

## Research Article

## The Number of Vaginal Epithelial and Neutrophil Strongly Correlates with the Occurrence of Premature Delivery

### *Jumlah Epitel dan Neutrofil Vagina Berkorelasi Kuat dengan Angka Kejadian Persalinan Kurang Bulan*

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#### Abstract

**Objective:** To investigate the relationship of the amount of vagina epithelia and neutrophil with premature delivery. The study was carried out in several hospitals at Obstetrics and Gynecology Department of the Faculty of Medicine Hasanuddin University, from September 2011 to January 2012.

**Methods:** The study was cross-sectional study involving two groups of sample: premature delivery group fulfilling inclusive criteria and a control group of normal delivery. The total samples are 48 persons, comprising of 16 premature deliveries, and 32 normal pregnancy.

**Result:** The study revealed that there was a significant correlation between  $\geq 1$  parity and premature delivery ( $p < 0.05$ ). The average vagina epithelia in the premature delivery were 6.81 per field of view and in the normal pregnancy were 1.59 per field of view ( $p < 0.001$ ). The average vagina neutrophil in the premature delivery was 10.6 per field of view and in the normal pregnancy was 1.91 ( $p < 0.001$ ). Spearman correlation test showed that the vagina epithelia and neutrophil have a significant correlation with premature delivery as reflected by the coefficient correlation values of 0.907 and 0.770 with  $p = 0.000$ .

**Conclusion:** The number of epithelia and vagina neutrophil in the premature delivery is higher than normal pregnancy, thus there is a strong correlation between number of epithelia and vagina neutrophil and premature delivery.

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**Keywords:** epithelia, neutrophil, premature delivery

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#### Abstrak

**Tujuan:** Mengetahui hubungan jumlah epitel dan neutrofil vagina dengan persalinan kurang bulan. Penelitian ini dilakukan di beberapa RS Pendidikan Bagian Obstetri dan Ginekologi FK UNHAS di kota Makassar, mulai bulan September 2011 - Januari 2012.

**Metode:** Sampel dibagi menjadi 2 kelompok, yaitu kelompok persalinan kurang bulan yang memenuhi syarat inklusi dan sebagai kontrol adalah kehamilan normal dengan usia kehamilan yang sesuai. Jumlah sampel adalah 48 orang, terdiri dari persalinan kurang bulan 16 orang dan kehamilan normal 32 orang.

**Hasil:** Menunjukkan ada hubungan bermakna antara paritas  $\geq 1$  dengan persalinan kurang bulan ( $p < 0,05$ ). Rerata jumlah epitel vagina pada persalinan kurang bulan 6,81 perlapang pandang, pada kehamilan normal 1,59 perlapang pandang ( $p < 0,001$ ). Rerata jumlah neutrofil vagina persalinan kurang bulan 10,6 perlapang pandang, pada kehamilan normal 1,91 perlapang pandang ( $p < 0,001$ ). Uji korelasi Spearman menunjukkan jumlah epitel dan neutrofil vagina mempunyai korelasi kuat terhadap persalinan kurang bulan (nilai koefisien korelasi 0,907 dan 0,770 dengan nilai  $p = 0,000$ ).

**Kesimpulan:** Jumlah epitel dan neutrofil vagina pada persalinan kurang bulan lebih tinggi dibanding pada kehamilan normal, terdapat korelasi kuat antara jumlah epitel dan neutrofil vagina dengan persalinan kurang bulan.

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**Kata kunci:** epitel, neutrofil, persalinan kurang bulan

## INTRODUCTION

Preterm delivery is the major cause of perinatal morbidity and mortality. The incidence of preterm delivery in developed country (5-7%) is relatively less than in developing country (8-21%).<sup>1</sup> Beverly stated that the incidence of preterm delivery has not decreased for the last 40 years and in the US, it is estimated that 1 in 10 deliveries is a preterm delivery, resulting in 75% of neonatal death.<sup>2</sup> Meanwhile in the Southeast Asia, preterm delivery has reached 3 million cases every year.<sup>3</sup>

Lately, neonatal mortality rate has become one of the measuring points to assess the health care system.<sup>4</sup> Preterm labor has a potential to increase the rate of perinatal death. Perinatal mortality is generally associated with low birth weight and it is still dominated by a baby with a low birth weight. In 1997, the perinatal mortality rate in Indonesia is 52.2 per 1,000 live births, and preterm labor is one of the main causes of the high mortality rate. In Dr. Wahidin Sudirohusodo Hospital Makassar, in 2010 there were 2.75% perinatal

deaths of all deliveries.<sup>5</sup> One cause of the failure in preventing preterm labor is a major delay in early diagnosis of preterm labor.<sup>6</sup>

The etiology of spontaneous preterm labor is still not clearly understood. According to Cunningham Meis, of all preterm birth less than 37 weeks in the U.S, 28% was due to preeclampsia, fetal distress, fetal growth retardation, abrupted placenta and fetal death in utero. Seventy-two percent of the rest of preterm labor with or without rupture of amniotic membrane.<sup>4</sup> Romero reported as much as 65% of preterm labor cases were caused by infection.<sup>7</sup> Simhan also stated that preterm labor can occur due to infection. Infection spreads upward from the cervix to the vaginal lining that causes chorioamnionitis, which in turn causes preterm labor. Chorioamnion infection in preterm labor may occur spontaneously or during early pregnancy.<sup>8</sup>

There were several studies regarding the markers for detecting an infection in chorioamnion by examining vaginal pH and neutrophils as well as the number of the vaginal epithelium and neutrophils. Beverly et al reported that there was a significant correlation between the increasing number of neutrophil cell and vaginal epithelium and the incidence of preterm labor.<sup>9</sup>

Yamada conducted research using vaginal washings and Giemsa or Wright staining to assess the number of neutrophils vagina and vaginal epithelium, and get the same result that there was a relationship between the increasing number of neutrophils vaginal epithelium and the incidence of preterm labor.<sup>10</sup>

In Dr. Hasan Sadikin Hospital, a comparison study of diagnostic tests between the vaginal epi-

thelium and neutrophils examination vaginal pH and neutrophils in preterm labor had been performed and it showed that the vaginal epithelium and neutrophils count are better diagnostic tools for the examination of preterm labor compared to ph examination and vaginal neutrophils count.<sup>11</sup>

According to the literature, examination of the amount of vaginal epithelium and neutrophils is easily performed, not invasive, and able to detect the presence of lower genital tract infections because the shedding of vaginal epithelial cells occurs faster than the rise of pH.<sup>12</sup> Study regarding the examination of vaginal epithelium and neutrophils in preterm labor has not been done in Makassar.

## METHOD

This research was conducted to understand the relationship between vaginal epithelial and neutrophil count and the incidence of preterm birth. This was a cross sectional study. This research was performed in Department of Obstetrics and Gynecology in several teaching hospitals in Makassar, starting from 1 September 2011 to 31 Januari 2012.

## RESULT

Research conducted during the period September 2011-January 2012 at a Teaching Hospital Obstetrics and Gynecology Medical Faculty of Hasanuddin University in Makassar, found 16 cases of preterm labor that goes inclusion criteria, and to take control groups of pregnant women with gestational age < 37 weeks control in the clinic as many as 32 people who have met the inclusion criteria.

## Sample characteristic

**Table 1.** The Characteristic of Study's Sample.

Variable	Group		p*	
	Preterm (n = 16)	Normal (n = 32)		
Maternal age	≤ 20	2 (12.5%)	0 (0%)	p = 0.355
	20-35	13 (81.3%)	29 (90.6%)	
	≥ 35	1 (6.3%)	3 (9.4%)	
Parity	0	0 (0%)	13 (40.6%)	p = 0.003
	≥ 1	16 (100%)	19 (54.3%)	
Education (in years)	≤ 6	3 (18.8%)	7 (21.9%)	p = 0.584
	7 - 9	5 (31.3%)	7 (21.9%)	
	10 - 12	8 (50.0%)	15 (46.9%)	
	> 12	0 (0%)	3 (9.4%)	
History of preterm delivery	Yes	2 (12.5%)	0 (0%)	p = 0.106
	No	14 (87.5%)	32 (100%)	

Note: p\* = chi-square test

Table 1 presents the characteristics of the subjects, including maternal age, parity, education and a history of preterm labor. There is a statistically significant relationship between parity with the incidence of preterm labor ( $p < 0.05$ ). There were 16 multiparity women (100%) in preterm labor and 19 multiparity women (54.3%) with normal pregnancy.

### Vaginal Epithelial number

**Table 2.** Comparison of Vaginal Epithelial Count between Normal Pregnancy and Preterm Delivery.

Variable	Group		p value
	Preterm(n=16)	Normal (n=32)	
<b>Epithelial</b>			
> 5	14 (87.5%)	0 (0%)	0.000
≥ 5	2 (12.5%)	32 (100%)	
$\bar{X}$ (SD)	6.81 (2.76)	1.59 (0.61)	

Note:  $p^* =$  Mann-Whitney U test, Chi-Square test

Table 2 presents the vaginal epithelium count in preterm labor and normal pregnancies. It also presents the relationship of vaginal epithelium count with preterm labor. Vaginal epithelium > 5 per field of view were found in the total of 14 cases (87.5%) in preterm labor group, whereas in the case of normal pregnancies there was no subject with vaginal epithelium count > 5 (0%). The mean vaginal epithelium count in preterm labor was higher than in normal pregnancies. The mean epithelial count in preterm labor group was 6.81 per visual field, whereas in normal pregnancy, it was 1.59 per field of view. Results of the analysis with the Mann-Whitney U test found no significant difference between the number of vaginal epithelium in preterm labor and in normal pregnancy. Chi-Square test at 95% confidence level indicates that there is a significant relationship between the vaginal epithelium count with preterm labor ( $p = 0.000$ ).

### Vaginal neutrophil count

Table 3 presents the number of neutrophils in the vagina of subjects with preterm labor and normal pregnancy. There were 15 subjects (87.5%) with vaginal neutrophil count > 5 per field of view and 3 cases (9.4%) in the normal pregnancy group. The mean vaginal neutrophil count in preterm labor is higher than in normal pregnancy. In the preterm labor group, the mean neutrophil count was 10.06

**Table 3.** Comparison between the Number of Neutrophils Vaginal in preterm delivery and Normal Pregnancy.

Variable	Group		p value
	Preterm(n=16)	Normal (n=32)	
<b>Neutrofil</b>			
> 5	14 (87.5%)	3 (0%)	0.000
≥ 5	2 (12.5%)	29 (100%)	
$\bar{X}$ (SD)	6.81 (2.76)	1.59 (0.61)	

Note:  $p^* =$  Mann-Whitney U test, Chi-Square test

per field of view, whereas in normal pregnancy, the mean neutrophil count was 1.91 per field of view. The analysis with the Mann-Whitney U test showed that there was a significant difference between the number of neutrophils in the vagina of preterm labor group and in normal pregnancy ( $p = 0.000$ ). Chi-Square test at 95% confidence level indicates that there is a significant relationship between the vaginal neutrophils count with preterm labor ( $p = 0.000$ ).

**Table 4.** Correlation between Vaginal Epithelial and Neutrophil Count with Preterm delivery.

	Variable	
	Epithelial count	Neutrophil count
<b>Preterm delivery</b>		
Spearman's rho	0.907	0.770
p value	0.000	0.000
n	48	48

Table 4 presents the results of correlation analysis between the vaginal epithelium and neutrophil count and preterm labor with the Spearman Correlation Test at 95% confidence level, indicating that there is a significant positive correlation with correlation coefficient 0.907 for the relationship of the vaginal epithelium count and preterm labor of 0.770 for the relationship of the vaginal neutrophils count and preterm labor. These number means that there is a positive correlation on the value of  $p = 0.000$  ( $p < 0.001$ ).

## DISCUSSION

We obtained 16 cases of preterm labor and 32 pregnant women with gestational age < 37 weeks who have met the inclusion criteria. There were 16 multiparity women (100%) in preterm labor and

19 multiparity women (54.3%) with normal pregnancy. In this study, there was no statistically significant association between parity and preterm labor ( $p < 0.05$ ). In the research conducted by Yudha, the highest parity was two.<sup>11</sup> Creasy et al stated that multiparity patients have a high risk for the occurrence of preterm labor.<sup>13</sup>

In this study, the difference of vaginal epithelium count in the group of preterm labor with normal pregnancies was statistically significant ( $p < 0.001$ ). Simhan study reported that in the third trimester of pregnancy there was higher rise on the number of vaginal epithelium in preterm labor compared with in normal pregnancy. The mean number of neutrophils in normal pregnancy is 2 per field of view while in the group of preterm labor, it is 5 per field of view.<sup>8</sup>

There was also significant difference ( $p < 0.001$ ) between the vaginal neutrophil counts in preterm labor and normal pregnancies. There were 15 subjects (87.5%) with vaginal neutrophil count  $> 5$  per field of view and 3 cases (9.4%) in the normal pregnancy group. In the study conducted by Vincendo, they found that there was one subject with vaginal neutrophil count  $> 5$  per field of view in preterm labor than in the control group.<sup>14</sup>

There is a significant positive correlation with correlation coefficient 0.907 for the relationship of the vaginal epithelium count and preterm labor of 0.770 for the relationship of the vaginal neutrophils count and preterm labor. Yamada conducted research using vaginal washings and Giemsa or Wright staining to assess the number of vaginal epithelium and neutrophil. The result was similar with our studies, there is a significant correlation between the increase in the number of neutrophils vaginal epithelium and the incidence of preterm labor.<sup>10</sup>

## CONCLUSION

This study suggests that the number of vaginal epithelium and neutrophils in preterm labor is higher than the number of vaginal epithelium and neutrophils in normal pregnancy. There is a strong correlation between the number of vaginal epithelium and neutrophils with the incidence of preterm labor. Further research needs to be done with a long-

er study period and different research methods to prove that there is a significant relationship between the number of vaginal epithelium and neutrophils with preterm labor and can be used as predictors of the incidence of preterm labor.

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