

## ORIGINAL ARTICLE

# Correlation Between Nutritional Status of Pregnant Women Based on Upper Arm Circumference and Preeclampsia/Eclampsia Severity Degree at Jagir Public Health Center During January 2014 - March 2014

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## ABSTRACT

**Introduction:** Preeclampsia/eclampsia is one of the causes of maternal mortality besides bleeding and infection. The exact etiology of this condition is still unknown. Nutritional status of pregnant women who are overweight can increase the risk. This study aims to determine the correlation between obesity and the severity of preeclampsia/eclampsia through upper arm circumference (UAC) measurement.

**Methods:** This study is a cross-sectional analytic study. Data on preeclampsia/eclampsia and UAC obtained from patient medical records in Jagir Public Health Center Surabaya. Data were analyzed using Chi-square test.

**Results:** Prevalence of mild preeclampsia was greater than severe preeclampsia (87.5% and 12.5%). The majority of patients with mild preeclampsia have normal UAC size (91.3%). Severe preeclampsia found higher in obesity group than normal nutritional status group (22.2% and 9.1%). From Chi-square test analysis, found that  $p = 0.557$ .

**Conclusion:** There was no significant correlation between the nutritional status of pregnant women based on UAC measurement of and the severity of preeclampsia/eclampsia.

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## Introduction

Preeclampsia/eclampsia has definition as hypertension arising after 20 weeks of pregnancy, followed by proteinuria, and/or edema; in some cases it can cause convulsion to coma.<sup>1</sup> In worldwide, 12% of maternal deaths are caused by preeclampsia/eclampsia, in which almost 99% of the total cases occur in developing countries.<sup>2</sup> In Indonesia, eclampsia is the second highest cause of maternal death after bleeding.<sup>3</sup>

There are three maternal risk factors that cause preeclampsia/eclampsia, namely excessive nutritional

status (obesity), chronic hypertension, and severe anemia.<sup>4</sup> Obese pregnant women are at risk 3–4.4 fold times higher to suffer from preeclampsia.<sup>5</sup> One of the methods to predict chronic energy and protein deficiencies or to detect obesity in pregnant women is using upper arm circumference measurement (UAC). It functions as nutritional status indicator.<sup>6,7</sup>

Obesity is a condition when fat accumulation is too excessive, proven by body mass index (BMI) > 30 or UAC > 32.<sup>8</sup> In Indonesia the prevalence of obesity in adult women (> 18 years) is 32.9%, increase 18.1% from 2007 and 17.5 percent higher from 2010.<sup>6</sup> Globally, in 2016, the prevalence of obesity in adult women was

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around 15%. This number continues to increase up to three times compared to 1975.<sup>2</sup> Obesity through inflammatory stimulus mechanism can determine the symptoms that occur in patients with preeclampsia/eclampsia.<sup>1</sup> Previous studies have shown that excess nutritional status can increase the risk of preeclampsia/eclampsia.<sup>5</sup> Until now, study about the correlation of maternal nutritional status through the measurement of UAC with the severity of preeclampsia is still lacking.

## Methods

This is an observational-analytic epidemiological study with cross-sectional approach. Sample used was secondary data of all patients with preeclampsia/eclampsia in the child and maternal health and also obstetric-gynecological outpatient section at Jagir public health center, recorded from January 2014 to March 2014 with the exclusion criteria of patients who had a history of chronic diseases and/or incomplete secondary data. Data processed using Chi-square test to determine the correlation between two variables. All data analyzed using Chi-square test and Fisher's exact test to determine correlation between the two.

## Results

Total sample was 32 patients with preeclampsia/eclampsia. Sample characteristic shows in table 1. The largest distribution of age group was 21-35 years (59%) with mean age was 31 years old, and multigravida status (69%). Table 2 shows that the majority of the samples had mild preeclampsia (87.5%) with the UAC range was between 23.5-31.9 (69%). This study result did not find any patient diagnosed with eclampsia.

Table 1. Sample Characteristics

		Total	Percentage
Age (years)	<20	3	10%
	21-35	19	59%
	>35	10	31%
	Total	32	100%
Parity	Primigravida	10	31%
	Multigravida	22	69%
	Total	32	100%

From 23 mothers who has UAC <32, 21 mothers (91.3%) had mild preeclampsia and only 2 mothers (8.7%) with severe preeclampsia. Whereas, only 9 mothers had UAC>32, but 2 mothers (22.2%) had severe preeclampsia (Table 2).

Even though both groups showed higher proportion of mild preeclampsia, but the percentage of severe preeclampsia in UAC> 32 found higher.

Table 2. Distribution of Frequency of Preeclampsia and UAC Severity Degrees

		Total	Percentage
Preeclampsia category	Mild	28	87.5%
	Severe	4	12.5%
	Total	32	100%
UAC	<23.5 (Underweight)	1	3%
	23.5-31.9 (Normal-overweight)	22	69%
	>32 (Obesity)	9	28%
	Total	32	100%

Through Chi-square test, found that frequency value of expectations less than 5, then Fisher's exact test is used to determine whether there is a correlation between the two. P = 0.557 is obtained, which means there is no significant correlation between UAC and the severity of preeclampsia (Table 3).

Table 3. Distribution of UAC and Preeclampsia severity

UAC category	Preeclampsia Category		Total	p
	Mild (%)	Severe (%)		
<32 (Not Obese)	21 (91.3)	2 (8.7)	23 (100)	0.557
≥32 (Obese)	7 (77.8)	2 (22.2)	9 (100)	
Total	28 (87.5)	4 (12.5)	32 (100)	

## Discussion

Age group <20 years and >35 years is a risk factor for preeclampsia.<sup>9</sup> In <20 years age group, the condition of the reproductive organs is not in an optimal condition for pregnancy, so complications are prone to, including preeclampsia. But in this study, 19 samples (59%) were aged 20-35 years, this means that the cases of preeclampsia were found to be higher in the middle age group. Similar results were also found in Sutrimah study (2015), that found 75% of preeclampsia patients were at an age range that was not at risk. This suggests that at an age group that is not at risk, the risk of preeclampsia cannot be ruled out.<sup>10</sup> These results contradict to previous studies which stated that the age group <20 years and >35 years had a greater tendency to develop preeclampsia.<sup>11, 12</sup> It is suspected because of the

multifactorial etiology of preeclampsia.<sup>13</sup>

Primigravida defined as one of the preeclampsia risk factors, because of incomplete blocking antibodies to placental proteins, and only formed perfectly in subsequent pregnancies.<sup>1</sup> But in this study, 22 mothers diagnosed with preeclampsia (69%) were multigravida. This shows that primigravida is not the main factor of preeclampsia. In line with a study from Faiqoh and Hendrati (2014) in Surabaya that also showed no statistically significant correlation between primigravida and the incidence of preeclampsia. Different results are mentioned by Artikasari (2009) that showed mothers with primigravida experience more preeclampsia (58.3%).<sup>14</sup> It is suspected that the cause of these differences is due to other factors, namely primipaternity (the first pregnancy at the second marriage) which also potentially block antibodies that will result in preeclampsia.

In this study, more than half of the samples were diagnosed with mild preeclampsia (87.5%). It is in line with a study conducted by Yogi et al. (2014) where 83% of the samples have mild preeclampsia. The number of severe preeclampsia is less because the sampling site is not the main referral health facility.<sup>15</sup>

This study uses UAC as a measuring tool to assess maternal nutritional status. The division was based on BAPEN's interpretation of BMI (2011) and IOM's BMI category (2009).<sup>8</sup> Fisher's Exact test obtained p value of 0.557, which means there is a significant correlation between UAC and the severity of preeclampsia. Different from the result of study conducted by Rozikhan (2007), that found a greater proportion severe preeclampsia cases in not obese patient, with a percentage of 91%. However, Rozikhan explained that pregnant women who are obese remain at risk 1.55 times greater for the occurrence of severe preeclampsia than mothers who are not obese.<sup>16</sup>

Obesity has been shown to aggravate endothelial dysfunction that will lead to preeclampsia. This is due to excessive expenditure of inflammatory mediators and free radicals on obese mothers. These excessive inflammatory mediator can cause clinical symptoms of preeclampsia. In obese women, inflammatory mediators also originate from adipose tissue, which will certainly worsen their clinical symptoms. But without obesity, a mother can also experience preeclampsia through other mechanisms such as trophoblast debris which will then release to the blood circulation, which then causes inflammation. In addition, the result of a lack of trophoblast invasion will develop placental ischemia and hypoxia. This will subsequently make excessive oxidative stress so that many free radicals are formed which also trigger the onset of preeclampsia. In other words, obesity is a risk factor and can also aggravate the

pathophysiology of preeclampsia through this mechanism.<sup>1</sup>

This is the first study that examine the correlation of obesity through UAC measurement. There are other similar studies comparing BMI in early and late type severe preeclampsia, which are known to have different pathophysiology. The result is that obesity is more associated to the slow type severe preeclampsia than early type preeclampsia. Severe and mild preeclampsia classification does not differentiate its pathophysiology, but rather emphasizes how the first clinical disease appeared.<sup>17</sup>

Limitations in this study are the lack of a number of severe preeclampsia samples and the limited data on nutritional status from the medical records. Especially related to the data on maternal body weight before pregnancy in the entire sample because it is important to calculate nutritional status using BMI. This study also did not equate the first gestational age when the diagnosis was made, this is needed especially for severe type preeclampsia to eliminate early type preeclampsia, where slow type preeclampsia has been shown to have more influence on maternal obesity status.

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## Conclusion

It cannot be proven that obesity is associated with the severity of preeclampsia statistically, but it resulted that the percentage of severe preeclampsia in obesity mothers tends to be higher (22.2%), similar to mild preeclampsia (8.7%).

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## Conflict of Interest

The author stated there is no conflict of interest.

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