Correlation Between Oxygen Saturation, Uric Acid and Creatinine Level to Maternal Outcome of a Woman with Severe Preeclampsia

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Abstract

The aims of the research is to measurecorrelation between oxygen saturation, uric acid and creatinin level to maternal outcomes of a woman with severe preeclampsia. The research is observational with cross sectional cross design. The amount of samples is counted by using categorical correlative analysis uncoupled and the sample taking is using total sampling technique which collected 135 women sample with severe preeclampsia in Wahidin Sudirohusodo General Hospital Makassar. The data is analyzed by using SPSS 21. The result of this research shows oxygen saturation (p=0.021) the uric acid has (p=0.006) association with complication on severe preeclampsia. Oxygen saturation (p=0.000) and uric acid (p=0.028) also has the association with the mortality on severe preeclampsia. Creatinine has no relation with the complication (p= 0.56) and mortality (p=0.358) on severe preeclampsia. The logistic regression analysis shows that oxygen saturation (OR=5.443; p=0.016) and uric acid (OR=4.333; p=0.004)has the relation with the complication on severe saturation. This research concludes that oxygen saturation and uric acid has relation with the complication and mortality on severe preeclampsia.

Keywords: *Severe Preeclampsia, Oxygen Saturation, Creatinine, Uric Acid.*

Introduction

The number of maternal death in Indonesia is still very high, which is 305 per 100,000 life birth in 2015 based on the data showed by Indonesia Republic Minister of Health. This findings is still far from the target planned in the 5th Millenium Development Goals (MDGs) for 2015 which is 102 per 100.000 life birth (Wibowo dkk, 2016)[1].

Until today, preeclampsia and eclampsia still become Obstetric service issue and the mother and baby mortality beside bleeding and infection. The number of preeclampsia case is around 5-10% of the whole pregnancy cases with each country gaining different number of it. In 2015 the World Health Organization (WHO) estimated 303,000 maternal death in the whole wide world. According to the MDGs, the number of maternal death is decreasing 43% since 1990 (Primadi dkk, 2015). World Health Organization estimates that preeclampsia cases are seven times higher in developing countries compare to ones in developer countries. The preeclampsia prevalence in developer countries is 1.3%-6%, while in developing countries is 1.8%-18%. There are 128.273 and around 5,3% preeclampsia incidents in Indonesia and there has not been any indication of the incidents decreasing in the past two decades (Wibowo dkk, 2016; Primadi dkk, 2015). The data is compiled by fetomaternal Division of Wahidin Sudirohusodo General Hospital Makassar, which shows there were 175 severe preeclampsia cases in 2016.

There are several indicators to notify maternal outcomes complication on preeclampsia, which are from oxygen saturation, uric acid and creatinine. <93% oxygen saturation is one of the high risk factors of maternal complication from respiration and non respiration system (Alexandra et al., 2011).

The purpose of this research is to rate the association

of oxygen saturation, uric acid and creatinine level in maternal outcomes of patients with severe preeclampsia.

Methodology

The research is and observational research and cross sectional design. The amount of samples is counted by using categorical correlative analysis uncoupled and the sample taking is using total sampling technique which collected 135 women sample. The samples are pregnant women with severe preeclampsia diagnosis admitted at Dr. Wahidin Sudirohusodo General Hospital Makassar during the period of the research with included and excluded criteria. The included criteria in this research are pregnant women diagnosed with severe preeclampsia who are willing to take part in the research. The excluded criteria are subject with complication before oxygen saturation, uric acid and creatinine test and have history of kidney disorders, cardiopulmonary and metabolic disease. The procedure in the this research is by taking blood samples in order to examine the uric acid level and the creatinine in the laboratory and also to check the oxygen saturation by using pulse oxymetry attaching informed consent signed by the subjects. The data analysis consists of descriptive analysis and hypothesis test. In descriptive analysis, nominal and ordinal data is stated in frequency and percentage distribution. The hypothesis test is using Chi square for free and bound categorical scale. To identify the confounding variable on the outcomes, Chi square test is performed to indicates the rate of the risk. The amount of influence is stated based on the magnitude of risk which is know as Relative Risk (RR) for bivariate analysis. The rate of RR > 1 and the range of trust is not 1, which means the variable is considered to be risk factor. The boundary limits is when $p < 0.5$ with the interval of trust as 95%. The data analysis is conducted by using SPSS program for Windows.

Results

From the research, there are 135 women samples with severe preeclampsia in Dr. Wahidin Sudirohusodo General Hospital Makassar. Some common characteristic are researched suc as gravidity, educational background, occupation, age, gestational age and maternal outcomes. Table 1 shows there no significant differences between the groups of primigravida and multigravida and their relation to mortality and morbidity on severe preeclampsia with percentage 42,2% and 57,8%.

Most of the research correspondents have low educational background (65,2%). Most respondents of the research have steady job, 75 people (55,6%). This reasearch shows that no correlation between occupation incidents on severe preeclampsia.

Most of the respondents of the research are diagnosed with severe preeclampsia at the gestational age of <34 weeks, 85 people (63%). The severe preeclampsia incidents in this research tend to happens to the high risk age group, with the percentage of 59,3%, 80 people.

Table 1. Characteristics of Research Subjects

Characteristics	n	%
Gravidity		
Primigravida	57	42.2
Multigravida	78	57.8
Working Women		
Well Educated	47	34.8
Lower Educational Background	88	65.2
Occupation		
Employed	75	55.6
Unemployed	60	44.4
Gestational Age		
<34 weeks	85	63.0
>34 weeks	50	37.0
Age		
Low risk	55	40.7
High risk	80	59.3
Total	135	100

Table 2. Correlation between oxygen saturation, uric acid and creatinine towards complication incident of severe preeclampsia

Variable	Complication	Without Complication	p
SpO_2			
Normal	18 (78.3%)	106 (94.6%)	0.021*
Abnormal	5 (21.7%)	6 (5.4%)	

Variable	Complication	Without Complication	p
Creatinine			
Normal	10 (43.5%)	59 (52.7%)	0.565**
Abnormal	13 (56.5%)	53 (47.3%)	
Uric Acid			
Normal	7 (30.4%)	72 (64.3%)	0.006**
Abnormal	16 (69.6%)	40 (35.7%)	

*Fisher's Exact Test, **Continuity Correction

Table 2 shows correlation between SpO2, creatinine, uric acid and the existence of any complication what so ever to patients with severe preeclampsia. The level of SpO2 indicates significant association of complication on severe preeclampsia with the rate of p=0.021. The creatinine level does not show any significant association on the complication incident to severe preeclampsia with the rate of p=0.565. On the other hand, uric acid shows significant association with the complication on severe preeclampsia. Severe preeclampsia complication tends to happens to respondents with abnormal level of uric acid (69,6%). This indicates that uric acid has significant association to severe preeclampsia complication incident (p=0.006).

Table 3. Correlation between oxygen saturation level, creatinine, uric acid, to severe preeclampsia mortality

Variable	Life	Died	p
SpO_2			
Normal	124 (94.7%)	0 (0%)	0.000*
Abnormal	7 (5.3%)	4 (100%)	
Creatinine			
Normal	68 (51.9%)	1 (25,0%)	0.358*
Abnormal	63 (48.1%)	3 (75,0%)	
Uric Acid			
Normal	79 (60.3%)	0 (0%)	0.028*
Abnormal	52 (39.7%)	4 (100%)	

*Fisher's Exact Test

The data in table 3 shows correlation between the level of SpO2, creatinine and uric acid towards the incident of mortality to severe preeclampsia patients. The severe preeclampsia patients who finally died had abnormal SpO2 level. On a contrary, only 7 respondents (5%) with severe preeclampsia who survive have abnormal SpO2 level. Correlation between SpO2 level with mortality incident on severe preeclampsia shows significant relation with the rate of p>0.05 (p=0.000).

Creatinine shows no significant association on severe preeclampsia mortality (p=0.358). There are 68 People (51,9%) who survive from the group of severe preeclampsia with normal creatinine level. That number does not show much difference from the group severe preeclampsia who survive with abnormal creatinine level, which is 48,1%. The uric acid has significant relation with mortality incident on severe preeclampsia with the rate of p=0.028. All the death case over severe preeclampsia have abnormal uric acid level. The surviving severe preeclampsia patients dominantly have abnormal uric acid level (60,3%).

Table 4. The effect of oxygen saturation and uric acid towards severe preeclampsia morbidity

Variable	p*	OR
SpO_2	0.016	5.443
Uric Acid	0.004	4.333

*Logistic regression analysis

Table 4 show the logistic regression analysis from the oxygen saturation and uric acid level variable to predict the complication on severe preeclampsia cases. The data in the Table shows the level of SpO2 (OR=5.443; p=0.016) and uric acid (OR=4.333; p=0.004) has significant predictive rate over severe preeclampsia case.

Table 5. The effect of oxygen saturation and uric acid towards severe preeclampsia mortality

Variable	p	OR
SpO_2	0.995	0.000
Asam Urat	0.996	0.000

*Logistic regression analysis

The data in table 5 shows the effect between oxygen saturation and uric acid towards the incident of mortality to severe preeclampsia case. The data also shows that oxygen saturation and uric acid have no significant effects towards severe preeclampsia mortality (p=0.995).

The aims of this research is to identify the association of SpO2, creatinine and uric acid towards the incident of complication on severe preeclampsia patients.

Primigravida is one of the risk factors on preeclampsia cases. It suspected that the case may show because the incompetency of the immune system during first pregnancy between maternal and fetoplacenta tissue (Grum et al., 2017). Our research has shown that there is no significant difference between the groups of primigravida and multigravida with the incidents of morbidity and mortality on severe preeclampsia cases.

Luo et al (2007), in his systematic study shows that the primipara has 2,4 times tendency to experience severe preeclampsia compare to the ones in multipara group. This is different from the study that stated severe preeclampsia cases are more to be found in multipara. Immune system maldaptation suspected as a factor taht may contribute to the high incidence of preeclampsia in primigarvida (Luo,Z. C., *et. al*, 2007)

This research also shows that from 135 severe preeclampsia samples, only 4 people (3,0%) of them died. Curiel-Belsara et al (2011) in the research shows that the rate of mortality on severe preeclampsia reaches 1,5% and tend to happens to multipara. This also indicates that severe preeclampsia has lover mortality number but has more complication cases (17%) (Curiel-Belsara et al., 2011).

Early onset preeclampsia is the condition where the preeclampsia incident happens on the 34th week of gestational age. Late onset preeclampsia is one of the terminologies used when the preeclampsia develops after the 34th week of gestational age (Raymond & Peterson, 2011). Wojtowicz et al (2019), in their research show that early onset preeclampsia tend to experience more severe complication compare to late onset preeclampsia. In our research, we have come across different statement, where are no significant differences between early onset preeclampsia and late onset preeclampsia towards severe morbidity and mortality incident.

Sari et al (2019), in their research shows that severe preeclampsia tend to happens more on the high risk age group. Grum et al (2017), shows that there are no significant differences between age and severe preeclampsia incidents. It is similar to the research we have conducted where most of the severe preeclampsia patients come from high risk group, which is < 20 years of age or > 35 years of age. Von Dadelszen et al (2011), in their research show that there no relation between age with complication incidents on preeclampsia cases. The result is similar to our research, where there are no significant differences found between the age group and mortality and morbidity happens to severe preeclampsia cases.

The oxygen saturation in the research shows that there is significant association that triggers the complication on severe preeclampsia (p=0.021). This suits to the research conducted by Millman et al (2011), that stated that oxygen saturation is able to act as main preeclampsia predictor if it is combined with the accompaniment complaints such as difficult to breathe or chest pain (AUC ROC 0.73; 95% CI 0.67-0.78). Von Dadelszen et al (2011), shows that level of SpO2 <90% also acts as predictor on severe preeclampsia complication.

Creatinine level is one of the parameters used to measure the renal function on patients with severe preeclampsia. Vyakaranam et al (2015), in the research shows that creatinine with 80% sensitivity and 77,4% to measure the renal damage that happens to preeclampsia patients by using 0,7mg/dl limitation. The creatinine level on patients with severe preeclampsia have higher average rate, which is 0.94 mg/dl ± 0.26 SD. Our research has failed to indicates the significant relation between the level of creatinine and the complication incident on severe preeclampsia cases. This is probably caused by the Method od study.

Manjareeka & Nanda (2012), in their research shows that the level pf uric acid on patients with severe preeclampsia have higher rate compare to the normal group. The research shows that the level of uric acid has no relation with the increase blood pressure of preeclampsia patients. On a contrary, the level of uric acid can work as the reflection of kidney function and as free radical scavenging which can be more protective on preeclampsia patients. The research that we have conducted shows higher level of uric acid found on severe preeclampsia patients with complications. This may also support the previous researches which explains that uric acid may has protective role in damaging the organ on severe preeclampsia.

At first, uric acid might decrease at the first trimester with the rate of 3 mg/dl, this happens for the uricosuria effect from the estrogen and the increase of renal blood stream. Uric acid level will be higher related to worse maternal and fetal outcomes. The average uric acid rate on severe preeclampsia patients is 7.88 ± 3.11 mg/dl higher compare to normal group (Kumar & Singh, 2019). The research suits the research we have done where most of the severe preeclampsia patients have complications (69,6%) and die (100%) have abnormal uric acid level.

Conclusion

Based on the result and the discussion of the research, it can be concludes that oxygen saturation and uric acid level have significant correlation with severe preeclampsia mortality and morbidity, while creatinine level has no significant correlation on severe preeclampsia mortality and morbidity incidents. Oxygen saturation and level of uric acid are together have significant effect on the morbidity incident. But it shows no significant effect on severe preeclampsia mortality incidents.

Ethical Clearance: The Research Ethical Committee at scientific research by ethical approval of both environmental and health and higher education and scientific research ministries in Indonesia.

Conflict of Interest: The authors declare that they have no conflict of interest.

Funding: Self-funding

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