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Research Article

The correlation between maternal hypomagnesemia and preterm labour

Shatha A. Mahmoud, Ikhlas M. Saleh*, Huda H. Khalaf

Department of Obstetrics and Gynaecology, Yarmouk teaching hospital, Baghdad, Iraq

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***Correspondence:**
Dr. Ikhlas M. Saleh,
E-mail: drikhlas2007@gmail.com

ABSTRACT

Background: Preterm birth is defined as all births before 37 weeks completed, which is a major cause of neonatal death and significant cause of long term loss of human potential amongst survivors. The objective of this study was to verify the correlation between low maternal serum magnesium level and preterm delivery.
Methods: one hundred patients who admitted into the labour room of the hospital due to preterm labour ($28\text{-}36^{+6}$ weeks of gestation) whose etiology could not be explained by etiological factors were enrolled in this prospective case-control study during the period from June 2013 to June 2014. And another 80 women of comparable gestational age who were referred to the consultation clinic of our hospital for achieving prenatal care or for causes other than preterm labour, provided only those whose birth occurred after 37^{th} week considered as a control group. Serum magnesium level was measured in both groups.
Results: Women in preterm labour had a significantly reduced serum magnesium level (mean1.552 mg/dl with a S.D. of 0.658 versus 1.81 mg/dl with a SD of 0.735) for those delivered at term ($p<0.032$). Number of patients with Preterm labour who gave of history of muscle cramps were significantly greater than those delivered at term ($p<0.00193$). Percentage of patients with preterm labour belonging to low socio-economic class was significantly higher than the upper and middle socio-economic classes ($p<0.041$).
Conclusions: Serum magnesium level can be used as a predicting tool for idiopathic preterm labour.

Keywords: Preterm labour, Serum magnesium level

INTRODUCTION

Preterm birth is defined as delivery of the baby before 37 completed weeks of pregnancy to the limit of viability as 24 weeks, births before 32 weeks of gestation (2% of all births) account for most neonatal deaths and disorders.[1,2] Preterm birth is a major cause of neonatal mortality, which is estimated to be at least 50% of all neonatal deaths, with the highest rates of health care costs due to hospitalization of woman with preterm labor and the expenses of long-term care of preterm birth.[3-5] The incidence in the developed world is 7-12%.[6]

Approximately 45-50% of preterm births are idiopathic, 30% are related to preterm rupture of membranes (PROM) and another 15-20% is attributed to medically indicated or elective preterm deliveries.[7,8]

Other causal factors include infection e. g. Urinary tract infection and bacterial vaginosis.[9] In addition, ascending intrauterine infection and inflammation with secondary premature cervical shortening.[10]

Beside these etiologies, preterm labour may be due to a biochemical alteration of body function at the cellular level stating emphasis on trace elements such as magnesium, which is the second most abundant intracellular cation after potassium.[11,12] It plays a number of vital physiological and biochemical roles; intracellular ionized magnesium is essential for nerve conduction and

muscle contraction.[13] The inhibitory effect of magnesium on preterm labour is attributed to antagonism of calcium mediated uterine contractions.[14]

METHODS

A cross sectional case-control study had been carried out in the department of obstetrics and gynecology, Yarmouk teaching hospital/Baghdad-Iraq; for 12 months. A total of 180 women were enrolled and divided into two groups.

Group l (study)

Consisted of 100 patients who admitted in labour room of the hospital due to preterm labour which could not be explained by the known etiological factors (idiopathic).

Group II (control)

Consisted of 80 women with uncomplicated pregnancy of comparable gestational age that referred to the consultation clinic of our hospital for achieving prenatal care or for causes other than preterm labor, only women whose delivery occurred after 37th week considered as a control group.

Every patient underwent full evaluations that include

Detailed and comprehensive history taking with emphasis on

- Demographic data: Name, age, gravidity, parity, socioeconomic class and employment status
- Gestational age: determined by date of last menstrual period or early ultrasound examination.

History of muscle cramps during pregnancy

- Physical examination: systemic and local (speculum and digital vaginal examination)
- Investigations: include full blood count, general urine examination, and random blood glucose.

Inclusion criteria

Age (>18 years and <40 years), singleton gestation, intact fetal membranes, preterm onset of labour (between 28 and 36+6 weeks of gestation) and Bishop score ≥7.

Exclusion criteria

Previous history of preterm delivery; recurrent UTI, pre-eclampsia, polyhydramnios, antepartum hemorrhage, intrauterine death, premature rupture of membranes and any significant medical or surgical illness.

Blood samples from the patient were drawn after taking written consent into syringe, sent to laboratory of the hospital immediately. The quantitative assessment of serum magnesium levels was done in the biochemistry unit by using Xylidyl blue colorimetric method (manufactured by Egyptian company for biotechnology (S.A.E).[15]

Statistical analysis of the obtained data was done by Student's t-test for comparison of means.

P- Value considered significant when it is equal to or less than 0.05 and considered highly significant when it is equal to or less than 0.005.

RESULTS

The mean age in group I was 24.31±5.77years (range 18 to 39 years) while in group II it was 26.52±5.74years (range 18 to 40). No statistically significant difference was observed in patients' age between the two groups; (P=0.183). According to obstetrical history of parity and miscarriage, no statistically significant difference was observed between the two groups (p=0.226, 0.203 respectively) as in Table 1. There was no significant difference in employment status (p=0.58) while for socioeconomic classes, there was statistically significant difference between two groups (P=0.041) as Table 2.

Table 1: The obstetrical history in both groups.

Variable		Group I	Group II	P-value
Parity	0	35	23	0.226
	1 or more	65	57	
Miscarriage	yes	17	13	0.203
	No	73	67	

Table 2: Social characteristics in both groups.

Variable	Group I	Group II	P-value
Employment			
Housewife	85	71	0.58
Employed	15	9	
Socioeconomic classes			
High	4	4	
Moderate	44	48	0.041
Low	52	28	

Regarding history of muscle cramps, there was statistically highly significant difference between the two groups (P=0.00193) as in Table 3.

The mean serum magnesium level in group I was found to be 1.552 mg/dl with a S.D. of 0.658 where as in group II it was 1.81 mg/dl with a SD of 0.735.

Table 3: History of muscle cramps in both groups.

Variable	Group I	Group II	P-value
Muscle cramps			
Positive	73	42	0.00193
Negative	27	38	

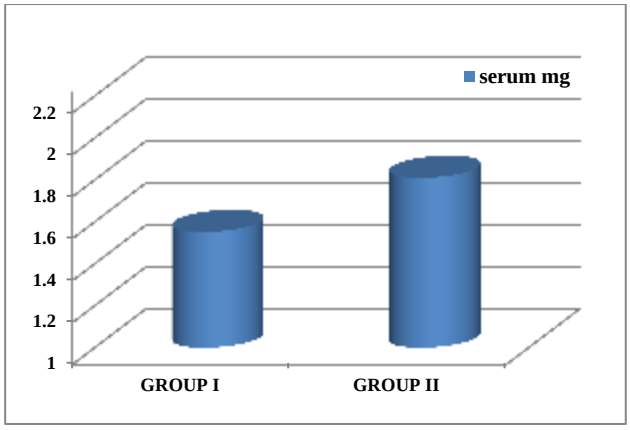

Figure 1: comparison of serum magnesium levels in both groups.

The difference between the two groups was found to be statistically significant (p<0.032) as in Figure 1.

The mean serum magnesium level was divided according to gestational age into three groups as in Table 4.

Table 4: Serum magnesium levels at different gestational age.

Gestational age (weeks)	Group I (mean ±SD)	Group II (mean ±SD)	P-value
28-30	1.843±0.70	1.84±0.512	0.992
31-33	1.309±0.369	1.82±0.54	0.016
34-36	1.23±0.28	1.73±0.416	0.035

DISCUSSION

The main focus in the current study to compare the serum magnesium level in preterm birth and in those who had a term delivery, many records findings have augmented measuring magnesium level as a predictor for preterm birth. The exact cause of hypomagnesaemia in patient of preterm birth is unknown but individualized and socioeconomic factors have been blamed.[16]

In this study, the age of the women, their parity, history of miscarriages and employment status were comparable in study and control groups, which exclude their effect on the result; similar to Kamal's et al and Shahid et al findings.[17,18]

The number of preterm labour cases belong to lower socioeconomic class was significantly higher than high or middle classes, the same as Sharma A et al findings.[19] On the contrary Khani et al demonstrated non- significant increase in preterm labour among low socioeconomic class women may be due to the smaller sample size in his study when he took only 40 pregnant women.[20]

This result reflect the real figure in our society, as the high social class women attend governmental hospital when they have preterm labour because intensive neonatal care units are not available in private hospitals.

This increase in preterm labour in low socioeconomic class may be attributed to poor prenatal care, stressful life style and nutritional deficiency of trace elements including magnesium.

We found that a history of muscle cramps were more in the study group than in control group like Hantoushzadeh et al finding, as hypomagnesaemia leads to neuromuscular hyper excitability resulting in muscle cramps and uterine hyperactivity.[21]

The mean magnesium level was 1.552±0.658 mg/d in those with preterm labour and 1.81±0.735mg/dl in those with term delivery, this result is supported by the findings of many investigators, Puspo and Jagdish et al found serum magnesium level in preterm labour 1.67±0.23 mg/dl.[22] Begum et al also found serum magnesium 1.77±0.36 in preterm labour.[23] Kehinde et al found mean serum magnesium level 1.73±0.4 versus 1.93±0.4 mg/dl.[24]

Uludağ et al found basal serum magnesium was significantly lower in successful preterm labour group in whom contractions ceased with magnesium sulfate tocolysis 1.6 versus 1.9 mg/dl for unsuccessful preterm labour group whose contractions increased and delivered preterm despite magnesium sulfate tocolysis (p value <0.001) and a cut off value of <1.75 mg/dl had a significant predictive value for better identifying a positive response to tocolytic magnesium sulfate.[25]

Regarding magnesium level at different gestational age, we found that in 28-30 weeks, although it was higher in group II but statistically non-significant unlike Shakura et al who found it highly significant, probably because of different dietary habits in our society, while it was lower in group I compared to group II in gestational age 31-33 and 34-36 weeks and the difference was statistically significant like Shakura et al, which may due to increased demand with the advance of pregnancy.[26]

We observed that there was a decrease in serum magnesium with progression of pregnancy in both groups in agreement with observation of other investigators.[27,28]

A study conducted by Cunze et al. on magnesium and calcium concentration in the pregnant and non-pregnant myometrium, concluded that a low magnesium concentration in the pregnant human myometrium could be a cause of preterm labour.[29]

Further studies have demonstrated that prophylactic oral magnesium supplementation to patient at risk of preterm labour was successful in lowering the preterm delivery rate and intake should be sufficient to maintain serum magnesium level at the range of 2.0 - 3.5 mg/dl.[30-32]

CONCLUSION

Estimation of serum magnesium levels may be a useful parameter in pregnancy especially in women at high risk of preterm labour mainly in countries with poor resources since it is cheap investigation.

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