The Relationship Between Premature Rupture of Membranes and Leukocyte Level in Mothers at PKU Muhammadiyah Hospital of Mamajang District of Makassar

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Abstract: The major purpose of this research was to investigate the relationship between premature rupture of membranes and leukocyte level in mothers at PKU Muhammadiyah hospital of Mamajang, Makassar. A quantitative method by using an observational analytical research design through a cross sectional approach.The population is all pregnant mothers registered and recorded in the medical records of PKU Muhammadiyah hospital of Mamajang in 2020 and 2021. The sampling technique was purposive sampling where 101 respondents and were analysed through the use of SPSS application with the chi-square test. There were various aspects influencing the prevalence of premature rupture of membranes. The relationship between the age and the cases of premature ruptures of membrances, the p-value obtained was $0.003 < 0.05$. The relationship between the parity and the cases of premature ruptures of membrances, the p-value obtained was $0.041 < 0.05$. The relationship between the leukocyte level of pregnant women and the duration of premature ruptures of membrances, the p-value obtained was $0.004 < 0.05$. The relationship between the leukocyte level of pregnant women and the occurrences of premature ruptures of membrances at the term and preterm gestation, the p-value obtained was $0.040 < 0.05$. There are relationships between leukocyte levels of pregnant women and the high cases of premature rupture of membranes

Keywords: leukocyte level, premature rupture of membranes

1. Introduction

Maternal Mortality Rate (AKI) is one indicator to see the success of maternal health efforts. According to the World Heart Organization, it is estimated that in 2017, 810 women die every day from complications and childbirth, in achieving the sustainable development goals (SDGs) stated globally in 2017, AKI in the world reached 211/100,000 Live Births. At the regional level, AKI in ASEAN is ranked 3rd which reaches 152/100,000 live births, while Indonesia as one of the developing countries has a high enough AKI when compared to other countries in the world, reaching 177/100,000 Live Births [1].

The results of the Indonesian Demographic and Health Survey (SDKI) stated, in 2012 the maternal mortality rate in Indonesia is still high at 359 per 100,000 live births, the result is decreasing but not significant. From the 2015 Census Population Survey (SUPAS), the maternal mortality rate in Indonesia was 305/100,000 live births and ranked Indonesia as the country with the highest number of AKI cases (Rochmatin 2019). Cases of maternal death in Indonesia in 2018-2019 obtained 4,221 cases (Indonesia Health Profile 2019). Maternal mortality is caused by bleeding 28%, KPD 20% influenza, eclampsia 12%, abortus 13%, old partus 18%, and other causes 2% [2].

South Sulawesi Provincial Health Office has conducted a survey with the number of AKI cases over the last 3 years, namely in 2017 there were 115 cases, in 2018 there were 144 cases, and in 2019 there were 139 cases of maternal death [3]. The causes of high AKI are bleeding, infection, high blood pressure during pregnancy, old partus, and abortus. The main complications that cause almost 75% of AKI are severe bleeding, pre-eclampsia eclampsia, childbirth complications, unsafe abortions and infections. Infection in pregnancy is more common in the old partus state, mothers who suffer from gonorrhea and premature rupture of membranes (PROM), in this case as many as 65% of infections experienced by the mother are PROM [4, 5].

Based on several theories, PROM can be caused by an infection characterized by leukocytosis, and can be assessed through a blood test used as one of the efforts in monitoring the possibility of infection in maternal pregnancy. Increased number of leukocytes (leukocytosis) indicates the presence of infectious or acute inflammatory processes [6, 7].

Based on the description above, shows that infection is one of the 3 biggest causes of maternal death, one of which is PROM. Although there have been many studies on PROM, but research comparing the relationship of leukocytes and long PROM in pregnancy aterm, preterm and at the same time assessing its relationship with sociodemographic factors in RS PKU

Muhammadiyah Mamamajang Makassar city does not exist, then researchers are interested in further study with the title "Relationship Between Premature Rupture Of Membranes With Maternal Leukocyte Levels In Childbirth At PKU Muhammadiyah Mamajang Hospital Makassar City".

2. Methods

This study is an observational analytical study that uses a cross sectional approach that aims to determine the relationship of Premature rupture of membranes with leukocyte levels in maternity mothers. This research was conducted at PKU Muhammadiyah Mamajang Hospital makassar city which was conducted from June-July 2021. The population in this study is all maternity mothers and recorded in the register book and medical record records at PKU Muhammadiyah Mamajang Hospital Makassar city in 2020 and 2021 with the number of cases of mothers who experienced Premature rupture of membranes there were 124 cases. The samples in this study were all maternity mothers who experienced premature rupture of membranes located at the research site that met the criteria of inclusion and exclusion. Sampling techniques Using purposive samplingmethod, and obtained 101 samples, obtained from medical record data (secondary data) which is then processed with SPSS application using chi-square test to find out the association Premature rupture of membranes with leukocyte levels of maternity mothers.

3. Result

At this stage, the analysis of the percentage frequency distribution of each single variable and the characteristics of respondents and samples can be seen in the following table:

Table 1. Frequency distribution of respondent characteristics

Characteristic	sum	
	n	%
Age (years)		
<20	13	12.9
20-35	69	68.3
>35	19	18.8
Parity		
Primigravida	45	44.6
Multigravida	56	55.4
Gestational Age		
Preterm	21	20.8
Aterm	80	79.2
Education		
low	20	19.8
tall	81	80.2
Work		
work	24	23.8
Not working	77	76.2
Old KPD		
<12 him	45	44.6
$\geq$ 12 jam	56	55.4
Leukocyte		
Normal	77	76.2
Leukositosis	24	23.8
PROM		
< 12 for him	36	45.0
$\geq$12 jam	44	55.0
PPROM		
< 12 for him	9	42.9
$\geq$12 jam	12	57.1
Total	**101**	**100.0**

Based on table 1 shows that the distribution of frequency distribution on each variable measured in the study. In the age variable there were 13 respondents (12.9%) respondents at the age of <20 years, 69 respondents (68.3%) respondents aged 20-35, and 19 respondents (18.8%) respondents at the age of >35 years. In addition, there were 45 respondents (44.6%) with parity primigravida category and 56 respondents (55.4%) with parity of multigravida category. At the age of pregnancy there were 80 respondents (79.2%) aterm gestational age and 21 respondents (20.8%) in the preterm age. In Education, 20 respondents (19.8%) with low education, while 81 respondents (80.2%) with higher education. At work, there were 24 respondents (23.8%) working and 77 respondents (76.2%) that does not work. For the old variable of maternity KPD, there were 56 respondents (55.4%) category with a kpd duration of >12 hours, and 45 respondents (44.6%) kpd old category <12 hours. In leukocyte variables there were 77 respondents (76.2%) leukocytes, and 24 respondents (23.8%) leukocytosis. Then, for the variable category KPD aterm >12 hours there were 44 respondents (55.0%), premature rupture of membranes <12 hours there were 36 respondents (45.0%), while the variable category KPD preterm >12 hours there were 12 respondents (57.1%) and KPD preterm <12 hours there were 9 respondents (42.9%).

Table 2. Analysis of age relationships with PROM variables

variable	category	Group				sum		p
		PROM		PPROM				
		n	%	n	%	n	%	
age	<20 years	6	46.2	7	53.8	13	100.0	
	20-35 years	56	81.2	13	18.8	69	100.0	0.003
	>35 years	18	94.7	1	5.3	19	100.0	
Total		80	79.2	21	20.8	101	100.0	

Table 2 shows the relationship between the age of respondents and the incidence of PROM, with the classification of PROM and PPROM For <20 year olds there are 13 respondents, 7 respondents (53.8%) experienced PPROM and 6 respondents (46.2%) kpd PROM Furthermore, for respondents aged 20-35 years there are 69 respondents, 56 respondents (81.2%) PROM and 13 respondents (18.8%) PPROM. And for respondents with the age of >35 years there are 19 respondents, 18 respondents (94.7%) PROM and 1 respondent (5.3%) PPROM.

Based on the results of the chi-square test shows a p-value of 0.003 which is smaller than the alpha value of 5% or 0.05 ($p<0.05$). This indicates that there is a relationship between age and the incidence of PROM.

Table 3. Analysis of parity relationships with PROM variables

variable	category	group				sum		p
		PROM		PPROM				
		n	%	n	%	n	%	
Parity	Primigravida	31	68.9	14	31.1	45	100.0	0.041
	Multigravida	49	87.5	7	12.5	56	100.0	
Total		80	79.2	21	20.8	101	100.0	

Table 3 shows the relationship between respondent parity and PROM occurrence, with PROM classification and PPROM. For respondents with primigravida parity there were 45 respondents, 31 respondents (68.9%) PROM and 14 respondents (31.1%) PPROM. While in respondents with multigravida there were 56 respondents, 49 respondents (87.5%) PROM and 7 respondents (12.5%) PPROM.

Based on the results of the chi-square test shows a p-value of 0.041 which is smaller than the alpha value of 5% or 0.05 ($p<0.05$). This indicates that there is a significant relationship between parity and PROM events

Table 4. Analysis of leukocyte relationship with PROM incidence length

Leukocyte Levels	Amniotic Rupture Early				sum		p
	<12 hours		>12 hours				
	n	%	n	%	n	%	
Normal	41	53.2%	36	30.8%	77	100.0%	0.004
Leukositosis	4	16.7%	20	88.9%	24	100.0%	
Total	45	44.6%	56	54.5%	22	100.0%	

In table 4 shows the relationship between leukocyte levels and the length of time the Premature rupture of membranes (PROM). Based on the table obtained 77 respondents with the category of normal leukocyte levels, whereas as many as 41 respondents (53.2%) PROM

<12 hours and 36 respondents (30.8%) PROM >12 hours. As for the category of increased leukocyte levels (leukocytosis) obtained by 24 respondents, there were 4 respondents (16.7%) PROM <12 hours and 20 respondents (88.9%) PROM >12 hours.

Based on the chi square test on leukocyte levels relationship to the length of the incident of Premature rupture of membranes in RS PKU Muhammadiyah Mamajang Makassar City obtained pvalue 0.004, where 0.004 disagreement α = 0.05, then H0 rejected and it can be concluded that there is a significant relationship between leukocyte levels with the length of the incident of Premature rupture of membranes in PKU Muhammadiyah Mamajang Hospital Makassar City.

Table 5. Analysis of leukocyte relationship with PROM incidence length

Leukocyte Levels	Premature Rupture of Membranes				sum		p
	PROM		PPROM				
	n	%	n	%	n	%	
Normal	65	84.4	12	15.6	77	100.0	0.040
Leukositosis	15	62.5	9	37.5	24	100.0	
Total	80	79.2	21	20.8	79	100.0	

In table 5 shows the relationship between leukocytes and the incidence of Premature rupture of membranes. Based on the table obtained a number of 77 respondents with a category of normal leukocyte levels, whereas as many as 65 respondents (84.4%) PROM and 12 respondents (15.6%) PPROM. While in the category of increased leukocyte levels (leukocytosis) there were 24 respondents, 15 respondents (62.5%) who experienced PROM and 9 respondents (37.5%) who experienced PPROM.

Based on the chi square test on leukocyte levels relationship to the occurrence premature rupture of membranes in RS PKU Muhammadiyah Mamajang Makassar City obtained pvalue 0.040, where 0.040 disagreement α = 0.05, then H0 rejected and it can be concluded that there is a significant relationship between leukocyte levels and the occurrence of premature rupture of membranes In RS PKU Muhammadiyah Mamajang Makassar City.

4. Discussion

4.1. Age relationship with premature rupture of membranes

In this study obtained statistical tests with chi square obtained a p-value of 0.003 which is smaller than the alpha value of 5% or 0.05 which shows that there is a significant age relationship with the incidence of premature rupture of membranes (PROM) This is in accordance with Sari's [7] research mentions that there is a significant relationship between maternal age and the incidence of premature rupture of membranes, with a pvalue 0.000 [7].

In this study, respondents' age was dominated by 20-35 years old with high KPD figures. With the trend of getting older mother's age is increasing anka PROM at the age of aterm and the younger the age of the mother the higher the PPROM, as many as 7 respondents (53.8%) this is because there are many factors that can cause premature rupture of membranes, one of which is the age of the individual calculated from the moment of birth until the birthday. According to Mundi age is divided into 3 criteria, namely < 20 years, 20-35 years and > 35 years. Safe reproductive age for pregnancy and childbirth is 20-35 years old [8, 9].

The results of this study are in line with Vidia's research stating that age has a meaningful relationship with the occurrence of PROM,then Titi's research that shows age has a meaningful relationship with the incidence of PROM so as to prove that the age of the mother at risk can result in the mother experiencing PROM. Then Manuaba's research stated that less than 20 years old is the age of delaying pregnancy, where the reproductive organs are not fully functional. Can result in less formation of connective tissue and imperfect vascularization that forms a thin and not strong amniotic membrane can trigger the occurrence of PROM [10, 11, 12]. In contrast to budi's research stated that age has no relationship with PROM this is because respondents always control the condition of the pregnancy so that midwives can communicate, provide information, education to check their pregnancy regularly so that there are no complications during childbirth [13].

4.2. Parity relationship with premature rupture of membranes

In this study obtained statistical tests with chi square obtained a p-value of 0.041 greater than the alpha value of 5% or 0.05. This suggests that there is a significant association between parity and the incidence of premature rupture of membranes, where multigravida is more dominant than primigravida. The results of this study are in line with research conducted by Agatha Maria and Utin Siti Candra SariAprihastiwi on the relationship of gestational age and maternity parity with the incidence of premature rupture of membranes in 2016 which concluded some respondents with parity 2 - 3 as many as 43 people (45.7%) did not experience premature rupture of membranes and parity 1 and >3 some respondents as many as 45 (47.9%) premature rupture of membranes [14].

In this study obtained statistical tests with chi square obtained a p-value of 0.041 greater than the alpha value of 5% or 0.05. This suggests that there is a significant association between parity and the incidence of early ruptured amniotic fluid, where multigravida is more dominant than primigravida. The results of this study are in line with research conducted by Agatha Maria and Utin Siti Candra SariAprihastiwi on the relationship of gestational age and maternity parity with the incidence of amniotic rupture early in 2016 which concluded some respondents with parity 2 - 3 as many as 43 people (45.7%) did not experience early rupture of amniotic fluid and parity 1 and >3 some respondents as many as 45 (47.9%) amniotic rupture early [14].

4.3. Relationship of leukocyte levels of pregnant women with the old occurrence of premature rupture of membranes

In table 4 shows the relationship between leukocyte levels and the length of time premature rupture of membranes. Based on the table obtained 77 respondents with the category of normal leukocyte levels, whereas as many as 41 respondents (53.2%) premature rupture of membranes <12 hours and 36 respondents (30.8%) premature rupture of membranes >12 hours. As for the category of increased leukocyte levels (leukocytosis) obtained by 24 respondents, there were 4 respondents (16.7%) premature rupture of membranes <12 hours and 20 respondents (88.9%) premature rupture of membranes >12 hours.

Based on the chi square test on leukocyte levels relationship to the length of the incident of Early Ruptured Amniotic in RS PKU Muhammadiyah Mamajang Makassar City obtained p value 0.004, where 0.004 disagreement α = 0.05, then H0 rejected and it can be concluded that there is a significant relationship between leukocyte levels with the length of the

incident of premature rupture of membranes in PKU Muhammadiyah Mamajang Hospital Makassar City.

The results of this study are in accordance with the theory, saying that in general the length of occurrence of PROM can increase the risk of infection characterized by increased leukocytes in the mother. This study is also in accordance with Manuaba's opinion, the longer the latent period, the more likely the infection that occurs in the uterus. This is certainly related to the length of time the amniotic rupture. From the cross table between the length of premature rupture of membranes in maternity mothers with PROM, it can be known that the longer the rupture of membranes, the higher the leukocyte levels. Proven from the data obtained by researchers, as in table 4.5 the length of rupture membranes >12 hours as much as 88.9% who experienced leukocytosis (Manuaba 2010). The results of this study are also in line with Erni Dwi Widayana's research on premature rupture of membranes and maternity leukocyte levels that there is a link between the length of rupture membranes and the increase in maternal leukocytes, which based on the results obtained long premature rupture of membranes rupture membranes>12 hours and >24 hours 100% leukocytosis [12, 15].

However, the results of this study are not in line with the research conducted first et al. where there is no significant relationship between levels of C-reactive protein and intra-uterine infection in people with early ruptured amniotic (p=0.082 and value I= 0.236). Similarly, the results of research conducted by Torbe & Czejka [17] that said that there is no significant relationship between the amount of procalcitonin in vaginal fluid and the incidence of subclinical intrauterine infection in cases of PROM (r= -0.14; p= 0.33), nor levels of C- reactive protein (r= -0.17; p= 0.24). The results of this study are also not in line with the research of Annisa Firdausi, where the results showed there is a weak and insignificant relationship between the length of the occurrence of premature rupture of membranes with leukocytes in the mother. This indicates that there may be other factors that can cause changes in the leukocyte rate of mothers who have PROM, as described by Prawirohardjo, the causes of infection during pregnancy there are several, among others, the occurrence of malaria, hepatitis, influenza, ISPA, bronchitis, and others. But in this case, these factors have become the exclusion criteria in this study in sampling [6, 16, 17, 18].

4.4. Relationship of leukocyte levels of pregnant women with PROM in aterm and preterm gestational age

In table 5 shows the relationship between leukocytes and the incidence of premature rupture of membranes. Based on the table obtained a number of 77 respondents with the category of normal leukocyte levels, whereas as many as 65 respondents (84.4%) premature rupture of membranes and 12 respondents (15.6%) preterm premature rupture of membranes. While in the category of increased leukocyte levels (leukocytosis) there were 24 respondents, 15 respondents (62.5%) who experienced premature rupture of membranes and 9 respondents (37.5%) who experienced preterm premature rupture of membranes.

Based on the results of this study found dominant leukocytosis in pregnant women with KPD >12 hours, namely as many as 80 respondents (79.2%). chi square test on Leukocyte Level Relationship to the occurrence of Premature Rupture of Membranes in RS PKU Muhammadiyah Mamajang Makassar City obtained p-value 0.040, where 0.040 disagreement α = 0.05, then H0 rejected and it can be concluded that there is a significant relationship between Leukocyte Levels and the occurrence of premature rupture of membranes.

The results of this study are in accordance with the theory, that the amniotic membrane is very strong in young pregnancies and weakens in the third trimester. One of the causes of the weakening of the amniotic membrane in the last trimester is the occurrence of biochemical changes in the amniotic membrane. There is a balance between synthesis and extracellular degradation of the matrix [6].

In this study, 21 respondents (20.8%) were obtained who experienced Amniotic Rupture Early before the age of 37 weeks of pregnancy, and called preterm premature rupture of the membrane (PPROM). preterm premature rupture of membranes occurs in about 1 percent of all pregnancies and is associated with 30 to 40 percent of preterm births. Thus, lead causes of preterm birth were identified (after less than 37 weeks of pregnancy completed) and complications, including respiratory distress syndrome, neonatal infections, and intraventricular bleeding [19].

The results of this study are similar to those conducted by Agatha Maria and Utin Siti Candra Sari who showed that the number of respondents who experienced Early Rupture Amniotic Rupture at the age of aterm pregnancy (≥ 37 weeks) is more than that experienced by the preterm and posterm pregnancy age groups, namely 44 respondents and 3 respondents with p-value = 0.000 (< 0.05). The results of this study are also supported by research conducted by Budi Rahayu and Ayu Novita Sari, which is as many as 80.3% of respondents experienced Premature Rupture of Membranes at the age of aterm pregnancy (≥ 37 weeks) [14, 20].

Based on the results of the study, 77 respondents (76.2%) were found leukocyte levels and as much as 24 (23.8%) respondents had elevated leukocyte levels. In pregnant women, each part of the body will undergo changes as a form of adaptation to the presence of the fetus. Leukocytes as one of the important blood components, will experience a suppression of the amount in the first and second trimesters and experience an increase in the third trimester, leukocyte count usually ranges from 5,000 to 12,000/μL. During childbirth and early nifas, the number can greatly increase to 25,000/ μL or even more but the average is 14,000 to 16,000/μL [21].

Based on the chi square test obtained p-value 0.040, where 0.040< α= 0.05, then H0 rejected and it can be concluded that there is a significant relationship between leukocyte levels and the occurrence of Premature Rupture of Membranes In hospital PKU Muhammadiyah Mamajang Makassar City. The results showed that out of 101 medical records, there were 80 respondents who experienced KPD in aterm gestational age and there were 24 respondents who had elevated leukocyte levels. Research conducted by Iqsyadina Fikriya has similar results, where pregnant women who have KPD have a higher leukocyte count than pregnant women who do not experience KPD [22].

Based on the results of the study, there were some samples that experienced KPD in preterm gestational age of 20.8% with higher leukocyte levels with samples that experienced KPD in aterm gestational age. Another theory states, premature rupture of membranes in preterm pregnancy is caused by external factors such as infection that spreads from the vagina, polyhidrmanion, cervical incompetence and placental solusio. A similar statement was described by the health journal Denver Health (2018), where the following factors can increase the risk of premature rupture of membranes in preterm pregnancy, namely amnion sac infection, other infections (Chlamydia, Bacterial Vaginosis), bleeding during the second and third trimesters, lung disease, nutritional deficit, low BMI, smoking history during pregnancy, to low socioeconomic conditions [6].

5. Conclusion

From the results of research that has been conducted in rs PKU Muhammadiyah Mamajang Makassar city related to the relationship of early rupture of amniotic with leukocyte levels of maternity mothers can be concluded as follows:

a) There is a significant relationship between age and the incidence of premature rupture of membranes in PKU Muhammadiyah Mamajang Hospital with p value 0.003 (p<0.5)

b) There is a significant relationship between Parity and the occurrence of premature rupture of membranes in PKU Muhammadiyah Mamajang Hospital Makassar City with p value 0.041 (p<0.5)

c) There is a significant relationship between leukocyte levels of pregnant women with long incidence of premature rupture of membranes in PKU Muhammadiyah Mamajang Hospital Makassar city with p value 0.004 (p<0.5)

d) There is a significant relationship between leukocyte levels of pregnant women with the incidence of premature rupture of membranes in pregnancy aterm and preterm in PKU Muhammadiyah Mamajang Hospital Makassar city with p value 0.040 (p<0.5)

Conflicting Interest
All authors declare no conflict of interest.

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