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## Relationship of Plasma Cystatin C level and renal dysfunction in patients with preeclampsia



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### ABSTRACT

**Background:** Renal dysfunction is an important aspect of the pathophysiology of preeclampsia besides vascular endothelial dysfunction and placental hypoperfusion. Cystatin C is one of the most important inhibitors of extracellular protease enzymes and can be reliable marker for the calculation of Glomerular Filtration Rates (GFR). This study aimed to determine the relationship between plasma levels of cystatin C and renal dysfunction in patients with preeclampsia.

**Method:** This was an analytical cross sectional study conducted at Haji Adam Malik General Hospital Medan, Dr. Pirngadi Hospital Medan, several affiliated hospitals of the Faculty of Medicine University of North Sumatra and Prodia Clinical Laboratory Medan. A total of 26

preeclamptic patients were included in this study. Samples were divided into renal dysfunction and without renal dysfunction group.

**Results:** Eleven subjects with renal dysfunctions were mostly aged 20 – 35 years (73.3%), and the other eight subjects without renal dysfunctions were at the age of 20 – 35 years (72.7%). Most of the subjects had multigravida pregnancies, five subjects (33.3%) with renal dysfunctions, and six subjects (54.5%) without renal dysfunctions. The mean level of cystatin C in renal dysfunction ( $1.52 \pm 0.37$  mg/L) was significantly higher than without renal dysfunction ( $1.17 \pm 0.12$  mg/L) ( $p < 0.05$ ).

**Conclusion:** The cystatin C level in preeclamptic patients with renal dysfunctions patient was higher than those who did not have renal dysfunction.

**Keywords:** cystatin C, preeclampsia, renal function

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### INTRODUCTION

Preeclampsia is a potentially serious condition that still contributes to significant morbidity and mortality for affected mothers and neonates. Maternal mortality during pregnancy and child-birth is a major concern of the World Health Organization (WHO). The growth of both morbidity and mortality in developing countries are even higher than in modern countries. One substantial consideration for maternal death is preeclampsia. Data showed that the maternal mortality rate was 216 out of 100,000.<sup>1</sup> At least fourteen percent of the result was due to hypertension in pregnancy.

WHO stated that the incidence of preeclampsia was around 0.51 – 38.4% in Indonesia. The incidence of preeclampsia was around 3 – 10% (2012). Preeclampsia is a major cause of maternal and fetal morbidity and mortality. This condition is a widespread vascular endothelial dysfunction that causes vasospasm after 20<sup>th</sup> week of gestation, which results in decreased perfusion, and multi-organ dysfunctions.

Renal dysfunction is an important aspect of the pathophysiology of preeclampsia besides vascular endothelial dysfunction and placental hypoperfusion. The main sites of renal injury in preeclampsia

are endothelial cells, including glomerular endothelial cells.

Cystatin C is one of the most important inhibitors of extracellular protease enzymes. Because of its small size (13.3 kDa) so that it is freely filtered by the glomerulus, fully encoded in the proximal tubule and stable production. Cystatin C can be a reliable marker for the calculation of Glomerular Filtration Rates (GFR).

Franceschini et al.<sup>6</sup> in a research involving 200 patients has showed that there was a significantly different amount of cystatin C between preeclampsia and normal pregnancy. It was stated that the value of cystatin C in preeclampsia was  $1.38 \pm 0.04$  mg/L and  $1.22 \pm 0.03$  mg/L in normal pregnancy.

According to this background and authors' best knowledge, this was the first study evaluating the relationship between plasma levels of cystatin C and renal dysfunction in preeclamptic patients in Department of Obstetrics and Gynecology Faculty of Medicine University of North Sumatra. Thus, the authors were interested in conducting this study to examine the relationship of plasma levels of cystatin C and renal dysfunction in preeclamptic patients.

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## METHOD

This was an analytical cross sectional study conducted at Haji Adam Malik General Hospital Medan, Dr. Pirngadi Hospital Medan, as well as at several affiliated hospitals of the Faculty of Medicine University of North Sumatra and Prodia Clinical Laboratory Medan. Sampling method in this study was consecutive sampling until the minimum sample size was reached. The inclusion criteria were women with preeclampsia diagnosed by gynecologist and agreed to involve in this study by signing informed consent.

A total of 26 patients were included based on sample criteria. Samples were divided into two groups, which were “renal dysfunction” and “without renal dysfunction”. Renal dysfunction was defined as patients with creatinine level > 1.1 mg/dL, while without renal dysfunction was defined as patients with creatinine level ≤ 1.1 mg/dL.

Data on this study were normally distributed. In order to determine the difference between variable, independent t-test was performed. It was considered statistically significant when p values was < 0.05.

## RESULTS

A total of 26 patients with preeclampsia were included in this study. There were fifteen subjects

(57.69%) who had renal dysfunction and eleven subjects (42.31%) who did not have renal dysfunction. As shown in Table 1, it can be seen that most subjects who experienced renal dysfunction were at the age of 20 – 35 (73.3%). Most subjects in the group without renal dysfunction were at the age of 20 – 35 also (72.7%). Most subjects were multigravidas, five of them had renal dysfunction (33.3%) and the other six were without renal dysfunction (54.5%).

Based on Table 2, there was significant difference of plasma cystatin level between renal dysfunction and without renal dysfunction ( $p = 0.003$ ). Cystatin C levels in renal dysfunction were higher than without renal dysfunction.

## DISCUSSION

As shown in Table 1, it can be concluded that renal dysfunction was not related to parity. This is not in accordance with Strevens et al., they stated that multigravida tended to increase the incidence of renal dysfunction in preeclamptic patients (84%).

As shown in Table 4, there was a statistically significant relationship between levels of cystatin C and renal dysfunction in preeclamptic patients.

## CONCLUSION

Cystatin C levels in preeclamptic patients with renal dysfunction were higher than those without renal dysfunction.

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**Table 1** Characteristics of subjects

Characteristics	Preeclampsia	
	Renal dysfunction n (%)	Without renal dysfunction n (%)
<b>Age (Years)</b>		
< 20 and > 35	4 (26.7)	3 (27.3)
20 – 35	11 (73.3)	8 (72.7)
Total	15 (100.0)	11 (100.0)
<b>Gravida</b>		
Primigravida	5 (33.3)	2 (18.2)
Secundigravida	4 (26.7)	3 (27.3)
Multigravida	5 (33.3)	6 (54.5)
Grandemultigravida	1 (6.7)	0 (0.0)
Total	15 (100.0)	11 (100.0)

**Table 2** Differences of cystatin C levels between preeclamptic patients with renal dysfunction and without renal dysfunction

Preeclampsia	Cystatin C levels (mg/L)			
	N	Mean	SE	P value
Renal dysfunction	15	1.52	0.37	0.003
Without renal dysfunction	11	1.17	0.12	



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