

Determinants of prelabour rupture of membrane among pregnant women admitted to Hospitals in Wolaita zone, southern Ethiopia, 2022

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ABSTRACT

Introduction: Prelabour rupture of membrane refers to rupture of the membranes and leakage of amniotic fluid before the onset of true labor. It can lead to significant maternal, fetal, and neonatal complications. It complicates 8% to 10% of all pregnancies.

Objective: To identify the determinants of prelabour membrane rupture among pregnant women admitted to hospitals in the Wolaita zone in southern Ethiopia in 2022.

Methods and materials: A facility-based, unmatched case-control study was conducted at selected hospitals in Wolaita zone from 15 August to 20 October, 2022. Three consecutive controls were included in the study. The study population included all pregnant women admitted to the selected hospitals. The collected data were entered into Epi data version 4.6.0.2 and exported to the Statistical Package for Social Science (SPSS) version 25.0. Bivariable and multivariable logistic regression analyses were performed

Result: A total of 384 participants (96 cases and 288 participants) were included in this study. A history of abortion (AOR 3.21 [95% CI: 1.15–8.92]), history of prelabor rupture of membrane (AOR 3.76 [95% CI: 1.46–9.62]), history of caesarean delivery (AOR 3.57 [95% CI: 1.83–6.96]), history of invasive uterine procedures (AOR 6.23 [95% CI: 2.08–18.55]), history of chronic medical conditions (AOR 5.20 [95% CI: 1.18–23.02]), and history of ever using contraceptive methods (AOR 0.33 [95% CI: 0.19–0.58]) were significantly associated.

Conclusion: Health facilities should have well-managed recording systems, and patient-card stores. Focused ANC has contributed to the early detection and treatment of high-risk mothers. Health workers must update their scientific knowledge. Mothers should have encouraged to family planning utilization.

Keywords: Prelabor rupture of membrane, Wolaita Zone, Pregnant Women, Case Control

INTRODUCTION

Amniotic fluid is the liquid contained in the amniotic sac surrounding the fetus in the uterus. Its major benefits are that it protects the fetus by serving as a cushion for growth and fetal breathing until delivery [1, 2]. In the near term of pregnancy, weakening of the amniotic sac and physiological changes lead to the spontaneous rupture of the membrane. However, before the

beginning of labor, accidental rupture or idiopathic causes can lead to the prelabour rupture of membranes (PROM) [3, 4].

PROM refers to rupture of the fetal membranes or amniotic sac and leakage of amniotic fluid before the onset of true labor. It can be categorized as when membrane rupture occurs before the onset of regular contraction after completion of 37 weeks of gestational age and preterm PROM when it occurs before 37 weeks [3, 5].

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Globally, prevalence of PROM is approximately 1–4% of all pregnancies [6] and complicates 8% to 10% of all pregnancies [3]. Among all pregnancies, approximately one third of PROM occurs in preterm pregnancies, whereas two-thirds are pregnancies at term, from which 2% of fetal deaths due to perinatal and neonatal complications occur [5-8]. The prevalence of PROM in Ethiopia is approximately 9.2% and it is one of the major causes of neonatal death [9].

The burden of PROM can be individual, community, health facility, or country throughout the world. It can lead to morbidity, mortality and lifelong complications. Hence, PROM leads to major complications; most of the time, it is managed at the tertiary level in health institutions [3, 7, 9, 10]. At the individual level, PROM complicates the socioeconomic burden, such as financial expense for the course of treatment, wasting time due to hospitalization, stress and abstaining from work and social participation [3, 7, 11]. At the health facility level, challenges the management of complications through bed occupancy due, unavailability of medication and medical equipment, and inadequacy of health workers per patient ratio [12].

The rates of severity of complications are higher in settings such as low-income rather than high-income, rural rather than urban setting, illiterate rather than literate, and primigravida rather than multigravida pregnancies [7, 13]. It is associated with considerable increases in adverse maternal, fetal, and neonatal outcomes [3, 14]. Overall for women with PROM, more than 50% of patients may result in preterm pregnancies and 14% have major perinatal complications [3, 10]. Maternal complications related to PROM, such as infection and unnecessary caesarean section [15, 16]; uncommon but serious complications maternal death [3]. A large proportion of maternal complications are preventable with the provision of high-quality, evidence-based, and timely interventions without delay in care [17].

Several countries have developed strategies to prevent maternal and child morbidity and mortality. The World Health Organization (WHO) has adopted guidelines for PROM management and women giving birth too soon [18] and prenatal screening [19]. In Ethiopia, basic and comprehensive emergency obstetric and neonatal care (BEmONC and CEmONC) training is provided to health workers, management protocols, follow-up and capacity building, exempted maternal service, maternity waiting rooms, advanced health extension packages, and health information dissemination has been adopted [4, 9]. Therefore, this study aimed to identify the determinants of prelabour rupture of membranes among pregnant women admitted to hospitals in the Wolaita zone, southern Ethiopia, in 2022.

METHODS AND MATERIALS

Study area, Design and Period

This facility-based, unmatched case-control study was conducted in selected hospitals in the Wolaita zone from 15 August 15 to 20 October, 2022. Wolaita zone is one of 16 administrative zones in the Southern Nation, Nationalities, and People region of Ethiopia, bordered on the south by the Gamo and Gofa zones, on the west by the Omo river, which separates it from the Dawuro zone, on the northwest by the Kambata tambaro zone, on the north by the Hadiya zone, on the northeast by the Oromia region, on the southeast by Lake abaya, and on the east by Bilate river which separates it from the Sidama region. The administrative center of the Wolaita zone is Wolaita Sodo Town. The Wolaita zone covers

451,170.7 hectares with a population of 2,161,842, 1,090,217 of them being female. In total, 414,192 households were counted in a zone of approximately five members per household. Currently, there are 362 functional health posts, 69 health centers, and 12 hospitals (three non-governmental hospitals, eight governmental primary hospitals, and one comprehensive specialized hospital), and the average expected yearly pregnancy rate is 74,804 in the Wolaita zone. Nine hospitals were selected for the study: Wolaita Sodo University Comprehensive Specialized Hospital (WSUCSH), Bombe Primary Hospital, Bodit Primary Hospital, Bale Primary Hospital, Humbo Primary Hospital, Gasuba Primary Hospital, Halale Primary Hospital, Bitena Primary Hospital, and Dubo Primary Hospital. One of the primary hospitals was recently inaugurated after collecting data from Badessa Primary Hospital.

Study Populations

All pregnant women who visited the labor ward and were admitted to the obstetric ward of selected hospitals in the Wolaita zone for birth and pregnancy-related problems at 28 weeks of gestation.

For case: The study population included all pregnant women who visited the labor ward and were admitted to the obstetric ward of selected hospitals in Wolaita zone and presented with leakage of amniotic fluid or a confirmed diagnosis of prelabor rupture of the membrane above 28 weeks of gestational age during the study period.

For control: The study population included pregnant women who visited the labor ward, were admitted to the obstetric ward of hospitals in Wolaita zone, and presented with any diagnosis except confirmed PROM above 28 weeks of gestational age during the study period.

Eligibility Criteria

Inclusion criteria

For case: All pregnant women with clinically confirmed PROM above 28 weeks of gestational age who visited the labor ward and were admitted to the obstetric ward in the selected hospitals were included in the study.

For control: All pregnant women who visited the labor ward and were admitted to the obstetric ward in selected hospitals with no PROM and a gestational age of >28 weeks were included.

Exclusion criteria

Pregnant women who were mentally incompetent, seriously ill, had fetal death in the uterus, or were <28 weeks of gestational age during data collection were excluded from both cases and controls.

Sample Size Determination

Sample size was calculated using Epi Info version 7.2.0.1, with the assumption of 95% confidence interval and 80% power odds ratio (OR) = 3.46 control to case, a ratio of 3:1, and proportion of controls with a history of caesarean delivery, 4.9 %, which was taken from a study conducted in Gedeo zone [20]. The sufficiently large sample size with a 5% non-response rate was 388 (97 cases and 291 controls).

Sampling Technique and Sampling Procedure

Nine hospitals were selected based on the provision of exempted maternal delivery services for the community. Eight primary hospitals, namely Bombe, Dubbo, Bodit, Bale, Bitena, Halale,

Gasuba, and Humbo, and Wolaita Sodo University Comprehensive Specialized Hospital (WSUCSH), were selected. Consecutive sampling was then performed. From all pregnant women admitted to obstetric and visited labor wards, first a case was selected based on inclusion criteria, then three consecutive controls were selected, until the maximum sample size of the study was reached.

Study Variables

Dependent variable

Prelabor ruptures of membrane.

Independent variables

Maternal factors

Socio-economic characteristics: Age, address/residence, ethnicity, religion, marital status, occupation, education level, income, middle upper arm circumference (MUAC), alcohol intake, smoking habits, stress, and heavy weight.

Past obstetric history: Previous history of PROM, caesarean section delivery, type and number of abortions, preterm delivery, and contraceptive method.

Current pregnancy history: Gravidity, parity, inter-pregnancy interval, number of ANC follow-ups, gestational age, last normal menstrual period (LNMP), hemoglobin level, polyhydramnios, vaginal bleeding, passage of liquor, amniocentesis, sexual intercourse, cervical length, and preeclampsia.

Medical history: Chronic medical illness (diabetes mellitus (DM), hypertension, asthma, heart disease, HIV/AIDS, collagen vascular disease), acute medical illness (acute fever, acute respiratory syndrome, anemia, malaria, and abdomen), trauma, chronic steroid therapy, illicit drug use, treatment course, and treatment course.

Fetal factors: Fetal weight or macrosomia, multiple fetuses, fetal malposition, or presentation.

Utero-placental: Uterine anomaly, abruption placenta, cervical incompetence, previous cervical conization, invasive uterine procedure (manual vacuum aspiration, evacuation and curettage, myomectomy, endometrial ablation, polyp removal, and cervical cerclage amniocentesis).

Operational definitions

Prelabor rupture of membrane: Rupture of fetal membrane and leakage of amniotic fluid or collection of fluid through vaginal fornix examined by speculum categorized before onset of true labor after 28 weeks of gestational age.

Invasive uterine procedure: Common gynecological procedures or surgeries, such as myomectomy, polyp removal, ovarian cyst removal, instrumental delivery, cervical cerclage, amniocentesis, endometrial ablation, manual vacuum aspiration, evacuation, and curettage.

Data collection tool and Procedure

The interview questionnaire was adapted after reviewing the relevant literature. The questionnaire contained variables related to sociodemographic characteristics, previous and present obstetric history, utero-placental factors, maternal factors, and fetal-related factors. Data were collected through face-to-face interviews using a pretested questionnaire with 10 BSc midwives at nine hospitals under close supervision of the assigned supervisors (one obstetrics

and gynecology resident and two general practitioners) and the principal investigator during the data collection period. In addition, the MUAC of each woman was measured at the midpoint between the tips of the shoulder and elbow.

Data Quality Assurance

Before data collection, a pretest was conducted at Shone Primary Hospital, Ethiopia. Five percent of the total sample size (five cases and 15 controls) were collected and checked for the questionnaire's consistency and reliability. Accordingly, the modified errors have been corrected. To obtain good quality data, training was provided to data collectors, and day-to-day activities were followed during data collection. A sample cross-checkup of the collected data with the patient's card was performed by the principal investigator to confirm data trustworthiness.

Data Processing and Analysis

The collected data were coded, cleaned, entered into Epi data version 4.6.02, and exported to the Statistical Package for Social Science (SPSS) version 25.0. Descriptive statistics and proportions were used to describe data. Bivariable and multivariable logistic regression analyses were performed to determine the association between the outcome and explanatory variables. Variables that are found statistically significant in the bivariable analysis (≤ 0.25) were entered into a multivariable logistic regression model. Finally, multivariable logistic regression analysis was done to identify factors that determine the PROM. The occurrence of multicollinearity was checked for the final model. There is no collinearity among candidate variables. An effort was made to assess whether the necessary assumptions for the application of multivariable logistic regression were fulfilled. In this regard, the Hosmer and Lemeshow's goodness-of-fit test with a large χ^2 value (≥ 0.05) was checked to see good model fitness (P value 0.94). Only variables with $\chi^2 < 0.05$ were reserved in the final model. Odds ratio along with 95% confidence interval (CI) was used to assess the association between explanatory variables and PROM. A P value < 0.05 was considered statistically significant and determinant of PROM in this study.

RESULT

Socio-demographic status of participant

From a total of 388, 384 participants (96 cases and 288 controls) participated, with a non-response rate of 1%. From a total of 384 study participants, 129 (33.59%) were categorized in the 20–24 age group, of whom 37 (9.64%) and 92 (23.96%) were cases and controls, respectively. The minimum age of the participants was 18 years and the maximum age was 36 years. The mean age was 24.4 (± 4.3 SD) and 25.2 (± 4.7 SD) years for case and control, respectively. For ethnicity, 56 (58.33%) out of the cases and 187 (48.20%) out of the controls were from Wolaita, followed by Amhara. About 59 (61.45%) out of cases and 205 (71.18%) out of controls resided in rural areas, 37 (38.54%) from the cases and 83 (28.82%) from the controls resided in urban areas.

According to religion, 46 (47.92%) out of the total cases and 174 (60.42%) out of the total controls were protestant, followed by 35 (36.46%) of the total cases and 84 (29.17%) from the total controls were orthodox followers [Table 1].

Regarding education, 28 (29.17%) of the total cases and 102 (35.42%) from the total controls were at the primary level of education, while 26 (27.08%) of the total cases and 51 (17.71%) of

Table 1: Socio demographic characteristics of pregnant mothers who admitted hospitals of Wolaita Zone, 2022.

Variable	Category	Case(n=96)	Control(n=288)	Total(384)%
Age in years	≤ 19	12 (12.5)	44 (15.28)	56 (14.58)
	20-24	37 (38.54)	92 (31.94)	129 (33.59)
	25-29	32 (33.33)	102 (35.42)	134 (34.89)
	30-34	14 (14.58)	43 (14.93)	57 (14.84)
	35-39	1 (1.04)	7 (2.43)	8 (2.08)
Ethnicity	Wolaita	56 (58.33)	187 (64.93)	243(63.28)
	Kambata	7 (7.29)	29 (10.07)	36(9.37)
	Gofa	5 (5.21)	16 (5.55)	21(5.47)
	Sidama	3 (3.12)	8 (2.77)	11(2.86)
	Hadiya	5 (5.21)	15 (5.21)	20(5.21)
	Amhara	12 (12.5)	20 (6.94)	32(8.33)
	Gurage	4 (4.17)	8 (2.77)	12(3.12)
	Oromo	4 (4.17)	5 (1.74)	9(2.34)
Residence	Urban	37 (38.54)	83 (28.82)	120(31.25)
	Rural	59(61.46)	205 (71.18)	264(68.75)
Religion	Protestant	46 (47.92)	174 (60.42)	220(57.29)
	Orthodox	35 (36.46)	84 (29.17)	119(39.99)
	Muslim	8 (8.33)	14 (4.86)	22(5.73)
	Catholic	3 (3.12)	11 (3.82)	14(3.64)
	Apostolic	4(4.17)	5 (1.74)	9(2.34)
Marital status	Married	95(98.96)	286(99.31)	381(99.22)
	Unmarried	1(1.04)	2(0.69)	3(0.78)
Educational level	No formal education	16 (4.17)	31 (8.07.0)	47(12.24)
	Reads and write	15 (3.90)	58 (15.1)	73(19.01)
	Primary level	28 (7.29)	102(26.56.0)	130(33.85)
	Secondary School	26 (6.77)	51 (13.28)	77(20.05)
	Diploma and above	11 (2.86)	46 (11.98)	57(14.84)
Occupation	House wife	42 (43.75)	113 (39.24)	155(40.36)
	Merchant	23 (23.96)	40 (13.89)	63(16.41)
	Employee	8 (8.33)	41 (14.24)	49(12.76)
	Farmer	1 (1.04)	47 (16.32)	48(12.50)
	Student	11 (11.46)	19 (6.60)	30(7.81)
	Daily laborer	11(11.46)	28 (7.29)	39(10.16)
Income monthly	≤ 1000 birr	33 (34.38)	22 (7.69)	55(14.32)
	1001-2000 birr	25 (26.04)	101 (35.42)	126(32.81)
	2001-3000 birr	19 (19.79)	100 (34.72)	119(30.99)
	3001-4000 birr	9 (9.38)	27 (9.38)	36(9.37)
	≥4001birr	10 (10.42)	38 (13.19)	48(12.50)
MUAC	≤ 23 cm	1 (1.04)	5 (1.74)	6(1.56)
	>23 cm	94 (97.92)	283 (98.26)	377(98.18)
BMI	< 18.5 kg/m ²	1 (1.04)	3 (1.04)	4(1.04)
	18.5-25 kg/m ²	95 (98.96)	278 (96.53)	373(97.13)
	≥25 kg/m ²	1 (1.04)	7 (2.43)	8(2.08)

the total control group completed high school. About 42 (43.75%) out of the cases and 113 (39.24%) out of the controls were housewives whereas 23 (23.96%) of the cases and 40 (13.89%) of the controls were merchants by their occupation. Concerning the income of the household, out of the total cases, 25 (26.04%) and out of the total control, 101 (35.07%) were from a family whose average monthly income was 1001–2000 birr. Nineteen (19.79%) out of the total cases and 100 (34.72%) out of the total controls had income levels of 2001 to 3000 birr [Table 1].

Bivariate analysis of factors associated with PROM

In the bivariate analysis, pregnant mothers with a history of abortion, preterm labor and delivery, prelabor rupture of membranes, caesarean delivery, use of contraceptive methods, lifting heavy weight, hypertensive disorders during pregnancy, urinary tract infection, history of chronic conditions, and invasive uterine procedures were candidate variables ($p < 0.25$) in multivariate logistic regression [Table 2].

Multivariable analysis to identify determinant of PROM

All candidate variables that have an association ($p < 0.25$) with outcome variables in the bivariate analysis were entered into multivariable logistic regression. Among the variables entered into the multivariable regression analysis, six variables ($p < 0.05$) were found to be determinants of prelabor rupture of the membrane.

The odds of developing PROM was nearly 3 (AOR 3.21 [95% CI: 1.15–8.92]) times higher among mothers who had a history of abortion compared to mothers with no history of abortion. The odds of developing PROM was nearly 4 (AOR 3.76 [95% CI: 1.46–9.62]) times higher among mothers who had a history of PROM compared to mothers with no history of PROM. Pregnant mothers with a history of

previous caesarean delivery were approximately 3.6 (AOR 3.57 [95% CI: 1.83–6.96]) times more likely to develop PROM than pregnant women without a history of caesarean delivery. Pregnant mothers with a history of invasive uterine procedures were approximately 6 (AOR 6.23 [95% CI: 2.08–18.55]) times more likely to develop PROM than pregnant women without a history of invasive uterine procedures. The odds of developing PROM was nearly 5 (AOR 5.20 [95% CI: 1.18–23.02]) times higher among mothers who had a history of chronic medical conditions compared to mothers without a history of chronic medical problems. In this study, pregnant mothers who had ever used contraceptive methods were 67% (AOR 0.33 [95% CI: 0.19–0.58]) less likely to develop PROM compared to mothers who had never used contraceptive methods [Table 3].

Table 2: Binary logistic regression analysis of factors associated with PROM among pregnant mothers who admitted hospitals of Wolaita Zone, 2022.

Variable	Category	Case	Control	COR [95% CI]	P value
History of abortion	Yes	12(12.50)	9(3.13)	4.43(1.80-10.87)	0.001
	No	84(87.50)	279(96.87)	1.00	
History of preterm labour	Yes	11(11.46)	10(3.47)	3.60(1.48-8.76)	0.005
	No	85(88.54)	278(96.53)	1.00	
History of PROM	Yes	13(13.54)	12(4.17)	3.60(1.58-8.19)	0.002
	No	83(86.46)	276(95.83)	1.00	
History of Cesarean delivery	Yes	29(20.21)	38(13.19)	2.85(1.64-4.95)	0.000
	No	67(69.79)	250(86.81)	1.00	
Ever used contraceptive method	Yes	54(56.25)	199(69.10)	0.57(0.36-0.92)	0.022
	No	42(43.75)	89(30.90)	1.00	
Chronic medical illness	Yes	5(5.21)	4(1.39)	3.90(1.03-14.83)	0.046
	No	91(94.79)	284(98.61)	1.00	
Invasive uterine procedure	Yes	11(11.46)	15(5.21)	2.35(1.04-5.32)	0.000
	No	85(88.54)	273(94.79)	1.00	
Lifting heavy weight	Yes	5(5.21)	4(1.39)	3.90(1.03-14.83)	0.039
	No	91(94.79)	284(98.61)	1.00	
Urinary tract infection	Yes	4(4.17)	2(0.69)	6.23(1.12-34.49)	0.037
	No	92(95.58)	286(99.31)	1.00	

Table 3: Multivariable logistic regression analysis determinant premature rupture of membrane among pregnant mothers who admitted hospitals of Wolaita Zone, 2022.

Variable	Category	Case%	Control%	COR(95% CI)	AOR(95% CI)	P value
History of abortion	Yes	12(12.50)	9(3.13)	4.43(1.80-10.87)	3.21(1.15-8.92)	0.026*
	No	84(87.50)	279(96.87)	1.00	1.00	
History of preterm labor	Yes	11(11.46)	10(3.47)	3.60(1.48-8.76)	2.51(0.86-7.36)	0.093
	No	85(88.54)	278(96.53)	1.00	1.00	
History of PROM	Yes	13(13.54)	12(4.17)	3.60(1.58-8.19)	3.76(1.46-9.62)	0.006**
	No	83(86.46)	276(95.83)	1.00	1.00	
History of CS delivery	Yes	29(20.21)	38(13.19)	2.85(1.64-4.95)	3.57(1.83-6.96)	0.000**
	No	67(69.79)	250(86.81)	1.00	1.00	
Ever used contraceptive method	Yes	54(56.25)	199(69.10)	0.57(0.36-0.92)	0.33(0.19-0.58)	0.000**
	No	42(43.75)	89(30.90)	1.00	1.00	
History of invasive uterine procedure	Yes	13(13.54)	7(2.43)	6.29(2.43-16.27)	6.23(2.08-18.55)	0.001**
	No	83(86.46)	281(97.57)	1.00	1.00	
Lifting Heavy weight during pregnancy	Yes	11(11.46)	15(5.21)	2.35(1.04-5.32)	2.46(0.98-6.12)	0.053
	No	85(88.54)	273(94.79)	1.00	1.00	
Chronic medical illness	Yes	5(5.21)	4(1.39)	3.90(1.03-14.83)	5.20(1.18-23.02)	0.03*
	No	91(94.79)	284(98.61)	1.00	1.00	
Urinary tract infection during pregnancy	Yes	4(4.17)	2(0.69)	6.23(1.12-34.49)	6.19(0.98-34.49)	0.053
	No	92(95.58)	286(99.31)	1.00	1.00	

DISCUSSION

PROM is categorized as one of the major causes of maternal and neonatal morbidities. Several risk factors for PROM have been hypothesized in studies conducted worldwide. In this study, the determinants of PROM were a history of abortion, prelabour rupture of the membrane, caesarean delivery, invasive uterine procedure, history of contraceptive use, and chronic medical conditions.

A history of abortion is showed that significant association with PROM. In this study, the odds of prelabour rupture of membrane among pregnant women who had history of abortion were nearly three times more likely as compared to those who had no history of abortion. This finding is consistent with studies conducted in the Guragie, Mekele, and Gedeo zones of Ethiopia [20-22] and is in line with other studies conducted in Brazil [23] and China [24]. However it is inconsistent with studies conducted in Wolkite, Ethiopia [25], and Canada [16]. This may occur most of the time after abortion, as the uterus increases apoptosis and decreases cell proliferation. In this case, it resulted in the weakening and rupture of the amniotic sac.

Pregnant mothers who have a history of PROM were nearly four times more likely to develop PROM than mothers who have no history of PROM. This study was supported by studies conducted in Guragie, Mekele, Gedeo, and Ambo, Ethiopia (20-22). This result was inconsistent with those conducted in Singapore [26] and Brazil [23].

This study revealed that pregnant mothers who had a history of caesarean delivery were approximately 3.6 times more likely than those who had no history of caesarean delivery to suffer from PROM. This finding is supported by the findings of case-control studies conducted in Gurage, Mekele City, and Gedio, Ethiopia [20-22]. However, this study contrasts with the studies conducted in Debretabor, Ambo, and Wolkite in Ethiopia [11, 25, 27]. One of the major complications of pregnancy after a previous caesarean delivery is uterine adhesion, which may affect the fetal membrane by weakening the implantation site of the embryo during index pregnancy and result in early ruptures of the amniotic sac.

Mothers who underwent invasive uterine procedures were approximately six times more likely to develop PROM than those with no history of invasive uterine procedures. However, this difference was not statistically significant. This might be due to the absence of consolidated variables for invasive uterine procedures in the study tools. Mothers who have previously undergone invasive uterine procedures and uterine surgery may develop Asherman's syndrome, and long-term uterine scarring leads to adhesion, resulting in inappropriate implantation rather than the fundus of the uterus and debilitating the fetal membrane.

Pregnant mothers with chronic medical illnesses were approximately five times more likely to develop PROM in their current pregnancy than pregnant mothers without chronic medical illnesses. This study incorporated chronic medical illnesses, such as diabetes mellitus, hypertension, asthma, and other diseases, which may lead to pathological or physiological changes during pregnancy. This variable was not used in a previous study in generalized terms with medical conditions, but rather with specific diseases. Poor maternal nutrition may lead to susceptibility to disease and untreated medical problems may lead to maternal physiological changes. Chronic and acute maternal infections incapacitate the amniotic sac and cause early rupture of the fetal membrane.

In this study, a mother who had ever used contraceptive methods experienced a 67% reduction of having a PROM compared to mothers who had never use contraceptive methods. This finding was statistically significant and may indicate the presence of protective factors. However, this difference was not statistically significant. The presence of a statistical association between the use of contraceptive methods indirectly or directly linked to PROM requires further study.

In this study, a previous history of preterm delivery, hypertensive disorder during pregnancy, wealth index, short pregnancy interval, smoking or alcohol intake, low or high BMI, and urinary tract infection were not significantly associated with PROM; however, other studies identified a risk factor in these for the occurrence of PROM.

CONCLUSION AND RECOMMENDATION

This study identified the determinant factors of prelabour membrane rupture in pregnant women. These patients had a history of abortion, PROM, caesarean section delivery, invasive uterine procedure, chronic medical illness, and a history of ever using contraceptive methods. Health facilities should be equipped with vital machines, investigations and well-managed recording systems, and patient-card stores. Focused ANC has contributed to the diagnosis of high-risk mothers. Early detection and treatment have increased the investigation and workup of obstetric complications to reduce the risk and maximize maternal wellbeing. Health workers must update their scientific knowledge and provide modernized evidence-based care for pregnant mothers. Mothers should have encouraged to family planning utilization.

ABBREVIATIONS

ANC- Antenatal Care

AOR- Adjusted Odd Ratio

APH- Antepartum hemorrhage

BMI- Body Mass Index

CI- Confidence Interval

CS- Caesarean Section

IVH- Inter ventricular Hemorrhage

MUAC- Mid Upper Arm Circumference

NGO- Non-Governmental Organization

PH- Primary Hospital

PROM- Prelabour Ruptures of Membrane

ETHICAL APPROVAL AND CONSENT TO PARTICIPATE

We declare that this paper is our original work and has never been presented at any university; we understand that plagiarism will not be tolerated and directly quoted material has been appropriately referenced. The Wolaita Sodo University College of Health Science and Medicine Institutional Review Board approved all the experimental protocols and issued ethical clearance with project number CHSM/ERC/01/14. A letter of permission and cooperation was received from the Wolaita Zone Health Department. Informed consent was obtained from all participants after the nature of the study was fully explained to them in their local languages. All methods were performed in accordance with the relevant guidelines and regulations.

CONSENT FOR PUBLICATION

Not Applicable

AVAILABILITY OF DATA AND MATERIALS

The datasets used in this study were obtained from the corresponding authors upon request.

COMPETING INTERESTS

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AUTHOR CONTRIBUTIONS

AA: Conceptualization, data curation, formal analysis, funding acquisition, investigation, methodology, software, supervision, validation, visualization, writing – original draft, writing – review, and editing.

TL: Conceptualization, data curation, formal analysis, methodology, software, supervision, writing, reviewing, and editing. **SK:** Methodology, writing – review, and editing.

GK: Data curation, investigation, resources, software, validation, writing review, and editing.

TG: Formal analysis, investigation, methodology, visualization, writing – original draft.

CT: Resources, supervision, writing the original draft, writing the review, and editing.

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REFERENCES

- Schoenwolf GC, Bleyl SB, Brauer PR, Francis-West PH. Larsen's human embryology E-book. Health Sci; 2020.
- Ladfors L ML EM, Fall O. Management of premature rupture of membrane at term guideline. 2016.
- Gabbe S, Niebyl JR, Simpson JL, Jauniaux ER, Driscoll DA, Berghella V, et al. Obstetrics: Normal and Problem Pregnancies: 1st South Asia Edn-E Book. Elsevier India; 2017.
- FMOH E. Management protocol on selected obstetrics topics for hospitals. 2020.
- Dc D. Textbook of obstetrics. 2018.
- Jena BH, Biks GA, Gete YK, Gelaye KA. Incidence of preterm premature rupture of membranes and its association with inter-pregnancy interval: a prospective cohort study. Scientific Reports. 2022;12(1):5714.
- Medina TM, Hill DA. Preterm premature rupture of membranes: diagnosis and management. Am Fam Physicia. 2006;73(4):659-64.
- Tasha MacDonald R KS. Management of prelabour rupture of Membranes at term, Clinical practice guideline association of ontario midwives. 2014.
- Tiruye G, Shiferaw K, Tura AK, Debella A, Musa A. Prevalence of premature rupture of membrane and its associated factors among pregnant women in Ethiopia: A systematic review and meta-analysis. SAGE open medicine. 2021;9:20503121211053912.
- American College of Obstetricians and Gynecologists. Premature rupture of membranes. Clinical management guidelines for obstetrician-gynecologists. ACOG practice bulletin no. 1. Int J Gynaecol Obstet. 2020.
- Addisu D, Melkie A, Biru S. Prevalence of preterm premature rupture of membrane and its associated factors among pregnant women admitted in Debre Tabor General Hospital, North West Ethiopia: institutional-based cross-sectional study. Obstet Gynecol Int. 2020.
- Simhan HN, Canavan TP. Preterm premature rupture of membranes: diagnosis, evaluation and management strategies. BJOG. 2005;112:32-7.
- Endale T, Fentahun N, Gemada D, Hussen MA. Maternal and fetal outcomes in term premature rupture of membrane. World J Emerg Med. 2016;7(2):147.
- Goldenberg RL, Culhane JF, Iams JD, Romero R. Epidemiology and causes of preterm birth. The lancet. 2008;371(9606):75-84.
- Norwitz ER, Zelop CM, Miller DA, Keefe DL, editors. Evidence-based obstetrics and gynecology. John Wiley & Sons; 2019.
- Mohan SS, Thippeveeranna C, Singh NN, Singh LR. Analysis of risk factors, maternal and fetal outcome of spontaneous preterm premature rupture of membranes: a cross sectional study. Int J Reprod Contracept Obstet Gynecol. 2017;6(9):3781-7.
- WHO U. Maternal mortality: Levels and trends 2000 to 2017. Geneva: World Health Organisation. 2019.
- Althabe FBZ BH, Chandra-Mouli V, Chou D, Costello A, Cousens S, Davidge R, et al. The global action report on preterm birth. WHO. 2012.
- James DK, Steer PJ, Weiner CP, Gonik B. High risk pregnancy e-book: Management options-expert consult. Elsevier Health Sciences; 2010.
- Enjamo M, Deribew A, Semagn S, Mareg M. Determinants of premature rupture of membrane (PROM) among pregnant women in Southern Ethiopia: a case-control study. Int J Womens Health. 2022;455-66.
- Assefa NE, Berhe H, Girma F, Berhe K, Berhe YZ, Gebreheat G, et al. Risk factors of premature rupture of membranes in public hospitals at Mekele city, Tigray, a case control study. BMC Pregnancy Childbirth. 2018;18(1):1-7.
- Habte A, Dessu S, Lukas K. Determinants of premature rupture of membranes among pregnant women admitted to public hospitals in Southern Ethiopia, 2020: A hospital-based case-control study. Int J Womens H. 2021:613-26.
- Hackenhaar AA, Albernaz EP, Fonseca T. Preterm premature rupture of the fetal membranes: association with sociodemographic factors and maternal genitourinary infections. Jornal de pediatria. 2014;90:197-202.
- Zhou Q, Zhang W, Xu H, Liang H, Ruan Y, Zhou S, Li X. Risk factors for preterm premature rupture of membranes in Chinese women from urban cities. Int J Gynecol Obstet. 2014;127(3):254-9.
- Argaw M, Mesfin Y, Geze S, Nuriye K, Tefera B, Embiale A, et al. Preterm Premature Ruptures of Membrane and Factors Associated among Pregnant Women Admitted in Wolkite Comprehensive Specialized Hospital, Gurage Zone, Southern Ethiopia. Infect Dis Obstet Gynecol. 2021.

26. Aris IM, Logan S, Lim C, Choolani M, Biswas A, Bhattacharya S. Preterm prelabour rupture of membranes: a retrospective cohort study of association with adverse outcome in subsequent pregnancy. *BJOG*. 2017;124(11):1698-707.
27. Gutema RM, Dina GD, Berhanu A, Erena MM. Prevalence of Preterm Premature Rupture of Membrane and Associated Factors Among Pregnant Women Admitted To Health Facilities in Ambotown, Ethiopia, 2021.