

## Conference Paper

# Does Excessive Gestational Weight Gain Contribute to Preeclampsia?

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## Abstract

Preeclampsia is the leading cause of both maternal and infant mortality and morbidity worldwide. It is a disorder of pregnancy characterized by hypertension and high levels of protein in the urine. Preeclampsia has multifactorial determinants, one of which is excessive gestational weight gain. The purpose of this study was to determine the relationship between weight gain during pregnancy and the incidence of preeclampsia among patients at Panembahan Senopati Bantul Hospital, D.I.Y. in 2014. The assessment of excessive weight gain during pregnancy was based on the weight gain recommendations given by the Institute of Medicine (IOM). This study was conducted using a case-control design. Based on patient medical records, subjects were included if the length of gestation was greater than or equal to 20 weeks, and were excluded if it was the mother's first pregnancy, the mother was less than 20 years old, or the gestational weight gain was less than the IOM recommendation. After a process of random selection, there were 55 subjects in the case group that met the inclusion criteria. The case to control ratio was 1:1; thus there were also 55 subjects in the control group after random selection. The case and control groups were selected from the same hospital. Data analysis was conducted using a Chi-Square test. The results of the study showed that 63.6% of mothers with preeclampsia exhibited excessive gestational weight gain, while 16.4% of those without preeclampsia exhibited excessive gestational weight gain ( $p$  value  $< 0.05$ , 95% CI: 3.63-22.06 and OR: 8.94). The results confirmed that excessive weight gain during pregnancy increases the incidence of preeclampsia.

**Keywords:** pregnant women, hypertension, preeclampsia, weight gain during pregnancy

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## OPEN ACCESS

## 1. INTRODUCTION

According to the United Nations Population Fund (2012), the causes of maternal death in Indonesia are hemorrhage (28%), eclampsia (24%), sepsis (11%), abortion complication (6%), obstructed labor (5%), and others (26%). By 2014, one fifth of maternal deaths in D.I.Y. were caused by preeclampsia [5]. In recent years, Bantul Regency has experienced an increase in the number of patients suffering from preeclampsia.

Preeclampsia is the second leading cause of maternal mortality. It is a disorder of pregnancy that is specifically diagnosed when a pregnant woman develops hypertension and proteinuria after 20 weeks of gestation [8]. Risk factors of preeclampsia include nulliparity, advanced maternal age, high body mass index (BMI), chronic hypertension, pre-pregnancy diabetes mellitus (type 1 or type 2), chronic kidney disease, systemic lupus erythematosus, antiphospholipid antibody syndrome, assisted reproduction, and multiple pregnancy. Selected risk factors from a previous pregnancy include a history of pre-eclampsia, placental abruption, fetal intrauterine growth restriction, and stillbirth [1].

A maternal pre-pregnancy BMI that is categorized as overweight or obese is an associated risk factor for preeclampsia [9]. In addition to considering pre-pregnancy BMI, IOM also provide a recommendation for weight gain in pregnancy. Weight gain that exceeds the recommendation of IOM can be a sign of preeclampsia. This study aimed to determine the relationship between the weight gain of pregnant women and the incidence of preeclampsia among patients in Panembahan Senopati Bantul Hospital, D.I.Y. in 2014.

## 2. METHODS

This case-control study was conducted by selecting subjects (case and control) from Panembahan Senopati Bantul Hospital, D.I.Y in 2014. In that year, there was a total of 1783 pregnant patients at the hospital. Based on patient medical records, subjects were included if the length of gestation was greater than or equal to 20 weeks, and were excluded if it was the mother's first pregnancy, the mother was less than 20 years old, or the weight gain during pregnancy was less than the recommendation of IOM. After a process of random selection, there were 55 subjects in the case group that met the inclusion criteria. The case to control ratio was 1:1; thus there were also 55 subjects in the control group after random selection.

The dependent variable of the study was the incidence of preeclampsia, as such subjects were divided into those with preeclampsia and those without preeclampsia. The independent variable was the weight gained during pregnancy, which was categorized based on the classification of BMI before pregnancy: underweight ( $<18.5$  kg/m<sup>2</sup>), normal (18.5–24.9 kg/m<sup>2</sup>), overweight (25–29.9 kg/m<sup>2</sup>), or obese ( $\geq 30$  kg/m<sup>2</sup>). The average weight gain during pregnancy was compared to the weight gain of pregnant women recommended by IOM, and subjects were then classified into two categories: excess weight gain (more than the recommendation of IOM) and normal weight gain (meets with the recommendation of IOM). The average gestational weight gain was obtained from mother's weight before delivery reduced mother's weight when preeclampsia was detected or more than 20 weeks (control) divided by gestational age at delivery was reduced by the time of diagnosis of preeclampsia or more than 20 weeks (control). The external variables in this study were parity, age, and history of preeclampsia. Mother's parity included the number of pregnancy, childbirth and miscarriage.

Data analysis was used to determine the relationship between the dependent and independent variables, namely the relationship between the weight gain of pregnant women and the incidence of preeclampsia. Data analysis was undertaken using the Chi-Square test and a 95% confidence interval (CI).

### 3. RESULTS

The age variable in the case and control groups was predominantly 20–35 years old. With regard to parity, almost all subject had 2–5 factors in common. Nearly half of the subjects in the case group had a normal BMI, as did more than half of the control group. More than half of the subjects in the case group exhibited excessive weight gain. In contrast, most subjects in the control group gained weight in accordance with the recommendation of IOM.

### 4. DISCUSSION

Providers of prenatal care should endeavor to meet the guideline developed by IOM for nutrition and weight gain counseling. A study undertaken by Chasan-Taber et al (2016) denotes that women who gain above the guideline from IOM have an odds ratio (OR) of 2.94 of developing preeclampsia. A previous study by Swank (2014) found that pregnant women with excessive BMI changes were nearly twice as likely to

TABLE 1: Distribution of selected characteristics and association of excess weight gain and preeclampsia.

Characteristics	Case		Control		$\chi^2$	P <sub>value</sub> *	OR	CI (95%)
	(f)	(%)	(f)	(%)				
Age (years)								
>35	15	27.3	9	16.4	1.919	0.166	1.917	0.75-4.85
20-35	40	72.7	46	83.6				
Parity(gravida)								
>5	0	0	2	3.6	2.037	0.154	2.038	1.68-2.46
2-5	55	100	53	96.4				
Preeclampsia history								
Yes	5	9.1	1	1.8	2.821	0.093	5.4	0.61-47.82
No	50	90.9	54	98.2				
BMI								
Underweight	1	1.8	7	12.7	16.08	0.001	0.22	0.03-1.91
Normal	24	43.7	37	67.3				
Overweight	19	34.5	7	12.8			4.185	1.53-11.46
Obese	11	20	4	7.3			4.24	1.21-14.87
Weight gain								
Excess weight gain	35	63.6	9	16.4	25.6	0	8.94	3.63-22.06
Normal weight gain	20	36.4	46	83.6				

experience gestational hypertension/preeclampsia (OR=1.94). Similarly, Lewis (2014) found that pre-pregnancy BMI was associated with preeclampsia/eclampsia. Gaining “too much” weight, based on IOM-QWG guidelines, was associated with increased odds of developing preeclampsia/eclampsia. Women who were overweight or obese were more likely to develop preeclampsia [9]. In addition to excess weight gain, a BMI of more than 30 kg/m<sup>2</sup> has also been strongly associated with a high rate of preeclampsia; moreover, a BMI of more than or equal to 25 kg/m<sup>2</sup> was found to increase the risk of preeclampsia by 4.7 times [1, 10].

Pre-pregnancy BMI and excessive weight gain have been found to predict a range of negative outcomes. Incidence of preeclampsia increases two until three times among women with a pre-pregnancy BMI greater than 30 kg/m<sup>2</sup> [8]. Among preeclamptic women, levels of leptin increased whilst adiponectin hormones decreased. Hipoadiponectin leads to insulin resistance, which results in the kidney function being damaged and causes a disturbance diuresis and natriuresis, endothelial tissue dysfunction and impaired vasodilatation. Hipoadiponectin is associated with increased plasma volume and cardiac output, and happen to occur vasoconstriction of blood vessels renal sympathetic nerve stimulator. Sympathetic nerve stimulation

activates the renin angiotensin aldosterone system (RAAS) and causes sodium reabsorption. This results in fluid resistance, which leads to increased blood pressure and causes vasoconstriction of narrow blood vessels so that the blood flow to the infant decreases [2, 4, 11].

The study was only conducted in the hospital districts with limited subjects using secondary data so the data being analyzed is not complete. Further study is needed to explore additional factors of preeclampsia.

## 5. CONCLUSIONS

Pregnant women whose weight gain exceeds the recommendations of IOM are at an increased risk of developing preeclampsia, while suitable weight gain, based on the weight gain recommendations of IOM, can decrease the incidence of preeclampsia. Healthcare providers need to take some remedial action with regard to preeclampsia, including monitoring and advising the increase in body weight of pregnant women in accordance with the recommendations of IOM. Pregnant women should seek regular antenatal care to prevent and detect preeclampsia as early as possible.

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