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Factors Influencing the Incidence of Threatened Preterm Labor at Ngudi Waluyo Wlingi Regional General Hospital: A Retrospective Study

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ABSTRACT

Background: Threatened preterm labor (TPL) is an obstetric emergency characterized by labor signs before 37 weeks of pregnancy and associated with increased infant morbidity and mortality. Globally, preterm birth accounts for approximately 10% of deliveries. In Indonesia, preterm delivery prevalence reaches 15–20% and remains a major contributor to neonatal mortality. Medical records from Ngudi Waluyo Regional General Hospital Wlingi show an increase in TPL cases from 86 (2021) to 112 (2023). Infection, anemia, and history of preterm birth are suspected risk factors. This study aimed to identify factors influencing TPL at Ngudi Waluyo Regional General Hospital Wlingi.

Methods: This observational analytic study used a retrospective approach. The sample consisted of 120 pregnant women meeting the inclusion criteria, with data obtained through medical record reviews. Bivariate analysis used the Chi-Square test with $p<0.05$. Variables with $p<0.25$ were further analyzed using Odds Ratios (OR) to determine the most influential factors.

Results: TPL incidence was 50%. Infection ($p<0.001$), anemia ($p<0.001$), and history of preterm birth ($p<0.001$) were significantly associated with TPL. Infection was the most dominant factor (OR = 13.62; 95% CI: 2.78–66.65), followed by history of preterm birth (OR = 7.87; 95% CI: 1.18–52.27) and anemia (OR = 6.29; 95% CI: 1.36–29.10).

Conclusion: Infection, anemia, and history of preterm birth were significantly associated with TPL, with infection being the most dominant factor. Early detection, antenatal screening, and integrated management are necessary to reduce TPL.

Keywords: ***anemia; infection; preterm birth history; threatened preterm labor***

INTRODUCTION

Threatened preterm labor (TPL) is an obstetric emergency characterized by the onset of labor symptoms before 37 weeks of gestation, posing a significant risk of serious complications and neonatal mortality. The World Health Organization (WHO) reports that preterm birth is the leading cause of death among newborns worldwide, with a prevalence of approximately 10% of all live births. In 2023, an estimated 13.4 million babies were born preterm, establishing prematurity as a critical global maternal-neonatal health issue.[1] In Indonesia, the 2023 National Health Survey (Riskesdas) recorded that 15–20% of deliveries occurred before 37 weeks of gestation,

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acting as a major contributor to high neonatal mortality rates.[2] This trend is reflected in data from RSUD Ngudi Waluyo Wlingi, Blitar Regency, where cases of threatened preterm labor rose from 86 in 2021 to 112 in 2023. As a regional referral hospital, this rising trend underscores the urgent need to strengthen detection and management efforts.

According to the Reference Manual for Preterm Labor, the causes of threatened preterm labor are classified into various risk factors, including race, age, education, occupation, parity, pregnancy spacing, socioeconomic status, stress, demographic status, smoking, workload, gestational infections, anemia, history of previous preterm birth, daily habits, current pregnancy conditions, cervical length, and hypothyroidism.[3] At RSUD Ngudi Waluyo Wlingi, the most frequently observed risk factors include infection, anemia, and a history of preterm birth, although local data remains limited. Maternal infections including intrauterine infection, bacterial vaginosis, vulvovaginitis, bacteriuria, and periodontal disease are known to trigger the release of prostaglandins that accelerate the labor process. Furthermore, bacterial compounds can weaken the fetal membranes, thereby increasing the risk of TPL. Previous research conducted at RSUD Brigjend H. Hasan Basry Kandangan identified a significant correlation between urinary tract infections and the occurrence of threatened preterm labor.[4]

In addition to infection, anemia during pregnancy defined as a hemoglobin level below 11 g/dL increases the likelihood of preterm delivery. The oxygen deficiency resulting from anemia can trigger fetal hypoxia and premature uterine contractions. This is supported by studies at RSUD Haji East Java Province and RSUD Dr. Moewardi Surakarta, which found a significant association between third-trimester anemia and preterm birth.[5, 6] Another influential factor is a history of previous preterm labor, as reported in studies at RSUD Wates Kulon Progo and RSUD Tugurejo Semarang.[7, 8] However, some research, such as a study at RSUD Dr. Soetomo Surabaya, showed no significant correlation, indicating inconsistencies that require further investigation.[9]

The rising incidence of threatened preterm labor in Blitar Regency presents a major challenge in efforts to reduce maternal and infant morbidity and mortality. The scarcity of local data regarding these risk factors hinders the development of effective preventive interventions. To date, few studies have specifically examined the factors contributing to the incidence of threatened preterm labor at RSUD Ngudi Waluyo Wlingi. Consequently, this study was conducted to identify the elements influencing TPL to serve as a foundation for strengthening promotive and preventive programs, as well as early management for high-risk pregnant women.

METHODS

This study adopted an observational analytic design with a retrospective approach to investigate the factors influencing the incidence of threatened preterm labor without intervention in the research subjects. The study population comprised all pregnant women who underwent delivery at RSUD Ngudi Waluyo Wlingi between January 1 and December 31, 2024. The sample consisted of pregnant women diagnosed with threatened preterm labor and those who were not, serving as a comparison group. Subjects were selected based on inclusion and exclusion criteria through a comprehensive review of medical records.

The research was conducted from August to September 2025 at RSUD Ngudi Waluyo Wlingi. The independent variables included infection, anemia, and a history of previous preterm labor, while the dependent variable was the incidence of threatened preterm labor. Data were retrieved from medical archives using a

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standardized data collection form as the primary research instrument.

Univariate analysis was employed to describe the distribution of respondent characteristics and the variables under study. To evaluate the relationship between variables, a bivariate analysis was conducted via the Chi-Square test with a significance threshold of $p<0.05$. To identify the primary predictors and control for potential confounding factors, variables that demonstrated a significant or near-significant association in the bivariate analysis ($p<0.25$) were entered into a multivariate logistic regression model. The magnitude of contribution from each independent variable toward Threatened Preterm Labor was determined based on the Odds Ratio (OR) values derived from the multivariate analysis.

The Odds Ratio (OR) was selected as the measure of association because this study employs a retrospective analytic design to estimate the strength of the association between specific risk factors and the occurrence of Threatened Preterm Labor. Furthermore, OR is the standard output for the logistic regression model used to control for confounding variables in this study.

RESULT

This study was conducted at RSUD Ngudi Waluyo Wlingi using an observational analytic design and a retrospective approach, involving 120 pregnant women who met the inclusion and exclusion criteria between January 1 and December 31, 2024. The dependent variable was the incidence of threatened preterm labor, while the independent variables included infection, anemia, and a history of previous preterm labor.

Table 1 shows univariate analysis revealed that the incidence of threatened preterm labor was 50% (60 respondents). Regarding the independent variables, 62 respondents (51.7%) presented with infection, while 58 respondents (48.3%) did not. A majority of the respondents (62.5%) did not have anemia, whereas 37.5% were found to be anemic. Furthermore, most respondents (69.2%) had no history of previous preterm labor, with only 30.8% of the sample having such a history.

Table 1 Frequency Distribution of Respondent Characteristics (n=120)

Variable	Category	Frequency (n)	Percentage (%)
Incidence of Threatened Preterm Labor (TPL)	Yes	60	50.0
	No	60	50.0
Infection	Yes	62	51.7
	No	58	48.3
Anemia	Yes	45	37.5
	No	75	62.5
Preterm Birth History	Yes	37	30.8
	No	83	69.2

Table 2. shows bivariate analysis using the Chi-Square test demonstrated that all three independent variables, infection, anemia, and a history of previous preterm birth, were significantly associated with the occurrence of threatened preterm labor (TPL). Specifically, regarding the infection variable, 55 out of 62 respondents (88.7%) who presented with an infection experienced TPL, yielding a significance value of $p<0.001$. Similarly, anemia showed a significant correlation, as 40 out of 45 anemic respondents (88.9%) were diagnosed with TPL ($p<0.001$). Furthermore, a history of previous preterm labor was found to be highly significant ($p<0.001$), with 35 out of 37 respondents (94.6%) with such a history experiencing the condition.

Table 2. The Association between Infection and Threatened Preterm Labor

Infection	Threatened Preterm Labor (Yes)	Threatened Preterm Labor (No)	Total	p-value
Yes	55	7	62	0.001
No	5	53	58	
Total	60	60	120	

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Table 3. The Association between Anemia and Threatened Preterm Labor

Anemia	Threatened Preterm Labor (Yes)	Threatened Preterm Labor (No)	Total	p-value
Yes	40	5	45	0.001
No	20	55	75	
Total	60	60	120	

Table 4. The Association between a History of Preterm Birth and Threatened Preterm Labor

History of Preterm Birth	Threatened Preterm Labor (Yes)	Threatened Preterm Labor (No)	Total	p-value
Yes	35	2	37	0.001
No	25	58	83	
Total	60	60	120	

Multivariate Logistic Regression analysis at Table 3. was performed to identify the primary predictors of Threatened Preterm Labor (TPL). Variables that yielded a p-value < 0.25 in the Chi-Square test—specifically infection, anemia, and a history of preterm birth—were included in the final model to account for their simultaneous influence. The results, as presented in Table 8, indicated that all three variables remained significant predictors even after controlling for each other. All p-values remained below 0.05, and the 95% confidence intervals (CI) did not cross 1, confirming the statistical stability of the observed associations.

As presented in Table 4. infection emerged as the most dominant factor, with an OR of 13.62 (95% CI: 2.78–66.65), suggesting that pregnant women with infections are approximately 13.6 times more likely to experience TPL than those without. Additionally, a history of previous preterm birth showed a strong association with an OR of 7.87 (95% CI: 1.18–52.27), indicating a significantly increased risk for recurrence. Anemia also remained a substantial contributor, with an OR of 6.29 (95% CI: 1.36–29.10). Overall, based on the OR magnitudes and the CI lower bounds, infection is the primary risk factor in this study, followed by a history of preterm birth and anemia.

Table 5 Multivariate Logistic Regression Analysis of Factors Influencing the Incidence of Threatened Preterm Labor

Variabel	B	S.E.	Wald	df	Sig.	Exp(B)
Infection	2.612	0.811	10.366	1	0.001	13.622
Anemia	1.839	0.772	5.680	1	0.017	6.293
History of Preterm Birth	2.062	0.970	4.519	1	0.034	7.865
Constant	-2.544	0.492	26.730	1	<0.001	0.079

DISCUSSION

The Association between Infection and the Incidence of Threatened Preterm Labor

The significant association between infection and TPL (p<0.001) underscores the role of the inflammatory cascade in triggering preterm labor. Biologically, maternal infections —particularly genitourinary— lead to the production of pro-inflammatory cytokines such as IL-6 and TNF-alpha. these mediators stimulate the production of prostaglandins in the fetal membranes and decidua, which ultimately results in uterine contractions and cervical remodeling.

While Rahmawati et al. (2024) and Wang et al. (2024) highlight similar risks, the high OR (13.62) in this study suggests that in regional settings like Wlingi, untreated infections may be more prevalent due to barriers in early screening access.[10, 11] Clinically, this necessitates a shift from symptomatic treatment to routine, proactive screening for asymptomatic bacteriuria and reproductive tract infections in early pregnancy.[12, 13]

A primary strength of this research is the use of Odds Ratio (OR) analysis to assess the influence of multiple factors simultaneously. However, the reliance on medical record data poses a potential limitation due to variations in clinical

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documentation. Furthermore, as the study was conducted at a single hospital, the generalizability of these results should be approached with caution. Overall, these findings underscore the vital importance of early detection and the clinical management of infections during pregnancy to mitigate the risk of threatened preterm labor.

The Association between Anemia and the Incidence of Threatened Preterm Labor

Anemia was found to be a potent contributor to TPL (OR = 6.29), a finding that aligns with the broader Indonesian context where nutritional deficiencies remain a challenge. The primary mechanism involves uteroplacental hypoxia, which induces physiological stress in both the mother and fetus. This stress triggers the premature release of Corticotropin-Releasing Hormone (CRH), which increases prostaglandin levels and enhances myometrial sensitivity to oxytocin.

Unlike previous studies that show varied results based on the severity of anemia, our findings emphasize that even moderate anemia significantly elevates the risk within this population.[14, 15] The higher Odds Ratio observed in this study (6.293) may be influenced by several factors, including variations in the trimester during which hemoglobin was measured, socioeconomic conditions, nutritional status, and the consistency of iron supplement intake within the local population.

The high prevalence of anemia during pregnancy in Indonesia further reinforces the clinical relevance of these findings. Preventive efforts, such as iron supplementation, nutritional education, and routine monitoring of hemoglobin levels, are essential to mitigate the risk of preterm labor. However, certain limitations of this study must be noted, including inconsistencies in laboratory data across different trimesters and the lack of differentiation regarding the specific type and severity of anemia, both of which may influence the variation in observed risks.

The Association between a History of Preterm Birth and the Incidence of Threatened Preterm Labor

A history of preterm birth remains the strongest predictor of recurrence (OR = 7.87) in this study. Epidemiologically, a prior preterm birth is a potent predictor of recurrence; these results align with studies by Seyama et al. (2022) and Tingleff et al. (2022), which reported an elevated risk in subsequent pregnancies.[16, 17]

Beyond simple recurrence, this association points toward persistent risk factors such as cervical insufficiency, disturbances in the vaginal microbiome, or permanent structural changes in cervical collagen composition.

The exceptionally high incidence of recurrence (94.6%) in our sample suggests a gap in postpartum follow-up and pre-conception care. From a policy perspective, this underscores the need for a 'High-Risk Registry' at the primary care level (*Puskesmas*) to ensure that women with a history of TPL receive specialized antenatal care, including serial cervical length monitoring and progesterone therapy where indicated.

Primary Predictors and Implications of Threatened Preterm Labor

The multivariate analysis identifies infection as the most dominant determinant, followed by a history of preterm birth and anemia. This hierarchy of risk factors suggests that the incidence of TPL at RSUD Ngudi Waluyo Wlingi is driven by a combination of acute clinical conditions (infection) and chronic health status (anemia and obstetric history).

These findings necessitate several clinical and policy-level shifts in midwifery practice. Primary health facilities should integrate mandatory infection screening (simple urinalysis and vaginal swabs) and consistent hemoglobin monitoring into standard ANC protocols. Hospitals should adopt standardized management for high-risk mothers, such as

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prioritizing the administration of tocolytics and corticosteroids for those with identified risk factors to improve neonatal outcomes. Strengthening the role of midwives in providing educational frameworks like the Health Belief Model (HBM) can increase patient adherence to treatment and nutritional interventions.

CONCLUSION

This study demonstrates that infection, anemia, and a history of previous preterm birth are significantly associated with the incidence of threatened preterm labor (TPL) at RSUD Ngudi Waluyo Wlingi. The Odds Ratio (OR) analysis identifies infection as the most dominant predictor; pregnant women presenting with an infection are 13.62 times more likely to experience TPL, followed by those with a history of preterm birth (OR = 7.87) and anemia (OR = 6.29). These findings underscore the role of these three factors as critical determinants of preterm labor.

Consequently, healthcare providers must enhance routine screening and management of infections and anemia during pregnancy, while providing more intensive monitoring for mothers with a prior history of preterm delivery. Healthcare institutions are encouraged to strengthen laboratory facilities, ensure the availability of necessary medications, and expand educational programs focused on risk factor prevention. Furthermore, future research should adopt a prospective design with a larger sample size and incorporate confounding variables such as nutritional status, age, and socioeconomic factors to obtain more comprehensive and generalizable results.

LIMITATION

The authors acknowledge several limitations that must be considered when interpreting these findings.

First, the retrospective observational design of this study inherently limits the ability to establish definitive causality, as it relies on historical data rather than prospective tracking of clinical outcomes. Second, the reliance on medical record reviews introduces potential information bias; variations in clinical documentation and inconsistencies in laboratory data across different trimesters may affect the accuracy and completeness of the analyzed variables. Additionally, birth history data may be subject to recall bias if not thoroughly documented in the hospital archives. Third, although a multivariate logistic regression was employed to control for infection, anemia, and obstetric history, there remain unmeasured confounding variables —such as maternal nutritional status, psychological stress, smoking habits, and specific socioeconomic conditions —that were not available in the medical records but could significantly influence the risk of TPL.

Finally, the generalizability of these results is limited, as the study was conducted at a single regional hospital in a specific setting. The findings may not fully represent populations in urban centers or high-resource health facilities with different screening protocols and patient demographics.

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