DISCUSSION

Magnesium is an important trace element or microelement which is the constituent of various enzymatic reactions in physiological activity of human beings. It is said to be present in all living cells. The plasma magnesium levels are maintained within very narrow limits and during rapid formation of the new tissues, the magnesium requirement goes up. This requirement even varies with different trimesters of pregnancy and other complications like abortion, preterm labour & PIH.

Present study was conducted to see the changes in serum magnesium levels in cases of threatened abortion, preterm labour and pregnancy induced hypertension. The study was conducted on 150 patients in Department of Obstetrics & Gynecology M.L.B. Medical College Jhansi. The mean values of serum magnesium in different trimesters obtained & comparison with control group done followed by oral magnesium supplementation in few cases.

In present study there were 50 cases of control group which comprised of patients with healthy antenatal period up to term gestation, 27 cases of threatened abortion, 43 patients with preterm labour and, 30 patients of PIH were studied for variation in serum magnesium levels.
VARIATIONS IN SERUM MAGNESIUM LEVELS IN CONTROL

GROUP:

Diversity of serum magnesium levels in normal pregnancy is due to hypervolemia of pregnancy. A further decreased level of serum magnesium during pregnancy may be due to increased demands by the growing fetus. These two facts, were pointed out by Lim et al (1969).

Rizvi et al (1979) attributed it to increased loss of magnesium ions to consume calcium ions and phosphates and proteins. Dawson et al (1969) found, increased demand of copper replaces the magnesium ions from blood which results in its reduced values.

In our study mean values of serum magnesium in normal pregnant females was found to be $2.48 \pm 0.162 \text{ mg}\%$ while in non pregnant state the values lie in range of 3-5mg\% so there is a definite role of physiological hemodilution of pregnancy and increased demand of the serum magnesium levels in pregnancy.

Different values obtained by different authors may also be attributed to different methods of determining it in the laboratory.
VARIATIONS IN THE MEAN SERUM MAGNESIUM LEVELS IN DIFFERENT TRIMESTERS:

Mean value of serum magnesium levels showed a gradual fall in the different trimesters. De Jorge et al attributed it to hemodilution during pregnancy. This fall may be attributed to decrease in amount of serum binding proteins. This fact can be related to the observation that serum magnesium levels were seen to rise with rising hemoglobin levels. The associated hypoprotinemia with decreased magnesium binding proteins leads to movement of the ions into the intracellular compartment subsequently showing reduced values in peripheral blood.

We found a gradual fall in second & third trimester of pregnancy. First trimester did not show much variation from non pregnant state & showed highest values among the first trimester. The fall had been greater in first to second trimester as compared to that from second to third trimester.

Our finding have also been supported by number of workers who have also reported a gradual fall in different stages of pregnancy and have found lowered serum magnesium levels Rosner and Gorfein (1968). Dawson et al (1969); Lim et al (1969); Singh et al (1979). Haffman et al (1979) have reported a fall which was more prominent – around 3rd, 5th & 8th month of pregnancy.
VARIATION IN SERUM MAGNESIUM ACCORDING TO AGE AND PARITY:

Majority of patients were multipara i.e. 57% of all and were in age group of 23-28% comprising 56% of all patients.

In present study not much variation was found in serum magnesium levels according to age and parity of the females. Achari et al (1961) did not find significant difference in serum magnesium levels according to age Olatiunmosium et al (1975) & Simpson & Dale (1994) found some difference and attributed it to be the effect of estrogen.

SERUM MAGNESIUM LEVELS IN CASES OF THREATENED ABORTION, PRETERM LABOUR, & PIH:

THREATENED ABORTIONS:

The mean magnesium levels in threatened abortion were much lower than that of control group i.e. a fall from $2.48 \pm 0.162$ to $1.62 \pm 0.309$mg%.

This fall is in accordance with Dumont (1965) Dumont and Singh (1979).

In the present series out of 27 threatened abortion cases 6 were below 1.2mg% level and the fetal outcome was poor. Only 7 reported in II trimester emphasising that most abortions occurred in the first trimester or they were in the category of ‘early abortions’. Dumont attributed lowered
magnesium levels as the contributing factor of abortion observing that in abortion uterus showed a state of hyper excitability. Whether a low magnesium level is the causative factor or its result, is not clear. It can be hypothesised that magnesium acts on cell energy and its deficiency may result in blighted ova. In animal studies it was seen that increase in calcium and decrease in magnesium result in uterine contractions (Kochman 1921). Oxytocic effect of ergot and histamine was depressed by increase in magnesium ions (Frazer, 1937), when animals were fed by keeping them on low magnesium diet. This resulted in low fertility, abortion, malformed and IUGR babies (Cosla; 1950, Hurley; 1976).

**PRETERM LABOUR:**

Present study showed lowered values of serum magnesium levels in cases of preterm labour in comparison of control group of normal pregnant patients from $2.48 \pm 0.162$ to $1.56+0.185\text{mg}\%$ which were consistent with finding of Rasu et al (1966).

Dumont (1965) observed that in all states of uterine hyperexcitability serum magnesium levels were lowered. Kochman in 1921 showed that increase in calcium showed a fall in serum magnesium levels & a decrease in magnesium resulted in uterine contractions.
Only 9 patient reported in IIInd Trimester, while 34 were in III trimester with magnesium levels having lowered values showing a pathological lowering superimposing physiological lowering of serum magnesium toward the finale of pregnancy.

Our finding of hypomagnesaemia in women with preterm labour are in agreement with the view of Potnis et al (1977) who believed that hypomagnesaemia plays an etiological role in the onset of preterm labour.

The outcome of cases in our study showed that 50% of patient gave births to full term healthy child. According to studies in South Africa, England, and United States (Arias) low socioeconomic states had higher incidence of preterm labour with a high as 52% neonatal mortality while higher states group had lesser incidence of preterm labour with neonatal mortality in these reported case to be about 38%. The main cases of perinatal mortality of neonates are primarily contributed to respiratory distress syndrome and intraventricular hemorrhage.

The higher prevalence of these cases in low socioeconomic groups shows its definite relation with hygiene and nutrition and its can be hypothesized that people with undernourished diet leading to various deficiencies and magnesium deficiency may have a contributing role in premature onset of labour.
PIH:

In pregnancy severe hypertension remains a major cause of maternal mortality and morbidity (Pago & Christiansion). The maternal mortality was between 0.3-3.4% by Pritchard & Pritchard.

The serum magnesium levels were found to be lower than that in normal pregnant female and the mean level calculated was 1.68±0.219 mg%. Majority of patients reported for the first time in the first trimester.

Regarding outcome at the end of III trimester raised hypertension and associated complications contributed to higher rates of operative interference in term pregnancy with PIH that is more than 50% underwent caesarean section.

The observation that withdrawal of magnesium from the extracellular medium caused vasoconstriction in human isolated umbilical vessels, have led to the hypothesis that magnesium deficiency during pregnancy may involve the risk of developing PIH through the utero placental vessels vasoconstriction.

It was observed that various hematocrit & hemoglobin levels showed elevation in cases of PIH due to characteristic decrease in plasma volume. Platelet count and serum trace elements were found to be lower. Such controversial rising of blood counts & acute lowering of the others are
attributed to abnormal fetoplacental functions and change in renal and liver functions and immunological factors regulating PIH. It was observed that there was a distinct relationship between basal blood pressure after medication. There was significant and almost similar fall in mean systolic blood pressure fall being greatest in first 24 hours followed by more gradual fall over the next 7 days. These have been the results with injectable magnesium sulphate but the oral magnesium supplementation requires long term treatment. (Bhat, Bestwala1995; Sibai et al (1981); Nagar et al (1988).

Comparison of the values of serum magnesium in study group S1, S2, S3 in comparison with other authors in mg%:

<table>
<thead>
<tr>
<th>Author</th>
<th>Control</th>
<th>Threatened</th>
<th>Preterm</th>
<th>PIH</th>
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</thead>
<tbody>
<tr>
<td>Present study</td>
<td>2.48+0.162</td>
<td>1.66+0.309</td>
<td>1.56+0.185</td>
<td>1.65+0.319</td>
</tr>
<tr>
<td>Khan et al</td>
<td>1.82</td>
<td>-</td>
<td>1.17</td>
<td>-</td>
</tr>
<tr>
<td>Singh et al</td>
<td>2.06</td>
<td>1.709+0.07</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Kister et al</td>
<td>1.33+0.29</td>
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This chart shows that results obtained in our study were consistent with the results of other authors.

**ORAL MAGNESIUM SUPPLEMENTATION**

Magnesium sulphate is the most commonly used regimen for the treatment and prevention of seizures in preclampsia cases as magnesium
blocks neuro muscular transmission peripherally. An intravenous dose of 4gms of magnesium sulphate causes an elevation of levels of magnesium in serum from 2.0mg% to about 7-9mg%. At this elevated plasma level one third of magnesium is protein bound. All patients on MgSO4 regimens have to be monitored for urinary output, patellar reflex and respiratory rates. Intravenous calcium gluconate is the antidote as the excess of calcium ion will increase the acetylcholine liberation.

Though role of injectable magnesium has been established role of oral magnesium salt as an alternative to beta adrenergic agents for the prophylactic treatment of PIH and preterm labour is under trial. Arias showed the effect by using magnesium gluconate in the doses of 1gm orally every 4-6 hours, or using magnesium oxide in the dosage of 200mg every 3-4 hours, or enteric coated tablet of magnesium chloride every 4 hours. The addition of magnesium to the treatment is effective in arresting uterine irritability despite the fact that very little rise in levels of serum magnesium was observed (Kristjar Skaja IndgeDorup, Britt marie Sandstorm)

In this study 30 patients were given magnesium salt in combination with calcium and 16 patients were given calcium only salt for comparative evaluation.
Out of these 18 patients were in study group S2 and 35 patients were in S3 group that is patients of PIH. Of 18 pts of preterm only 3 carried up to term in magnesium gp & 2 pts in calcium gp while 7 pts did not show any effect.

Out of 35 cases of PIH 4 pts carried to term & 10 pts showed no effect of the magnesium salt. There was slight increase in pretreatment and post treatment serum magnesium levels.

The results were consistent with Spatling & Spatling & Condrat et al who showed a reduction in preterm delivery rate with addition of oral magnesium.

In several countries including Denmark the recommendation for magnesium supplementation during pregnancy is advised these days and further studies will pave the way for future.