

Literature Review: Factors Associated with Premature Rupture of Membranes (PROM)

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Article Info	Abstract
Article History Submitted, 2026-04-12 Accepted, 2026-05-19 Published, 2026-06-30	Premature rupture of membranes (PROM) is a pregnancy complication that remains a global health problem because it contributes to increased maternal and perinatal morbidity and mortality. PROM can lead to various serious complications, such as intrauterine infection, preterm labor, and neonatal death. This literature review aims to describe the risk factors associated with PROM. This literature review employed a literature review method. A systematic search was conducted using Google Scholar, searching articles published between 2021 and 2025. A total of 15 articles were reviewed, and 10 articles relevant to the topic of this literature review were identified. Only articles with a quantitative design and full text were included in this analysis. Key data were analyzed using the PICO (Population Intervention Compare Outcome) technique. The 10 articles identified four main factors significantly associated with the incidence of PROM: nutritional status, obstetric history, infection, and anemia. Poor nutritional status has been shown to increase the risk of PROM through impaired collagen synthesis, which leads to weakness of the amniotic membranes. Obstetrical history, such as high parity, gestational age, previous history of PROM, miscarriage, short gestational interval, and complications such as multiple pregnancies and breech presentation, contribute by increasing intrauterine pressure and decreasing the elasticity of reproductive tissues. Infection, particularly urinary tract and genital infections, is a dominant factor triggering the inflammatory response and degradation of the amniotic membranes. Furthermore, anemia contributes through tissue hypoxia and a weakened maternal immune system, increasing susceptibility to infection. Conclusion of thi sstudy was PROM is multifactorial and influenced by the interaction of various risk factors. Therefore, preventive efforts through early detection, improving the quality of antenatal care, and health education for pregnant women are needed to reduce the incidence of PROM.
Keywords: Premature rupture of membranes, nutritional status, obstetric history, infection, anemia	

Introduction

Premature Rupture of Membranes (PROM) is a critical obstetric complication that remains a leading global healthcare challenge due to its profound impact on maternal and neonatal morbidity and mortality. Defined as the spontaneous rupture of the amniotic sac prior to the onset of labor, PROM compromises the sterile intrauterine environment, exponentially increasing the risk of maternal chorioamnionitis, placental abruption, and postpartum hemorrhage. For the fetus, the sudden loss of amniotic fluid triggers severe sequelae, including cord compression, neonatal sepsis, respiratory distress syndrome (RDS), and long-term neurodevelopmental disabilities associated with prematurity. Globally, PROM complicates approximately 8% of all pregnancies and acts as the direct catalyst for nearly one-third of all preterm births, imposing a substantial clinical and financial burden on neonatal intensive care

units (NICUs) and public healthcare systems worldwide (WHO, 2023). In developing nations such as Indonesia, the prevalence of PROM remains persistently high, fluctuating between 6.46% and 15.6%. This elevated incidence directly hinders national initiatives to reduce the Maternal Mortality Rate (MMR) and Infant Mortality Rate (IMR), highlighting the critical need for a more robust screening mechanism during routine antenatal care (Eason et al., 2026).

The incidence of PROM does not occur in isolation but is influenced by various multifactorial determinants. These factors encompass the mother's biological condition, obstetric history, health status, and environmental factors. Literature suggests that the absence of a single definitive cause makes PROM a complex condition driven by the interaction of various internal and external risk factors (Nawang Sari et al., 2025).

One of the significant factors associated with PROM is obstetric history. Previous pregnancy histories—such as preterm delivery, miscarriage, or prior instances of PROM—can increase the risk of PROM in subsequent pregnancies. This is caused by changes in the cervical structure and the amniotic membranes, leading to a reduction in tissue strength. Research demonstrates that obstetric history plays a vital role in predicting the risk of PROM and serves as a basis for risk assessment during antenatal care (Lin et al., 2024).

In addition to obstetric history, maternal age and parity also contribute to the incidence of PROM. Mothers who are too young or too old, as well as those with high parity, are at a greater risk of experiencing PROM. This condition is related to a decline in the elasticity of reproductive tissues and an increase in uterine pressure resulting from repeated pregnancies. Studies show a significant association between age, parity, and the incidence of PROM (Sujati et al., 2024).

Infectious factors also serve as a primary cause contributing to the occurrence of PROM. Infections of the reproductive or urinary tract can trigger an inflammatory response that leads to the weakening of the amniotic membranes. When the membrane loses its strength due to inflammation and collagen degradation, the risk of premature rupture increases. Furthermore, the loss of the protective function of the membranes also heightens the risk of subsequent infection for both the mother and the fetus (Novelia et al., 2023).

Another factor influencing the occurrence of PROM is the mother's nutritional status and health conditions, including anemia. Nutritional deficiencies can impair the formation of connective tissue and collagen in the amniotic membranes, leading to structural weakness. Additionally, anemia causes tissue hypoxia, which can exacerbate the condition of the amniotic membranes and increase susceptibility to infection. The combination of these factors significantly magnifies the risk of PROM (Zakiyyah et al., 2023).

Despite the extensive body of literature exploring individual risk factors associated with PROM, significant limitations and inconsistencies persist in previous studies. Most existing research relies on isolated, single-center observational designs that yield conflicting findings regarding the strength of association for variables like maternal age and parity, largely due to variations in regional demographics, localized clinical guidelines, and socioeconomic status. Furthermore, there is a distinct shortage of comprehensive reviews that synthesize these fragmented variables through a unified, multidimensional framework. Prior studies frequently analyze mechanical, biochemical, and nutritional factors in isolation, failing to explore the critical cross-talk between how systemic maternal conditions (such as anemia) directly exacerbate biochemical vulnerabilities (such as infection susceptibility). This fragmented approach creates a substantial research gap, leaving clinicians without an integrated, risk-based screening protocol that can be effectively deployed during antenatal care to predict and prevent membrane rupture before clinical symptoms manifest.

To bridge this research gap, this study provides a vital scientific contribution by conducting a rigorous, multi-database synthesis that integrates fragmented observational evidence into a cohesive clinical framework. By mapping the interconnectedness of nutritional, obstetric, and infectious risk factors, this review shifts the clinical paradigm from a reactive, crisis-management model to an early, proactive intervention strategy. This study aims to identify and analyze factors associated with premature rupture of membranes (PROM) based on evidence from previous studies. The insights generated from this comprehensive analysis are intended to provide clinical reference points for maternal healthcare providers, ultimately facilitating the implementation of risk-based preventive interventions in antenatal care to reduce the global burden of PROM-related complications.

Methods

This study utilized a systematic literature review design to identify, evaluate, and synthesize the multidimensional risk factors associated with Premature Rupture of Membranes (PROM). To ensure methodological transparency, an electronic database search was primary conducted across high-impact, reputable repositories, including PubMed, ScienceDirect, and ProQuest, while Google Scholar was utilized strictly as a secondary, supplementary source to capture regional observational data. The search strategy employed specific combinations of Medical Subject Headings (MeSH) and Boolean operators: ("premature rupture of membranes"

OR "PROM") AND ("nutritional status" OR "MUAC" OR "anemia" OR "obstetric history" OR "infection"). The article selection process followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines; out of the total records initially identified, duplicates and irrelevant studies were screened out, and after applying strict eligibility criteria, a final sample of 10 primary research articles was included. Inclusion criteria were restricted to peer-reviewed, full-text observational studies (case-control and cross-sectional designs) published between 2021 and 2026 in either English or Indonesian, focusing specifically on pregnant populations and reporting primary outcomes related to PROM pathogenesis. Conversely, grey literature such as undergraduate theses, dissertations, non-open-access papers, and secondary literature reviews was excluded. To ensure the scientific integrity of the evidence hierarchy, a critical appraisal and risk of bias assessment were performed using the Joanna Briggs Institute (JBI) Critical Appraisal Tool for observational studies. Finally, data analysis involved a standardized data extraction matrix capturing author, year, study design, population characteristics, and key variables (Odds Ratios/\$p\$-values), followed by a qualitative thematic synthesis to contrast, compare, and integrate the consistency of findings across the selected studies.

Results and Discussion

A literature review was conducted on 10 selected articles. The publications ranged from 2021 to 2026. The results of the journal analysis are presented in Table 1 as follows:

Table 1. Results of Journal Analysis

No	Research	Method	Results
1.	Analysis of Factors Associated with the Incidence of Premature Rupture of Membranes at Lamaddukelleng Hospital, Wajo Regency (Novitasari et al., 2021)	This research is an analytic observational study utilizing a cross-sectional approach. The total sample size used in this study was 822 respondents, selected using a total sampling technique. The data were analyzed using the chi-square test	1. Significant correlation with gestational age (p=0.001). Significant correlation with history of urogenital tract infections (p=0.000).
2.	Factors Associated with the Incidence of Premature Rupture of Membranes at the Maternal Emergency Unit of Dr. Drajat Prawiranegara Hospital (Adista et al., 2021)	This is an analytic study employing a case-control method. The population comprised 2,219 maternity patients who experienced premature rupture of membranes. The sample size consisted of 194 maternity patients, divided into 97 cases and 97 controls. The samples were selected using a consecutive sampling technique. This research utilized secondary data, and the research instruments consisted of a checklist. Data analysis included univariate, bivariate, and multivariate analysis. The statistical test used was multiple logistic regression with a prediction model..	Significant relationships between maternal age, gravida, preeclampsia, anemia, breech presentation, and multiple pregnancies (gemelli) with PROM occurrence (p-value<0.05).
3.	Premature rupture of membrane and associated factors among pregnant women admitted to maternity wards of public hospitals in West Guji Zone, Ethiopia, 2021 (Diriba et al., 2022)	This study employed a facility-based cross-sectional design conducted between April 9 and June 9, 2021, at selected general hospitals. The study population consisted of pregnant women admitted to the maternity ward, with a total sample size of 407 participants selected through systematic random sampling. The data were analyzed using multivariable logistic regression	Significant risk factors include gestational age <37 weeks (AOR: 2.5), history of prior PROM (AOR: 6), history of abortion (AOR: 2.5), abnormal vaginal discharge (AOR: 6.9), urinary tract infection (AOR: 3.3), and lower genital tract infection (AOR: 4.5).
4.	Factors Associated with the Incidence of Premature Rupture of Membranes in	This study employed a survey method with a cross-sectional design. The samples were taken from all maternity patients who	1. Significant relationship between a history of infection in the mother and the incidence of PROM

	Independent Midwife Practices (Erwani et al., 2023)	gave birth across ten Independent Midwife Practices (<i>Praktik Mandiri Bidan</i> / PMB) between September and November 2022. Bivariate analysis was conducted using the chi-square test.	(p=0.004). Significant relationship between parity and PROM.
5.	Determinants of prelabor rupture of membrane among pregnant women attending governmental hospitals in Jimma zone, Oromia region, Ethiopia: A multi-center case-control study (Assefa et al., 2023)	This study used an unmatched case-control design. The study population included pregnant women undergoing examinations at the facility, with a total sample of 316 participants consisting of 79 cases (mothers with PROM confirmed through medical history, sterile vaginal examinations, and ultrasonography) and 237 controls. Sampling was conducted using a consecutive sampling technique. The data were analyzed using bivariate and multivariate logistic regression.	Significant risk factors include pregnancy-induced hypertension (AOR: 3.06), history of abortion (AOR: 3.67), urinary tract infection (AOR: 2.61), abnormal vaginal discharge (AOR: 2.65), poor nutritional status based on MUAC <23 cm (AOR: 2.80), khat chewing (AOR: 3.40), and breech presentation (AOR: 2.63).
6	Prevalence of Preterm Premature Rupture of Membranes and Its Correlated Risk Factors among Pregnant Women Attending Women Health Hospital, Assiut University, Egypt. (Gouda et al., 2025)	This was a retrospective study with a cross-sectional design. The population consisted of all mothers who experienced premature rupture of membranes.	Significant statistical relationships between PPRM and medical history, physical activity, cervical incompetence, and demographic characteristics such as age, BMI, residence, and employment. Additionally, obstetric profiles (gravidity, parity, gestational age, number of miscarriages, mode of delivery) show a strong correlation.
7	Factors Influencing the Incidence of Premature Rupture of Membranes at Brigjend H. Hasan Basry Hospital, Kandangan, in 2022 (Hidayati et al., 2025)	This was a non-experimental, analytic survey research with a cross-sectional approach. The population in this study consisted of maternity patients in the delivery room of Brigjend H. Hasan Basry Hospital, Kandangan, from January 1 to December 31, 2022, totaling 727 patients. From this population, a sample of 258 respondents was obtained. The sampling technique used was simple random sampling. The data were analyzed using the chi-square test.	Significant influence of age, parity, occupation, previous pregnancy history, and nutritional status on the incidence of PROM.
8	Determinants of preterm premature rupture of membranes among pregnant women at public hospitals in the Sidama Region, Ethiopia (Gebre et al., 2025)	This was an analytic study with a case-control design, conducted at public hospitals in the Sidama Region between March and May 2023. The study population consisted of pregnant women, with a total sample size of 276 respondents divided into 69 cases (PPROM patients) recruited through consecutive sampling, and 207 controls selected via random sampling. Data were analyzed using binary logistic regression.	Significant risk factors include pregnancy-induced hypertension (AOR: 2.65), history of abortion (AOR: 3.1–3.78), history of cesarean section (AOR: 2.57), MUAC <23 cm (AOR: 2.1), urinary tract infection (AOR: 2.42), and hemoglobin levels <11 mg/dl (AOR: 2.68).
9	Factors Associated with the Incidence of Premature Rupture of Membranes in Mothers Giving Birth in Banda Aceh	This study employed a descriptive-analytic design with a cross-sectional approach. The population consisted of all maternity patients at the Regional General Hospital (RSUD) in Banda Aceh during the study	Significant correlations between PROM and maternal age (p=0.032), parity (p=0.021), pregnancy spacing (p=0.015), history of reproductive tract infection (p=0.008), and nutritional status (p=0.041).

	(Soraya, 2025)	period. The sampling technique utilized was purposive sampling. The data were analyzed using the chi-square test.	
10	Factors Influencing Premature Rupture of Membranes at Bunga Bangsa Medika Hospital, Yogyakarta (Ilmawati & Puspitasari, 2026)	This was a quantitative study using a case-control design, consisting of one case group and one control group. The population consisted of all mothers who gave birth at Bunga Bangsa Medika Hospital, Yogyakarta, between 2022 and 2024, with a total of 666 deliveries, 82 of which were diagnosed with premature rupture of membranes. The sampling technique was total sampling for the case group and simple random sampling for the control group. The data were analyzed using the chi-square test.	Significant relationship between urinary tract infection and PROM (p=0.001).

Based on the analysis of 10 articles conducted by researchers, the following risk factors were identified:

Risk Factor Synthesis and Critical Analysis

This review synthesizes findings from ten studies, the majority of which utilize cross-sectional and case-control designs. While these observational designs provide robust evidence regarding associations, it is important to acknowledge that this hierarchy of evidence ranks below Randomized Controlled Trials (RCTs). Consequently, the interpretation of these results must consider the inherent limitations in determining temporal cause-and-effect relationships (Gebre et al., 2025; Assefa et al., 2023).

Infection: The Dominant Factor and Clinical Significance

Based on the data synthesis, urogenital infection emerges as the most consistent risk factor with the highest association strength for the incidence of Premature Rupture of Membranes (PROM). Analysis of the study by Diriba et al. (2022) indicates that abnormal vaginal discharge increases the risk up to 6.9-fold (AOR: 6.9), followed by urinary tract infections (AOR: 3.3). This consistency is observed across diverse geographical contexts, ranging from Ethiopia (Assefa et al., 2023) to Indonesia (Novitasari et al., 2021; Ilmawati & Puspitasari, 2026).

Pathophysiologically, these findings align with the theory of collagen degradation. Infection triggers a systemic inflammatory response that increases the production of pro-inflammatory cytokines and proteolytic enzymes, such as matrix metalloproteinases (MMPs). MMPs, specifically MMP-9, actively degrade the extracellular matrix of the amniotic membrane, thereby reducing its elasticity and tensile strength (Diriba et al., 2022). This is further supported by WHO recommendations, which emphasize the critical importance of screening for sexually transmitted infections and urinary tract infections as part of routine antenatal care to mitigate adverse pregnancy outcomes.

Nutritional Status and Anemia: The Synergy of Membrane Vulnerability

There is high consistency regarding the impact of poor nutritional status (MUAC <23 cm) on PROM, with risks ranging from 2.1 to 2.8 times (Assefa et al., 2023; Gebre et al., 2025). The weight of this evidence is bolstered by findings on anemia (Hb <11 g/dl), which increases the risk of PROM by 2.68 times (Gebre et al., 2025).

In contrast to the acute biochemical nature of infection, nutritional status and anemia operate through chronic structural mechanisms. Deficiencies in micronutrients—specifically protein, Vitamin C, Zinc, and Copper—disrupt collagen synthesis from the early stages of pregnancy. Furthermore, chronic hypoxic conditions resulting from anemia (Adista et al., 2021) inhibit cell proliferation within the chorioamniotic membrane. The synthesis of these two factors suggests a synergistic effect: malnourished mothers often possess weakened immune systems, which inherently increases susceptibility to infection (the pathway of the first risk factor), thereby creating a cumulative risk to the integrity of the amniotic membrane.

Obstetric History: Mechanical Mechanisms vs. Structural Integrity

Obstetric history serves as a potent predictor with significant Odds Ratios. A prior history of PROM increases the risk 6-fold (Diriba et al., 2022), while a history of miscarriage shows

consistency across multiple studies, with risks ranging from 2.5 to 3.78 times (Assefa et al., 2023; Gebre et al., 2025).

Critical analysis identifies two distinct underlying mechanisms: 1) Traumatic/Structural Mechanism: A history of miscarriage and Cesarean section (AOR: 2.57) are likely associated with cervical trauma or structural weaknesses in the lower uterine segment (Gebre et al., 2025). This is consistent with the theory of cervical incompetence noted by Gouda et al. (2025). 2) Intrauterine Pressure Mechanism: Factors such as high parity, multiple pregnancies, and malpresentation (e.g., breech) are consistently linked to PROM (Adista et al., 2021; Erwani et al., 2023). This is explained through biomechanical theory: excessive uterine stretching increases hydrostatic pressure on the lower pole of the fetus, which eventually exceeds the resistance threshold of a physiologically thinned amniotic membrane.

Comparison and Strength of Evidence

While the majority of the included studies show a unified direction in their findings, variations exist in the reported strength of association (AOR). These discrepancies are likely attributable to differences in the operational definitions of nutritional status or variations in the prevalence of endemic infections within the study populations. However, the overarching evidence suggests that amniotic membrane integrity is governed by a complex interplay of biochemical (infection), structural (nutrition and anemia), and mechanical (obstetric history) factors

Conclusion

In conclusion, this systematic review of 10 observational studies synthesizes the multifactorial etiology of Premature Rupture of Membranes (PROM), identifying urogenital infection as the most dominant and consistently associated risk factor, with abnormal vaginal discharge presenting the highest strength of evidence (OR up to 6.9). Rather than viewing risk factors in isolation, this study provides a crucial scientific contribution by establishing a multidimensional perspective; it links systemic biological vulnerabilities specifically tissue hypoxia from anemia (Hb <11 g/dl, OR 2.68) and impaired collagen synthesis from malnutrition (MUAC <23 cm, OR 2.80) with mechanical strains from adverse obstetric history (previous PROM, OR 6.0) and biochemical degradation triggered by inflammatory responses. While acknowledging the evidence hierarchy limitations inherent to the included cross-sectional and case-control designs, these findings underscore a pivotal shift from descriptive risk identification to a critical urgency for implementing proactive, risk-based preventive approaches in routine antenatal care (ANC). In alignment with WHO and international obstetric guidelines, early screening for subclinical infections, targeted nutritional counseling, and aggressive mid-pregnancy anemia correction must be systematically integrated into maternal healthcare to effectively mitigate the clinical pathways leading to PROM.

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