



COMPARISON STUDY OF SERUM MAGNESIUM LEVELS IN HEALTHY NON-PREGNANT WOMEN, NORMAL PREGNANCY AND IN PRE ECLAMPSIA

Physiology

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ABSTRACT

Background: Pre eclampsia occurs in 3-5% of pregnancies and is an important cause of fetal and maternal morbidity and mortality worldwide.

Objectives: The aim of the study was to evaluate changes in serum magnesium in healthy young women, normal pregnancy and in preeclampsia in their third trimester.

Materials and Methods: The study population consisted of 120 subjects divided into three groups with each group comprising of 40 subjects. Serum magnesium level was estimated by fully automatic analyzer in healthy non pregnant women (Group-1), normotensive primigravida (Group-2) and preeclamptic primigravida in third trimester (Group-3). The results were analysed using statistical test ANOVA. At p value < 0.05, results were considered significant.

Results: The mean serum magnesium levels were 2.71 + 0.24 mg/dL, 1.90 + 0.21 mg/dL and 1.64 + 0.26 mg/dL respectively in healthy young women, normal pregnancy and in preeclampsia. There was a significant decrease in the serum magnesium levels in the normal pregnancy as compared to those in the nonpregnant women and the level is significantly decreased further in preeclampsia.

Conclusion: Decreased serum magnesium levels in pregnancy may be associated with increased risk of developing preeclampsia. Changes in the serum levels of magnesium can be used as an effective marker in the early diagnosis of pre eclampsia

KEYWORDS

Preeclampsia; Endothelial Dysfunction; Hypomagnesaemia

INTRODUCTION

Preeclampsia is one of the most common complications of pregnancy(1). Preeclampsia occurs in 7–10% of all pregnancies in India(2). In Kerala, mild preeclampsia is seen in 8-10% and severe preeclampsia in 1% (3). Although the exact cause of preeclampsia is still unknown, the basic pathology lies in the endothelial dysfunction and intense vasospasm(4). Magnesium is necessary for both fetal and maternal wellbeing. The low concentration of magnesium in serum exposes the subject to a risk of pregnancy complications like preeclampsia(5). Magnesium has a significant role in pathophysiological regulation of blood pressure because it effects contractility and tone of blood vessels (6). Various studies demonstrated the relationship between preeclampsia and changes in concentration of biochemical parameters such as serum magnesium. Recent studies suggest low serum magnesium concentration in pregnancy is associated with an increased risk for developing preeclampsia. Serum magnesium appears to play an important role in the pathogenesis of preeclampsia. There are reports pointing out the beneficial effects of magnesium supplementation in improving endothelial function(7).

OBJECTIVES

The aim of this study is to study and compare the levels of serum magnesium in healthy non pregnant women, normal pregnancy and in pre eclampsia in their third trimester.

MATERIALS AND METHODS

Present study was a cross sectional comparative study which is done to assess the levels of serum magnesium in healthy young women, normal pregnancy and in pre eclampsia. The study was conducted for a period of 1 year from July 2015 to June 2016. Study was conducted in obstetric OPD and antenatal wards of Institute of Maternal and Child Health, Government Medical College, Kozhikode.

Three study groups were selected according to inclusion and exclusion criteria. Prior to registering, an informed consent was taken and counseling was given to all patients. Sample size was calculated by using software called Epi Info. Study population consisted of women in age group between 18-30 years divided into 3 groups.

Study Group 1: 40 Healthy non pregnant women

Study Group 2: 40 Normotensive primigravida with gestational age between 34-40 weeks

Study Group 3: 40 Preeclamptic primigravida with gestational age between 34- 40 weeks

INCLUSION CRITERIA

Study Group 1 - Healthy non pregnant women in the age group of 18 - 30 years.

Study Group 2 – Normotensive age matched primigravida with gestational age between 34- 40 weeks.

Study Group 3- Preeclamptic age matched primigravida with gestational age between 34-40 weeks with blood pressure \geq 140/90mm of Hg in more than two occasions and proteinuria of at least 1+ in dipstick testing.

EXCLUSION CRITERIA

Any history of

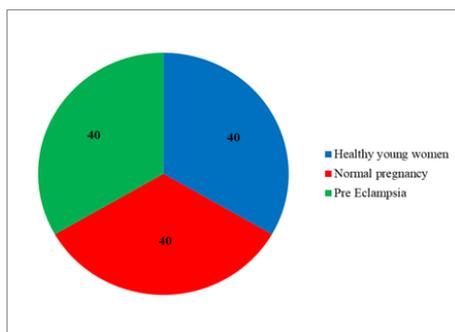
- Chronic hypertension
- Diabetes
- Kidney disease
- Liver disease
- Coagulation disorders
- Multiple Pregnancy
- Magnesium sulphate therapy

Prior informed consent had taken from all. A detailed history was taken from all subjects. Blood pressure recording along with a detailed physical examination was done. Urine protein was detected using dipstick method. 2mL of blood was collected under aseptic precautions for doing serum magnesium estimation using ERBA fully automatic analyzer.

RESULTS

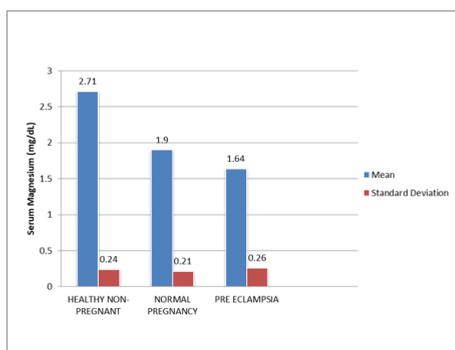
Statistical analysis has been done to determine the differences between the 3 groups. Data were analyzed using Microsoft excel and Statistical Package for Social Sciences [SPSS] version 18. Results were expressed as Mean + SD. Mean differences between the groups were analyzed using ANOVA (Analysis of Variance). It is used to test whether there is significant difference among two or more independent groups. The p value of <0.05 was taken as the level of significance.

THE STUDY POPULATION



COMPARISON OF SERUM MAGNESIUM LEVELS (mg/dL) AMONG THREE STUDY GROUPS

N=40



P=0.000 (Highly Significant)

The mean serum magnesium levels were reduced in preeclampsia when compared to that of healthy non – pregnant women and normal pregnancy. When compared to healthy non pregnant the levels were reduced in normal pregnancy. The differences were statistically significant in between the study groups with p value = 0.000.

DISCUSSION

In the present study, the mean serum magnesium levels were 2.71 + 0.24 mg/dL, 1.90 + 0.21 mg/dL and 1.64 + 0.26 mg/dL respectively in healthy young women, normal pregnancy and in preeclampsia. The value obtained in healthy young women was within normal range. The level was decreased in normal pregnancy. Pre eclamptic women showed still further decrease. The differences between the groups were statistically significant. Similar results were observed by Sayyed et al(7) and Indumati et al (8). Pregnancy itself is a state of physiological hypomagnesaemia(9). The decrease in serum magnesium in normal pregnancy may be due to poor dietary intake, hemodilution or expansion of extracellular space(10). In pre-eclampsia urinary excretion of magnesium increases in addition to above causes. So the level of serum magnesium decreases further in pre eclampsia(11). Aldosterone is believed to increase the urinary excretion of magnesium. PIH has been shown to have secondary aldosteronism. The further depletion of magnesium in pre eclampsia might be because of the aldosterone (8). Pre eclampsia is said to be a state of heightened insulin resistance. So hypomagnesaemia can also be due to the increased insulin resistance seen in pre eclampsia. Insulin seems to be one of the most important factors that regulate plasma and intracellular magnesium concentrations. It has been suggested that an ATP dependent pump is involved in the mechanism by which insulin regulates the magnesium content(12)(13).

Low levels of magnesium predispose to an increase in the arterial pressure. Magnesium acts as a calcium channel antagonist. Magnesium affects the cardiac and smooth muscle activity by altering the transport of calcium and its binding to the membrane(14). Reduction in the level of extracellular magnesium causes partial depolarization of the membrane and decreased rate of repolarization along with opening of membrane calcium channels. This leads to shift of calcium to inside of the cell. Increased intracellular calcium is said to produce vasoconstriction and a rise in blood pressure(8)(15). Magnesium is also involved in blood pressure regulation through an intracellular

inhibition of NO synthase in endothelial cells(16). This can lead to decreased vasodilatation and causes an increase in the arterial blood pressure(17). Endothelial dysfunction refers to an imbalance in the endothelial production of mediators that regulate vascular tone, platelet aggregation. In the endothelium, magnesium increases production of prostacyclin which in turn decreases platelet aggregation. Hypomagnesaemia impairs endothelial function by inhibition of endothelial prostacyclin synthesis, increased endothelin production and release and increased platelet aggregability. Endothelial dysfunction is said to be the most important factor in the etiopathogenesis of pre eclampsia(18).

Some reports point out the beneficial effects of magnesium supplementation in improving endothelial function(7). Magnesium sulphate therapy is used for the prevention and treatment of convulsions. A common pathway for the release of intracellular calcium from many stimuli such as hormones, growth factors and neurotransmitters is phospholipase C activation and hydrolysis of phosphatidyl inositol 4,5 biphosphate into inositol 1,4,5-triphosphate (IP3)(19). Therapeutic magnesium sulphate which is used in the treatment of PIH inhibits phosphatidylinositol-4, 5 biphosphate specific phospholipase C activity and subsequently decreases calcium release in the cells, thus leading to low intracellular calcium levels and a decrease in blood pressure(20).

CONCLUSION

From the observations and results of present study, it can be concluded that serum magnesium levels were decreased in pre eclampsia compared to normal pregnancy and healthy young women. These factors may play an important role in the pathogenesis of pre eclampsia. Screening of serum magnesium levels and correction of the same in pregnancy may prevent the risk of developing pre eclampsia.

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