PROM	Yes	91	23.2
	No	300	76.8
History of preterm birth	Yes	135	21.9
	No	92	78.1
Presentation	Cephalic	251	64.2
	Breech	129	32.9
	Shoulder	11	2.9
UTI current pregnancy	Yes	63	16.11
	No	328	83.88
Abnormal Vaginal discharge	Yes	53	13.5
	No	338	86.5
GDM	Yes	42	10.6
	No	349	89.4
PPROM	Yes	89	22.7
	No	302	77.3
Lifting heavy objects	Yes	8	2.6
	No	383	97.4
Falling in accident	Yes	5	1.0

Variables		Frequency	(%)
	No	386	99.0
Anemia	Yes	19	4.8
	No	372	95.1

Risk Factors of PPRM

Gravidity, preeclampsia, current urinary tract infection, history of previous preterm premature rupture of membrane, economic status, and being anemic are significantly associated with preterm premature rupture of membrane. Being Grand multigravida predisposes for PPRM is nearly five times more likely than Primigravida (AOR = 5.30, 95% (CI: 2.07, 13.52). Furthermore, women who had Preeclampsia were three times and those who have a history of Previous PROM two times more likely to develop PPRM than those who do not have respectively (AOR = 3.2, 95% (CI: 1.47–7.04) (AOR = 2.31 (95% (CI: 1.02–6.27). A woman whose economic status was less than one thousand Ethiopian birrs was two times more likely to develop PPRM than those who earn more than three thousand Ethiopian birrs (AOR = 2.14, 95% (CI: 0.89–5.41). Women who had anemia were nearly two times more likely to develop PPRM as compared to those who are not (AOR = 1.85, 95% (CI: 0.65–4.56) (Table 3).

Table 3

Bivariate and multivariable association of respondents on prevalence of preterm premature rupture of membrane and its associated factors among pregnant women attending health facilities in west Shoa Zone, Ethiopia, 2020. (n = 391).

Preterm PROM					
Variables		Yes	No	COR	AOR
Gravidity	Primigravida	30(20.7%)	115(79.3%)	6.05(3.01–14.02)	5.3(2.07–13.52)*
	Multigravida	41(23%)	138(77%)	1.41 (0.59–2.87)	1.78 (1.64–5.92)
	Grand multigravida	18(26.8%)	49(73.1%)	1	1
economic status	<= 1000.00	28(18.7%)	122(81.3%)	1	1
	1001.00–3000.00	38(23.6%)	123(76.3%)	1.02 (0.48–3.36)	1.27 (0.62–3.74)
	3001.00+	24(30%)	56(70%)	1.87 (0.60–3.90)	2.14(0.89–5.41)*
Gestational DM	Yes	21(50%)	21(50%)	0.26(0.10–0.69)	0.2(0.69 – 0.57)
	No	77(22.5%)	272(77.5%)	1	1
Preeclampsia	Yes	13(12.03%)	95(87.9%)	2.83(1.41–5.69)	3.2(1.47–7.04)
	No	59(27.3%)	157(72.7%)	1	1
Previous PROM	Yes	34(37.5%)	57(62.5)	2.53 (1.25–5.78)	2.31(1.02–6.27)*
	No	54(18.0%)	246(82%)	1	1
Current UTI	Yes	24(38%)	39(62%)	3.04 (1.43–5.23)	2.62 (1.32–5.19)*
	No	64(19.6%)	264(80.4%)	1	1
Lifting heavy objects	Yes	25(58.8%)	18(41.2%)	0.15(0.73 – 0.32)	0.76(0.03–0.18)
	No	63(18.1%)	285(81.9%)	1	1
Anemia	Yes	10(52.6%)	9(47.4)	2.08 (0.65–5.65)	1.85(0.65–4.56)*
	No	79(25.1)	293(74.9%)	1	1
*p value < 0.05					

Discussion

The prevalence of preterm premature rupture of membrane (PPROM) in this study was found to be 22.6%. This finding was higher than the studies conducted in, tertiary care center in India (2.01%), the Rio Grande in Brazil (3.1%), in China (19.2%), Kampala International University teaching hospital in Uganda (7.5%) and Debre Tabor (13.67%) (4, 5, 7, 9, 11). The difference might be due to reduced standard quality of health care, low economic status, and social life in developing countries. Since the sample of this study was from high-risk populations/admitted pregnant woman rather than those who are in the community this may also increase the magnitude of PPRM. Women with preeclampsia were three times more likely to develop PPRM than those who did not have preeclampsia. This finding is also supported by some studies conducted in Uganda, Lithuania, and China (9, 28, 29). In preeclampsia, reactive oxygen species which are generated by oxidative stress, and some pathological conditions that develop during pregnancy and are related to hypoxic stress can affect the elevation of S100B(Anti-S100 beta antibody) concentration in the amnion and alter production and/or clearance of prolactin from the maternal compartment that can bring premature rupture of membrane (30–32). Urinary tract infection was another factor associated with the development of PPRM. Pregnant women with a history of UTI in pregnancy were two times more likely to get PPRM than those who did not have UTI. This finding was consistent with the study performed by Singh et al and dagne et al. (2, 11). This might be Elevations of inflammatory mediators such as prostaglandins, cytokines, and proteinases in the local tissue play a causative role in the disruption of fetal membrane integrity and in triggering uterine contractility. They are produced as a part of the physiologic maternal defense mechanism in response to pathogens' invasion. The inflammatory mediators and production of matrix-degrading enzymes and TNFs are involved in mechanisms of PPRM (33). In the current study, those women whose monthly income was less than one thousand Ethiopian Birr /or less than twenty dollars were two times more at risk of developing PROM than those who earn more than three thousand Ethiopian Birr/sixty dollars. A study conducted in Northern Ethiopia supplemented this finding (11). This might be due to less income results nutritional deficiency and the mother becoming undernourished. Nutritional deficiencies, particularly micronutrient deficiencies such as vitamin C or ascorbic acid, affect collagen formation and can weaken the body's ability to defend itself from degenerative processes caused by oxidative stress, which could lead to easy breakage of the membrane (30). In our study, having had anemia was also found to be a major risk factor. Pregnant women with anemia would be at risk of PROM nearly two times greater than non-anemic mothers. This is supported by the study done in Indonesia (34, 35). This may be justified by the fact that women with anemia are more likely to develop intra-amniotic and intrapartum infections, which may lead to PPRM.

Some limitations of this study were: The respondents might be prone to social desirability bias because some of the variables were based on self-reports. Finally, there might be a possibility of recall bias because women were asked about events that happened before the study.

Conclusion And Recommendation

The prevalence of preterm premature rupture of the membrane is high in the study area. To prevent PPROM, it is essential to check for modifiable factors during antenatal care and early screening, diagnosis, and treatments of preeclampsia and UTI are indicated to reduce PPROM.

Since this study was carried out in hospital-admitted pregnant women, we recommend large low-risk population-based studies in the study area as well as in the country as a whole to interpret differences between countries. To prevent PPROM, it is essential to check for modifiable factors during antenatal care and early screening, diagnosis, and treatments of preeclampsia and UTI are indicated to reduce PPROM.

Declarations

Ethics approval and consent for participation

Ethical review Committee (IRC) of Ambo University approved this study. Letter of permission was sought from West Shoa Zonal health department and from each health institution. Verbal consent was taken from the participants after the data collectors clarified the objectives of the study, processes and their right to refuse not to participate at any time. Furthermore, confidentiality of the study participants was assured.

Consent for publication

Not applicable.

Availability of data and materials

The datasets produced and/or analyzed during this study are not publicly available due to some privacy reasons but are available from the corresponding author on time of request.

Competing interests

The authors stated that they have no competing interests.

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Authors' contributions

RM; Formed and designed the study, control the data collection, analyze the data and develop the manuscript. GD, AB, and MM supervised the data collection, analyzed, edited the data and reviewed the manuscript. All authors read and agree on the final manuscript.

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Abbreviations

PPROM Preterm Premature Rupture of Membrane

UTI Urinary Tract Infection

MUAC Mid Upper Arm Circumference

STI Sexually transmitted Infection

PROM Premature Rupture of Membrane

IUFD Intra Uterine Fetal Death

IUGR Intra Uterine Growth Retardation

NRFHRP Non Reassuring Fetal Heart Rate Pattern

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Figures

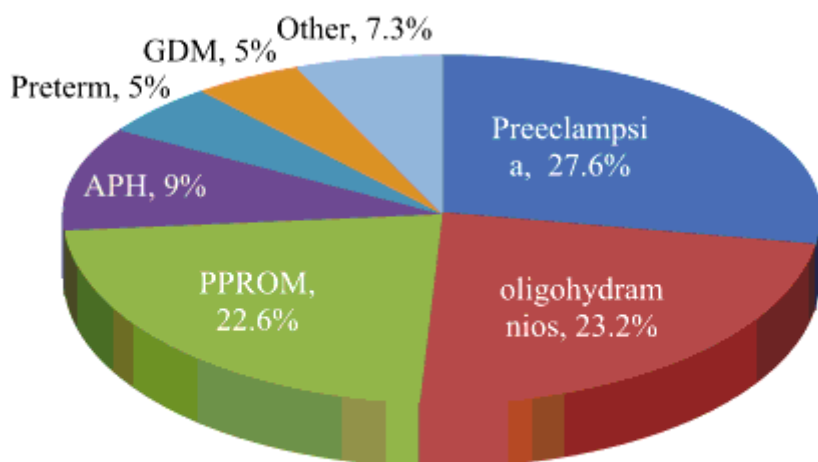


Figure 1

Reasons (indications of admission for pregnant woman in Ambo Hospitals, 2022. (n=391)

*Other: (IUFD, severe anemia, severe IUGR, NRFHRP)