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# Differences of maternal leukocyte count in premature rupture of membranes and preterm premature rupture of membranes



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## ABSTRACT

**Background:** Premature rupture of membranes (PROM) is rupture of membranes amniotic membrane prior to the labor. PROM is associated with an increased incidence of preterm labor and infection.

**Aim:** To compare maternal leukocyte count in premature rupture of membranes (PROM) and preterm premature rupture of membranes (PPROM)

**Methods:** This cross-sectional design was conducted at Dr. Kariadi General Hospital Medical Center and Kartini General Hospital Jepara from September 2019 to January 2020. The study sample was pregnant women with premature rupture of membranes that came

to Emergency Department. Samples were divided into two groups, PROM and PPRM. All samples were subjected to leukocyte count examination.

**Results:** This study has a total of 40 samples, with 20 samples each. In PROM, 8 (40%) leukocytosis and 12 (60%) were normal, while in PPRM 7 (35%) leukocytosis and 13 (65%) were normal. There were no significant differences in maternal leukocyte levels in PROM and PPRM ( $p=0.229$ ).

**Conclusion:** There were no significant differences in maternal leukocyte levels in PROM and PPRM.

**Keywords:** Premature rupture of membranes, aterm, preterm, leukocyte

**Cite this Article:** Pramono, B.A., Wiyati, P.S., Dewantiningrum, J. 2020. Differences of maternal leukocyte count in premature rupture of membranes and preterm premature rupture of membranes. *Bali Medical Journal* 9(3): 868-871. DOI: [10.15562/bmj.v9i3.2149](https://doi.org/10.15562/bmj.v9i3.2149)

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Received: 2020-10-23  
Accepted: 2020-11-28  
Published: 2020-12-01

## INTRODUCTION

Premature rupture of membrane (PROM) is defined as the rupture of the amniotic membrane prior to the labor. Premature rupture of membranes can occur during or after 37 weeks of gestation (premature rupture of membranes / PROM), or before 37 weeks of gestation (preterm premature rupture of membranes / PPRM).<sup>1</sup> Under normal circumstances, 8-10% women with a term pregnancy will experience PROM.<sup>2</sup>

Currently, the problem of PROM needs a greater attention, because its prevalence is quite large and the incidence of infection tends to increase. The incidence of term PROM occurs in approximately 6.46-15.6% of term pregnancies and preterm PROM occurs in approximately 2-3% of all singleton pregnancies and 7.4% of multiple pregnancies. The incidence rate of PROM in Indonesia ranges from 4.5-6%. In Dr. Kariadi General Hospital Medical Center, the incidence rate of PROM in 2012 was 6.1%.<sup>3</sup>

Leukocytes are cells of the immune system that play a role in protecting the body from infection and foreign bodies. Leukocytes are produced by multipotent cells in the spinal cord. Leukocytes have a larger size than erythrocytes. The leukocyte

count is a test done to count the number of leukocytes in 1 ml of blood.<sup>4</sup> Physiological levels of normal leukocyte counts in pregnancy tend to be higher, ranging from 5,600-13,800 mm.<sup>3,5</sup> In PROM, leukocytes play a role in activating cytokines that stimulate prostaglandin production and metalloproteinase matrix (MMP).<sup>6</sup>

Leukocytosis is one of the sign of clinical chorioamnionitis or intraamniotic infection (IAI) or Triple I (Intrauterine infection or inflammation or both) which can occur in 40-70% of patients with PROM.<sup>7</sup> In preterm PROM with maternal leukocytosis and managed as expectative management, poor infant outcomes can happen in the form of neurodevelopmental disorders during the first 2 years of life.<sup>8</sup>

Therefore, the authors intended to conduct a research on differences in levels of maternal leukocyte counts in patients with PROM and PPRM.

## METHOD

This study was a cross-sectional study, which was conducted at Dr. Kariadi General Hospital Medical Center Semarang and Kartini General Hospital Jepara from September 2019 to January 2020.

The sample of the study were pregnant women with premature rupture of membranes in the Emergency Room of both hospitals, which meet the inclusion criteria, namely primigravida and multigravida with a gestational age of  $\geq 20$  weeks, and a single live intrauterine fetus. Patients with a history of cardiovascular disorders, a history of chronic hypertension, diabetes mellitus, kidney disease, chronic and systemic infections, smoking habits, drinking alcohol, use of drugs containing estrogen and progesterone during pregnancy, obesity, intrauterine fetal death, and antepartum hemorrhage were excluded from the study.

Sampling was done by block randomization. All samples were subjected to anamnesis examination, physical examination, and laboratory blood tests as indicated. Blood samples used vein blood as much as 5 cc and checked with a hematology analyzer machine.

Statistical analysis was performed using the Shapiro-Wilk test to see the distribution of primary data distribution. Mann-Whitney test was used to analyze the levels of leukocyte counts.

## RESULTS

This research was conducted from September 2019 to January 2020, which obtained 40 research subjects consisting of 20 subjects in each PROM and PPRM.

Based on Table 1, there was no significant difference in the age variable ( $29.9 \pm 7.07$  vs  $27.4 \pm 4.68$ ) and parity ( $2.5 \pm 1.36$  vs  $2.0 \pm 0.89$ ) in the PROM groups at term and preterm ( $p > 0.05$ ). In this study, patients with a history of PROM were significantly different ( $p < 0.05$ ).

### Differences in the levels of maternal leukocyte counts in PROM and PPRM

Table 2 shows PROM group there were 8 (40%) leukocytosis and 12 (60%) normal, while in the PPRM group obtained 7 (35%) leukocytosis and 13 (65%) normal. There was no significant difference between the leukocyte count levels in PROM and PPRM ( $p = 0.229$ ).

## DISCUSSION

Premature rupture of membranes (PROM) is a rupture of the amniotic membrane prior to labor. Premature rupture of membranes can occur at or after 37 weeks' gestation (PROM or premature rupture of membranes), before 37 weeks' gestation (PROM or preterm premature rupture of membranes).<sup>1</sup>

The etiology of PROM is still uncertain. A history of PROM in previous pregnancy, genital tract infection, antepartum hemorrhage, and smoking have a very close association with the incidence of PROM.<sup>9</sup> In this study, the history of PROM was observed as much as 55% in PROM and 15% in PPRM. Research in Ethiopia stated that a previous history of PROM was a risk factor for the occurrence of PROM by 33.8%. The history of PROM is one of the risk factors for the incidence of PROM due to the presence of untreated/asymptomatic genital and urinary tract infections, short cervical length, as well as other obstetric problems underlying the cause of PROM.<sup>10</sup>

**Table 1. Characteristics of sample**

Characteristics	Type of Rupture of Membrane		P
	PROM (n = 20)	PPROM (n = 20)	
Age (years) (Mean $\pm$ SD; Median-min-max)	29.9 $\pm$ 7.07; 30.0 (17-39)	27.4 $\pm$ 4.68; 29.0 (17-35)	0.195
Parity (Mean $\pm$ SD; Median-min-max)	2.5 $\pm$ 1.36; 2.0 (1-5)	2.0 $\pm$ 0.89; 2.0 (1-4)	0.297
History of rupture of membrane			
Yes	11 (55 %)	3 (15 %)	0.009
No	9 (45 %)	17 (85 %)	

\* Age data distribution is normally distributed ( $p > 0.05$ )

The distribution of parity and the history of PROM were not normally distributed ( $p < 0.05$ )

**Table 2. Analysis of the level of the leukocyte count**

Levels of leukocytes	Type of rupture of membrane		P
	PROM (n = 20)	PPROM (n = 20)	
Value ( $\times 10^3$ )	10.885 $\pm$ 3.885; 11.450 (4.500-17.800)	12.5350 $\pm$ 3.119; 11.250 (7.800-18.300)	0.229
Leukocytosis			
Yes	8 (40 %)	7 (35 %)	
No	12 (60 %)	13 (65 %)	

\* The data is not normally distributed ( $p < 0.05$ )

Leukocytosis is a sign of clinical chorioamnionitis or intraamniotic infection (IAI) or Triple I (Intrauterine infection or inflammation or both) which can occur in 40-70% of patients with PROM.<sup>7</sup> In PPROM with maternal leukocytosis and managed as expectative management, poor infant outcomes can happen in the form of neurodevelopmental disorders during the first 2 years of life.<sup>8</sup> Maternal leukocytosis in PROM can affect neonatal outcomes such as acute respiratory failure, sepsis, and death.<sup>11</sup> In this study, PROM obtained at term 8 (40%) leukocytosis and 12 (60%) normal, whereas in preterm PROM obtained 7 (35%) leukocytosis and 13 (65%) normal.

In this study, there was no significant difference in the levels of maternal leukocyte counts in PROM and PPROM ( $p = 0.229$ ). This is the same results as the research conducted at Dr. H. Abdul Moeloek General Hospital at Lampung in 2018, which stated that there was no significant difference between the level of the patient's leukocyte count in PROM and PPROM.<sup>12</sup> Study in Czech Republic suggests that maternal leukocyte count levels are poor predictors of definitive diagnosis of IAI and microbial invasion of the amniotic cavity (MIAC), but can be used as a clinical sign of chorioamnionitis or IAI.<sup>13</sup>

During this study, there were no complications from venous blood sampling for routine blood laboratories. Examination of the maternal leukocyte count can be performed in PROM patients to determine the presence of leukocytosis as a clinical sign of chorioamnionitis.

The limitation of this study was that there was no assessment of other risk factors for the incidence of PROM in the form of body mass index data, the effect of genital infections, cervical length, and previous history of polyhydramnios. This study also did not have a limit on PROM occurrence for the first time, so that it can affect the level of leukocyte count in PROM and PPROM.

## CONCLUSION

Statistically, there was no significant difference in leukocyte levels in PROM and PPROM. Examination of the maternal leukocyte count can be performed in PROM patients to determine the presence of leukocytosis as a clinical sign of chorioamnionitis.

## CONFLICT OF INTEREST

The author declares there is no conflict of interest regarding publication of this study.

## ACKNOWLEDGMENTS

We are grateful to all the participants. We also present our greatest gratitude to Dr. Kariadi General Hospital Medical Center Semarang and Kartini General Hospital Jepara as they helped to facilitate the study.

## AUTHOR'S CONTRIBUTION

All of the authors developed the plan and design of the study together. BAP was the main investigator, he collected the data and conducted the analysis and first draft of the writing, as well as contributed in the editing and the approval of the final manuscript. PSW and JD were contributed in the editing and the approval of the final manuscript.

## FUNDING

This study was self-funded by the corresponding author. Therefore, there isn't any conflict of interest presented to this study.

## ETHICAL CONSIDERATION

This study has been approved by the Ethical Committee Faculty of Medicine Universitas Diponegoro/Dr. Kariadi Hospital, Semarang, Indonesia. All study protocol in accordance with Helsinki declaration of human rights.

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