

Urinary tract infection as a triggering factor for imminent preterm labor at RSUD Haji, East Java Province

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Abstract

Imminent preterm labor (Partus Prematurus Iminen/PPI) is a condition characterized by the threat of preterm delivery between >20 and <37 weeks of gestation. One of the most suspected triggering factors is urinary tract infection (UTI), which causes inflammation and prostaglandin release, thereby increasing uterine contractions. This study aims to analyze whether UTI acts as a triggering factor in the occurrence of PPI at RSUD Haji, East Java Province. This analytical observational study employed a case-control design with a 1:1 ratio. A total of 160 medical records were collected from January to March 2024, consisting of 80 PPI cases and 80 matched controls. Chi-square test and Odds Ratio (OR) analysis were used to evaluate the statistical association. Among the women with PPI, 55% were diagnosed with UTI, while only 8.3% of the control group had UTI. The statistical analysis revealed a strong association between UTI and PPI ($p < 0.001$; $OR = 23.222$), indicating that pregnant women with UTI are 23 times more likely to experience PPI. UTI is significantly associated with the incidence of imminent preterm labor. Early detection and prompt treatment of UTI during pregnancy are essential strategies to reduce the risk of preterm birth. This research contributes to the achievement of Sustainable Development Goal (SDG) 3, which aims to ensure healthy lives and promote well-being for all at all ages, especially in maternal and neonatal health.

Keywords: Bleeding During Pregnancy; Birth Complication; Antenatal Care; Infant Mortality; Malnourish; Pregnancy Failure

1. Introduction

Imminent preterm labor (IPL) is a clinical condition in pregnancy characterized by regular uterine contractions that occur between 20 and <37 weeks of gestation, and often accompanied by low birth weight (<2500 grams) [1]. It is defined as a threat of preterm birth with clinical signs such as uterine contractions and cervical dilation occurring at a gestational age of more than 20 weeks but less than 37 weeks [2]. Pregnant women with imminent preterm labor may present with abdominal pain, cervical dilation, restlessness, and anxiety.

Prompt diagnosis and appropriate management are crucial to prevent the progression to preterm birth. Early intervention plays a vital role in reducing neonatal morbidity and mortality. This condition is a global health concern that requires coordinated action and awareness among healthcare providers worldwide.

Preterm birth remains a global health challenge that significantly contributes to neonatal morbidity and mortality. It is estimated that approximately 35% of the 3.1 million annual infant deaths worldwide are due to preterm birth, making it the second leading cause of death among children under five, after pneumonia. Globally, approximately 60% of

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preterm births occur in Africa and Asia, with Indonesia reporting around 675,700 cases of preterm delivery annually [3]. The prevalence of imminent preterm labor in Europe is approximately 7%, in Southeast Asia between 8–14%, and in Australia around 5.6% [3]. According to the 2018 Riskesdas (Indonesia Basic Health Research), the national prevalence of imminent preterm labor was 3.75% [13].

At RSUD Haji in East Java Province, there has been a steady increase in cases of imminent preterm labor over the past three years. Several maternal risk factors have been identified, including maternal age, education level, occupation, pregnancy status, delivery history, and infectious conditions such as urinary tract infections (UTIs). It is estimated that approximately 70% of imminent preterm labor and subsequent spontaneous deliveries are triggered by infections, premature rupture of membranes, bleeding, stress, and malnutrition [4].

Among these, urinary tract infection (UTI) is one of the most frequently occurring infections during pregnancy due to anatomical factors, such as the shorter urethra in women. The incidence of UTI in pregnant women is estimated to range from 2% to 10%, and the most common pathogen identified is *Escherichia coli* [5]. UTI during pregnancy can cause both maternal and fetal complications, including an increased risk of imminent preterm labor and preterm birth.

The pathophysiological mechanism involves bacterial colonization of the cervix and urinary tract, where microbes produce enzymes such as protease and sialidase, which degrade cervical mucus and stimulate phospholipase activity, initiating the release of prostaglandins, which in turn stimulate uterine contractions. Elevated levels of prostaglandins in amniotic fluid have been observed during labor. Therefore, preterm labor induced by UTI poses a serious threat to maternal and neonatal safety [6]. Given the strong correlation between UTIs and increased rates of imminent preterm labor, this study seeks to explore and quantify the relationship between urinary tract infection and the incidence of imminent preterm labor at RSUD Haji, East Java Province.

This research is in line with the global development agendas such as the Sustainable Development Goals (SDGs) and the Millennium Development Goals (MDGs), specifically SDG Goal 3: Ensure healthy lives and promote well-being for all at all ages. By addressing maternal infections and reducing preterm birth rates, this study contributes directly to targets related to reducing maternal and neonatal mortality and improving reproductive health care service.

2. Material and Methods

This study is analytical observational research with a case-control design. The study population comprised all pregnant women who were diagnosed with imminent preterm labor (PPI) and those without PPI at RSUD Haji, East Java Province. Data were collected between January and March 2025, while the sample was drawn based on medical records from January to December 2024. This research involved two variables is: the dependent variable: incidence of imminent preterm labor (PPI) and the independent variable: presence of urinary tract infection (UTI)

The sampling technique used was total sampling for the case group (PPI), and simple random sampling for the control group. The study consisted of 80 respondents with a 1:1 ratio, comprising 40 cases and 40 controls. Inclusion and exclusion criteria were strictly applied to ensure appropriate subject selection. Data analysis was performed using the Chi-Square test, including univariate and bivariate analyses, using a 2x2 contingency table to examine the relationship between UTI and PPI.

This research was approved by the Ethics Committee of RSUD Haji East Java Province, under Ethical Clearance Number: 445/15/KOM.ETIK/2025.

3. Result and discussion

3.1. Characteristic of respondent with Imminent preterm labour

This study involved a total of 160 pregnant women as respondents. Their characteristics included maternal age, educational level, occupational status, gravidity, and presence of urinary tract infection (UTI). These characteristics are crucial for analysis as they are potentially associated with the incidence of Imminent Preterm Labor (IPL).

Table 1 Frequency Distribution of Respondents' Characteristics

Characteristic	Category	Total	
		Frequency (n)	Prosentage (%)
Age	Risk	78	48.8
	Not at Risk	82	51.2
Education	Rendah	45	28.1
	Tinggi	115	71.9
Occupation	Employed	85	53.1
	Unemployed	75	46.9
Pregnancy	Primipregnancy	53	32.5
	Multipregnancy	98	61.3
	Grandemultipregancy	10	6.3
ISK	Yes	48	30.0
	No	112	70.0

Table 1 Responden Cracteristic

The results show that 48.8% of respondents were in the at-risk age group, which is associated with a higher risk of pregnancy complications including preterm birth. Pregnancies in women younger than 20 years or older than 35 years are more vulnerable due to immature reproductive organs or age-related comorbidities such as hypertension, diabetes, and placental insufficiency [7].

Regarding educational level, 71.9% of respondents had a high level of education, which contributes to better access to health services, improved antenatal care compliance, and greater awareness of pregnancy danger signs [8,9]. Meanwhile, 53.1% were employed. Physically demanding work or psychological stress during pregnancy may increase cortisol production, leading to elevated prostaglandin levels, which in turn may trigger uterine contractions and cervical changes [10,11].

A majority of respondents were multipregnancy (61.3%). Although multiparity may provide maternal experience, it is also associated with complications such as uterine overdistension, cervical insufficiency, and placental vascular issues, which may increase the risk of IPL [7].

As for UTIs, 30% of respondents were diagnosed with infection. During pregnancy, anatomical and physiological changes predispose women to UTIs. If not properly managed, these infections can lead to preterm labor, premature rupture of membranes, and other obstetric complications [12]. Education during ANC sessions should emphasize the importance of hygiene, stress management, nutrition, and early detection of UTI symptoms.

Table 2 Association Between UTI and Imminent Preterm Labor at RSUD Haji East Java Province

UTI	Imminent Preterm Labour						p-value	OR	95% CC
	Case		Control		Total				
	n	%	n	%	N	%			
Yes	44	55.0	4	5.0	48	30.0	<0.001	23.222	7.748 – 69.602
NO	36	45.0	76	95.0	112	70,0			
Total	80	100	80	100	160	100			

The results show a significant association between UTI and IPL ($p < 0.001$). The calculated odds ratio (OR) was 23.222, indicating that pregnant women with UTI were 23 times more likely to experience imminent preterm labor compared

to those without UTI. This result demonstrates that UTI is a highly significant risk factor for IPL. UTIs, particularly during the second and third trimesters, are known to coincide with critical phases of fetal development and placental function. Infection during these periods may lead to inflammatory responses that precipitate premature uterine activity and cervical ripening.

IPL is a clinical condition defined by regular uterine contractions accompanied by early cervical changes, occurring before 37 weeks of gestation. One of the most frequently reported risk factors is infection, particularly UTI. Infections during pregnancy can stimulate systemic inflammatory responses that induce cervical ripening and myometrial activity [10, 14].

Pathogen-specific mechanisms have also been identified. *Escherichia coli*, the most common causative agent of UTIs in pregnancy, produces lipopolysaccharides (LPS) that activate Toll-like receptor (TLR) signaling pathways in maternal tissues. This leads to the release of proinflammatory cytokines such as IL-1 β , TNF- α , and prostaglandin E2, which play crucial roles in initiating uterine contractility and cervical effacement. In addition, infection-related inflammation contributes to premature rupture of membranes (PROM), which often precedes spontaneous preterm labor. A recent cohort study by Lee et al. found a significant association between UTIs and the occurrence of PROM, further strengthening the biological plausibility of UTI as a precursor to IPL [14].

Recent studies also emphasize the role of vaginal and urinary microbiota dysbiosis in preterm labor risk. Disruptions in the protective flora, particularly a decline in *Lactobacillus* species, may facilitate pathogen colonization and excessive inflammatory reactions, thereby increasing susceptibility to ascending infections and preterm uterine activation.

Pathophysiologically, UTIs trigger the release of proinflammatory cytokines such as IL-1 β , TNF- α , and prostaglandin E2, which can activate preterm labor cascades, including membrane rupture, increased uterine contractility, and matrix degradation. These processes can lead to early labor onset [11].

Anatomical and hormonal changes in pregnancy further predispose women to UTIs. Enlarged uterus may compress the ureters, while progesterone-induced smooth muscle relaxation slows urinary flow, creating an environment conducive to bacterial growth. If left untreated, even asymptomatic bacteriuria may progress to pyelonephritis or other complications [7].

Hence, routine screening for UTIs as part of antenatal care (ANC) is essential. WHO and various national guidelines recommend urine screening in pregnancy, particularly for asymptomatic bacteriuria, as early antibiotic treatment can significantly reduce the incidence of preterm labor. This strategy aligns with SDG Goal 3 by promoting maternal and neonatal health and reducing preventable deaths and Integrating UTI prevention strategies into routine maternal healthcare programs, including education on hygiene, hydration, and timely ANC visits, is thus essential for reducing IPL incidence and improving maternal–fetal outcomes.

4. Conclusion

Based on the findings of this study conducted at RSUD Haji, East Java Province, it can be concluded that urinary tract infection (UTI) is a significant risk factor for the occurrence of imminent preterm labor (IPL) among pregnant women. Statistical analysis demonstrated that pregnant women with UTI had a 23-fold increased risk of experiencing IPL compared to those without UTI (OR = 23.222; 95% CI = 7.748–69.602; $p < 0.001$).

These findings are supported by previous studies, including Goldenberg et al., who emphasized that maternal genitourinary infections are responsible for up to 25–40% of spontaneous preterm births through mechanisms involving proinflammatory cytokines and prostaglandins, which lead to uterine contractions and cervical changes before term.

Early detection, routine screening during antenatal care (ANC), and appropriate treatment of UTI are essential interventions in preventing imminent preterm labor. Educational counseling regarding personal hygiene, adequate hydration, timely urinalysis, and adherence to antibiotic regimens should be integral to maternal health programs.

This study contributes to the achievement of Sustainable Development Goal (SDG) 3, especially in: reducing global maternal and neonatal mortality, ending preventable newborn deaths, ensuring access to reproductive health services through strengthened ANC programs.

Preventing preterm birth through comprehensive infection control strategies is a critical global health effort, particularly in low-resource settings, to improve maternal and perinatal outcomes.

Compliance with ethical standards

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Disclosure of conflict of interest

The author declares no conflict of interest related to this research. The study was independently conducted without influence from any third party.

Statement of ethical approval

This study received ethical clearance from the Ethics Committee of RSUD Haji, East Java Province under the number: 445/15/KOM.ETIK/2025. All procedures involving human participants were conducted in accordance with ethical standards.

Statement of informed consent

This study was conducted using secondary data obtained from patient medical records. No direct contact or intervention was made with the patients. However, all patient data were anonymized and handled with strict confidentiality to protect privacy and comply with ethical standards. The use of medical records for research purposes was approved by the institutional ethics committee, and informed consent was waived as the data were retrospective, non-interventional, and de-identified.

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