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The Effect of Magnesium Supplement among Pregnant Women with Hypomagnesemia and Normal Magnesium

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ABSTRACT

Magnesium treatment during pregnancy can increase the quality of pregnancy and fetus. This study was performed to determine the effect of magnesium supplements among pregnant women with hypomagnesemia and normal magnesium. This study was experimental with a pre-test and post-test control group design. A total of 90 pregnant women who regularly take control of maternal and child health polyclinic, Primary Health Care, Padang City, Indonesia. The sample was composed of three groups (hypomagnesemia, normal magnesium in interventional groups, and normal magnesium in the control group). The intervention group with supplementation of magnesium 365 mg/ day during pregnancy starting at 22 weeks to 36 weeks. The control group received Fe tablets 180 mg/ day at the same time as the intervention group. In the third trimester of pregnancy blood samples were taken for examination of post-intervention magnesium in all groups. A paired sample T-test was used for statistical analysis. A p-value <0.05 was described as statistically significant. Data were processed by SPSS version 20.0. There were 33.3% of subjects with hypomagnesemia before magnesium supplementation, but after magnesium supplementation, there were 12.2%. In the normal magnesium in interventional groups, there was an increase in the number of subjects with normal magnesium from 66.7% to 87.8%. The highest elevated magnesium levels in the hypomagnesemia intervention group (0.34 mg/dl) compared to the intervention in the normal magnesium group (0.29 mg/dl). There was an effect of magnesium supplements among pregnant women with hypomagnesemia (p<0.05). This study confirmed the effect of magnesium supplements among pregnant women with hypomagnesemia.

Keywords: Magnesium, pregnant women, hypomagnesemia, normal magnesium

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INTRODUCTION

Maternal causing death in Indonesia is still dominated by bleeding (30.13%), hypertension in pregnancy (27.1%), and infections (7.3%). While infant mortality is caused by low birth weight (10.5%), intrauterine growth restriction (IUGR) (19.8%) and preterm labor (18.5%) [1].

One effort that can be done to prevent maternal and infant mortality rates are the fulfillment of nutritional needs. Good nutrition during pregnancy will support the success of the pregnancy. The mother's nutritional needs during pregnancy are micronutrients. The adequacy of these micronutrients can not only be fulfilled in the form of direct food but can be through food supplements. One micronutrient that plays a role in pregnancy is magnesium (Mg) which plays an important role in forming new tissues (maternal and fetal). Pregnant women need a higher magnesium intake than women who are not pregnant at the same age. Magnesium levels (normal 1.8 - 2.2 mg/dl) decreased during pregnancy, due to increased need and excretion of magnesium in the kidneys [2].

Magnesium supplementation during pregnancy can increase the quality of pregnancy and fetus. This is because magnesium supplementation during pregnancy can reduce the risk of preterm labor, IUGR, prevention, and management of seizures in preeclampsia and eclampsia in pregnancy, and reduce the incidence of maternal and neonatal care in hospitals [3-5].

MATERIALS AND METHODS

Study design and research sample

This study was experimental with a pre-test and post-test control group design. This research was conducted from June 2019 - May 2020. A total of 90 pregnant women who regularly take control of maternal and child health polyclinic, Primary Health Care, Padang City, Indonesia. The sample was composed of three groups ; (A) hypomagnesemia in an interventional group, (B) normal magnesium in an interventional group, and (C) normal magnesium in the control group. Inclusion criteria were willing to be the subject of research, a single live fetus, pregnant women aged 20-35 years, 22 weeks gestational age, never had a history of hypertension, kidney disease, a history of heart disease, diabetes mellitus, not suffering from severe anemia, no fetal anomalies, no smoking habits, no drinking habits and patients who consume Fe tablets until the end of pregnancy.

Operational definitions

The variables in this study were magnesium levels measured using Bioassay (Magnesium Kit), while magnesium status was measured using a spectrophotometric method with measurement results a) hypomagnesemia, if serum magnesium levels were <1.9 mg/dl; b) normal, if the serum magnesium level were ≥ 1.9 mg/dl.

Ethical approval

This study was approved by the ethics committee of the Faculty of Medicine, Universitas Andalas, Padang, Indonesia with No. 214/KEP/FK/2019.

Research procedure

The procedures in this study were divided into many steps: a) at the initial stage a screening of all patients undergoing antenatal care at Primary Health Care for screening samples that met the inclusion criteria; b) patients who met the criteria are given informed consent related to the study which includes the purpose of the study, research procedures, benefits, rights and obligations, as well as research risks; c) after the patient agrees to be a research sample, data collection is conducted on the study sample (identity, age during pregnancy, gestational age, history of current pregnancy, and blood pressure); d) interviews were carried out through filling out questionnaires, clinical and obstetric examinations, ultrasonography that was examined properly, as well as 2 cc venous blood samples taken for initial magnesium levels; e) after the results are obtained, the samples are then grouped into 3 study groups, namely the intervention group with normal magnesium and hypomagnesemia status and the control group with normal magnesium status; f) the intervention group with supplementation of magnesium (365 mg/day, Bioelectra®) during pregnancy starting at 22 weeks to 36 weeks. The control group received Fe tablets (180 mg/day) at the same time as the intervention group; g) in the third trimester of pregnancy blood samples were taken for examination of post-intervention magnesium in all groups. Research procedure (Figure 1).

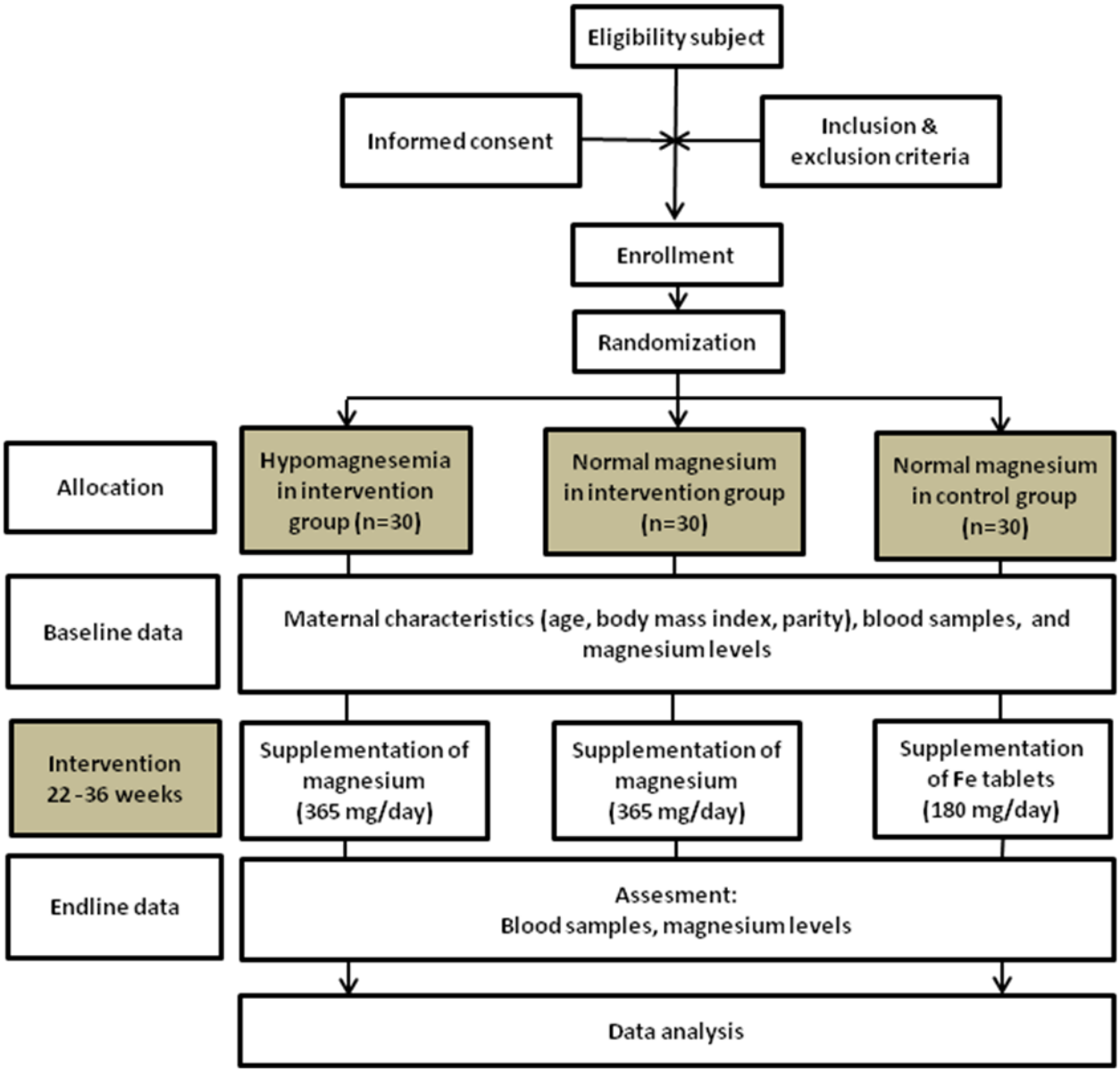

Figure 1: Research procedure

Data analysis

Characteristic data on numerical variables presented mean±SD and categorical variables presented frequency and percentage. A paired sample T-test was used for hypothesis statistical analysis. A p-value <0.05 was described as statistically significant. Data were processed by SPSS version 20.0.

RESULTS

Characteristics of respondents (Table 1).

Table 1: Characteristics of respondents

Variables	Groups			p-value
	A (n=30)	B (n=30)	C (n=30)	
Age (years), mean±SD	28.10±4.58	29.30±4.40	28.57±4.17	0.568[a]
Age groups, f(%)				0.813[b]
> 30 years	8 (26.7)	10 (33.3)	10 (33.3)	
≤ 30 years	22 (73.3)	20 (66.7)	20 (66.7)	
Body mass index, f(%)				0.886 [b]
Underweight	2 (6.7)	1 (3.3)	1 (3.3)	
Normal	16 (53.3)	21 (70.0)	21 (70.0)	
Overweight	9 (30.0)	6 (20.0)	6 (20.0)	
Obesity	3 (10.0)	2 (6.7)	2 (6.7)	
Parity, f(%)				0.531[b]
Nulliparous	18 (60.0)	16 (53.3)	12 (40.0)	
Primiparous	7 (23.3)	10 (33.3)	13 (43.3)	
Multiparous	5 (16.7)	4 (13.3)	5 (16.7)	

*p<0.05 statistically significant [a] one-way Anova test [b] chi-square test

Table 1 found that there were no differences in age, body mass index, and parity between hypomagnesemia, normal magnesium in interventional groups, and normal magnesium in the control group (p>0.05). Magnesium status of pregnant women before and after the supplementation of magnesium (Figure 2).

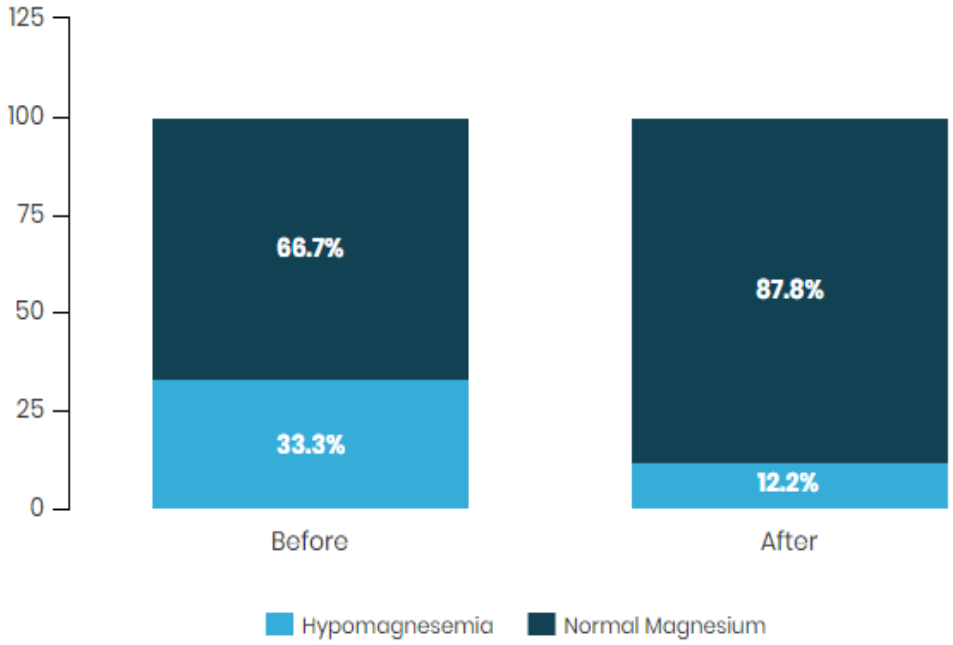

Figure 2: Magnesium status of pregnant women before and after the supplementation of magnesium

Figure 2 found that there were 33.3% subjects with hypomagnesemia before magnesium supplementation, but after magnesium supplementation, there were 12.2%. In the normal magnesium in interventional groups, there was an increase in the number of subjects with normal magnesium from 66.7% to 87.8%. The effect of magnesium supplement among pregnant women with hypomagnesemia and normal magnesium (Table 2).

Table 2: The effect of magnesium supplement among pregnant women with hypomagnesemia and normal magnesium

Magnesium levels (mg/dL)	Before Mean±SD (n=30)	After Mean±SD (n=30)	Δ Magnesium level	p-value
Hypomagnesemia in interventional group	1.78±0.11	2.12±0.18	0.34	<0.001[c*]
Normal magnesium in interventional group	2.07±0.11	2.36±0.19	0.29	<0.001[c*]
Normal magnesium in control group	2.24±0.19	2.03±0.20	-0.21	0.264[c]

*p < 0.05, statistically significant
[c], Paired sample T-test

Table 2 described that magnesium levels before intervention in the hypomagnesemia group were 1.78 ± 0.11 mg/dl and after the intervention was increased 2.12 ± 0.18 mg/dl with elevated magnesium levels was 0.34 mg/dl. There was an effect of magnesium supplementation in pregnant women with magnesium levels before and after treatment in the intervention group with hypomagnesemia status ($p<0.05$). Magnesium levels before intervention in the normal magnesium group were 2.07 ± 0.11 mg/dl increased after the intervention was 2.36 ± 0.19 mg/dl with elevated magnesium levels was 0.29 mg/dl. There was an effect of magnesium supplementation in pregnant women with magnesium levels before and after treatment in the intervention group with normal magnesium intervention ($p<0.05$).

Magnesium levels before intervention in the normal magnesium control group were 2.24 ± 0.19 mg/dl decreased after the intervention was 2.03 ± 0.20 mg/dl. There was no significant effect of magnesium supplementation in pregnant women with magnesium levels before and after treatment in the control group with normal magnesium ($p>0.05$).

Scatter plots of magnesium levels among pregnant women with hypomagnesemia and normal magnesium in the intervention group and normal magnesium in the control group (Figure 3-5).

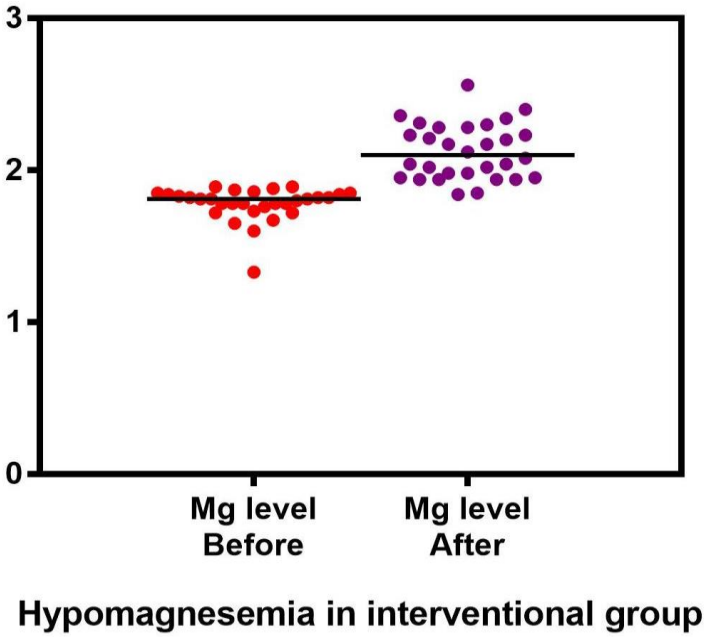

Figure 3: Magnesium levels among pregnant women with hypomagnesemia in the intervention group

Figure 3 found magnesium levels increased after treatment in pregnant women with hypomagnesemia status.

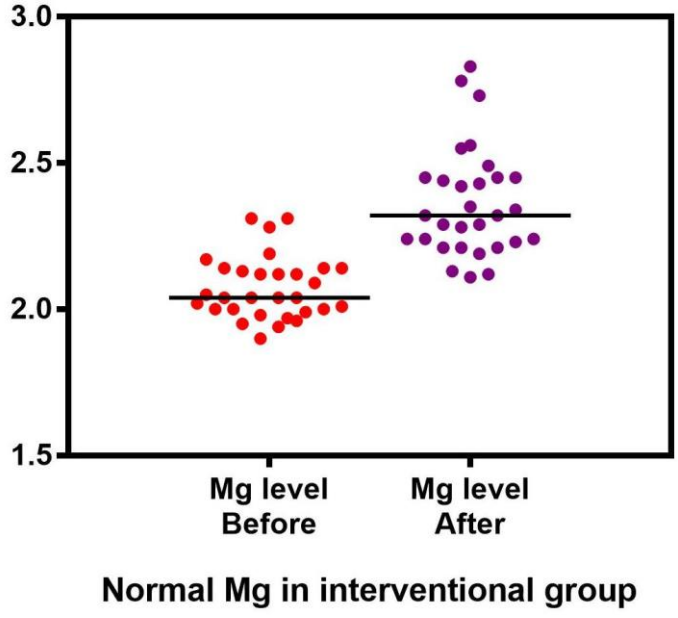

Figure 4: Magnesium levels among pregnant women with normal magnesium in the intervention group

Figure 4 found magnesium levels increased after treatment in pregnant women with hypomagnesemia status, but the highest elevated magnesium levels in the hypomagnesemia intervention group.

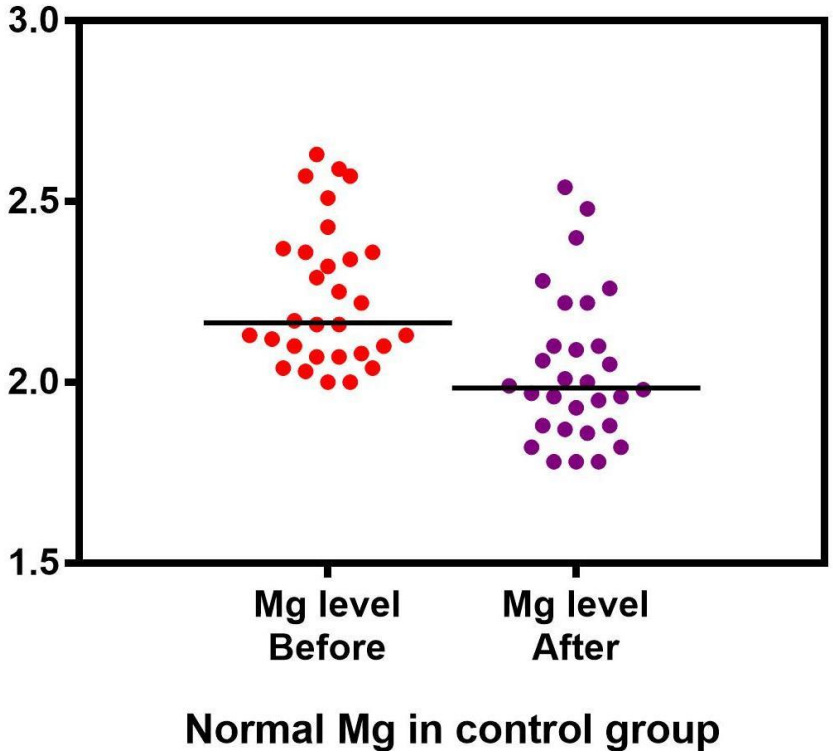

Figure 5: Magnesium levels among pregnant women with normal magnesium in the control group

Figure 5 showed magnesium levels decreased after treatment in pregnant women with normal magnesium.

DISCUSSION

There were 33.3% subjects with hypomagnesemia before magnesium supplementation, but after magnesium supplementation, there were 12.2%. In the normal magnesium in interventional groups, there was an increase in the number of subjects with normal magnesium from 66.7% to 87.8%. The highest elevated magnesium levels in the hypomagnesemia intervention group (0.34 mg/dl) compared to the intervention in the normal magnesium group (0.29 mg/dl). There was an effect of magnesium supplements among pregnant women with hypomagnesemia.

A study stated half of the respondents (50%) confirmed hypomagnesemia in pregnant women with magnesium levels <1.5 mg/dl compared to normal magnesium less than half of the respondents (41.7%) with magnesium level of 1.8-2.9 mg/dl [6]. A previous study found that preeclamptic pregnant women have significantly lower magnesium levels than normotensive. This study confirmed that magnesium contributed to the pathophysiology of preeclampsia [7]. Another study suggested magnesium plays an important role in pregnancy outcomes. Magnesium levels were lower in pregnant women with preeclampsia, preterm labor, and leg cramps. Magnesium deficiency during pregnancy is a predisposing factor for the success of the pregnancy. Therefore maintaining the serum magnesium levels of pregnant women above the normal value (0.75 - 1 mmol/L) is needed to reduce the undesirable events in pregnancy outcomes [4]. A study has recommended the effect of magnesium on fetal and maternal morbidity both prepartum and postpartum [8]. A previous study found magnesium deficiency in 4.6% of all pregnant women included in the study from urban slum communities. [9]. This is related to the ability of the family to meet the nutritional needs of pregnant women and also efforts to obtain health services so that the adequacy of magnesium needs can not be fulfilled by pregnant women in their pregnancy. Supplement magnesium in pregnancy can improve the quality of pregnancy and fetal growth. This is because supplement magnesium in pregnancy can decrease the preterm labor risk, IUGR, prevention and management of preeclampsia and eclampsia, and the important role to decrease the incidence of maternal and neonatal care in hospitals [3-5].

In pregnancy micronutrients including magnesium are important for the normal growth and development of babies. Lower magnesium levels in mothers can affect the mother and infant's health. The formation of new tissue (maternal and fetal) during pregnancy requires high magnesium intakes than that of the normal nonpregnant women of comparable age [1], [2], [11]. Magnesium deficiency in pregnant women is an important risk factor for complications that can be prevented by timely detection and proper management. Magnesium supplementation is important for the prevention of pregnancy-associated complications [10], [12].

CONCLUSION

This analysis confirmed the effect of magnesium supplements among pregnant women with hypomagnesemia. This study suggests the need for education and counseling about eating habits and the importance of magnesium supplement, because magnesium supplement may be an effective measure for hypomagnesemia prevention.

CONFLICT OF INTERESTS STATEMENT

The authors declared no potential conflicts of interest.

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