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Determinants of Prelabor Rupture of Membrane among Pregnant Women Admitted to Hospitals in Wolaita Zone, Southern Ethiopia, 2022

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Abstract

Introduction: Prelabor 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 morbidities, resulting in mortality and lifelong complications. It complicates 8% to 10% of all pregnancies.

Objective: To identify the determinants of prelabor 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 coded, cleaned, 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 to determine the association between the outcome and explanatory variables.

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: Advancing health technology contributes to the early detection, treatment, and workup of obstetric complications to reduce risk and maximize fetomaternal well-being. Women of reproductive age should be encouraged to use contraceptives.

Keywords: Prelabor Rupture of Membrane, Wolaita Zone, Pregnant Women, Case Control

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: Prelabor Ruptures of Membrane

1. 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; facilitates the exchange of nutrients, water, and biochemical products; protects against infection and trauma; maintains the temperature; and permits musculoskeletal development and fetal breathing until delivery [1,2]. Hence, 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 premature rupture of membranes (PROM). It is associated with the loss of preservative effects and developmental roles of the fetus, in utero, throughout life [1-3].

PROM refers to rupture of the fetal membranes or amniotic sac and leakage of amniotic fluid before the onset of true labor. It can occur at any gestational age beyond 28 weeks but before the onset of labor. PROM can be categorized as PROM 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. The rupture of fetal membranes more than 12 h before delivery is a prolonged PROM. Its management depends on gestational age of the pregnancy [3-5].

Globally, prevalence of PROM is approximately 1-4% of all pregnancies [6]. Its prevalence differs from country to country 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 burden, social or community burden, health facility burden, or country burden throughout the world. It can lead to significant maternal, fetal, and neonatal morbidity, resulting in mortality and lifelong complications [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, psychological burden such as stress and abstaining from work and social participation,

puerperal sepsis, chorioamnitis, and placental abruption [3,7,11]. At the health facility level, the outcome of PROM challenges the management of complications through the burden of bed occupancy due to the flow of cases, unavailability of medication and medical equipment, and inadequacy of health workers per patient ratio [12].

The severity of PROM depends on gestational age at membrane rupture and delivery time. 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. PROM is a leading cause of preterm delivery, with a third of all preterm births resulting from preterm PROM, followed by delivery of maternal indication. Spontaneous preterm labor accounts for 20–30%. Preterm birth related to PROM in black women or Africans is highly affected. Among the pregnant women presented with PROM resulting preterm delivery, about 70% of perinatal mortality throughout the world [3,14].

PROM sequences are rare and serious complications can lead to both maternal and neonatal deaths. Hence, PROM leads to major complications; most of the time, it is managed at the tertiary level in health institutions. Overall, for women with PROM, more than 50% of patients may result in preterm pregnancies and 14% have major perinatal complications. Fetal and neonatal complications of PROM include preterm delivery, respiratory distress syndrome (RDS), neonatal sepsis, umbilical cord prolapse, placental abruption, intra ventricular hemorrhage (IVH), necrotizing intercolitis and intra uterine fetal death (IUFD) [3,10]. Maternal complications related to PROM, such as chorioamnionitis, postpartum endometritis, postpartum hemorrhage, placental abruption, stillbirth with umbilical cord accidents, and caesarean delivery; uncommon but serious complications of PROM managed conservatively near the limit of viability include retained placenta and hemorrhage, requiring dilation and curettage, maternal sepsis, and maternal death [3,15,16].

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, particularly PROM-related deliveries and maternal and neonatal complications. The World Health Organization (WHO) has adopted guidelines for PROM management and women giving birth too soon. It aims to ensure the survival of preterm deliveries and their associated effects [18]. One major prevention protocol used in several countries worldwide is prenatal screening of vaginal bacteriology and treatment of women and partners, and cervical ultrasound assessment with fetal fibronectin or biochemical screening tests in women with a previous history of PROM [19].

In Ethiopia, several strategies, policies, and guidelines have been adopted to prevent and control maternal and child complications

or obstetric emergencies such as PROM, leading to morbidity and mortality. Interventions have been performed to decrease maternal and neonatal mortality related to PROM and its complications. Basic and comprehensive emergency obstetric and neonatal care (BEmONC and CEmONC) training is provided to health workers, follow-up and capacity building to health facilities, exempted maternal service has been provided, management protocols prepared at the facility level and national level, maternity waiting rooms, advanced health extension packages, and health information dissemination associated with role model kebeles has been adopted [4,9]. Therefore, this study aimed to identify the determinants of prelabor rupture of membranes among pregnant women admitted to hospitals in the Wolaita zone, southern Ethiopia, in 2022.

2. Methods and Materials

2.1. 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.

2.2. 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.

2.3. Eligibility Criteria
2.3.1. 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.

2.3.2. 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.

2.3.3. 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).

2.3.4. 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.

2.3.5. Study Variables
2.3.5.1. Dependent variable
Prelabor ruptures of membrane.
2.3.5.2. Independent variables
2.3.5.2.1. 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).

2.3.5.2.2. 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.

2.3.6. 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.

2.3.7. 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.

2.3.8. 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 ($p<0.25$) 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 p value ($p>0.05$) was checked to see good model fitness (P value 0.94). Only variables with $p < 0.05$ 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.

3. Result

3.1. 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 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).

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)

Table 1: Socio Demographic Characteristics of Pregnant Mothers Who Admitted Hospitals of Wolaita Zone, 2022

3.2. 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).

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 2: Binary Logistic Regression Analysis of Factors Associated With Prom among Pregnant Mothers Who Admitted Hospitals of Wolaita Zone, 2022

3.3. 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).

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	

Table 3: Multivariable Logistic Regression Analysis Determinant Premature Rupture of Membrane among Pregnant Mothers Who Admitted Hospitals of Wolaita Zone, 2022

4. 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, prelabor rupture of the membrane, caesarean delivery, invasive uterine procedure, history of contraceptive use, and chronic medical conditions.

In this study, pregnant mothers with a history of abortion were nearly three times more likely to develop PROM than were those without a history of abortion. This finding is consistent with studies conducted in the Guragie, Mekele, and Gedeo zones of Ethiopia and is in line with other studies conducted in Brazil and China [20-24]. However it is inconsistent with studies conducted in Wolkite, Ethiopia and Canada [16,25]. 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 developed PROM were nearly four times more likely to have a history of PROM than mothers were with 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 and Brazil [23,26].

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 Wolikite 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 di-

abetes 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.

5. Conclusion and Recommendation
This study identified the determinant factors of prelabor membrane rupture in pregnant women. These patients had a history of abortion, PROM, caesarean section delivery, invasive uterine procedure and uterine surgery, any medical condition, 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. Advances in health technology have contributed to the diagnosis of high-risk mothers. Health workers must update their scientific knowledge and provide modernized evidence-based care for pregnant mothers, especially for at-risk mothers. Early detection and treatment have increased the investigation and workup of obstetric complications to reduce the risk and maximize maternal wellbeing. Therefore, healthcare workers should encourage family planning.

Declaration
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.

Author Contributions
Adisu Ashiko: Conceptualization, data curation, formal analysis, funding acquisition, investigation, methodology, software, supervision, validation, visualization, writing – original draft, writing – review, and editing.
Temesgen Lera: Conceptualization, data curation, formal analysis, methodology, software, supervision, writing, reviewing, and editing.
Sintayehu Kussa: Methodology, writing – review, and editing.
Getu Kassaye: Data curation, investigation, resources, software, validation, writing review, and editing.
Temesgen Geta: Formal analysis, investigation, methodology, visualization, writing – original draft.
Cherinet Tilahun: Resources, supervision, writing the original draft, writing the review, and editing.

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