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Research Article

## Magnesium levels in pregnancy induced hypertension

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### ABSTRACT

Pre-eclampsia is a systemic disorder that occurs in or near the third trimester of pregnancy. Hypertension is a consequence and not the cause of the disorder and treatment is only justified to lower it from severe and immediately dangerous levels. Treating lower levels has been shown to confer no benefit and exposes the fetus to additional drugs. Magnesium sulfate reduces the incidence of eclamptic convulsions. This study assessed serum magnesium ( $Mg^{2+}$ ) and electrolytes levels in women with PIH (pregnancy-induced hypertension) and PE (pre-eclampsia), compared to that in normal pregnancy. This was a case control study which included 30 women with preeclampsia in their third trimester of pregnancy as Study group and 30 healthy pregnant women in the third trimester of pregnancy as control group, with similar maternal and gestational age. The concentration of total serum magnesium and electrolytes were assessed. The data was analyzed using Students' t-test wherever applicable. Our aim is to assess the concentration of total serum magnesium and electrolytes in the patients and control group. Increased levels of sodium and slight variation in potassium levels were observed. There is a slight elevation of magnesium levels when compared with normal individuals and parenteral magnesium sulfate therapy is not contraindicated to treat eclampsia in spite of high serum magnesium levels, as it is given for its neurosedative, and antihypertensive effects and not to correct a deficiency. There is no marked difference in serum potassium levels in preeclampsia and women with normal pregnancy, but there is a slight decrease in potassium levels in eclampsia cases to preeclampsia.

**Keywords:** Pre-eclampsia; Hypertension; Magnesium; Pregnancy; Potassium.

### INTRODUCTION

Incidence of preeclampsia worldwide is around 5-10% of all pregnancies, and in developing countries around 4-18%. Pre eclampsia is traditionally defined by the triad of edema, proteinuria and hypertension. Despite active research for many years, the etiology of this disorder remains unknown, although contributory factors including obesity, diabetes, magnesium deficiency, older maternal age and job stress have been observed and studied (Ankur Purohit, R. K. Vyas, 2016).

The most serious complications of pregnancy-induced hypertension in eclampsia, which is severe preeclampsia complicated by seizures or coma Eclampsia occurs in approximately 0.2% of pregnancies and causes the termination of 1 in 1000 pregnancies seizure and mental status changes in eclampsia are thought to be secondary to hypertensive encephalopathy. Intracranial hemorrhage is the major cause of maternal death. The

maternal mortality rate is 8-36% (Houry DE, Salhi BA., 2014).

Pre eclampsia presents progressively increasing risks to mother and fetus which can be reversed almost immediately by early delivery. In preexisting renal disease continuing the pregnancy for as long as possible may permit delivery of a healthier more mature baby. Proteinuria and hypertension in the first trimester of pregnancy suggest preexisting renal disease. (Rodie VA, Freeman DJ, et al., 2004). Liver injury from hepatocellular necrosis causes light upper quadrant pain and elevated liver function test. Cardiovascular manifestations include lower than normal intravascular volume, increased cardiac output, and an abnormally elevated peripheral vascular resistance. Microangiopathic hemolysis leads to anemia and thrombocytopenia. Placental infarction and abruption placenta leads to intrauterine growth retardation and fetal death (Program NH.2000).

The most common hazard faced by pregnant with chronic hypertensive vascular disease is the superimposition of preeclampsia. The frequency of pregnancy aggravated hypertension (PHA) is difficult to specify precisely, for the incidence varies with diagnostic criteria employed. If the diagnosis is made only on the basis of (a) significant aggravation of hypertension; (b) sus-

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tained proteinuria; (c) generalized oedema; then, the incidence will be relatively low since delivery is often accomplished before intense superimposed pre-eclampsia or eclampsia has developed (van der Logt E, *et al.*, 2013).

It is the increased responsiveness of the arterial system to pressure substances which probably cause the generalized vasoconstriction and hypertension of preeclampsia. In normal human pregnancy, there is a decreased blood pressure response to pressure materials but in preeclampsia there is a marked increase in response to vasopressin (Dieckmann and Michel, 1937) to norepinephrine and to angiotensin (Talledo *et al.*, 1968). The increased presser response to angiotensin in pregnant women precedes the development of the hypertension. Our aim is to assess the concentration of total serum magnesium and electrolytes in the patients and control group.

### MATERIAL AND METHODS

Control group:-1: Comprising 30 normal non pregnant women with normal blood pressure.

Group-2: Comprising 30 pregnant women with normal blood pressure more than 20 weeks.

Group-3: Comprising 30 pregnant women with PIH *i.e.*, the blood pressure 130/90mm Hg above, with pedal oedema and with albuminuria. This group was further subdivided in to group IIIA of twenty women with preeclampsia and group IIIB of ten women with eclampsia.

5 ml of Fasting blood sample was collected from cases and controls used for serum separation, for the following estimations: Serum magnesium and electrolytes.

### Statistics

All results were summarized as mean  $\pm$  SD. The statistical analysis was done using SPSS 11.5 (SPSS, Inc., Chicago), and the comparison between patients and control was done by using Anova. A P-value less than 0.05 were considered statistically significant.

### RESULTS AND DISCUSSION

Women to normal pregnant above 20 weeks gestation appear to show a mild disease in the mean magnesium levels when compared to the control group 12 out of 30 women in this group showed values lower than lowest value of the normal ranges. Though the decrease in the mean value of serum magnesium in this group is within the expected normal range of 1.8- to 2.2 meq/L this decrease was found to be statistically significant (Maynard SE, Min JY, *et al.*, 2003, López NJ, Smith PC, 2002. Program NH, 2000).

Several factors are responsible for the relative magnesium deficiency during normal pregnancy; the prime factor being increased accumulation of magnesium in the fetus from 4<sup>th</sup> to 10<sup>th</sup> lunar months. Several maternal organs also increase in weight during pregnancy

which requires additional supply of magnesium. Apart from these factor that involve increase in the GRF in normal pregnancy and increased levels of aldosterone and deoxycorticosterone (Toverud KU, Stearns G, *et al.*, 1950. Lyttleton J.2013). Also leads to the deficiency of magnesium as pregnancy progresses. As most of these factors do not come in to play in the early stages of pregnancy. The first reports of blood magnesium levels during pregnancy were in 1923 Krebs & Briggs reported a range of 1.7 – 2.2mEq/L (0.085 -1.10 mmol/L) among 17 women in their 8<sup>th</sup> to 40<sup>th</sup> weeks of pregnancy (Bell EC.1958).

Nine out of ten cases of preeclampsia studies showed an increase in serum magnesium levels above the normal range. Though the average serum levels of this group is the same as the higher limit of the normal range of the control group. This increase was found to be statistically significant, when compared to the control group-1, out of 10 cases eclampsia studied 5 cases showed value higher than the normal range. Thus women with eclampsia showed a definite and significant increase in the mean as well as individual value, when compared to all the study groups (Ko SH, Lim HR, *et al.*, 2001. Chobanian AV, Bakris GL, 2003. Dacey MJ.2001).

This increase in serum magnesium levels in eclamptic patients is in tune with the work of (Pritchard, 1995., Hall, Kontopolus, *et al.*, 1976/1979). Their work revealed that eclampsia women frequently have higher plasma or serum magnesium levels towards the end of pregnancy than do normal women at term. The increase found in serum magnesium levels in eclamptic patients may be explained by (a) renal involvement, (b) hormonal factor and (c) hepatic involvement.

In the present study, though the serum sodium levels in the PIH group showed comparatively higher values, when, compared to other groups, these values were found to be within the normal range. Thus the decreased aldosterone secretion might have contributed to the increased loss of sodium and decreased excretion of magnesium

The decrease in serum magnesium level in toxemia. May be due to an increase in the normal process of increased accumulation of magnesium in the growing tissues such as uterus and product of conception as in normal pregnancy. The serum levels of magnesium may decrease even to still lower levels under this conditions if there is an associated deficiency in dietary intake (Rizk NW, *et al.*, 1996. Pipkin FB, Roberts JM.2000). Hall (1957), the experimental and clinical evidence that magnesium deficiency is associated with neuromuscular irritability and convulsions, and because of long recognized efficacy of magnesium in the management of preeclampsia-eclampsia, initially considered the possibility that magnesium deficiency might contribute to toxemia of pregnancy (Seelig MS.2012. Seelig MS.1993. McLean RM.1994).

**Table 1: Serum Magnesium Levels in (mEq/L) Various Study Groups**

	Control group I (N=30)	Group II (N=30)	Group III Pregnant women	
			with PIH Preeclampsia(n=30)	Eclampsia (n=30)
Mean±SD	1.8±0.17	1.78±0.16	1.8±0.18	2.2±0.22

**Table 2: Serum Sodium Levels In (mEq/L) Various Study Groups**

	Control group I (N=30)	Group II (N=30)	Group III Pregnant women	
			with PIH Preeclampsia (n=30)	Eclampsia (n=30)
Mean±SD	135.1±3.57	139.6±3.23	142.85±3.17	147.5±2.41

**Table 3: Serum Potassium Levels in (Meq/L) Various Groups**

	Control group I (N=30)	Group II (N=30)	Group III Pregnant women	
			with PIH Preeclampsia(n=30)	Eclampsia (n=30)
Mean±SD	4.28±0.3	4.1±0.44	4.45±0.67	3.8±0.19

Group I : Non pregnant women (n=30).

Group II : Pregnant women without PIH(n=30)

Normal or elevated levels of serum magnesium are not considered a contraindication to the use of large doses of magnesium salts, which are given parentally in PIH for their pharmacodynamics, neurosedative antihypertensive effects and to correct a deficiency.

### CONCLUSION

Increased levels of sodium and slight variation in potassium levels were observed. There is a slight elevation of magnesium levels when compared with normal individuals and parenteral magnesium sulfate therapy is not contraindicated to treat eclampsia in spite of high serum magnesium levels, as it is given for its neurosedative, and antihypertensive effects and not to correct a deficiency. There is no marked difference in serum potassium levels in preeclampsia and women with normal pregnancy, but there is a slight decrease in potassium levels in eclampsia cases to preeclampsia. From this data we concluded that magnesium levels in pregnancy induced hypertension values are reliable accurate and precise values and magnesium therapy is indicated in all PIH cases (eclampsia) to control severe hypertension and convulsion and the neuromuscular plate or at central nervous system.

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