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Association between maternal parity status and premature rupture of membranes among delivering mothers

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Abstract

Background: Premature rupture of membranes (PROM) is one of the major obstetric complications associated with maternal and neonatal morbidity, particularly preterm birth. Maternal parity has been identified as one of the obstetric factors that may influence the occurrence of PROM; however, evidence regarding this association remains inconsistent.

Purpose: To determine the association between maternal parity and the incidence of premature rupture of membranes among delivering mothers.

Method: A retrospective analytic study with a cross-sectional design was conducted using secondary data from medical records at Panembahan Senopati Bantul Regional Hospital, Yogyakarta. The study population consisted of 168 mothers diagnosed with PROM, and 63 eligible participants were selected based on the inclusion and exclusion criteria. Maternal parity was categorized as primiparous and multiparous. Data were analyzed using the Fisher's Exact test with a significance level of $p < 0.05$.

Among 63 mothers with PROM, 81.0% experienced term PROM, while 19.0% had preterm PROM. Most respondents were aged 20–35 years (69.8%) and were multiparous (61.9%). Statistical analysis demonstrated a significant association between maternal parity and the incidence of PROM ($p = 0.044$). Primiparous mothers had a 4.38-fold higher likelihood of experiencing PROM compared with multiparous mothers ($OR = 4.38$).

Conclusion: Maternal parity was significantly associated with the incidence of premature rupture of membranes. Primiparous mothers were at greater risk of experiencing PROM than multiparous mothers. Early identification of parity-related risk factors during antenatal care may contribute to the prevention of PROM and improve maternal and neonatal outcomes.

Keywords: Maternal Parity; Obstetric Risk Factors; Premature Rupture of Membranes; Primiparous; PROM.

INTRODUCTION

Globally, the neonatal mortality rate (NMR) in 2025 is estimated at 17 deaths per 1,000 live births. This figure accounts for 47% of all deaths in children under 5 years of age (World Health Organization, 2024). Premature birth remains the leading cause of infant mortality, accounting for approximately 36% (816 cases), followed by birth asphyxia/trauma at 21% (475 cases), lower respiratory tract infections (pneumonia) at 11% (249 cases), and sepsis at 10%

(233 cases) (World Health Organization, 2024).

In Indonesia, prematurity is a leading cause of neonatal mortality, with a prevalence of 11%. According to the 2023 Indonesian Health Survey, premature and low birth weight (LBW) babies contribute to 63.5% of neonatal deaths (Ministry of Health of the Republic of Indonesia, 2023). Premature Rupture of Membranes (PROM) accounts for approximately 25–30% of infant deaths due to

premature birth (Goldenberg et al., 2008). The WHO (2021) states that the global prevalence of PROM reaches 12.3% of all births. Meanwhile, in Indonesia, the PROM rate reaches 35.7 to 55.3% per birth (World Health Organization, 2021).

Premature Rupture of Membranes (PROM) is the rupture of the amniotic sac before the onset of labor. If the membranes rupture before gestational age (<37 weeks), it is called preterm PROM or preterm prelabor Rupture of Membranes (PPROM). If the membranes rupture after 37 weeks of gestation, it is called term PROM or PROM (Dayal et al., 2024).

Several studies have shown that the etiology of PROM consists of various factors such as sociodemographic characteristics, obstetric history, history of infection, behavior and lifestyle, parity status, uterine fibroids, and vaginal bleeding in early pregnancy (Bouvier et al., 2019; Jiang et al., 2025). Recent research by Lin (2024) stated that low BMI, interpregnancy spacing or parity of <2 years, history of previous abortions and cesarean deliveries, history of hypertension/gestational diabetes, reproductive tract infections, abnormal vaginal discharge, fetal malpresentation, and increased abdominal pressure are associated with the occurrence of PROM.

Parity is defined as the number of deliveries a woman has experienced, whether resulting in live births or stillbirths. Parity is categorized into two groups: primiparous (having given birth once) and multiparous (having given birth more than once). Parity, as a reproductive factor, can be a crucial factor in the pregnancy process. In multiple pregnancies or excessive multiparity, the elasticity of the amniotic membranes can become thinner and more susceptible to premature rupture. This can disrupt embryonic development (Chambers et al., 2020). Previous research has shown that maternal parity and multiparity are associated with premature rupture of membranes (p -value = 0.000). Therefore, it can be concluded that the more frequently a woman gives birth, the greater the risk of intra-amniotic infection due to damage to the cervical structure from previous deliveries (Anisa et al., 2026).

RESEARCH METHOD

This study employed an analytical observational design with a retrospective cross-sectional approach. The study was conducted at the maternity ward of Panembahan Senopati Bantul Regional Hospital, Yogyakarta, Indonesia, using secondary data obtained from patients' medical records.

The study population consisted of all women diagnosed with premature rupture of membranes (PROM) who delivered at the hospital during the study period, totaling 168 cases. The sample comprised 63 respondents who met the predetermined inclusion and exclusion criteria. Samples were selected using a purposive sampling technique. The inclusion criteria were mothers diagnosed with PROM who had complete medical record data, including maternal age, gestational age, and parity status. Medical records with incomplete information were excluded from the study.

The independent variable was maternal parity, categorized into primiparous (first delivery) and multiparous (two or more deliveries). The dependent variable was the incidence of PROM, classified into preterm PROM (<37 weeks of gestation) and term PROM (≥ 37 weeks of gestation).

Data were collected using a structured data extraction form from eligible medical records. Descriptive statistics were used to summarize respondents' characteristics and are presented as frequencies, percentages, means, standard deviations, and ranges. The association between maternal parity and the incidence of PROM was analyzed using Fisher's Exact test because of the small expected cell frequencies. Statistical significance was determined at a p -value of <0.05. The odds ratio (OR) was calculated to estimate the strength of the association. All statistical analyses were performed using IBM SPSS Statistics.

Ethical approval for this study was obtained from the Health Research Ethics Committee of Universitas Ahmad Dahlan, Yogyakarta (No. REC-UAD/01/02/03-2026/088). Patient confidentiality and anonymity were maintained throughout the study by using coded secondary data without personal identifiers.

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RESEARCH RESULTS

Table Characteristics of Respondents (N=63)

Variable	Result	p-value	OR (95%) CI
Age (Mean±SD) (Years) (Range)	(24,79 ± 4,16) (18-35)		
High-risk (<20)	19/30.2		
No Risk (20–35)	44/69.8		
Premature Rupture of Membranes (PROM) (n/%)			
Preterm (<37 weeks)	12/19.0		
Term (≥37 weeks)	51/81.0		
Parity (n/%)		0.044	4.375
Primigravida (First Pregnancy)	24/38.1		
Multigravida (>1 Pregnancy)	39/61.9		

Based on the table above, it is known that from a total of 63 respondents, most of the Mothers with PROM (81%) gave birth at term gestational age (≥ 37 weeks), while as many as 19% of Mothers with PROM were included in the category of giving birth at preterm age (<37 weeks). Most of the respondents who gave birth to mothers who experienced PROM were classified as non-risk age (≥ 20 – 35 years), namely 69.8%, while 30.2% were included in the risk age category (<20 years). Data on maternal parity status also stated that the majority of 61.9% of Mothers with PROM had given birth > 1 time (multigravida) and a small portion (38.1%) were primigravida or had only given birth once. The results of the statistical test obtained a p-value = 0.044 < 0.05 or it can be concluded that the maternal parity was significantly associated with Premature Rupture of Membranes (PROM). Primiparous mothers status are at risk of 4,375 times experiencing PROM.

DISCUSSION

Based on research results, the incidence of PROM is more dominant in the term gestational age group (>37 weeks) with a prevalence of 81%. This is supported by previous research which showed that the majority of mothers giving birth who experience PROM are at term gestational age with a percentage of 95.8% (Ningsih et al., 2025). In addition, other research also shows that the majority of PROM cases occur at 37–42 weeks of gestation, namely 81.87%

(Oetami & Ambarwati, 2023). Premature Rupture of Membranes (PROM) and Preterm Premature Rupture of Membranes (PPROM) can occur due to the physiological weakening mechanism of the amniotic membranes during term pregnancy due to increased intra-amniotic pressure, intra-amniotic infection or inflammation, oxidative stress and impaired amniotic membrane remodeling process. Intrauterine infection is one of the main causes of inflammation. The inflammatory process plays a role in activating protease enzymes that degrade collagen in the amniotic membrane, thereby reducing membrane strength and making it more susceptible to rupture (Dayal et al., 2024).

Based on the study results, the majority of respondents experiencing PROM were mothers aged ≥20–35 years, or categorized as non-risk age (44 respondents (69.8%). In reproductive health, age is a significant factor influencing the level of maturity of a woman's reproductive organs, including preparation for pregnancy and childbirth. These results align with previous research indicating a prevalence of PROM of 75.8% and research by Deng (2025) that found the majority of PROM occurred in non-risk age groups, namely 20–29 years (Ningsih et al., 2025).

However, this contradicts the previously proposed theory that mothers aged <20 years and >35 years have a higher risk of PROM. At age <20, the reproductive organs and amniotic sac have not yet reached optimal maturity, while at age >35,

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degenerative processes occur that cause a decrease in the elasticity and strength of the amniotic sac's collagen. This condition makes the amniotic sac more susceptible to rupture before delivery (Chunningham (2022).

However, the incidence of PROM is a multifactorial condition, so age is not the sole cause, but rather a predisposing factor that interacts with other factors such as genital tract infections, multiparity, anemia, multiple pregnancies, polyhydramnios, a history of PROM, and impaired collagen formation in the amniotic membranes (Cunningham et al., 2022). Previous research has shown that maternal trauma (41.5%), increased intra-abdominal pressure (26.2%), cervical incompetence (10.8%), pelvic narrowing (8.5%), infection (7.8%), and fetal malposition (5.4%) influence the incidence of PROM. These factors can cause membrane weakness, increasing the risk of PROM even if the mother is of a reproductive age considered safe (Hardika et al., 2025).

In addition to maternal age, the results of this study indicate that the majority (61.9%) of respondents who experienced PROM were multigravida or had given birth more than once. The results of this study support previous research showing that 65.2% of PROM cases occurred in multiparous mothers (Astuti & Estri, 2025). Previous research also reported similar results, with 56% of mothers experiencing PROM being multiparous (Wulandari et al., 2024). However, these results are inconsistent with other research that found a higher prevalence of PROM in primiparous mothers (Deng et al., 2025). Primiparous mothers had a higher incidence of PROM, at 49.22%, compared to multiparous mothers (Oetami & Ambarwati, 2023).

This difference in PROM case findings based on parity status may be due to the higher risk of premature rupture of membranes in multiparous mothers due to structural changes in the reproductive organs resulting from previous pregnancies and deliveries. A history of repeated deliveries can cause trauma and decreased cervical elasticity, thus reducing the cervix's ability to maintain a pregnancy. Furthermore, changes in uterine tissue and amniotic sac due to repeated pregnancies can increase the risk of premature rupture of the amniotic sac (Dewi et al., 2020).

Statistical tests yielded a p-value of 0.044 ($p < \alpha$

(0.05), indicating a relationship between maternal parity and the incidence of PROM at Panembahan Senopati Bantul Regional Hospital in 2026. The OR value of 4.375 indicates that primiparous mothers are four times more likely to experience PROM.

This research is supported by previous research that found a significant relationship between parity and the incidence of PROM (p -value = 0.000) (Ningsih et al., 2025). This finding is further supported by other studies, which obtained p -values of 0.007 and 0.034, respectively, indicating a link between parity and the incidence of PROM (Wahyuni & Lestari, 2019). Previous research supports that the analysis results show a significant relationship between parity status and the incidence of KPD (p -value 0.027 $p < \alpha$ (0.05) (Benkia et al., 2024)

The results of this study showed an OR of 4.375, indicating that primiparous mothers were four times more likely to experience PROM. This finding is supported by previous research, which confirmed that primiparous mothers had a 1.56 times greater risk of PROM compared to multiparous mothers (AOR=1.56-95% CI) (Wahaby et al., 2024). This is in line with other research, which found that primiparous mothers had a 2.39 times greater risk (RR 2.39; 95% CI) of PROM compared to multiparous mothers (Jiang et al., 2025).

However, the results of this study differ from previous findings, which showed that parity had no significant association with the incidence of PROM (p -value = 0.620). This study stated that maternal age and urinary tract infections were factors associated with PROM, while parity status was not statistically significant (Ilmawati & Puspitasari, 2026).

Primigravida parity status carries certain risks, such as preeclampsia and prolonged labor due to lack of experience and physiological adaptation to pregnancy (Wahyuni & Lestari, (2019). Previous research has suggested that psychological factors contribute to preterm labor weakness. In primiparous mothers, the risk of PROM may increase because the first pregnancy is often accompanied by psychological changes, such as anxiety, stress, emotional changes, and physical discomfort during pregnancy. These conditions can influence hormonal responses through activation of the hypothalamic-pituitary-adrenal (HPA) pathway. Anxiety stimulates the amygdala to activate the hypothalamus, resulting in increased release of corticotropin-releasing

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hormone (CRH). Furthermore, CRH stimulates the secretion of adrenocorticotrophic hormone (ACTH), which leads to increased production of the hormone cortisol by the adrenal glands (Giurgescu, 2009).

Prolonged increases in cortisol levels can reduce the immune response and increase susceptibility to infection and inflammation. This inflammation can increase the production of inflammatory mediators, such as interleukin-1. (IL-1) and prostaglandins, which play a role in the activation of extracellular matrix-degrading enzymes and the degradation of collagen in the chorionic and amniotic membranes. As a result, the strength and elasticity of the amniotic membranes decrease, making them more fragile and at risk of premature rupture, leading to PROM (Giurgescu, 2009).

CONCLUSION

Maternal parity was significantly associated with premature rupture of membranes. Primiparous mothers had a higher likelihood of experiencing PROM than multiparous mothers. Early identification of women with parity-related risk factors during antenatal care may contribute to preventing PROM and improving maternal outcomes.

SUGGESTION

Healthcare workers are expected to optimize comprehensive antenatal care (ANC) services to detect emergencies in pregnant women early. Future research is recommended to conduct multivariate analysis by adding other variables to identify dominant factors potentially influencing the incidence of Premature Rupture of Membranes (PROM).

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