MAGNITUDE OF ADVERSE FETAL OUTCOMES AND ASSOCIATED FACTORS AMONG WOMEN WITH PREMATURE RUPTURE OF MEMBRANE WHO GAVE BIRTH AT PUBLIC HOSPITALS IN HARARI REGION, EASTERN ETHIOPIA

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Magnitude of Adverse Fetal Outcome and Associated Factors among Women with Premature Rupture of Membrane Who Gave Birth at Public Hospitals in Harari Region, Eastern Ethiopia

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In Partial Fulfillment of the Requirements for the Degree of

MASTERS OF SCIENCE IN MATERNITY AND NEONATAL NURSING.

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APPROVAL SHEET

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I hereby certify that I have read and evaluated this Thesis entitled **"Magnitude of adverse fetal outcome and its associated factors among women with premature rupture of membrane who gave birth at public hospital in Harari Region, Eastern Ethiopia"** prepared under my guidance by Naol Oda. I recommend that it can be submitted as fulfilling the thesis requirement.

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As a member of the board of examiners of the MSc Thesis Open Defense examination, I certify that I have read and evaluated the Thesis prepared by Naol Oda and examined the candidate. I recommend that the thesis should be accepted as fulfilling the Thesis requirement for the degree of Masters of Science in Maternity and Neonatal Nursing.

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BIOGRAPHICAL SKETCH

I was born in 1997 G.C in Meta Wolkite, West Shewa. I attended my primary education at Goro Primary School and Secondary school at Meta Kumute School. I completed my Preparatory school at Awash Melka School. After completing my Preparatory School, I joined Haramaya University in the year 2017 G.C. At Haramaya University I studied Midwifery and got my first BSC degree on March 2021 G.C. I was serving as an assistant lecturer at Haramaya university since 2022 G.C.

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LIST OF ACRONYMS AND ABBREVIATIONS

AOR ----------Adjusted Odd Ratio

APGAR----------Appearance, Pulse, Grimace, Activity, Respiration

CI----------Confidence Interval

COR----------Crude Odd Ratio

C/S----------Cesarean Section

EONS ----------Early Onset Neonatal Sepsis

GA----------Gestational Age

IMNCI----------Integrated Management of Newborn and Childhood Illness

LBW ----------Low Birth Weight

LRTI----------Lower Respiratory Tract Infection

MAS----------Meconium Aspiration Syndrome

NEC----------Necrotizing Enterocolitis

NICU---------- Neonatal Intensive Care Unit

PNA----------Prenatal Asphyxia

PPROM----------Preterm Premature Rupture of Membrane

PROM----------Premature Rupture of Membranes

RDS----------Respiratory Distress Syndrome

UNICEF----------United Nations International Children's Emergency Fund

UTI----------Urinary Tract Infection

WHO----------World Health Organization

ABSTRACT

Background: Premature rupture of membranes is a common occurrence in many pregnancies, resulting in adverse fetal outcomes that range from mild to irreversible long-term neonatal complications and even death. However, there is a lack of information concerning adverse fetal outcomes among women who have experienced premature rupture of membranes in the study area.

Objective: This study aimed to identify the magnitude of adverse fetal outcomes and the factors associated with premature rupture of the membrane among women who gave birth at public hospitals in Harari Region, Eastern Ethiopia, from January 1, 2021, to December 31, 2023.

Methods: A hospital-based cross-sectional study design was conducted from September 1 to 15, 2024. A simple random sampling technique was employed to select 421 charts of women diagnosed with premature rupture of membranes who gave birth at public hospitals in the Harari region. Data were collected using a data extraction checklist through Kobo Toolbox software. The collected data were exported and analyzed using Stata version 17. Descriptive analyses included percentages, frequency distributions, and measures of central tendency like the mean. A binary logistic regression model was then utilized to determine the association between independent and dependent variables. Adjusted odds ratios with 95% confidence intervals were used to measure the strength of the association. A P-value of ≤ 0.05 was used to declare statistical significance.

Results: The magnitude of adverse fetal outcomes among women who experienced premature rupture of membranes was 35.9% [95% CI, 31.3 to 40.7]. Factors significantly associated with adverse fetal outcomes included being rural residents [AOR=1.96, 95% CI (1.14-3.36)], preterm birth [AOR=6.48, 95% CI (3.45-12.15)], anemia during pregnancy [AOR=2.9, 95% CI (1.69-4.96)], and a history of adverse fetal outcomes [AOR=4.55, 95% CI (2.40-8.65)].

Conclusion: The magnitude of adverse fetal outcomes in this study was significant. Rural residents, preterm birth, anemia, and a history of adverse fetal outcomes were significantly associated with these outcomes. The findings highlighted improvements in maternal healthcare access, especially in rural areas, early detection of anemia and iron supplementation, and the optimization of preconception care for mothers with a history of adverse fetal outcomes.

Keywords: Premature rupture of membranes, Magnitude, Adverse fetal outcomes, Associated factors, Ethiopia

1. INTRODUCTION

1.1. Background

Adverse fetal outcome is a multifactorial outcome that most commonly comprises preterm birth, low birth weight, stillbirth, congenital anomaly, and infant or neonatal death. (Abebe et al., 2022). They are measures of fetal health at birth, and their prevalence has gradually decreased globally over the past 40 years. However, there is still a large gap between developing and developed countries (Blencowe et al., 2016, Alene et al., 2024). Premature rupture of the membrane increases adverse fetal outcome by four-fold and neonatal morbidity by three-fold (Gutema et al., 2022).

The high prevalence of neonatal mortality was seen in South Asia, West and Central Africa, and Sub-Saharan Africa. This high neonatal mortality rate showed that there was poor quality health care during the prenatal period in the given country causing the development of fetal hypothermia, RDS, and prenatal asphyxia (Ahmed et al., 2018). The prevalence of PROM was 16.27% and the perinatal mortality rate among PROM mothers was 101 per 1000 live births which suggests high adverse fetal outcomes among women who experienced PROM in Harar city, Ethiopia (Wolde et al., 2024).

Different approaches have been implemented to decrease the adverse fetal outcomes of PROM. A management protocol for selected obstetric cases was developed and the administration of prophylactic antibiotics for prolonged PROM (greater than 12 hours) and corticosteroid injection following PROM, especially for those that occurred before 34 weeks of gestation were implemented at all hospital levels to minimize adverse fetal outcomes of PROM (Wolde et al., 2024, Getnet et al., 2023).

Ethiopia has been setting different policies and programs to reach the neonatal health targets set in the sustainable goals of global development and the second national health sector's transformation plan. The strategies include: encouraging continuous maternal health care, Neonatal resuscitation, NICU, and community and facility-based IMNCI programs are currently executed in our country to decrease adverse fetal outcomes (Alene et al., 2024).

Ethiopia's maternal and newborn health policies, including the National Reproductive Health Strategies and Health Sector Transformation Plans (HSTP I & II), focus broadly on safe delivery and infection and infection prevention but lack specific guidelines for PROM-related fetal complications. This gaps suggests a need for more targeted strategies within these policies to effectively address PROM related adverse outcomes (Tiruye et al., 2021).

1.2. Statement of the Problem

WHO estimated overall fetal adverse outcomes at 15.5% (7% for most developed countries and 18.5% for developing countries). Globally, approximately 20% of still births, 33% of preterm births, 21% of early neonatal deaths, and 2% of congenital anomalies occur among PROM mothers (Okwaraji et al., 2024, Alene et al., 2024). According to a study in the American Journal of Obstetrics and Gynecology (2016), neonatal mortality in preterm PROM cases is about 10-20%, with the majority of deaths occurring due to complications related to prematurity and infection (Souza et al., 2016). Research conducted in India revealed 28% of neonates born to mothers with PROM experienced unfavorable outcomes (Pradeep, 2021). A study conducted in Egypt revealed 56.3% developed adverse fetal outcomes among PROM mothers (El-Mazzally and El-Mazzally, 2023). A study finding in the Amhara region showed that the prevalence of fetal adverse birth outcomes among all types of PROM mothers was around one-third of all the cases (Alene et al., 2024).

PROM is responsible for significant causes of adverse birth outcomes and is especially the leading contributor to the three leading causes of neonatal mortality, preterm birth (26%), intrapartum-related complications (30%), and sepsis (18%) in Ethiopia (Alene et al., 2024, Tiruye et al., 2021). PROM also leads to low birth weight, Low Apgar score after the first and fifth minutes, and signs of fetal distress (Liu et al., 2010). Premature membrane rupture is responsible for about one-third of preterm births and 13–60% of intra-amniotic infections or chorioamnionitis in pregnant women are attributed to PROM in Ethiopia. More than two-third of adverse perinatal outcomes occurred among PROM mothers in Hiwot Fana Comprehensive Specialized Hospital (Wolde et al., 2024).

The adverse fetal outcomes like stillbirth, preterm birth, low birth weight, neonatal death, sepsis, etc. have profound and multifaceted consequences. This can affect the physical, emotional, social, financial aspects of the lives of the parents, families, and even the health care system. It resulted in maternal complications like infections, hemorrhage and long term health issues related to adverse outcome. Long term health problems in survivors of preterm birth, or low birth weight, such as developmental delays, respiratory issues or cerebral palsy (Getnet et al., 2023).

There are several factors affecting adverse fetal outcomes among women with PROM. A previous study identified that later gestational age at PPROM was a protective for adverse fetal outcomes where as, gush type of PPROM, history of chorioamnionitis, and CS delivery were factors which increases odds of adverse fetal outcomes among women who gave birth with PROM (El-Mazzally and El-Mazzally, 2023) .

Length of labor, and inducing of labor, were also significant predictors of adverse birth outcomes among PROM mothers (Workineh et al., 2019). In addition, rural residents, UTI, anemia, previous history of adverse fetal outcomes, and less than two years inter-pregnancy interval were also significantly associated with fetal adverse birth outcome (Alene et al., 2024, Workineh et al., 2019). Gestational age at delivery less than 34 weeks had a higher risk of being born with a low APGAR score at the 5th minute and NICU admission was higher in women who failed to use steroids, had membrane ruptured, and delivered at 28-33+6 weeks (Abebe et al., 2022).

There are few inquiries done about adverse fetal outcomes among women who gave birth with PROM. In addition, adverse fetal outcomes like fetal distress was not included in previous studies. Most of the previous studies focused only on adverse fetal outcome among preterm PROM(Abebe et al., 2022). They also did not assess adverse fetal outcome during intra-uterine life focusing only on adverse birth outcome. Lastly, there is dearth of information regarding adverse fetal outcomes among women with PROM who gave birth in the study setting. Therefore, this study will further assess the magnitude and associated factors of adverse fetal outcomes among mothers with PROM who gave birth at a public hospital in the Harari region, Eastern Ethiopia.

1.3. Significance of the Study

The primary beneficiaries of the study will be all mothers with PROM and their fetuses to optimize better outcomes. It will also help healthcare providers particularly those who work at maternal and child health units, obstetrics wards, and labor and delivery rooms to provide quality care during labor, delivery, and immediate postpartum by identifying factors associated with adverse fetal outcomes among PROM mothers. The finding of this study will also provide information on the current magnitude of adverse fetal outcomes and related factors in the Harari region public hospitals and pattern information for future arranging and intercessions for health professionals and arrangement creators and it gives the modern and current perspective of the severity of the problems under study.

1.4. Objectives

1.4.1. General Objective

To assess the magnitude of adverse fetal outcomes and associated factors among women with premature rupture of membranes who gave birth at public hospitals in the Harari Region, Eastern Ethiopia, from September 1 to 15, 2024, and data will be reviewed from chart records from January 1, 2021, to December 31, 2023.

1.4.2. Specific Objectives

To determine the magnitude of adverse fetal outcomes among women diagnosed and admitted with any type of PROM

To identify factors associated with adverse fetal outcomes among women diagnosed and admitted with any type of PROM

2. LITERATURE REVIEW

2.1. Magnitude of Adverse Fetal Outcomes among Pregnant Women with PROM

According to a hospital-based observational, prospective study conducted in India, the magnitude of adverse fetal outcomes among women with PROM was seen in 31% of cases (Kasliwal et al., 2021). A retrospective audit hospital-based study done in the Department of Obstetrics and Gynecology and the Special Care Baby Unit of the Department of Pediatrics of a tertiary care hospital, Chamarajanagar showed that the majority of the neonates delivered from PROM mothers had birth asphyxia (55.4%) followed by neonatal septicemia (25.0%), convulsion (5.4%), congenital hydrocele (3.5%), umbilical cord sepsis (3.5%), and meconium aspiration syndrome (MAS), conjunctivitis, stillbirth with cord prolapse, and LRTI 1.8% each. 15.0% of the neonates had moderate-severe neonatal respiratory depression with Apgar <7 at the 5th minute. Low birth weight was reported in 16.5% of the neonates (Pradeep, 2021).

Neonatal intensive care unit admissions(14%), Respiratory distress syndrome(11%), and neonatal sepsis(2.6%) were adverse fetal outcomes according to a facility based cross-sectional study done in the Department of Obstetrics and Gynecology at Government Head Quarters Hospital, Cuddalore, Tamil Nadu, with a duration of 6 months (Poondru et al., 2021). A hospital based cross-sectional study conducted in Al-Azhar University Hospitals in Cairo, Egypt showed that the magnitude of adverse fetal outcomes among women who had PROM was 56.3% which includes fetal death(11.5%) and NICU admission(45.8%) (El-Mazzally and El-Mazzally, 2023).

A cross-sectional facility based study conducted in the Department of Obstetrics and Gynecology, Krishna Institute of Medical Sciences, Karad, Maharashtra, India suggested that stillbirth cases were seen in 7 percent of the patients. In comparison, the need for NICU was seen in 21 percent of the cases (Patel et al., 2022). A prospective hospital based study conducted in the Department of Obstetrics and Gynecology of Chalmeda Anand Rao Institute of Medical Sciences, Bommakal on clinical analysis of the PPROM on the magnitude of adverse fetal outcomes showed that 12 % perinatal deaths, 4% stillbirths, 10 % early neonatal deaths occurred (Mamatha et al., 2020).

A facility based cross-sectional study finding in the Amhara region showed that the magnitude of fetal adverse birth outcomes among all types of PROM mothers was 33.1% (Alene et al., 2024). A facility-based follow-up study done in Southern Ethiopia Public Hospitals showed that mothers with inter-pregnancy intervals of less than two years 46.67 % of them experienced adverse fetal birth outcome (Workineh et al., 2019). An institution based prospective dichotomous cohort study which was carried out at Jimma University Teaching Hospital (JUTH) on incidence, maternal and perinatal outcomes of clients with PROM cases showed that from all delivery neonatal morbidity occurred due to RDS (7.1%), NEC (2.2%), PNA (6.6%), MAS (14.4%), 5th minute APGAR score less than 7(16.4%), and neonatal death 4.3% and perinatal mortality rate were 93 in 1000 delivers(Diriba et al., 2017).

In another unmatched facility based prospective case-control study conducted at Addis Ababa University, College of Health Sciences, among 160 deliveries, the magnitude of neonates with low APGAR scores at the 5^{th} minute was 41(26%). Among 133 alive-born neonates 79(59%) were admitted to NICU and the most diagnosis at admission was EONS 55(41%) followed by RDS 40(30%), on the other hand, 19(12%) and 8(5%) of born neonates were died during antepartum and intrapartum respectively. The total fetal deaths before and during labor were 27(17%). The total perinatal mortality rate was 206 per 1000 births(Abebe et al., 2022).

A hospital based retrospective cross-sectional study conducted at Hiwot Fana Comprehensive Specialized University Hospital, Eastern Ethiopia revealed that from a total of 424 sample size, 69 of the women who experienced pre-labor rupture of membrane, 50 (72.5%) had adverse perinatal outcomes. Of all 69 neonates 17 (24.64%) were delivered with low birth weight and 20 (29%) of them were born preterm. The overall perinatal mortality rate was 10.1% or 101 per 1,000 live births (Wolde et al., 2024).

2.2. Factors Associated with Adverse Fetal Outcomes among Pregnant Women with PROM

2.2.1. Sociodemographic Factors

A study conducted in Al-Azhar University Hospitals in Cairo, Egypt showed that factors associated with poor fetal outcome on multivariate analysis was women employment among mothers delivered with PROM (El-Mazzally and El-Mazzally, 2023). A facility-based cross-sectional study conducted on PROM mothers who gave birth in the Amhara region also revealed that rural residents were significantly associated with fetal adverse birth outcome (Alene et al., 2024).

2.2.2. Health Service Utilization and Medical Factors

A facility-based cross-sectional study conducted in the Amhara region showed that a history of UTI, and anemia were significantly associated with fetal adverse birth outcomes among women who gave birth with PROM (Alene et al., 2024). Another facility-based follow-up study done in Southern Ethiopia public Hospitals revealed that lack of ANC follow-up was significantly associated with adverse fetal birth outcomes among PROM mothers delivered with interpregnancy intervals less than two years (Workineh et al., 2019).

2.2.3. Obstetrics and Gynecologic Factors

According a hospital based observational, prospective study conducted in India adverse fetal outcome was increased with longer duration between rupture of membrane to delivery. It was evidenced that when the duration of rupture of the membrane to delivery was greater than 20 hours, adverse neonatal outcomes were seen in 58.33 cases (Kasliwal et al., 2021). A study conducted in Al-Azhar University Hospitals in Cairo, Egypt showed that factors associated with poor fetal outcome on multivariate analysis were later gestational age at PPROM, history of chorioamnionitis, and CS delivery (El-Mazzally and El-Mazzally, 2023).

A facility-based follow-up study done in Southern Ethiopia public Hospitals showed that length of labor, inducing of labor, interpregnancy interval of less than two years, and cesarean section delivery on multiple logistic regression analysis were significant predictors of adverse birth outcomes among PROM mothers (Workineh et al., 2019).

A facility-based cross-sectional study conducted in the Amhara region revealed that a history of previous adverse birth outcomes and less than 2 years interpregnancy interval is significantly associated with adverse fetal birth outcomes among PROM cases (Alene et al., 2024). In another hospital based prospective cohort study conducted in Addis Ababa University, College of Health Sciences, on multivariate logistic regression analysis gestational age at delivery less than 34 weeks had a 7 times higher risk of being born with low APGAR score at the 5th minute. NICU admission was 8, 4, and 4 times higher in women who failed to use steroids, had membrane ruptured, and delivered at 28-33+6 weeks respectively. On the other hand, GA at membrane rupture in weeks less than 34 was found to have a 5 higher risk of developing early onset neonatal sepsis. Neonates born with low birth weight was 5 times higher than normal birth weight to be admitted to NICU (Abebe et al., 2022).

2.3. Conceptual Framework

After reviewing various literature on the magnitude of adverse fetal outcomes and associated factors among women delivered with PROM, the following framework is developed.

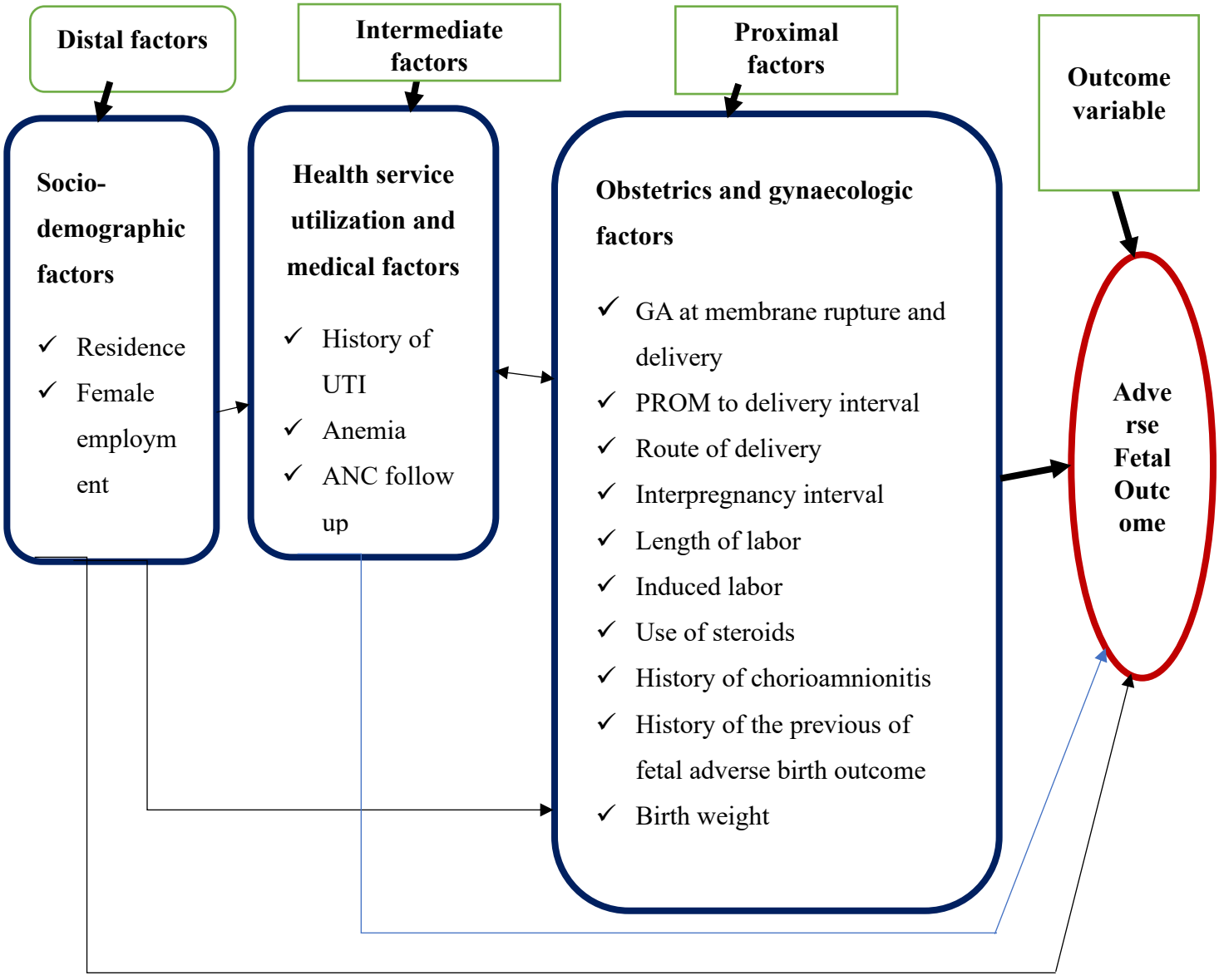

Figure 1:-Conceptual framework for the study to assess the magnitude of fetal adverse outcome and associated factors among women who delivered with PROM at Public hospitals in Harari region, Eastern Ethiopia, 2024.

Source: (Alene et al., 2024, Abebe et al., 2022, Kasliwal et al., 2021, Wolde et al., 2024, Workineh et al., 2019, El-Mazzally and El-Mazzally, 2023)

3. METHODOLOGY

3.1. Study Setting and Period

The study was conducted in two public hospitals found in Harari regional state, Ethiopia. Harar City is 526 kilometers away from Addis Ababa, the capital city of Ethiopia. The population of the Harari region was projected to be 283,000 with a 1:1 male-to-female ratio (CSA, 2023). These populations are currently being served by two public, two private, one police, and one non-government hospital in the region. In addition to those hospitals, there are 9 health centers, 29 private clinics, 26 health posts, and one regional laboratory to serve the community of the region (Cheru et al., 2024).

The two hospitals are Hiwot Fana Comprehensive Specialized Hospital (HFCSH) and Jugal General Hospital. HFCSH is a large teaching hospital with 210 beds and it is serving a major referral center for about 5.8 million population in eastern Ethiopia (Cheru et al., 2023). The Jugal General Hospital has 95 beds and it is serving population in the Harar town. Currently, a total of around 8800 pregnant women receive maternal health care in these hospitals (i.e., 5800 in Hiwot Fana Comprehensive Specialized University Hospital and 3000 in Jugal General Hospital). On average 958 of them had experienced PROM annually from the two public hospitals in Harari region. The study was conducted from September 1 to 15, 2024.

3.2. Study Design

A hospital-based cross-sectional study was conducted

3.3. Population

3.3.1. Source Population

All women diagnosed with premature rupture of membranes (PROM) and admitted to public hospitals in Harari Region, Eastern Ethiopia.

3.3.2. Study Population

Women who gave birth at two public hospitals in Harari (Hiwot Fana Comprehensive Specialized University Hospital and Jagula General Hospital) between January 1, 2021, and December 31, 2023.

3.4. Eligibility Criteria

3.4.1. Inclusion Criteria

Women diagnosed with any type of PROM (term or preterm) during pregnancy. Singleton or multiple pregnancies. Live births or stillbirths where the mother experienced PROM. Medical charts with complete records of maternal history, labor/delivery details, and fetal outcomes.

3.4.1. Exclusion Criteria

Charts missing critical variables (e.g., gestational age at PROM , fetal outcome details, or obstetric history). Women without a confirmed diagnosis of PROM. Pregnancies complicated by congenital anomalies or non-obstetric conditions (e.g., trauma, severe maternal illness unrelated to PROM).

3.5. Sample Size Determination

Sample Size Determination for the first Objective

The sample for the first objective was determined by a single population proportion

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

Where: n is sample size, Zα/2 at 95% Confidence level=1.96, d = is margin of error assumed to be 5%, =0.05.

P is assumed the prevalence of adverse fetal outcomes from PROM mothers is 46.67% according to a study conducted in Southern Ethiopia Public Hospitals (Workineh et al., 2019).

$$n = \frac{(1.96)^2 * 0.4667 * (0.5333)}{(0.05)^2} = 383$$

Sample Size Determination for the Second Objective

The sample size for the associated factors of adverse fetal outcome obtained from different literatures was calculated by Epi Info 7 menu StatCalc, by considering the following assumptions: confidence level 95%, power 80%, and exposed to an unexposed ratio of 1:1.

Table 1:-Sample size calculation for the associated factors of adverse fetal outcome among women delivered with PROM in Harari region public Hospitals, Eastern Ethiopia, 2024

Variable	Magnitude of adverse fetal outcome		Calculated sample size	Odds ratio	Reference
	Exposed	Non-exposed			
Residence	Rural (45%)	Urban (26.7%)	236	2.2	(Alene et al., 2024)
Birth weight (gm)	Low (41.1%)	Normal (22.1%)	208	2.5	(Abebe et al., 2022)
Duration of PROM	≥ 12 hours (22.4%)	<12Hours (5.9%)	164	11.5	(Endale et al., 2016a)
ANC follow up	No (50%)	Yes (30%)	206	2.3	(Kassahun et al., 2019)
Chorioamnionitis	Yes (50%)	No (23%)	112	3.3	(Abebe et al., 2022)

Finally, the sample sizes calculated for the first objective taken as a final sample are 383. By adding a 10% non-response rate the final sample size was **421.**

3.6. Sampling Procedure and Sampling Technique

Regarding to selection of hospitals, two public hospitals that are found in the Harari region was included. All medical charts of mothers diagnosed with premature rupture of membrane and gave birth between Jan 01, 2021, to Dec 31, 2023, was taken from the respective card's room of the hospital. The desired sample size from each Hospital was determined based on the size of PROM mothers delivered in the individual hospital using a proportionate allocation method. An individual study participant was selected using simple random sampling method. The sampling frame used were maternal records on which admission/discharge was registered.

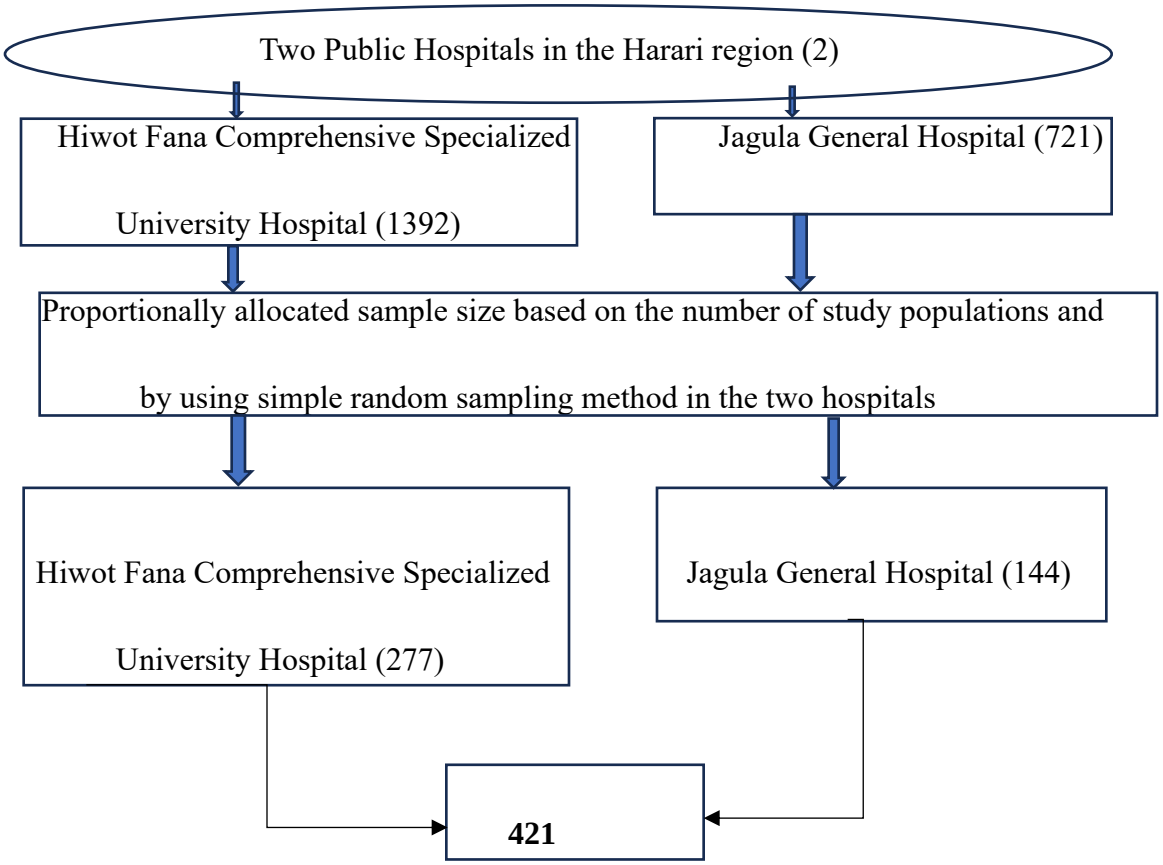

Figure 2:-Schematic presentation of sampling procedure to assess the magnitude of adverse fetal outcome and associated factors among women who delivered with PROM in the Harari region public hospitals, Eastern Ethiopia, 2024

3.7. Study Variables

3.7.1. Dependent Variables

Adverse fetal outcomes

3.7.2. Independent Variables

Socio-demographic factors: - Residence, Female employment

Health service utilization and medical characteristics of mother: - ANC follow-up, History of urinary tract infection, Anemia

Obstetrics factors:- History of the previous adverse fetal outcome, PROM to delivery interval, GA at membrane rupture and delivery, Length of labor, Induced labor, Inter-pregnancy interval, Route of delivery, Use of steroids, History of chorioamnionitis, Birth weight will be collected from medical charts as an independent variable.

3.8. Operational Definition

Adverse fetal outcomes- are when the mother with all types of premature rupture of the membrane had one or more of the following; stillbirth, preterm birth, low birth weight, early neontal death, congenital anomalies, birth asphyxia, and fetal distress(Alene et al., 2024, Wolde et al., 2024, Gedefaw et al., 2020).

Stillbirth- is the loss of fetus after 28 weeks of pregnancy, but before or during delivery (Alene et al., 2024).

Prematurity- Fetus born alive before 37 completed weeks of pregnancy (Wolde et al., 2024).

Low birth weight- neonates born with birth weight of less than 2500 g (Abebe et al., 2022).

Birth asphyxia- Newborn with Apgar score of less than 7 at birth (Workineh et al., 2019).

Length of labor:- Measured as how long the pregnant mother stays after initiation of labor to delivery, it was classified as < 24 hours and ≥ 24 hours (Workineh et al., 2019).

Interpregnancy interval:- How soon after a prior pregnancy a women becomes pregnant again measured in years as short (< 2 years) and long (≥ 2 years) (Workineh et al., 2019).

GA at membrane rupture and delivery:- Gestational age at which membrane rupture and delivery occurred which is measured in weeks and classified as between 28 and 36^{+6} weeks and 37 weeks and above (Abebe et al., 2022, Workineh et al., 2019).

3.9. Data Collection Method

3.9.1. Data Collection Tool

The data was collected using a data extraction checklist which is adapted by reviewing different literature(Alene et al., 2024, Workineh et al., 2019, Abebe et al., 2022, Wolde et al., 2024). The data extraction checklist consists of four parts: Socio-demographic variables, Health service utilization and medical history, Obstetric history, and Fetal outcomes.

3.9.2. Data Collectors

Four trained diploma midwives were collected data from patients' charts by using a data extraction checklist. The two BSc midwife supervisors were provided all items necessary for the data collection, check for completeness and consistency of all variables required, and solve problems during data collection.

3.9.3. Data Collection Procedures

The data collection checklist was conducted in the public hospitals. Charts of patients were reviewed by using a pre-tested data extraction checklist on Kobo toolbax. The maternal charts that fulfill the inclusion criteria was collected for an average of 30 minutes. On-site supervision was carried out during the whole period of data collection daily by the supervisor and principal investigator. Any uncertainty in the data collection procedure was handled by the principal investigator timely.

3.10. Data Quality Assurance

The data collection checklist was pre-tested on about 5% of the sample size in Haramaya General Hospital, (the area which is out of the study), to identify the missing variables on the checklist that are found in the clients' records, as well as to correct the misrepresenting variables in the checklist for the final data collection.

In addition, data collectors and supervisors were trained for one day on how to collect data from maternal charts and check for the completeness of all variables. During the data collection, the supervisor and the principal investigators were strictly followed the data collection process, providing corrective feedback to data collectors daily. After data collection, appropriate coding and handling of each data was done. Those charts that have incomplete information was managed by a random replacement mechanism.

3.11. Data Analysis

The collected data was coded and exported to Stata version 17 for analysis. Descriptive analyses such as percentages, frequency distribution, and measures of central tendency was conducted. Those outcomes with atleast one adverse outcomes was coded as 1 and no adverse outcomes 0. Then bivariate analysis between dependent and independent variables was performed using binary logistic regression. Finally, those variables showing association at a p-value less than 0.25 was considered in a multivariable binary logistic regression analysis to control possible confounding and to identify independent predictor variables of adverse fetal outcomes.

To declare statistical significance p-value ≤ 0.05 and a 95% confidence interval (CI) was used. Fulfillment of major assumptions of binary logistic regression was confirmed by multi co-linearity test. The multi co-linearity test was carried out to see the correlation between independent variables by using variable inflation factor (VIF). The mean VIF was 1.65. Finally, the results of bivariate and multivariable logistic regression analysis was presented in a crude and adjusted odds ratio respectively with 95% confidence intervals. The goodness of fit was checked by the Hosmer and Lemeshow model fit-test (P-value =0.9057).

3.12. Ethical Consideration

Before the commencement of data collection, ethical clearance, and approval official letter was written from the Institutional Health Research Ethical Review Committee (IHRERC) of the College of Health Medical Sciences, Haramaya University with Re.No. IHRERC/200/2024. In addition, an official letter was issued from the College of Health and Medical Sciences, Haramaya University to the director of each hospital. Informed, Voluntary, Written, and Signed consent was obtained from the Head of Hospitals. After obtaining consent from each Hospital administrator, the data collection was commenced. All information obtained from the participant's charts was kept confidential.

3.13. Dissemination Plan

The study's results was submitted to the Haramaya University, College of Health and Medical Sciences, School of Nursing to meet the requirements for the master's degree in Maternity and Neonatal Nursing. The study's findings will be distributed to the Harari Region health office and the decision-makers at various administrative levels of the area's health sector. Additionally, we will submit this thesis to national or international peer-reviewed publishers for publication purposes. This thesis will serve as a benchmark for other researchers working in this field.

4. RESULTS

4.1. Socio-Demographic Profile of the Participants

A total of 421 postpartum mothers who experienced all types of premature rupture of membranes participated in this study with 100% response rate. The mean age of the mothers was 26 years with a standard deviation of ± 5.5. Around one-third 128 (30.4%) of mothers were in the age groups of 20-24 years and teenage mothers were 56 (13.3%). More than half of the respondents 235 (55.82%) lived in rural setting.

Table 2. The socio-demographic characteristics of a mothers diagnosed with PROM at Harari region public hospitals from January 1, 2021 to December 31, 2023.

Variables	Categories	Frequency	Percent (%)
Maternal age	15-19	56	13.3
	20-24	128	30.4
	25-29	126	29.9
	30-34	75	17.8
	≥ 35	36	8.6
Residence	Urban	186	44.18
	Rural	235	55.82

4.2. Medical and Health Service Utilization Factors

According to the finding from this study most of the women 328 (77.91%) had at least one ANC follow up and 144 (43.9%) had less than 3 ANC contacts. 303 (72%) of mothers supplemented with iron and folic acid during the current pregnancy. Regarding the mothers' medical conditions, 156(37.05%) had anemia, 45 (10.69%) had a history of urinary tract infection, 6 (1.43%) had history of STI, 4 (0.95%) had HIV infection, 2 (0.48%) had history of known DM, 8 (1.9%) had history of hypertension in previous pregnancy. 312 (74.11%) of the mothers were administered with prophylactic antibiotics, while only 82 (19.48%) of mothers had steroids administration.

Table 3.Medical and health service utilization factors of mothers diagnosed with PROM at Harari region public hospitals from January 1, 2021 to December 31, 2023.

Variables	Categories	Frequency	Percent (%)
ANC follow up	Yes	328	77.91
	No	93	22.09
Number of ANC follow up	1-2 contacts	144	43.9
	3-4 contacts	135	41.16
	>4 contacts	49	14.94
Timing of 1st ANC contact	1st Trimester	68	20.73
	2nd Trimester	108	32.93
	3rd Trimester	152	46.34
Iron and folic acid supplementation	Yes	303	71.97
	No	118	28.03
HIV status	Reactive	4	0.95
	Non-reactive	417	99.05
UTI	Yes	45	10.69
	No	376	89.31
History of STI	Yes	6	1.43
	No	415	98.57
History of HTN	Yes	8	1.9
	No	413	98.1
Prophylactic antibiotics	Yes	312	74.11
	No	109	25.89
Steroids administration	Yes	82	19.48
	No	339	80.52
Anemia in pregnancy	Yes	156	37.05
	No	265	62.95

4.3. Obstetric Factors

Among the study participants 147 (34.92%) of them were primigravida mothers. Mothers who had history of adverse fetal outcomes were 109 (25.89%) and 91 (21.62%) of them had previous history of abortion. Regarding the current birth, 206 (48.9%) of mothers had optimal birth interval, 393 (93.35%) were cephalic presentation, 141(33.49%) had experienced preterm PROM, 102(24.23%) of them delivered preterm, 236 (56.06%) of mothers' labor started spontaneously, 8(1.9%) experienced chorioamnionitis in pregnancy, and majority of them 327 (77.67%) had spontaneous vaginal delivery. Lastly, 177 (42.04%) of mothers stayed minimum of 12 hours to reach hospitals and 180 (42.76%) of them stayed 24 hours or above to deliver after experienced rupture of membranes.

Table 4. The obstetrics factors of mothers diagnosed with PROM at Harari region public hospitals ffrom January 1, 2021 to December 31, 2023.

Variables	Categories	Frequency	Percent (%)
Gravidity	Primigravida	147	34.92
	Multigravida	184	43.7
	Grandmultipara	90	21.38
GA at membrane rupture	< 37 weeks	141	33.49
	≥ 37 weeks	280	66.51
GA at birth	< 37 weeks	102	24.23
	≥ 37 weeks	319	75.77
Interpregnancy interval	< 2 years	68	16.2
	≥ 2 years	206	48.9
History of adverse fetal outcomes	Yes	109	25.89
	No	312	74.11
History of abortion	Yes	91	21.62
	No	330	73.38
Onset of labor	Spontaneous	236	56.06
	Induced	185	43.94
Mode of delivery	SVD	327	77.67
	C/S	90	21.38
	Instrumental	4	0.95
Total duration to reach hospital after PROM occurred	< 12 hours	244	57.96
	≥ 12 hours	177	42.04
The total duration between PROM to delivery	< 24 hours	241	57.24
	≥ 24 hours	180	42.76

4.4. Magnitude of Adverse Fetal Outcome

This study findings showed that the magnitude of adverse fetal outcome among postpartum women who experienced all types of PROM was 35.9% [95% CI, 31.3-40.7]. Of which, 118 (28.03%) had low APGAR score at first minute, 69 (16.39%) of the outcomes were low birthweight, 102 (24.23%) were prematurity, 118 (28.03%) had birth asphyxia, 13 (3.09%) had visible congenital anomalies, 4 (0.95%) were stillbirth, 39 (9.26%) had experienced fetal distress, 8 (1.9%) had early neonatal sepsis, 40 (9.5%) were admitted to NICU, 6 (1.43%) were IUFD, 2 (0.48%) experienced immediate newborn death and 21 (4.99%) had low APGAR score at 5th minutes.

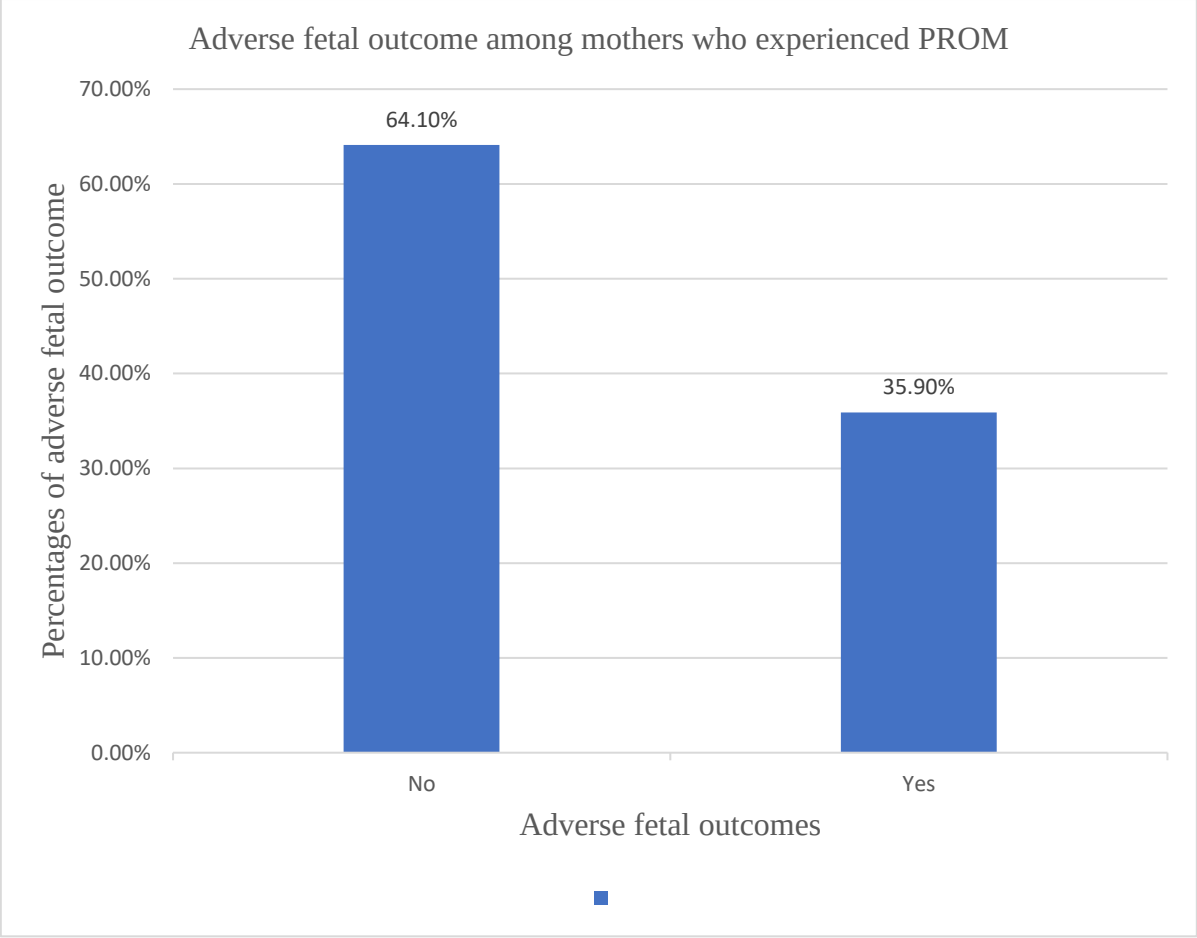

Figure 3: Bar graph showing magnitude of adverse fetal outcome among mothers diagnosed with PROM at Harari puplic hospitals from Jan 1, 2021 to Dec 31, 2023.

Table 5: fetal outcomes of mothers diagnosed with PROM at Harari region public hospitals from January 1, 2021 to December 31, 2023.

Variables	Categories	Frequency	Percent (%)
Low APGAR score at 1st minute	Yes	118	28.03
	No	303	71.97
Low birth weight	Yes	69	16.39
	No	352	83.61
Preterm birth	Yes	102	24.23
	No	319	75.77
Birth asphyxia	Yes	118	28.03
	No	303	71.97
Congenital anomalies	Yes	13	3.09
	No	408	96.91
Stillbirth	Yes	4	0.95
	No	417	99.05
IUFD	Yes	6	1.43
	No	415	98.57
Immediate newborn death	Yes	2	0.48
	No	419	99.52
Early neonatal sepsis	Yes	8	1.9
	No	413	98.1
Low APGAR score at 5th minutes	Yes	21	4.99
	No	400	95.01

4.5. Factors Associated with Adverse Fetal Outcomes

Bivariate analysis revealed place of residency, anemia status, history of previous adverse fetal outcomes, gravidity, duration of PROM to delivery interval, chorioamnionitis status, and gestational age at birth were considered for multi-variable analysis at a p value ≤ 0.25. Multi-variable analysis indicated place of residence, gestational age at delivery, anemia status, and history of previous adverse fetal outcomes were significantly associated with adverse fetal outcomes at p-value ≤ 0.05.

Multivariable logistic regression analysis showed that the odds of developing adverse fetal outcomes were 2 times higher among women who lived in rural settings than those women who lived in urban settings [AOR=1.96, 95% CI (1.14-3.36)].

Similarly, mothers who delivered before 37 completed weeks of gestations were 6 times higher odds of developing adverse fetal outcomes than those who delivered after 37 completed weeks of gestation [AOR=6.48, 95% CI (3.45-12.15)]. In addition to this, the odds of developing adverse fetal outcomes were 5 times higher among women who had a history of previous adverse fetal outcomes as compared to those who hadn't previous adverse fetal outcomes [AOR=4.55, 95% CI (2.40-8.65)]. Lastly, the odds of developing adverse fetal outcome were 3 times higher among anemic women than non- anemic women [AOR=2.9, 95% CI (1.69-4.96).

Table 6. Bivariate and multivariable binary logistic regression analysis of adverse fetal outcomes and its associated factors of mothers diagnosed with PROM at Harari region public hospitals from January 1, 2021 to December 31, 2023.

Variables		**Adverse fetal outcomes**		**COR (95% CI)**	**AOR (95% CI)**
		Yes	**No**		
Residency	Rural	101(43%)	134(57%)	2.05(1.35-3.10)	1.96(1.14-3.36)*
	Urban	50(26.9%)	136(73.1%)	1	1
Anemia	Yes	96(61.5%)	60(38.5%)	6.1(3.94-9.47)	2.9(1.69-4.96)*
	No	55(20.8%)	210(79.2%)	1	1
GA at birth	< 37 weeks	81(79.4%)	21(20.6%)	13.7(7.92-23.74)	6.48(3.45-12.15)*
	≥ 37 weeks	70(21.9%)	249(78.1%)	1	1
Previous history of adverse fetal outcome	Yes	80(73.4%)	29(26.6%)	9.36(5.67-15.45)	4.55(2.40-8.65)*
	No	71(22.8%)	241(77.2%)	1	1
Duration b/n membrane rupture and delivery	≥ 24 hours	87(48.3%)	93(51.7%)	2.58(1.71-3.89)	1.46(0.85-2.50)
	< 24 hours	64(26.6%)	177(73.4%)	1	1
Chorioamnionitis	Yes	7(87.5%)	1(12.5%)	13(1.59-107.3)	6.31(0.49-82.18)
	No	144(34.9%)	269(65.1%)	1	1
Gravida	Grandmultipara	50(55.6%)	40(44.4%)	2.45(1.45-4.28)	0.88(0.42-1.87)
	Multigravida	52(28.3%)	132(71.7%)	0.78(0.49-1.26)	0.6(0.33-1.11)
	Primigravida	49(33.3%)	98(66.7%)	1	1

* Significant at p-value ≤ 0.05, AOR=Adjusted odds ratio, COR=Crude odds ratio, CI=Confidence interval

5. DISCUSSION

The magnitude of adverse fetal outcomes found in this study was 35.9% [95% CI, 31.3-40.7]. Being rural residents, preterm delivery, anemia during pregnancy, and having previous history of adverse fetal outcomes were factors significantly associated with adverse fetal outcomes.

In this study the magnitude of adverse fetal outcomes among women admitted with PROM was 35.9%. This rate of adverse fetal outcomes in PROM cases is concerning and alarming that highlights the need for strategies to reduce this figure. This finding is in line with the study conducted in the Amhara region (33.1%) (Alene et al., 2024) and Mizan Aman General Hospital, Ethiopia (33.5%) (Endale et al., 2016b). This alignment likely stems from similarities in population characteristics, healthcare access, and the clinical approaches to managing of PROM across these settings. Moreover, the comparable study designs, data collection methods, and definitions of adverse fetal outcomes used in these studies further contribute to the observed consistency.

However, this study found a lower magnitude of adverse fetal outcomes (35.9%) compared to the study conducted in Egypt (56.3%) (El-Mazzally and El-Mazzally, 2023). This discrepancy can be attributed to variations in the study populations. The Egyptian study specifically focused on preterm PROM cases, which are known to carry a higher risk of adverse fetal outcomes due to the immaturity of the fetus and prolonged exposure to complications such as infection and prematurity. In contrast, the current study included all types of PROM, encompassing both term and preterm cases, which likely diluted the proportion of adverse outcomes as term PROM typically poses fewer risks for the fetus (Abebe et al., 2022, Sirak and Mesfin, 2014).

The magnitude of adverse fetal outcomes in this study is higher than the 25% reported in the study conducted in Germany (Hanke et al., 2015) and WHO overall adverse fetal outcomes target (15.5%) due to the current study focused on adverse fetal outcomes among PROM mothers which increases adverse outcomes by four-fold (Gutema et al., 2022). This might be due to variations in the healthcare systems, with Germany benefiting from advanced medical infrastructure, comprehensive prenatal care, and timely interventions for PROM. In contrast, the setting of the current study may face resource constraints, delays in healthcare access, and differing standards of care, all of which can increase the likelihood of adverse outcomes.

In the current study, rural residents exhibited higher odds of adverse fetal outcomes compared to urban residents. The finding from this study was supported by previous studies conducted in the Amhara region (Alene et al., 2024), overall in Ethiopia (Abdo et al., 2016). This might be delayed referral system, limited healthcare access, socioeconomic challenges, and inadequate infrastructure in rural settings (Alene et al., 2024). There is also a chance of exposure to agricultural pesticides and insecticides in rural areas, which increases adverse fetal outcomes, as evidenced by another study (Demelash Enyew et al., 2023, Larsen et al., 2017). This is due to when pesticides are inhaled or ingested by the mother it can cross the placenta easily since it is lipophilic causing placental tissue damage reducing uteroplacental blood flow and accumulating in fetal tissues which causes neurotoxicity (Kalliora et al., 2018).

On the other hand, a neonate born before 37 completed weeks is also significantly associated with adverse fetal outcomes as compared to their counterparts. This is supported by previous studies done in Addis Ababa (Abebe et al., 2022), Tikur Anbessa Specialized Teaching Hospital (Sirak and Mesfin, 2014). This might be in this study only 19.48% of mothers received steroids, far below WHO's 80% target for preterm PROM which leads to respiratory distress in preterm neonates. Preterm neonates often have immature lungs, brain, and digestive systems, making them more vulnerable to conditions, such as respiratory distress syndrome, hemorrhages in the brain, and feeding difficulties (Abraham and Rejiya, 2016).

This study found that maternal anemia is significantly associated with adverse fetal outcomes. Several studies from the Amhara region (Alene et al., 2024), Indonesia (Tchirikov et al., 2018), Bangladesh (Perveen et al., 2019), and Canada (Dars et al., 2014) also reported the same findings. This is because maternal anemia can be a risk factor for spontaneous preterm birth, low birth weight, neonatal anemia, and fetal hypoxia as anemia reduces oxygen-bearing capacity and its transportation to the placenta through spiral arteries to reach fetal circulation. On the other hand, maternal anemia exacerbates the risk of intra-amniotic infection due to compromised immunity, leading to adverse fetal outcomes like preterm birth and neonatal sepsis (Tandu-Umba and Mbangama, 2015).

The mothers with a previous history of adverse fetal outcomes were significantly associated with adverse fetal outcomes in the current study. This finding is in line with a study conducted in the Amhara region (Alene et al., 2024), Shire town of northern Ethiopia (Teklehaimanot et al., 2014), and Uganda (Dars et al., 2014). This is related to several interrelated biological, medical, and environmental factors like underlying maternal health conditions, placental dysfunction, recurrence of specific complications like preterm birth, intrauterine growth restriction, genetic and environmental factors, psychological and behavioral factors, etc, which increases adverse fetal outcomes in subsequent pregnancies.

5.1. Strength and Limitation of the Study

5.1.1. Strength of the study

The strength of this study is s that, since it is a record review included large number of cases over time and had 100% response rate. Since the study used existing hospital records, it assessed a wide variety of data without need for extensive fieldwork.

5.1.2. Limitation of the study

This study was conducted in Harari Public Hospitals, limiting the generalizability of the findings to other regions with different healthcare systems, practices, or population characteristics. The cross-sectional nature of the study only captures data at one point in time, which limits the ability to assess long-term outcomes or trends. Since the study relies on hospital records, it might be subjected to biases in documentation or underreporting of certain adverse fetal outcomes.

6. CONCLUSION AND RECOMMENDATION

6.1. Conclusion

The magnitude of adverse fetal outcomes in this study was found to be high compared to World Health Organization's report (15.5%). Rural residents, preterm birth, anemia, and having history of adverse fetal outcomes were significantly associated with adverse fetal outcomes. Therefore, these findings highlight the need of addressing these risk factors through targeted interventions, improving maternal healthcare access, screening, iron supplementation, optimization and preconception care for mothers who had history of adverse fetal outcomes are paramount to decrease adverse fetal outcomes.

6.2. Recommendation

For Harari Region and East Hararghe Health Bureau

Strengthen healthcare access in rural areas

Implement comprehensive maternal health programs including early screening for preterm birth risk factors and support hospitals in administering timely interventions

Address maternal anemia in settings

For Hiwot Fana Comprehensive Specialized Hospital and Jugal General Hospital

Enhance early detection and management of preterm birth

Address anemia in pregnant women

Improve preconception care for women with history of adverse fetal outcomes

For health professionals

Early screening and risk identification for risk factors such as anemia, preterm birth and previous adverse fetal outcomes

Counselling and education to women with history of adverse fetal outcomes

Develop specialized care for women with history of adverse fetal outcomes

For Researchers

Further research using primary data is recommended to assess some predictors variabales missed in secondary data such as; maternal occupation, dietary practice, smoking, khat use, alcohol intake, income and etc.

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8. ANNEXES

8.1. English Version Information Sheet and Voluntary Consent Form for Medical Directors of Harari Region Public Hospitals

My name is **Naol Oda**. My first degree was a BSc in Midwifery and currently, I am attending my MSC study in Maternity and Neonatal Nursing at Haramaya University. I am here to conduct a study in your hospital. I am conducting this study under Haramaya University, College of Health and Medical Science, for partial fulfillment of my Master of Science in Maternity and Neonatal Nursing. It will also have a paramount importance for your organization to know the problem under study and act accordingly. So, I kindly request you to give me time to explain the study's importance, ethical issues, and how the study will be conducted to you. First, I would like to thank you for your time and help.

Study Title

Magnitude of adverse fetal outcomes and associated factors among women with premature rupture of membrane who gave birth at public hospitals in Harari region, Eastern Ethiopia, 2024.

Purpose of the Study

The findings of this study can be of paramount importance for the Hospital to plan intervention programs to prevent adverse fetal outcomes among women with premature rupture of membranes and to take appropriate modification strategies to improve fetal health and survival in general. Besides this, this study aims to write a thesis as a partial fulfillment of a master's program in Maternity and Neonatal Nursing for me.

Study Procedure

Four diploma midwives and two supervisors will collect data from maternal charts who are delivered in your hospital with premature rupture of membranes. The data collection will be held using a checklist that contains 43 questions, mainly focusing on the magnitude of adverse fetal outcomes and associated factors. The data collection will take about 30 minutes. So, I kindly request you to permit me to collect data only for this particular study.

Risks and benefits: Since the study will be conducted by taking appropriate information from the medical chart, the risk to patients is very minimal. The information retrieved will only be used for study purposes. The research has no direct benefit for those whose document/ record is included in this study. Rather this study will serve as a basis for the future and may reveal important information for the local health planners and managers about the effect of premature rupture of membranes on fetal outcomes.

Confidentiality: The information collected from the maternal charts will be confidential. There will be no information that will identify the individual women because their names will not be included in the data collection tool. The findings of the study will be general for the study area and will not reflect anything particular about individual persons. The tool will be coded to exclude showing names. No reference will be made in oral or written reports that could link participants to the study.

Rights: Permitting data collection from the maternal charts for this study is fully voluntary. Considering the importance of the research to your health institution you are free to decide on it. If any violation of ethical rules and conduct is seen throughout the study, your health institution has the full right to withdraw and stop the study at any time.

Contacts: If you have any questions about the study, the procedure, or anything else related to the study, please contact through the following address: Mobile phone of investigator: +251-914137746. Email address: naoloda1234@gmail.com.

Institutional Research Ethics Review Committee (IRERC), Haramaya University: Office phone: 0254662011: P.O.Box: 235, Harar, Ethiopia.

Declaration of informed voluntary consent: I have read and understand the Institution Information Sheet very well. I have clearly understood the purpose of the research, procedures, risks and benefits, confidentiality issues, rights, and contact address for any inquiries. I was informed that the health institution has the right to stop the study where certain misconduct and unethical procedures are reported according to the health institution's premises.

Also, I understand that the health institution has the right to use the result of the study as public property. Therefore; I declare my voluntary consent on behalf of the health institution to allow this study to be conducted in the institution with my name and signature.

Name and signature of the medical director: _____

Principal Investigator: Naol Oda: _____

Thank you for your cooperation!

8.2. Data Extraction Checklist

Title: Magnitude of adverse fetal outcomes and associated factors among women with premature rupture of membrane who gave birth at public hospitals in Harari region, Eastern Ethiopia.

General information

Date: _____

Name of the health facility _____

Code given for the chart by investigator_____

Name of the data collector_____

Name of the supervisor_____

Section A - Socio-demographic profile of the participants.

S.NO	QUESTIONS	ALTERNATIVE RESPONSE	REMARK
A01	Maternal age in years	_____	
A02	Residence	1. Urban 2. Rural	
A03	Region of residency	1. Harari 2. Oromia 3. Others	

Section B – Health service utilization and medical characteristics of mother's information.

S/NO	QUESTION	ALTERNATIVE RESPONSE	REMARK
B01	ANC follow up	1. Yes 2. No	If no skip to Question B04
B02	How many ANC follow up	_____contact	
B03	Timing of first ANC contact	_____weeks	
B04	Iron and folic acid supplementation	1. Yes 2. No	
B05	HIV status in current pregnancy	1. Reactive 2. Non-reactive	
B06	UTI in the current pregnancy	1. Yes 2. No	
B07	History of sexually transmitted infection	1. Yes 2. No	
B08	History of Diabetes mellitus	1. Yes 2. No	
B09	History of hypertension	1. Yes 2. No	
B10	Hemoglobin level in current pregnancy	_____in gm/dl	

B11	Maternal use of prophylactic antibiotics in the current pregnancy	1. Yes 2. No	
B12	Administration of steroids for mother in current pregnancy	1. Yes 2. No	

Section C – Obstetrics factors.

S/NO	**Variables**	**ALTERNATIVE**	**REMARK**
C01	Number of pregnancies	_____	
C02	Gestational age at membrane rupture in weeks	_____	
C03	Gestational age at delivery in weeks		
C04	Cord prolapses in the current pregnancy	1. Yes 2. No	
C05	Interpregnancy interval in most recent birth (years)	_____	
C06	History of abortion	1. Yes 2. No	
C07	Onset of labor	1. Spontaneous 2. Induced	
C08	Color of liquor	1. Clear 2. Meconium stained	

		3. Bloodstained	
C09	Mode of delivery	1. SVD 2. C/S 3. Instrumental	
C10	The total duration of PROM before reaching a hospital	_____	
C11	Total duration of PROM to delivery	_____	
C12	Chorioamnionitis in the current pregnancy	1. Yes 2. No	
C13	Previous history of adverse fetal outcome	1. Yes 2. No	
C14	Fetal presentation at delivery in current pregnancy	1. Cephalic 2. Breech 3. Others	
C15	Pregnancy type	1. Singleton 2. Multiple gestation	

Section D –Fetal outcome

S/NO	**QUESTION**	**ALTERNATIVE RESPONSE**	**REMARK**
D01	Newborn's birthweight at delivery (gm)	_____	
D02	Fetal distress	1. Yes 2. No	

D03	Stillbirth	1. Yes 2. No	
D04	Intrauterine fetal death	1. Yes 2. No	
D05	Immediate newborn death	1. Yes 2. No	
D06	NICU admission	1. Yes 2. No	
D07	GA at birth	_____	
D08	APGAR score at 1st minute	1. ≥ 7 2. < 7	
D09	APGAR score at 5th minute	1. ≥ 7 2. < 7	
D10	Birth asphyxia	1. Yes 2. No	
D11	Presence of early neonatal sepsis	1. Yes 2. No	
D12	Presence of congenital anomaly	1. Yes 2. No	
D13	Sex of the baby	1. Male 2. Female	

The end of the questions

8.3. Principal Investigator's Curriculum Vitae

Curriculum Vitae

1. Personal information

Name: Naol Oda Tafa

Sex: Male

Birth date: 20/06/1989 E.C

Place of birth: -Wesht Shewa, Oromia, Ethiopia

Nationality: Ethiopian

Marital status: Single

Tel: +251914137746

E-mail: naoloda1234@gmail.com

2. Educational background

No	Name of school	Place	Grade	Year in E.C
1	Goro Primary School	West Shewa	1-8	1997-2004
2	Meta Kumute Secondary School	West Shewa	9-10	2005-2006
3	Awash Melka Preparatory School	Sabeta	11-12	2007-2008
4	Haramaya University, CHMS	Harar	BSc degree	2009-2013

3. Current address: Harar, Harari region

4. Qualification: - BSc. degree in Midwifery (CGPA 3.87)

Research Title: Magnitude of adverse fetal outcomes and associated factors among women with premature rupture of membrane who gave birth at public hospitals in Harari region, Eastern Ethiopia, 2024

5. Skill

Language skill

No	**Language**	**Listening**	**Reading**	**Speaking**	**Writing**
1	English	Excellent	Excellent	Excellent	Excellent
2	Amharic	Excellent	Excellent	Excellent	Very good
3	Afan Oromo	Excellent	Excellent	Excellent	Excellent

Social skills and competencies

- ✓ Hard working and motivated in community-based fieldwork and diagnosis and research
- ✓ Developing teams and working in a team environment

Technical skills and competencies

- ✓ Very good in communication and interpersonal skills
- ✓ Very good in Microsoft office tools(Word, Excel, PowerPoint), statistical software's(SPSS,STATA, Epi data, Epi info) and reference management software's(Endnote and Mendeley)

Hobbies and special interests

- ✓ Teaching, reading books and journals, and conducting health research
- ✓ Grasp and learn new technology quickly

Working Experience, Awards, and Participation

Working as graduate assistant II at Haramaya University from April 2021- April 2022.

Working as an assistant lecturer at Haramaya University from April 2022 – until now.

I took Pedagogical skills (Induction) training and a Higher Diploma Program in teacher education

I have participated in PHEM (public health emergency management) training and got a certificate

I also participated in the online COVID-19 prevention and management training on both infection prevention and control and clinical management and got a certificate

6. References

1. Mr. Sisay Habte (MSc, Assistant Professor), Former Head of School of Nursing at Haramaya University

Phone No:-+251911807998

Email: sisayhabtem@yahoo.com

2. Mr. Degu Abate (MSc. Ass professor and Former HU CBE office coordinator**)**

P.O.Box: 235

Email: dgabate2007@gmail.com