

Research Article

Serum magnesium in pregnancy induced hypertension

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ABSTRACT

Background: PIH is a major cause of maternal & perinatal morbidity & mortality worldwide because of its complications. The etiology of PIH is uncertain but appears to be related to uteroplacental ischaemia. Magnesium is one of the principle macronutrients, regulates vascular tone, causes relaxation of muscles of uterus and decreases excitability of nerves & muscles. Hence the study was planned to estimate and compare the levels of magnesium between women with PIH and normal pregnant women.

Methods: The study comprised of thirty clinically diagnosed PIH patients and thirty gestational age-matched controls. Serum magnesium was estimated spectrophotometrically.

Results: Significant decrease was observed in magnesium levels in women with PIH as compared to normal pregnant women.

Conclusion: The decreased serum magnesium levels may indicate its possible role as one of the risk factors in the development of PIH in pregnant women. Hence the screening of clinically diagnosed cases of PIH for hypomagnesemia may help in minimizing the complications of PIH. Hypomagnesemia could be treated with magnesium supplementation and follow up of the patients for complications would be necessary to comment further.

Keywords: PIH, Magnesium, Hypomagnesemia, Uteroplacental ischaemia

INTRODUCTION

Magnesium is the fourth most abundant cation in the body and is present in more than 300 enzymatic systems where it is crucial for ATP metabolism.¹ Total body magnesium is about 20 g. 70% of which is complexed with calcium and phosphorus in bone. The remaining 30% occurs in soft tissues (mainly liver & muscles) & body fluids.² Only about 1% of the body magnesium is in the blood & extracellular fluid. Serum concentration of magnesium is 0.7 – 1.05 mmol/l (1.6 – 2.6 mg/dl)

The requirement for magnesium is about 400 mg /day for men & 300 mg/ day for women, more is required during

pregnancy and lactation. Cereals, beans, leafy vegetables and fish are major sources of magnesium.³

Magnesium performs various important functions in our body. Emphasize was given to only those functions related to this study. It synthesizes vasodilators like prostacyclins & nitric oxide thus regulates vascular tone & reactivity thereby maintains normal blood pressure.⁴ Also the action of magnesium as a calcium channel blocker may a help to reduce the release of calcium and thus reducing vascular resistance. In addition, magnesium also activates the Na-K ATPase pump that controls the balance of these minerals contributing to the homeostasis of electrolytes in cells.⁵

Pregnancy induced hypertension (PIH) is defined as the development of new arterial hypertension in a pregnant woman after 20th week of gestation without the presence of protein in the urine. It occurs in about 6-8% of all pregnancies.⁶

The etiology of PIH is uncertain but appears to be related to uteroplacental ischaemia.⁷ If untreated, PIH may cause pre-eclampsia (PIH + proteinuria + edema) or eclampsia (pre-eclampsia + seizure) which may result in premature labour, low birth weight sometimes even maternal & fetal death.⁸

Thus it is a major cause of maternal & perinatal morbidity & mortality worldwide.

Hence the study was planned to study the levels of magnesium in PIH by estimating and comparing serum magnesium in normal pregnant women and PIH pregnancies.

METHODS

Selection of Cases

Prevalence of PIH in this hospital was observed 3.5% in an approximate 400 patients attending ANC OPD per month. Considering 20 % allowable error at 95 % confidence limit, the estimated sample size was 30 PIH cases.

The study was designed as a randomized case control study. The patients were selected from OPD and IPD of Gynecology & Obstetrics department of MIMER Medical College and BSTRH Hospital. Approval of college ethical committee was also taken.

Inclusion Criteria

Cases - Thirty ANC patients aged 25-35 yrs between 20-25 gestational weeks diagnosed clinically as PIH

Controls - Accordingly 30 normal ANC patients were selected after matching age & gestational age.

Exclusion Criteria

ANC patients with concomitant disease such as diabetes or a history of gestational diabetes, chronic hypertension, kidney diseases or coagulation disorders were excluded.

Sample Collection

About three ml of fasting venous blood sample was collected with all aseptic precautions in plain bulb with informed consent.

Serum was estimated for magnesium level by Calmagite kit method.⁹

The biochemical data was expressed as mean ± standard deviation. Significance was analyzed using student unpaired 't' test.

RESULTS

Table 1 shows that both the groups were statistically comparable (P>0.05) for the age distribution.

Table 1: Age distribution in cases and controls.

Group (n=30)	Cases	Controls
Age (Years) Mean±SD	27±2.4	29±2.4

(P>0.05: not significant)

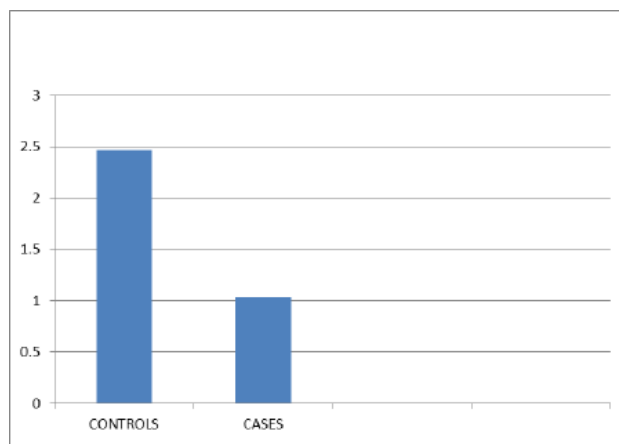


Figure 1: Mean serum magnesium levels (mg/dl).

Table 2 shows that serum magnesium levels are significantly decreased (p<0.001) in women of PIH as compared to normal pregnant women.

Table 2: Comparison of serum magnesium levels in women with PIH and normal pregnant women.

Biochemical parameter	Controls (n=30)	Cases (n=30)
Average Serum magnesium levels (mg/dl)	2.46 ± 0.11	1.03 ± 0.15

Values represent mean ± standard deviation, n= sample size, P value <0.001

DISCUSSION

Magnesium may influence blood pressure by modulating vascular tone and structure through its effects in myriad biochemical reactions that control vascular contraction/dilatation, growth/apoptosis, differentiation and inflammation. Magnesium acts as a calcium channel antagonist. It stimulates production of vasodilators prostacyclin and nitric oxides and alters vascular responses to vasoconstrictor agents. Its deficiency can also play a role in hypertension of pregnancy.¹⁰

Magnesium deficiency may also be responsible for spasm of umbilical and placental vasculature. Magnesium deficiency causes haemodynamic abnormalities such as arterial wall thickening, abnormal vascular tone and endothelial dysfunction which are alteration in the biology of cellular and non-cellular components of arterial wall. There may be a causal relationship between hypomagnesaemia and pre-eclampsia, since magnesium is involved in blood pressure regulation through intracellular inhibition of nitric oxide synthase in endothelial cells.¹¹

In Mg deficiency, the production of ATP and ATP dependent sodium/potassium and calcium pump are also impaired, providing another hypothesis to unify the clinical thinking about pre-eclampsia.¹²

According to one study, in normal pregnancy haemodilution effect of estrogen and increased demand of foetus decrease the serum magnesium levels and in pre-eclampsia urinary excretion of magnesium also increases so the level decreases further.¹³

Hypomagnesemia may result from a number of conditions including inadequate intake of magnesium, chronic diarrhea, malabsorption, alcoholism, chronic stress, and medications such as diuretics use among others.¹⁴

The results of this study also corroborated with the results of other studies which also showed significantly lower serum magnesium levels in PIH patients.^{15,16,17}

However the results also were contradicting with another study where the serum magnesium levels of normal pregnancies were not significantly different from those of PIH cases which may be explained by the dietary variations in the two population groups under study.^{18,19}

Thus hypomagnesaemia may be one of the important factors for the pathophysiological changes of pregnancy induced hypertension.^{20,21} Hence screening of clinically diagnosed cases of PIH for hypomagnesaemia may help in minimizing complications that may arise out of the condition. Hypomagnesaemia if found in the patient can be corrected by magnesium supplements.²² Follow up of the patients for complications will be necessary to comment further.

Thus serum magnesium estimation soon after 20 weeks of gestation can give a clue if the lady is predisposed to development of PIH. And if she is found to be hypomagnesaemic then magnesium supplements can be given to her to minimize chances of development of PIH.

As it was mentioned in another study that degree of hypomagnesaemia correlated with the severity of PIH¹⁶, estimation of serum magnesium levels and their correlation with the patients symptoms can be done and can be taken up as a further part of the study. During

pregnancy, early detection of hypomagnesaemia will prevent its complications and it will help in the better management of disease.

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Conflict of interest: None declared

Ethical approval: Approved by Institutional Ethical Committee

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