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Research Article

COMPARISON OF MEAN SERUM MAGNESIUM LEVELS BETWEEN THE PATIENTS WITH PRETERM LABOUR AND TERM LABOUR

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Abstract:

Objective: To compare the mean serum magnesium levels between the patients with preterm labour and term labour at tertiary care hospital.

Material and methods: This case/control study was conducted at Department of Obstetrics & Gynecology, Bahawal Victoria Hospital, Bahawalpur from March 2018 to October 2018 over the period of 6 months. Study was approved by ethical committee and written informed consent was taken from every patient. The subjects included 100 pregnant women with preterm labour (cases) between 28 and 37 weeks gestation (Group A) and similar number of pregnant women with term labour (controls) between 37 and 40 weeks (Group B). Mean serum magnesium levels were compared between the both groups.

Results: In present study total cases and 100 controls were selected. Mean age of cases and control was 24.96 versus 25.04 years. In age group ≤ 20 years, mean serum magnesium level in group A was 1.32 ± 0.42 mg/dL and in group B was 1.3 ± 0.47 mg/dL. Difference of mean serum magnesium level between both groups was statistically insignificant with p value 0.35. In age group 21-25 years, mean serum magnesium level of study group A was 1.13 ± 0.41 mg/dL group B was 1.62 ± 0.43 mg/dL. Difference of mean serum magnesium level between the both groups was statistically significant with p value 0.0001. In age group 26-30 years, mean serum magnesium level was 1.03 ± 0.40 mg/dL and 1.51 ± 0.50 mg/dL respectively in group A and B. Difference was statistically significant with p value 0.0002. In age group ≥ 31 years, mean serum magnesium level in group A was 1.01 ± 0.30 mg/dL and in group B was 1.74 ± 0.49 mg/dL. Difference was statistically significant with p value 0.002. Mean serum magnesium level of Primigravida of group A and B was 1.18 ± 0.41 mg/dL and 1.65 ± 0.43 mg/dL respectively. Difference of mean serum magnesium level between the both groups was statistically significant with p value 0.0001. Among Gravida 2 and 3, mean serum magnesium level of group A was 0.88 ± 0.29 mg/dL and group B was 1.32 ± 0.46 mg/dL and the difference was statistically significant with p value 0.0002.

Conclusions: Low maternal serum magnesium level is associated with preterm labour. Patients with preterm labour have significantly low serum magnesium level when compared with labour at term.

Keywords: Maternal serum magnesium, Preterm labour, Term delivery.

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INTRODUCTION:

Preterm labour is occurrence of regular uterine contractions and cervical changes in a woman with intact fetal membranes and gestational age <37 weeks. [1] Uterine contractions without cervical change is also a marker of threatened preterm labour. [2] Magnesium is the second important positively charged ion found within the cells of body. It acts as a cofactor in more than 300 enzyme reactions. It activates those enzymes and plays an important role in the nerve conduction and contractile response of smooth muscles. Pregnancy is marked by a state of relative hypomagnesaemia and varied hypomagnesaemia is observed in preterm labour. Hypomagnesaemia leads to neuromuscular hyper-excitability resulting in muscle cramps and uterine hyper-activity. [3]

Magnesium plays an important role in pregnancy for the formation of new tissues, both maternal and fetal. Pregnant women require higher magnesium intake than the normal non-pregnant women of same age. Normal serum levels of magnesium in third trimester of pregnancy range from 1.1 to 2.2 mg/dL. [2]

Magnesium deficiency results in fatigue, confusion, irritability, weakness and hypertension, loss of appetite, insomnia, nausea, vomiting, diarrhoea, defect in nerve conduction and muscle contraction. Its deficiency during pregnancy is also associated with preterm labour, pre-eclampsia, small for gestational age (IUGR) foetus, leg cramps as well as sudden infant death syndrome. [4]

Estimation of serum magnesium levels in pregnancy may prove to be a valuable tool in the prediction of preterm onset of labour. This can help to provide greater antenatal surveillance in the asymptomatic group, and administration of steroids, tocolytics and transfer to a higher centre in those with symptoms of preterm labour.⁵ This study was conducted in a tertiary care hospital to find association between serum magnesium levels and women with preterm labour, and to compare these values with those patients who had a term delivery.

MATERIAL AND METHODS:

This case/control study was conducted at Department of Obstetrics & Gynecology, Bahawal Victoria Hospital, Bahawalpur from March 2018 to October 2018 over the period of 6 months. Study was approved by ethical committee and written informed consent was taken from every patient. The subjects included 100 pregnant women with preterm labour (cases) between 28 and 37 weeks gestation (Group A) and similar number of pregnant women with term labour

(controls) between 37 and 40 weeks (Group B). Inclusion criteria for cases was singleton pregnancy, painful uterine contractions more than two in 30 minutes, intact fetal membranes, cervical dilatation (at least 1 cm) and effacement (80%). Pregnant women with fibroid uterus, cervical incompetence/any uterine malformation, previous history of recurrent abortions/preterm delivery, with multiple pregnancy, ruptured membranes, placenta previa, known or detected fetal abnormality, polyhydramnios and significant medical/surgical history were excluded from the study. Controls were selected on the same day as that of cases by simple random sampling.

All the patients were subjected to thorough history taking including socio-economic status, systemic and obstetric examination. Laboratory investigations were done as per hospital protocol. Serum magnesium levels were done in both the groups. Patients were followed until delivery. Routine antenatal investigations were done. Findings were entered on pre-designed proforma.

Selected data was entered in SPSS version 20 and analyzed. Numerical data was presented as mean and SD and categorical data was presented as frequency and percentage. Student T test was used to detect difference between serum magnesium levels of group A and B. A p-value of <0.05 was taken as significant.

RESULTS:

In present study total cases and 100 controls were selected. Mean age of cases and control was 24.96 versus 25.04 years. Patients were divided into 4 age groups i.e. age group ≤20 years, age group 21-25 years, age group 26-30 years and age group ≥31 years. Total 9 patients of group A and 7 patients of group B belonged to age group ≤20. Mean serum magnesium level in group A was 1.32±0.42 mg/dL and in group B was 1.3±0.47 mg/dL. Difference of mean serum magnesium level between both groups was statistically insignificant with p value 0.35. In age group 21-25 years, among the 47 patients of group A, mean serum magnesium level was 1.13±0.41 mg/dL. Among the 56 patients of group B, mean serum magnesium level was 1.62±0.43 mg/dL. Difference of mean serum magnesium level between the both groups was statistically significant with p value 0.0001. In age group 26-30 years, mean serum magnesium level was 1.03±0.40 mg/dL and 1.51±0.50 mg/dL respectively in group A and B. Difference was statistically significant with p value 0.0002. In age group ≥31 years, mean serum magnesium level in group A was 1.01±0.30 mg/dL and in group B was

1.74±0.49 mg/dL. Difference was statistically significant with p value 0.002. (Table 1)

Mean serum magnesium level of Primigravidas of group A and B was 1.18±0.41 mg/dL and 1.65±0.43 mg/dL respectively. Difference of mean serum magnesium level between the both groups was statistically significant with p value 0.0001. Among Gravida 2 and 3, mean serum magnesium level of group A was 0.88±0.29 mg/dL and group B was 1.32±0.46 mg/dL and the difference was statistically significant with p value 0.0002. (Table 2)

Among urban residents, mean serum magnesium level was 1.31±0.41 mg/dL and 1.68±0.42 mg/dL respectively in group A and B. Difference of mean serum magnesium level between the both groups was statistically significant with p value 0.0001. Among rural residents, mean serum magnesium level was 0.97±0.35 mg/dL in group A while 1.30±0.44 mg/dL in group B and the difference was statistically significant with p value 0.0003. (Table 3)

Mean serum magnesium level among non-obese of group A and B was 1.10±0.40 mg/dL and 1.57±0.47 mg/dL respectively. Difference was statistically significant with p value 0.0001. In obese patients of group A mean serum magnesium level was 1.11±0.43 mg/dL and in group B was 1.59±0.41 mg/dL and the difference was statistically significant with p value 0.0006. (Table 4)

Patients were divided into two groups according to cervical dilatation i.e. <3 cm group and >3 cm group. In <3 cm cervical dilatation group, mean serum magnesium level of group A was 1.19±0.40 mg/dL and in group B was 1.72±0.37 mg/dL. Difference of mean serum magnesium level between the both groups was statistically significant with p value 0.0001. In >3 cm cervical dilatation group, mean serum magnesium level was 0.83±0.28 mg/dL and 1.24±0.47 mg/dL respectively in group A and B and the difference was statistically significant with p value 0.0003. (Table 5).

Table 1: Comparison of mean serum magnesium level between the both groups for age

Age group (in years)	Group A		Group B		P value
	N	Mean±SD (mg/dL)	N	Mean±SD (mg/dL)	
≤20	9	1.32±0.42	7	1.3±0.47	p=0.35
21-25	47	1.13±0.41	56	1.62±0.43	p<0.0001
26-30	36	1.03±0.40	29	1.51±0.50	p=0.0002
≥31	8	1.01±0.30	8	1.74±0.49	p=0.002

Table 2: Comparison of mean serum magnesium level between the both groups for parity

Parity	Group A		Group B		P value
	No.	Mean±SD (mg/dL)	No.	Mean±SD (mg/dL)	
Primigravida	74	1.18±0.41	78	1.65±0.43	0.0001
Gravida 2 and 3	26	0.88±0.29	22	1.32±0.46	0.0002

Table 3: Comparison of mean serum magnesium level between the both groups for place of residence

Place of residence	Group A		Group B		P value
	No.	Mean±SD (mg/dL)	No.	Mean±SD (mg/dL)	
Urban	38	1.31±0.41	73	1.68±0.42	0.0001
Rural	62	0.97±0.35	27	1.30±0.44	0.0003

Table 4: Comparison of mean serum magnesium level between the both groups for obesity

Obesity	Group A		Group B		P value
	No.	Mean±SD (mg/dL)	No.	Mean±SD (mg/dL)	
Non-obese	81	1.10±0.40	76	1.57±0.47	0.0001
Obesity	19	1.11±0.43	24	1.59±0.41	0.0006

Table 5: Comparison of mean serum magnesium level between the both groups for cervical dilatation

Cervical dilatation	Group A		Group B		P value
	No.	Mean±SD (mg/dL)	No.	Mean±SD (mg/dL)	
<3 cm	75	1.19±0.40	70	1.72±0.37	0.0001
>3 cm	25	0.83±0.28	30	1.24±0.47	0.0003

DISCUSSION:

Magnesium deficiency in pregnancy is likely to cause perinatal complications which may last throughout life. In the present study, mean serum magnesium level was 1.10 ± 0.44 mg/dL in patients with preterm labour while it was 1.58 ± 0.46 mg/dL in patients with term labour, the difference being statistically significant. Sixty-six percent patients with preterm labour had low serum magnesium level (<1.1 mg/dL). This finding showed that preterm labour was associated with low serum magnesium level. Preterm birth is the single major cause associated with neonatal morbidity and mortality in both developing and developed world.

This result is in accordance with the study of Shahid et al. in which significantly more patients with preterm labour (60%) had serum magnesium level <1.9 mg/dL. [6] Bhat et al, found that patients in preterm labour group had a significantly depressed mean serum magnesium level as compared to normal pregnancy (1.34 mEq/L vs. 1.87 mEq/L; $p < 0.001$). [7] Mahmoud et al, found that patients with preterm labour had significantly reduced serum magnesium level (mean 1.55 mg/dL versus 1.81 mg/dL) for those who delivered at term ($p < 0.032$). [8] Jenabi et al, also found positive association between maternal serum magnesium levels and preterm labour. [9]

The mean maternal age in our study (24.96 years for preterm group and 25.04 years for term group) was consistent with the studies of Mahmoud et al, (24.31 versus 26.52 years) and Jenabi et al, (24.56 vs. 25.18 years). [8,9] However, it was lower in preterm group as compared to study conducted by Bhat et al, (28.63 years). [7] The difference can be explained due to early age of marriage and lesser use of contraceptives methods in our study.

In the present study, 74% patients in preterm labour group were primigravida, which is in accordance with the study of Khani et al. (75%). [10] Mean gestational period in our study was 33.69 weeks in preterm labour group and 37.97 weeks in term group, the difference being statistically significant ($p < 0.0001$). Similarly, Begum and Das found mean gestational age of 33.03 weeks and 38.95 weeks in patients with preterm and term labour. [5]

In our study 62% patients with preterm labour and 27% patients with term labour were from rural areas, the difference being statistically significant ($p < 0.0001$). The difference was due to high rate of referrals of preterm pregnancies to our hospital (tertiary health care centre) from peripheral rural areas where NICU facilities were not available. Similarly, Kumar also found 65% of patients with preterm labour were from rural areas. [11]

Also, in our study 85% patients with preterm labour were house wives. The increase in preterm labour among housewives could be due to poor prenatal care. This result is in accordance with the studies of Mahmoud et al, and Khani et al, who also reported that 85% and 90% patients with preterm labour were housewives. [8,10]

In the present study, 70%, 22% and 8% patients with preterm labour and 55%, 32% and 13% with term labour belonged to low, middle and high socioeconomic class respectively, the difference being statistically significant ($p = 0.04$). Bhat et al, found patients with preterm labour belonging to low socioeconomic class were significantly higher than the middle and higher socioeconomic classes (58% in preterm labour patients and 45% in term, $p < 0.05$). [7] Mahmoud et al, also found that in preterm labour group lower socioeconomic class was significantly higher than the middle and upper socioeconomic classes. [8] Patients belonging to low socioeconomic classes have stressful lifestyle, inaccessible medical care and diet deficient in micronutrients including magnesium.

In our study 44% patients with preterm labour and 37% patients with term labour were anaemic. Mean value of haemoglobin came out to be 9.93 gm/dL and 10.19 gm/dL respectively in patients with preterm and term labour. The difference was statistically significant ($p = 0.03$). These results were in accordance with the study of Manzoor et al, who found mean haemoglobin of 9.13 ± 1.54 gm/dL in 48.6% of patients with preterm labour. [12]

83% patients with preterm labour and 51% with term labour in our study reported the incidence of muscle cramps. The difference was statistically highly significant ($p < 0.0001$). Our findings were similar to

the observations of Bhat et al, Mahmoud et al, and Shaikh et al, who reported percentage of patients with preterm labour having history of muscle cramps as 89%, 73% and 46.7% respectively.⁷⁻⁹ Neuromuscular hyperexcitability is an initial problem cited in individuals who have magnesium deficiency resulting in muscle cramps and uterine hyperactivity leading to premature onset of labour. [13]

In our study low birth weight neonates were significantly more in patients with preterm labour with percentage of 60% and 11% in patients with term labour. Mean neonate birth weight in preterm neonates (1907.3gm) was significantly less ($p < 0.0001$) than term neonates (2723.6 gm). 33% and 49% neonates of patients with preterm labour got admitted to NICU due to RDS and jaundice. IUGR was present in 11% neonates in patients with preterm labour. Neonatal morbidities like IVH (11%), still birth (1%) and neonatal mortalities (8%) were observed in neonates of patients with preterm labour only. Similarly, Khani et al, reported that low birth weight neonates were 80% in patients with preterm labour.¹⁰ In a study conducted by Shaikh et al, IUGR was significantly higher 41.3% patients with preterm labour ($p < 0.001$). [13] Almonte et al, found that reduced free magnesium concentration in both maternal and offspring blood and an increased incidence of periventricular hemorrhage. [15]

Magnesium deficiency in pregnancy is likely to cause perinatal complications which may last throughout life. 66% of patients in our study with preterm labour had low serum magnesium level ($< 1.1 \text{ mg/dL}$). This finding shows that preterm labour was associated with low serum magnesium level. Mean serum magnesium level in our study came out to be $1.10 \pm 0.44 \text{ mg/dL}$ in patients with preterm labour while it was $1.58 \pm 0.46 \text{ mg/dL}$ in patients with term labour. Difference was statistically significant with $p < 0.0001$. This result is in accordance with the study of Shahid et al, where significantly more patients (60%) with preterm labour had serum magnesium level $< 1.9 \text{ mg/dL}$. [6] Jenabi et al, also found positive association between maternal serum magnesium levels and preterm labour. [9]

In our study mean serum magnesium level was found to be less in all age groups among patients with preterm labour as compared to patients with term labour. However, in age groups 21-25 years, 26-30 years and > 31 years the difference was highly significant ($p < 0.0001$ and $p = 0.0002$ and $p = 0.002$ respectively). While in age groups < 20 years the difference was not significant ($p = 0.35$). It was

observed in our study that high maternal age was associated was low serum magnesium levels in the preterm labour group. This is likely a result of higher demands of pregnancy at an age characteristic of poor nutrition. This is similar to the study of Sharma et al., who found that serum magnesium levels decreased with advanced maternal age. [16] However, in a study by Begum and Das, serum magnesium level was independent of maternal age.⁵ This variation in result may be due to less number of patients taken in their study groups.

In our present study mean serum magnesium level in primigravida with preterm labour and term labour was found to be $1.18 \pm 0.41 \text{ mg/dL}$ and $1.65 \pm 0.43 \text{ mg/dL}$. Multigravida had levels of $0.88 \pm 0.29 \text{ mg/dL}$ and $1.32 \pm 0.46 \text{ mg/dL}$ in the preterm and term labour group. The difference was statistically significant in both with $p < 0.0001$ and $p = 0.0002$. It was observed that multigravida had low magnesium levels as compared to primigravida in both the groups. Kumar correlated serum magnesium levels among pregnant women with increasing parity and found that pregnant women with parity 2 and more had lower serum magnesium level when compared to primigravid. He found that in primiparous pregnant women, mean serum magnesium value was $1.77 \pm 0.34 \text{ mg/dL}$. Serum magnesium level in pregnant women with 2nd and 3rd parity was 1.58 ± 0.19 and $1.52 \pm 0.26 \text{ mg/dL}$ respectively.¹¹ Pathak et al, also found a significant decrease ($p = 0.01$) in serum magnesium with the increase in parity. Pregnant women with parity 2 or more had a significantly lower serum magnesium level ($1.77 \pm 0.35 \text{ mg/dL}$) compared to nulliparous pregnant women ($2.01 \pm 0.57 \text{ mg/dL}$). [17]

In our study mean serum magnesium level was found to be significantly less in patients residing in rural ($0.97 \pm 0.35 \text{ mg/dL}$) as well as urban ($1.31 \pm 0.41 \text{ mg/dL}$) areas with preterm labour as compared to patients with term labour (1.30 ± 0.44 and $1.68 \pm 0.42 \text{ mg/dL}$; $p = 0.0003$ and < 0.0001 respectively). However, Kumar and Sharma et al, in two different studies reported that serum magnesium levels showed slight decrease in both rural and urban pregnant women cases compared to controls but the difference was statistically not significant. [11,16]

CONCLUSION:

In this study, low maternal serum magnesium level was associated with preterm labour. Patients with preterm labour had significantly low serum magnesium level when compared with labour at term. This study recommends that important steps should be

taken to prevent and treat magnesium deficiency as it has direct implication on mother as well as fetus.

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