Determinant of Premature Rupture of Membrane in Indonesia (Secondary Data Analysis of Idhs 2017)

Chintya Elittasari[1], Sudijanto Kamso[2]

[1]Magister Program of Public Health, Faculty of Public Health, [2]Biostatistics and Population Studies Department, Faculty of Public Health, Universitas Indonesia, Depok, Indonesia

Abstract

Premature rupture of membranes (PRoM) constitutes 5-10% of the causes of complications in full-term pregnancy and 30% of preterm pregnancy. In Indonesia, according to Riskesdas data in 2018, ProM is the biggest delivery complication of 5.6% in women aged 10 - 54 years. Based on IDHS 2017 data, it is the third biggest complication during labor with a percentage of 16.1%, which increased from 14.9% in 2012. Premature rupture of membranes risks troubled mothers and fetuses that potentially cause maternal and perinatal morbidity and mortality. Little is known about the determinants of PRoM in Indonesia. Therefore, this study was conducted to identify the determinants of the ProM in Indonesia. This research method using logistic regression analysis to individual data IDHS 2017 by enclosing 4 independent variables: age, parity, amount of iron tablet consumption, and smoking habit to predict the incidence of PRoM. Sample of this study counted 12,340 people. Based on multivariate analysis found that consumption of Fe tablets is significantly related to PRoM by Odds Ratio (OR) 0.7 (95% CI: 0.631 - 0.777) controled by maternal age. The conclusion of this study is mothers who consume ≥ 90 iron tablets during pregnancy are 0.7 times low risk of experiencing PRoM than mothers who consume iron tablets < 90 tablets during pregnancy.

Keywords : *PRoM ; Amount of Iron Tablet Consumption; Indonesia*

Introduction

Premature rupture of membranes (PRoM) is a condition of membranes rupture before the beginning of labour, where cervical dilatation of less than 3 cm in primipara and less than 5 cm in multiparas. PRoM which occurs before 37 weeks pregnancy is called premature PRoM, whereas occurs after 37 weeks PRoM itself[(1)]. PRoM constitutes 5-10% of the causes of complications in full-term pregnancy and 30% of preterm pregnancy[(2)]. According to Riskesdas 2018, PRoM is the biggest delivery complication of 5,6%[(3)]. Based on IDHS data 2017, ProM is the third biggest complication during labour of 16.1%[(4)]. PRoM is risked causing maternal and perinatal morbidity and mortality. A serious complication of ProM includes retained placenta and haemorrhage requiring dilatation and curettage (12%), maternal sepsis (0,8%), and maternal death (0,14%). So that, ProM is a high risk of caesarean deliveries [(1)]. Based on IDHS data 2017 the number of caesarean deliveries caused by PRoM decreased to 18.8% from 22.8% in 2012. Meanwhile, cases of within a month old infant mortality increased to 19% from the previous 14%[(4,5)].

The risk factors associated with PRoM include maternal age, parity, infection, anemia, multiple pregnancies, increased intrauterine pressure, and genetic factor[(6)]. According to a case-control study conducted at Tugurejo Regional General Hospital mentioning the relationship between fetal malposition, maternal age, parity, history of PRoM, maternal employment status, anemia status, and active-passive smoking with the incidence of PRoM and there was no association between multiple pregnancies, genetic factor, previous recurrent miscarriage with PRoM[(7).] Another case-control study where conducted in Mekele City Tigray about risk factors of PRoM in public hospital mention abortion histories, caesarean delivery histories, previous PRoM, and abnormal vaginal discharge significantly associated with KPD, and previous PRoM to be the strongest risk factor for PRoM[(1)].

Corresponding author:
Chintya Elittasari
E-mail: chintya.elittasari@ui.ac.id

Determinants identification of PRoM is needed to predict and prevent the occurrence of PRoM to prevent complications. Previous PRoM determinant researches have been conducted in various regions and different times of health services, yet secondary data utilization thoroughly in Indonesia still less in amount. Therefore, this study aims to fill those gap by identifying the determinants of PRoM using Indonesian Demographic and Health Survey (IDHS) data.

Method

This study used secondary data from IDHS 2017 and designed in cross-sectional. Populations of this study are all interviewed women who had live births in the 5 years before the survey. The total sample of this study were 12,340 people. Univariate, bivariate (crosstabs), and multivariate analysis (logistic regression) were performed in this study. Statistical analyses were performed using SPSS version 21.0; p <0.05 indicated statistical significance. Inclusion criteria of this study were women who gave birth to the last child within 5 years before the survey and experienced complications at the time of delivery. The dependent variable of this study was PRoM and the independent variables were maternal age, parity, amount of iron tablet consumption and smoking.

Tabel 1. Bivariate Analysis result for significant variables (ρ ≤ 0,25) of determinant PRoM in Indonesia, 2017

Variable	PRoM				OR	P Value
	No		Yes			
	n = 8400	%	n = 3940	%		
Age (years)						
No risk (20 – 35)	6051	49	2956	24	0,857	0,006
High Risk (< 20 & > 35)	2349	19	984	8		
Parity						
< 2	2822	22,9	1341	10,9	0,980	0,686
≥ 2	5578	45,2	2599	20		
Amount of iron tablets consumption						
≥ 90	4253	34,5	2342	18,9	0,700	0,000
< 90	4147	33,6	1598	13		
Smoking						
No	8275	67,1	3885	31,5	0,936	0,729
Yes	125	1	55	0,4		

**Bivariat analysis was using crosstabs*

The bivariate analysis showed that maternal age (*p-value*: 0.006) and total consumption of iron tablets (*p-value*: 0,000) are related to PRoM. Meanwhile, parity (*p-value*: 0.686), and smoking (*p-value*: 0.729) were not related to PRoM. Based on the table above there are 2 variables that have *p-value* <0.25, there are age and amount of consumption of iron tablets. So both of them required to enter multivariate modelling.

Tabel 2. Multivariate analysis Determinant of PRoM in Indonesia, 2017

Variable	Model 1	Model 2
	cOR (95% CI)	aOR (95% CI)
Age	0,851 (0,761, 0,952)**	0,858 (0,769 - 0,958)**
Parity	1,032 (0,933, 1,120)	-
Amount of iron tablets consumption	0,700 (0,631, 0,777)***	0,700 (0,631 - 0,777)***
Smoking	0,940 (0,645, 1,370)	-

OR, odds ratio; CI, confidence interval.
*p<0,05, **p<0,01, ***p<0,001

The multivariate analysis showed that iron tablet consumption was the dominant factor causing PRoM, with OR 0.7 (95% CI: 0.631 - 0.777) after controlled by maternal age variable. This study in line with the case-control study conducted at Wates Regional Hospital in 2015 that stated there is an association of anemia in pregnancy with ProM with *p-value* = 0.036 and OR 2,524 (95% CI: 1.042 - 6.113) pregnant women with anemia have a risk 2, 524 times higher experiencing PRoM[8].

Discussion

Study Limitation

This study used secondary data of IDHS 2017, because of limitation the research data, anemia variable which in theory is related to PRoM incidences in this study was replaced by the amount of iron tablet consumption during pregnancy. Researchers also could not control results from interviews with respondents due to the possibility of recall bias that caused by respondents memories related to research variables.

Relationship Between Maternal Age and ProM

The results of this study showed that there is a relationship between maternal age and PRoM incidences. Similarly with past research conducted by Berkowits (in Hussain, 2012) which found that mothers with 30 years old or older significantly increased occurrence of preterm rupture of membrane (pPROM)[9]. Larger studies by retrospective cohort study conducted by Lucke and Brown (2007) show that increasing maternal age is significantly associated with a high risk of pPROM occurrence after being controlled by variables of race, parity, diabetes, chronic hypertension and maternal smoking status[10]. However, in contradiction with past research conducted at Yogyakarta Hospital by Rahayu (2018) which states that there is no relationship between maternal age, parity, gestational age, uterine over distance with PRoM occurence[11].

Based on literature optimal maternal reproduction age is between 20-35 years old. Under or above those ages will increase pregnancy and deliveries risked. Maternal age will affect the reproductive organs by decreasing their ability and elasticity in pregnancies. The older maternal ages, both of environmental stress and oxidative stress are increased that induce biological damage of cell at molecular level[12], which affects decreasing of vitamin C level on blood circulation[13] so that inhibit collagen formation and stability of collagen cross-link[12]. Structure alteration, amount of cells and collagen catabolism cause rupture of membranes[14].

Relationship Between Parity and ProM

This study showed that there is no significant relationship between parity and occurrence of PRoM. In line with research conducted in Gowa, suggesting that the amount of parity is not a risk factor of premature rupture of membranes even though both of ≤ 1 and> 3 parity are 1.5 times higher risked than maternal parity of 2-3 (OR = 1.5 95%CI: 0, 91 - 2.48)[15]. Contradiction with results research was conducted at Bahteramas Hospital which states that maternal parity is a risk factor of PRoM occurrence (OR = 9.94 95%CI: 4.44 - 22.24) [16]. This may be due to more respondents with ≥ 2 parity who didn't experience PRoM compared to those who experienced it.

In multiparous and grand multiparous women the risk of PRoM occurrence will increase. Multiparous women have intrinsic weakness of the uterus caused by cervical trauma due to previous deliveries that caused increasing of uterine motility, hanging bellies and decreasing of cervical flexibility that causes premature cervical dilatation and ends with PRoM. Furthermore, in multiparous and grand multiparous women occurred cervical damage tissue which consists more of nerve fibres than connective tissue that allows the basic muscles of the uterus to stretch[17].

Relationship Between Amount Of Maternal Iron Tablet and ProM

Overall, 50% of anemia was caused by iron deficiency[18]. 75 - 95% of anemia during pregnancy were caused by iron deficiency[19]. A study conducted in Singapore in 2019 mentioned that almost three-quarters of pregnant women in Singapore experienced an iron deficiency in the early third trimester of pregnancy[20]. During pregnancy, women lose 680 mg iron. Iron necessity enhances 3 times higher during pregnancy (> 4 mg per day). Pregnant women are fragile to iron deficiency due to an increased need for iron during pregnancy for the expansion of erythrocytes, plasma volume, fetal, and placental growth. Based on research at Karang Asem primary health services in Samarinda 2015-2017, it was found that there was a significant relationship between the distribution of Fe tablets and anemia. Pregnant women who are not compliant with consuming Fe tablets are 1.3 times more likely to develop anemia than pregnant women who are compliant in consuming Fe tablets[21].

This study showed that mother who consumes ≥ 90 iron tablets during pregnancy is 0.7 times low risk of experiencing PRoM than mothers who consume iron tablets < 90 tablets during pregnancy. Same with the retrospective cohort study conducted in Purworejo Regency stated that anemia in the second trimester has been shown to increase of PRoM occurrence. Mothers with anemia are at risk of PRoM 2.11 (RR = 2.11; 95% CI: 1.06 - 3.44) times higher than mothers without anemia after controlled by iron tablet consumption[22]. Another case-control study in Singaraja Bali found, mothers with anemia at risk of experiencing PRoM 3.59 (OR = 3.59; 95% CI = 1.82-7.09) times higher than mothers who were not anemic after controlled by parity variable[23].

Anemia during pregnancy causes weakness of amnion membranes due to lack of tissue oxygenation caused by reduction of haemoglobin mass[6]. So that mother with anemia during pregnancy is risky to PRoM occurrences

Relationship Between Smoking and ProM

This study showed that smoking is not associated with PRoM. Same with a case-control study at General Hospital of Mekele Tigray City, December 2015 - June 2016 that Stated there was no significant relationship between smoking and PRoM(1). Contradiction with research was conducted in Southern Ethiopia, that smoking is a positive predictor of premature rupture of membranes, women with a history of smoking during pregnancy are at risk of experiencing PRoM of 17 times higher than non-smoking mothers (AOR; 17,053, 95% CI [2,145, 135,6])[24]. The differences might be due to the low prevalence of smoking respondents.

Based on the literature, smoking lead to decrease of collagen and protein in membranes by increasing cadmium levels and decreasing the ability of CU2 + to synthesize collagen in mesenchymal cells of aminion[25]. Also, nicotine causes arteriolar constriction leading to uterine decidua ischemia[26] so affecting the integrity of the membrane that leads PRoM.

Conclusion

Amount of iron tablets consumption is a dominant factor of PRoM occurrence after controlled by maternal age variables. Based on these results, the researcher recommends consumption of ≥ 90 iron tablets to all pregnant women during pregnancy to prevent the occurrence of PRoM, that can cause maternal and perinatal morbidity and mortality. The results of this study are expected to encourage the effectiveness of distribution and compliance of the iron tablets consumption for pregnant women.

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