

eISSN : 2579-8324

pISSN : 2579-8323

Address for Correspondence:Editorial Room Andalas Obstetrics and Gynecology Journal, 3rd floor of KSM of Obstetrics and Gynecology, RSUP DR. M. Djamil Padang, Jl. Perintis Kemerdekaan Padang, Sumatera Barat 25127**Website:**<http://jurnalobgin.fk.unand.ac.id/index.php/JOE>**RESEARCH**

The Correlation of the Average Increase in Blood Magnesium Levels with the Incidence of Preeclampsia After Magnesium Supplementation in Hypomagnesemic Pregnant Women at the Padang City Health Center

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Abstract

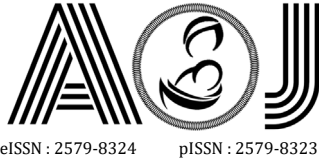
Preeclampsia is a hypertensive disorder in pregnancy that occurs in 5-10% of pregnancies and occurs after 20 weeks of gestation and recovers spontaneously after delivery. Several studies have stated that one of the risks of hypertension in pregnancy is related to magnesium homeostasis. Magnesium plays an important role in forming new tissues (maternal and fetal). Pregnant women need a higher intake of magnesium than non-pregnant women of the same age. Magnesium deficiency during pregnancy not only causes problems for the nutrition of pregnant women and fetuses, but also associated with the occurrence of preeclampsia, preterm labor and muscle cramps during pregnancy. This study aims to determine the relationship between the average increase in blood magnesium levels with the incidence of preeclampsia in hypomagnesemic pregnant women.

Keywords: preeclampsia, hypertension, blood magnesium levels

INTRODUCTION

Preeclampsia is a hypertensive disorder in pregnancy that occurs in 5-10% of pregnancies and occurs after 20 weeks of gestation and recovers spontaneously after delivery.¹ Preeclampsia can cause various severe complications in pregnant women such as postpartum hemorrhage, placental abruption, kidney disorders, edema. and pulmonary embolism, eclampsia and death.²

Death caused by preeclampsia begins with hypertension that is not detected and treated until it progresses to preeclampsia and then eclampsia. Preeclampsia is listed as one of the causes of maternal death after postpartum hemorrhage and infection.³ WHO in 2011 also stated that preeclampsia is one of the causes of perinatal death and pregnancy that occurs worldwide.³ WHO data show that preeclampsia is 16% of the causes of all maternal mortality in developing countries, 9% in Africa and Asia and 26% in Latin America and the Caribbean.⁴ In Indonesia, the incidence of preeclampsia is around 7-10% of all pregnancies.⁵ In 2014 in the city of Padang, preeclampsia developed into eclampsia is the biggest cause of



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maternal mortality, which is 5 people, followed by bleeding as many as 3 people and sepsis as much as 2 people.⁶ Data from the medical records of the Central General Hospital (RSUP) Dr. M. Djamil Padang, the incidence of preeclampsia in 2015 was 146 cases out of 593 deliveries (24.6%).⁷

There are several theories that are suspected as the etiology of preeclampsia, namely trophoblast invasion abnormalities, immunological maladaptations, endothelial cell activation, genetic factors and nutritional factors.^{8,9} Several studies have stated that one of the risks of hypertension in pregnancy is related to magnesium homeostasis.⁸

Magnesium plays an important role in forming new tissues (maternal and fetal).⁹ Pregnant women need a higher intake of magnesium than non-pregnant women of the same age.¹⁰ Refer to the Regulation of the Minister of Health Number 75 of 2013 concerning the recommended Nutritional Adequacy Rate (RDA). for the people of Indonesia, the need for magnesium (Mg) in women of childbearing age is 320 mg/day, and during pregnancy this need increases by about 40 mg/day.¹¹ Magnesium deficiency during pregnancy not only causes problems for the nutrition of pregnant women and fetuses, but also associated with the occurrence of preeclampsia, preterm labor and muscle cramps during pregnancy.^{10,12}

Therefore, researchers are interested in seeing the relationship between increased blood magnesium levels with the incidence of preeclampsia after giving magnesium supplements to hypomagnesian pregnant women at the Padang City Health Center.

METHODS

This research is an analytical study using a cross sectional comparative study design. This research was conducted during April 2020 until the sample was fulfilled which was carried out in 8 Padang City Health Centers in collaboration with the Obstetrics and Gynecology Section of the Faculty of Medicine, Andalas University. The study population was pregnant women who were controlled at the Maternal and Child Health Polyclinic at the Padang City Health Center who met the inclusion criteria; (1) Willing to be research subjects by signing the informed consent, (2) Pregnant women aged 20-35 years and have blood magnesium levels <1.9 mg/dL, (3) Pregnant women who are given magnesium supplementation, (4) Age pregnancy at the time of examination of blood magnesium levels was 22 weeks. And there are no exclusion criteria; (1) There are fetal anomalies, (2) Pregnancy with a history of DM, kidney disease, previous heart disease, (3) Pregnancy with a history of smoking and alcohol consumption, and (4) Patients with magnesium levels 2.25 mg/dL

From the results of the calculation using the sample formula, it was determined that the sample size was 38 people. Sampling was carried out by consecutive sampling, namely part of the population that met the inclusion criteria and there were no exclusion criteria until it met the number of research subjects. Data were collected on pregnant women with



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hypomagnesemia at 22 weeks of gestation who were examined for blood magnesium levels and given magnesium supplementation until the patient give birth. Data on monthly blood pressure checks are taken from the patient's medical record when the patient performs antenatal care examinations. If the systolic blood pressure 140 mmHg or diastolic blood pressure 90 mmHg measured on two measurements with a distance of at least 4 hours, when the gestational age is > 20 weeks with or without proteinuria, the patient is classified as preeclampsia. Then the blood magnesium levels were checked after the patient gave birth and then assessed whether there was an increase or not after the magnesium supplementation.

After the data is collected, the data is processed through the following processes: editing, coding, tabulating, and analyzing. Analysis of the data presented in this study, univariate analysis was used to see the characteristics of the sample. Numerical data is presented in the form of central tendency, namely mean, standard deviation, minimum and maximum values, while categorical data is presented in the form of frequency and percentage tables. Bivariate analysis to assess the relationship between the incidence of preeclampsia and blood magnesium levels after magnesium supplementation used the chi-square test. If the results of the analysis obtained a p value <0.05, then there is a significant relationship.

RESULTS

Research has been carried out on 38 respondents of pregnant women who did a pregnancy check at the Padang City Health Center. This study assessed the relationship between the average increase in blood magnesium levels with the incidence of preeclampsia after magnesium supplementation in hypomagnesaemic pregnant women.

The description of blood magnesium levels before and after supplementation in research respondents can be seen in table 1 below.

Table 1. Blood Magnesium Levels Before and After Supplementation

| Blood magnesium levels | Mean ± SD |
|---|-------------|
| Before supplementation (mg/dL) | 1.77±0.10 |
| After supplementation (mg/dL) | 2,14 ± 0,17 |
| Average increase in blood magnesium level (mg/dL) | 0,37 ± 0,17 |

Based on table 1, it is known that the average blood magnesium level before supplementation was 1.77 ± 0.10 mg/dL. The mean blood magnesium level after supplementation was 2.14 ± 0.17 mg/dL. The average increase in blood magnesium levels in respondents was 0.37 ± 0.17 mg/dL. The description of an increase in blood magnesium levels more than the average in respondents after magnesium supplementation can be seen in table 2 below.



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| Hypomagnesemic pregnant women after magnesium supplementation | f | % |
|---|-----------|------------|
| Increased magnesium levels | 17 | 45 |
| Magnesium levels do not increase | 21 | 55 |
| Total | 38 | 100 |

Based on table 2, it can be seen that there were 17 respondents (45% of all patients who experienced an increase in magnesium levels after taking supplements) experienced an increase in blood magnesium levels more than the average. The incidence of preeclampsia in pregnant women with hypomagnesemia after magnesium supplementation can be seen in the following table, where 3 people (8%) experienced preeclampsia after supplementation.

Table 3. Preeclampsia Incidence

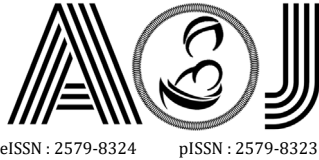
| Hypomagnesemic pregnant women | f | % |
|-------------------------------|-----------|------------|
| Preeclampsia | 3 | 8 |
| No preeclampsia | 35 | 92 |
| Total | 38 | 100 |

Based on table 3, it can be seen that 3 people (8%) experienced preeclampsia after supplementation. The relationship between increased blood magnesium levels and the incidence of preeclampsia after magnesium supplementation in pregnant women with hypomagnesemia can be seen in table 4.

Table 4. The Relationship of the Mean Increase in Blood Magnesium Levels with the Incidence of Preeclampsia After Magnesium Supplementation in Pregnant Women with Hypomagnesemia

| Group | Preeclampsia f (%) | No Preeclampsia f (%) | Total f (%) | p value |
|----------------------------------|-----------------------|--------------------------|----------------|---------|
| Increased magnesium levels | 3 (18) | 14 (82) | 17 (100) | 0,097 |
| Magnesium levels do not increase | 0 (0) | 21 (100) | 21 (100) | |

Based on table 4, it is known that the incidence of preeclampsia was found to be higher in respondents with increased magnesium levels than respondents with no increase in magnesium levels, namely 18% versus 0%. This is not statistically significant ($p > 0.05$).



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The blood magnesium level of respondents before being given supplementation in this study was 1.77 ± 0.10 mg/dL. Similar results were also found in Zarean's 2017 study, namely the respondent's blood magnesium level was 1.72 ± 0.89 mg/dL.¹³ Dovy's research in 2020 in Padang regarding the effect of magnesium supplementation on pregnancy outcome, also found magnesium levels blood in pregnant women is 1.78 ± 0.11 mg/dL.¹⁴

Patients who were given magnesium supplementation were then re-examined for magnesium levels, then the blood magnesium level after the supplementation was 2.14 ± 0.17 mg/dL, with a mean increase of 0.37 ± 0.17 mg/dL. This result is in line with Dovy's research which gave magnesium supplementation to the respondents. It was found that after supplementation, magnesium levels were 2.12 ± 0.18 mg/dL with an increase in magnesium levels of 0.34 mg/dL.¹⁴

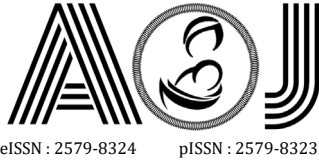
In this study it was found that all respondents who received magnesium supplementation experienced an increase in blood magnesium levels when re-examination was carried out after the patient gave birth. There are respondents who experience an increase in magnesium more than the average number of increases in all respondents.

A total of 17 respondents (45%) experienced an increase in magnesium levels more than the average while the other 21 respondents (55%) had an increase in magnesium levels less than the average. Pregnant women tend to experience hypomagnesemia compared to non-pregnant women because of the increased need for magnesium for the mother and fetal growth, but magnesium excretion also increases by 25% compared to non-pregnant women due to physiological changes during pregnancy, namely an increase in the glomerular filtration rate and hemodilution. in the second and third trimesters of pregnancy.¹⁵⁻¹⁷

The incidence of preeclampsia still occurs in respondents who have been given magnesium supplementation. There are 3 people (8%) respondents who have preeclampsia. This is in line with Dovy's research that 10% of respondents experienced preeclampsia after being given magnesium supplementation.^{12,14} Of the three respondents, all of them experienced an increase in serum magnesium. However, it is necessary to consider several other risk factors for preeclampsia. Respondents with registration numbers Hypo/GT/7 and Hypo/GT/31 are primigravida and respondents Hypo/GT/32 are obese with a BMI of 33.3 kg/m². Primigravida from several previous studies is also a risk factor for preeclampsia.¹⁸⁻²⁰

CONCLUSIONS

Based on this article, it can be concluded that there was an increase in the amount of blood magnesium levels after supplementation in all research respondents, an increase in blood magnesium levels was more than the average in 45% of respondents (17 people) in the study, the incidence of preeclampsia in pregnant women with hypomagnesemia after



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administration magnesium supplementation occurred in 8% of respondents (3 people), there was no relationship between an increase in the average blood magnesium level with the incidence of preeclampsia after magnesium supplementation in hypomagnesemic pregnant women ($p > 0.05$), and magnesium supplementation in hypomagnesemic women has not been shown to be effective in reducing the incidence of preeclampsia.

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