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Association Between Maternal Occupation and History of Vaginal Discharge with Premature Rupture of Membranes: A Cross-Sectional Study

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ABSTRACT/ ABSTRAK

ABSTRACT. *Premature rupture of membranes (PROM) is an important obstetric complication that contributes to increased maternal and neonatal morbidity and mortality. Maternal factors, including occupation and a history of vaginal discharge, have been suggested to be associated with PROM; however, existing evidence remains inconsistent. This study aimed to examine the association between maternal occupation, a history of vaginal discharge, and the occurrence of PROM at Paniai Regional General Hospital. An analytical observational study with a cross-sectional design was conducted among 101 women who delivered in August 2024 using a total sampling technique. Data were collected from medical records using an observation checklist and analyzed using descriptive statistics and the Chi-square test with a significance level of 0.05. Most participants were aged 20–35 years (61.4%), had completed senior high school (55.4%), and were homemakers (64.4%). Overall, 77.2% experienced PROM, while 38.6% had a history of vaginal discharge. Significant associations were identified between maternal occupation and PROM ($p = 0.007$), as well as between a history of vaginal discharge and PROM ($p < 0.001$). Maternal occupation and a history of vaginal discharge may be considered during antenatal risk assessment to support the early identification and prevention of PROM.*

Kata kunci:

Ketuban Pecah Dini, Pekerjaan Ibu, Riwayat Keputihan, Kehamilan

ABSTRAK. Ketuban pecah dini (KPD) merupakan salah satu komplikasi obstetri yang berkontribusi terhadap meningkatnya morbiditas dan mortalitas maternal maupun neonatal. Berbagai faktor maternal, termasuk pekerjaan dan riwayat keputihan, diduga berhubungan dengan kejadian KPD, namun bukti yang tersedia masih menunjukkan hasil yang beragam. Penelitian ini bertujuan menganalisis hubungan antara pekerjaan ibu dan riwayat keputihan dengan kejadian ketuban pecah dini di RSUD Paniai. Penelitian menggunakan desain observasional analitik dengan pendekatan cross-sectional terhadap 101 ibu bersalin yang dipilih menggunakan teknik total sampling pada Agustus 2024. Data diperoleh dari rekam medis menggunakan lembar observasi dan dianalisis secara univariat serta bivariat menggunakan uji Chi-square dengan tingkat signifikansi 5%. Sebagian besar responden berusia 20–35 tahun (61,4%), berpendidikan SMA (55,4%), dan merupakan ibu rumah tangga (64,4%). Sebanyak 77,2% responden mengalami ketuban pecah dini, sedangkan 38,6% memiliki riwayat keputihan. Analisis menunjukkan terdapat hubungan yang bermakna antara pekerjaan ibu dan kejadian ketuban pecah dini (p = 0,007), serta antara riwayat keputihan dan kejadian ketuban pecah dini (p < 0,001). Pekerjaan ibu dan riwayat keputihan berhubungan dengan kejadian ketuban pecah dini sehingga dapat dipertimbangkan sebagai bagian dari penilaian risiko pada pelayanan antenatal untuk mendukung deteksi dini dan upaya pencegahan.

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INTRODUCTION

Premature rupture of membranes (PROM) is an obstetric complication characterized by rupture of the fetal membranes before the onset of labor. This condition is associated with increased maternal and neonatal morbidity and mortality because it predisposes women to intrauterine infection, chorioamnionitis, preterm birth, respiratory distress syndrome, neonatal sepsis, and perinatal death. Consequently, PROM remains an important challenge in maternal healthcare, emphasizing the need for early identification of modifiable risk factors to improve pregnancy outcomes and strengthen antenatal care services (Deng et al., 2025).

According to the World Health Organization (WHO), an estimated 13.4 million babies were born preterm worldwide in 2020, representing approximately one in every ten live births. Complications of preterm birth remain the leading cause of death among children under five years of age, accounting for approximately 900,000 deaths annually. WHO further emphasizes that many of these deaths are preventable through cost-effective interventions, including high-quality antenatal care, early identification of pregnancy-related risk factors, and appropriate management of conditions associated with preterm birth. Since PROM is one of the major antecedents of preterm delivery, identifying factors associated with PROM is essential to reduce adverse maternal and neonatal outcomes (World Health Organization, 2023).

The pathophysiology of PROM is multifactorial and involves complex interactions among infection, inflammation, oxidative stress, and extracellular matrix degradation within the fetal membranes. Activation of pro-inflammatory cytokines stimulates matrix metalloproteinases (MMPs), leading to collagen degradation in the amniotic and chorionic membranes, thereby reducing membrane integrity and increasing susceptibility to rupture before the onset of labor (Deng et al., 2025; Clavellina et al., 2024). Consistent with these biological mechanisms, previous studies have identified numerous maternal risk factors associated with PROM, including hypertensive disorders of pregnancy, gestational diabetes mellitus, genital tract infections, urinary tract infections, previous PROM, poor maternal nutritional status, inadequate antenatal care, and socioeconomic factors, including maternal occupation (Aticeh et al., 2025; Gebre et al., 2025).

Among these determinants, maternal occupation has attracted increasing attention because occupational activities during pregnancy may influence maternal physiological conditions. Occupations involving prolonged standing, repetitive movements, heavy lifting, and excessive physical workload may increase intra-abdominal pressure and impose continuous biomechanical stress on the fetal membranes, potentially accelerating membrane weakening. However, evidence regarding the association between maternal occupation and PROM remains inconsistent, partly because occupational characteristics, work intensity, physical demands, and socioeconomic conditions differ substantially across study populations (Sholihah et al., 2025; Sejbæk et al., 2024; Lv et al., 2024).

Another factor that has been increasingly recognized is a history of pathological vaginal discharge, particularly when associated with genital tract infections. Conditions such as bacterial vaginosis and vulvovaginal candidiasis may facilitate ascending infection, trigger inflammatory responses, activate matrix metalloproteinases, and accelerate collagen degradation within the fetal membranes, thereby increasing susceptibility to premature rupture. Although most studies have reported a positive association between genital tract infections and PROM, inconsistent findings have also been reported, indicating that further investigation is required across different populations and healthcare settings (Alikamali et al., 2025; Nam et al., 2025).

Local hospital data also indicate that PROM remains a significant obstetric problem at Paniai Regional General Hospital. Preliminary observations showed 346 deliveries with 19 PROM cases in 2021, 323 deliveries with 9 PROM cases in 2022, and 369 deliveries with 54 PROM cases in 2023. Although the annual number of cases fluctuated, the marked increase observed in 2023 highlights the continuing importance of identifying factors associated with PROM in the local population to support more effective preventive strategies.

Previous studies have primarily focused on classical obstetric risk factors, including parity, gestational age, hypertensive disorders, gestational diabetes mellitus, and previous PROM. In contrast, studies simultaneously examining the associations between maternal occupation, a history of vaginal discharge, and PROM remain limited, particularly in Papua, where geographical conditions, sociocultural characteristics, and access to maternal healthcare differ substantially from many other regions of Indonesia. Therefore, this study aimed to analyze the associations between maternal occupation, a history of vaginal discharge, and the occurrence of premature rupture of membranes among women who delivered at Paniai Regional General Hospital. The findings are expected to contribute evidence for early risk identification and support the development of risk-based promotive, preventive, and antenatal care strategies to improve maternal and neonatal health outcomes.

RESEARCH METHOD

An analytical observational study with a cross-sectional design was conducted to examine the association between maternal occupation, history of vaginal discharge, and premature rupture of membranes (PROM). The independent and dependent variables were measured simultaneously at a single point in time. The study was conducted at Paniai Regional General Hospital in August 2024. The study population consisted of all women who delivered at the hospital during the study period, totaling 101 participants. A total sampling technique was employed, resulting in a final sample of 101 respondents.

The independent variables were maternal occupation and history of vaginal discharge, while the dependent variable was premature rupture of membranes (PROM). Data were collected using an observation form based on medical record reviews, which included participants' demographic characteristics (age, education, and occupation), history of vaginal discharge, and the occurrence of PROM.

Data were analyzed using the Statistical Package for the Social Sciences (SPSS). Descriptive statistics were used to summarize participants' characteristics and study variables as frequencies and percentages. Bivariate analysis was performed using the Chi-square test to evaluate the associations between maternal occupation, history of vaginal discharge, and PROM. A p-value of <0.05 was considered statistically significant. The study was conducted after obtaining research permission from the Director of Paniai Regional General Hospital. Participant confidentiality was maintained throughout data collection, analysis, and reporting in accordance with ethical research principles.

RESULTS

A total of 101 participants met the eligibility criteria and were included in the analysis.

Participant Characteristics

Table 1. Participant Characteristics (n = 101)

Characteristic	n	%
Age (years)		
<20	3	3.0
20–35	62	61.4
>35	36	35.6
Education		
Primary school	9	8.9
Junior high school	21	20.8
Senior high school	56	55.4
Diploma/Bachelor's degree	15	14.9
Occupation		
Homemaker	65	64.4
Civil servant	9	8.9
Private-sector employee	27	26.7

Most participants were 20–35 years of age (61.4%), followed by those aged >35 years (35.6%) and <20 years (3.0%). Regarding educational attainment, the largest proportion had completed senior high school (55.4%), followed by junior high school (20.8%), diploma or bachelor's degree (14.9%), and primary school (8.9%). In terms of occupation, 64.4% of participants were homemakers, whereas 26.7% were private-sector employees and 8.9% were civil servants.

Distribution of Study Variables

Table 2. Distribution of Study Variables

Variable	n	%
Premature Rupture of Membranes		
Yes	78	77.2
No	23	22.8
History of Vaginal Discharge		
Yes	39	38.6
No	62	61.4

Among the 101 participants, 78 (77.2%) experienced premature rupture of membranes, whereas 23 (22.8%) did not. A history of vaginal discharge was reported by 39 participants (38.6%), while 62 participants (61.4%) had no such history.

Association Between Maternal Occupation and Premature Rupture of Membranes

Table 3. Association Between Maternal Occupation and Premature Rupture of Membranes

Occupation	PROM Yes n (%)	PROM No n (%)	Total n (%)
Homemaker	55 (54.5)	10 (9.9)	65 (64.4)
Civil servant	8 (7.9)	1 (1.0)	9 (8.9)
Private-sector employee	15 (14.9)	12 (11.9)	27 (26.7)
Chi-square test: $p = 0.007$			

Among the 65 homemakers, 55 participants (54.5%) experienced premature rupture of membranes, whereas 10 participants (9.9%) did not. Of the nine civil servants, eight (7.9%) experienced PROM and one (1.0%) did not. Among private-sector employees, 15 participants (14.9%) experienced PROM and 12 participants (11.9%) did not. The Chi-square test demonstrated a statistically significant association between maternal occupation and premature rupture of membranes ($p = 0.007$).

Association Between History of Vaginal Discharge and Premature Rupture of Membranes

Table 4. Association Between History of Vaginal Discharge and Premature Rupture of Membranes

History of Vaginal Discharge	PROM Yes n (%)	PROM No n (%)	Total n (%)
Yes	39 (38.6)	0 (0.0)	39 (38.6)
No	39 (38.6)	23 (22.8)	62 (61.4)
Chi-square test: $p < 0.001$			

All 39 participants (38.6%) with a history of vaginal discharge experienced premature rupture of membranes, whereas none remained free of the condition. Among participants without a history of vaginal discharge, 39 (38.6%) experienced PROM and 23 (22.8%) did not. The Chi-square test revealed a statistically significant association between a history of vaginal discharge and premature rupture of membranes ($p < 0.001$).

DISCUSSION

Participant Characteristics

The present study found that most participants were aged 20–35 years, had completed senior high school, and were homemakers. The predominance of women within the reproductive age group is consistent with the demographic profile commonly observed in hospital-based obstetric populations, as women aged 20–35 years represent the period of optimal reproductive capacity and account for the highest proportion of pregnancies. Similar findings were reported by Naher and Faria (2025), who observed that most women diagnosed with premature rupture of membranes (PROM) were within the reproductive age range, particularly between 25 and 34 years. Nevertheless, maternal age in this reproductive period should not be interpreted as an independent risk factor for PROM but rather as reflecting the age distribution of women seeking maternity care.

Regarding educational attainment, the majority of participants had completed senior high school. Maternal education is widely recognized as an important social determinant of health that influences health literacy, decision-making, and utilization of maternal healthcare services. Women with higher educational attainment generally demonstrate better awareness of pregnancy-related complications, greater adherence to antenatal care recommendations, and improved health-seeking behaviors, all of which may contribute to reducing adverse pregnancy outcomes. Aticeh et al. (2025) also reported that maternal education was associated with improved utilization of antenatal care services, which may indirectly contribute to the prevention and early detection of obstetric complications, including PROM.

Most participants in this study were homemakers. This finding primarily reflects the socioeconomic characteristics of the study population rather than indicating that homemakers are inherently at greater risk of developing PROM. Occupational status should therefore be interpreted within the context of the population under investigation. Similarly, Kayumova and Khamroyev (2025) reported that homemakers constituted the largest proportion of

women with PROM; however, the occurrence of PROM is likely influenced by multiple interacting factors, including occupational workload, physical activity, maternal health status, and access to quality antenatal care.

Association Between Maternal Occupation and Premature Rupture of Membranes

The present study demonstrated a statistically significant association between maternal occupation and the occurrence of premature rupture of membranes ($p = 0.007$). This finding suggests that occupational characteristics may be associated with the occurrence of PROM among pregnant women in the study population. However, because this study employed a cross-sectional design, the observed association should not be interpreted as evidence of a causal relationship.

The findings are consistent with those reported by Sholihah et al. (2025), who found that employed women had a higher likelihood of experiencing PROM than unemployed women. Previous studies have also suggested that occupational activities involving prolonged standing, repetitive movements, heavy lifting, and physically demanding workloads during pregnancy may increase the risk of adverse obstetric outcomes, including PROM (Frankel et al., 2025). These findings highlight the importance of considering occupational exposure as part of routine antenatal risk assessment, particularly among women whose daily activities involve substantial physical exertion.

Several biological and physiological mechanisms may explain the relationship between maternal occupation and PROM. Excessive physical activity, prolonged standing, repetitive occupational tasks, and physically demanding work may increase intra-abdominal pressure and impose continuous biomechanical stress on the fetal membranes. Persistent mechanical loading may reduce membrane integrity and increase susceptibility to premature rupture before the onset of labor (Frankel et al., 2025). Furthermore, occupational fatigue and prolonged physical exertion may induce physiological stress responses that could adversely affect pregnancy, although the underlying mechanisms remain multifactorial and are not yet fully understood.

Despite these findings, the association between maternal occupation and PROM has not been consistently reported across all studies. Variations in occupational classification, work intensity, duration of physical activity, socioeconomic status, healthcare accessibility, population characteristics, and methodological approaches may contribute to differences in reported outcomes. In addition, differences in controlling for potential confounding variables may partially explain the inconsistent findings observed in previous studies. Therefore, maternal occupation should be considered one of several interacting factors contributing to the risk of PROM rather than an isolated determinant.

From a clinical perspective, these findings emphasize the importance of incorporating occupational assessment into routine antenatal care. Healthcare providers should evaluate maternal occupational activities, particularly among women engaged in physically demanding work, and provide individualized counseling regarding workload modification, adequate rest, and recognition of early warning signs of pregnancy complications. Such preventive strategies may contribute to reducing the occurrence of PROM and improving both maternal and neonatal outcomes.

Association Between History of Vaginal Discharge and Premature Rupture of Membranes

The present study demonstrated a statistically significant association between a history of vaginal discharge and the occurrence of premature rupture of membranes (PROM)

($p < 0.001$). Women with a history of vaginal discharge were more likely to experience PROM than those without such a history. These findings suggest that a previous history of abnormal vaginal discharge may represent an important clinical indicator of increased susceptibility to membrane rupture during pregnancy. Nevertheless, because this study employed a cross-sectional design, the observed association should be interpreted as a statistical relationship rather than evidence of causality.

The present findings are consistent with accumulating evidence identifying reproductive tract infections as one of the major risk factors for PROM. Recent studies have reported that genital tract infections occur substantially more frequently among women with PROM than among those with uncomplicated pregnancies, emphasizing the importance of early detection and appropriate management of vaginal infections during antenatal care. Similarly, Aticeh et al. (2025) identified reproductive tract infections as one of the principal determinants of PROM and highlighted that untreated genital infections may contribute to adverse maternal and neonatal outcomes. Collectively, these findings reinforce the clinical relevance of incorporating a comprehensive history of vaginal discharge into routine antenatal risk assessment.

The association observed in the present study may be explained through several biological mechanisms. Abnormal vaginal discharge is frequently associated with lower genital tract infections, particularly bacterial vaginosis and vulvovaginal candidiasis. These infections facilitate ascending microbial invasion from the lower genital tract to the fetal membranes, thereby initiating localized inflammatory responses. Furthermore, vaginal dysbiosis, characterized by reduced *Lactobacillus* dominance and increased pathogenic microorganisms, disrupts the normal vaginal microenvironment and increases susceptibility to ascending infection, ultimately contributing to progressive weakening of the fetal membranes (Alikamali et al., 2025; Nam et al., 2025).

Following microbial invasion, the inflammatory response further accelerates degradation of fetal membrane integrity. Pro-inflammatory cytokines, including interleukin-1β (IL-1β) and interleukin-6 (IL-6), activate inflammatory cascades that stimulate matrix metalloproteinases (MMPs), particularly MMP-9, resulting in collagen degradation within the extracellular matrix of the fetal membranes. Progressive loss of collagen weakens the structural integrity of the amniochorionic membranes, thereby increasing susceptibility to membrane rupture before the onset of labor (Labossa et al., 2025; Cao et al., 2025; Karampitsakos et al., 2025). In addition, oxidative stress associated with intrauterine inflammation may further compromise membrane strength and increase vulnerability to PROM.

Despite the significant association identified in this study, previous investigations have reported inconsistent findings regarding the relationship between vaginal discharge and PROM. Such discrepancies may be attributed to differences in sample size, population characteristics, diagnostic criteria for vaginal infections, microbiological confirmation, study design, and adjustment for potential confounding variables. Moreover, variations in healthcare access, antenatal care utilization, and the prevalence of genital tract infections across study populations may also contribute to heterogeneity in reported findings. Therefore, comparisons across studies should be interpreted cautiously while taking methodological differences and contextual factors into consideration (Alikamali et al., 2025; Feduniw et al., 2025; Jiang et al., 2025).

From a clinical perspective, the present findings have important implications for maternal healthcare practice. Routine antenatal care should incorporate systematic assessment

of a history of vaginal discharge and other symptoms suggestive of genital tract infection as part of comprehensive maternal risk screening. Early recognition, accurate diagnosis, and appropriate treatment of reproductive tract infections may reduce inflammatory damage to the fetal membranes and potentially decrease the risk of PROM. Furthermore, health education regarding genital hygiene, early reporting of abnormal vaginal discharge, and timely utilization of antenatal care services should be strengthened as part of comprehensive preventive strategies. Although a history of vaginal discharge should not be regarded as the sole predictor of PROM, integrating this information into routine antenatal risk assessment may facilitate earlier identification of women requiring closer clinical monitoring and preventive interventions.

Strengths, Limitations, and Clinical Implications

The present study has several strengths that enhance the credibility of its findings. First, the use of a total sampling technique allowed all eligible women who delivered during the study period to be included in the analysis, thereby minimizing selection bias and improving the representativeness of the study population at Paniai Regional General Hospital. Second, the study focused on two clinically relevant maternal characteristics, namely maternal occupation and a history of vaginal discharge, both of which can be readily identified during routine antenatal care. In addition, the utilization of medical records as the primary data source enabled systematic extraction of clinical information from routine healthcare documentation.

Nevertheless, several limitations should be acknowledged when interpreting the findings. The cross-sectional design allows identification of statistical associations but does not establish temporal relationships or causal inferences between maternal occupation, a history of vaginal discharge, and PROM. Because exposure and outcome were measured simultaneously, the temporal sequence between these variables could not be determined.

Furthermore, the study relied on retrospective medical record data, making the quality of the analysis dependent on the completeness, consistency, and accuracy of routinely documented clinical information. Variables that were incompletely recorded could not be analyzed, potentially introducing information bias. In addition, because the study was conducted in a single hospital, differences in patient characteristics, healthcare systems, and local sociocultural conditions may limit the generalizability of these findings to other settings.

Another important limitation is that several potential confounding factors previously associated with PROM, including gestational age, parity, maternal nutritional status, body mass index, previous history of PROM, urinary tract infection, smoking status, and pregnancy-related comorbidities, were not included in the analysis. Consequently, residual confounding may have influenced the observed associations. Future prospective cohort studies incorporating multivariable analyses are therefore warranted to clarify the independent contribution of these maternal risk factors to the occurrence of PROM.

Despite these limitations, the findings have meaningful implications for maternal healthcare practice. Routine assessment of maternal occupation and a history of vaginal discharge should be integrated into antenatal risk screening to facilitate early identification of women at increased risk of PROM. Early detection and appropriate management of reproductive tract infections may help prevent inflammatory processes that contribute to fetal membrane weakening.

Moreover, antenatal health education should emphasize appropriate physical activity during pregnancy, workload modification when necessary, maintenance of genital hygiene,

recognition of abnormal vaginal discharge, and adherence to regular antenatal care. Collectively, these promotive and preventive interventions may facilitate early identification of modifiable risk factors, reduce the incidence of PROM, and improve both maternal and neonatal outcomes. Therefore, the present findings provide evidence that may support the development of comprehensive risk-based strategies for the prevention of premature rupture of membranes.

CONCLUSION

This study demonstrated significant associations between maternal occupation, a history of vaginal discharge, and the occurrence of premature rupture of membranes among women who delivered at Paniai Regional General Hospital. The findings suggest that these maternal factors may be considered as part of antenatal risk assessment for premature rupture of membranes. However, because the study employed a cross-sectional design, the observed associations should not be interpreted as causal relationships. Further prospective studies are warranted to confirm these findings and to evaluate the contribution of additional maternal risk factors.

Healthcare professionals, particularly midwives and obstetric care providers, should incorporate routine assessment of maternal occupation and a history of vaginal discharge into antenatal risk screening. Health education should emphasize appropriate physical activity during pregnancy, maintenance of genital hygiene, and early recognition and management of reproductive tract infections to support the prevention of premature rupture of membranes. Future research should employ prospective cohort designs or multivariable analytical approaches while incorporating additional confounding variables, including gestational age, parity, maternal nutritional status, previous history of premature rupture of membranes, and urinary tract infections, to provide a more comprehensive understanding of the determinants of premature rupture of membranes.

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