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PRETERM LABOUR;
SERUM MAGNESIUM LEVELS

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ABSTRACT... Background: Spontaneous preterm labor that is labor before 37 weeks of gestation is the main cause of preterm delivery. With increasing gestation the level of Serum magnesium levels decreases. Magnesium inhibits uterine contractions by antagonizing calcium. Hypomagnesaemia also causes hyper excitability of neuromuscular junction bringing in muscle cramps and uterine hyperactivity. **Objectives:** To determine the mean serum magnesium levels in women presenting with preterm labor. **Study Design:** Cross Sectional Study. **Location and duration of study:** Ziauddin University Hospitals, Karachi from 8th December 2015 to 7th June 2016. **Methodology:** Total 40 women of age 18-40 years having singleton pregnancy between 28-36 weeks gestation with established preterm labor having cervical dilatation less than 3cm. were included. 5ml blood was collected and analyzed. Outcome in terms of Mean Standard Deviation were noted. Descriptive statistics were applied. Stratification was done using student t-test and ANOVA where appropriate. The p-value ≤0.05 was considered as significant. **Results:** The mean age was 26.25±2.38 years. Mean gestational age was 32.77±2.11 weeks. Mean cervical dilatation was 1.85±0.39 cm. Mean serum magnesium level was found 1.43±0.25 mg/dl. The results showed that there was significant difference in mean serum magnesium level for gestational age but not significant for age, cervical dilatation, parity and gravida. **Conclusion:** The results showed that serum magnesium level reduced with increased gestational age. Preterm labor can be predicted by serum magnesium levels.

Key words: Mean, Serum Magnesium Level, Preterm Labor.

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INTRODUCTION

Preterm labor is said to occur with the start of consistent, and recurrent uterine contractions resulting in advancing cervical dilatation before full 37 gestational weeks.[1,2]

Around 10-15% of all pregnancies end up in preterm labor and an estimated 15 million babies are born preterm every year that is more than one in 10 babies. The incidence varies in different parts of world. In Pakistan rate of preterm labor said to be 15.8%.[2]

It is the most important cause of perinatal mortality and morbidity.[3] Most of the preterm labor are said to be spontaneous in origin.[4]

There are different causes of preterm birth. In majority cases, the cause is vague.

Different micro and macro minerals are said to have a role in preterm labor. Although, they do not play a direct role in causation, they do indirectly play their part through pathogenesis.[5] One of the mineral is Magnesium which has a vital part in the physiology of labor and delivery.

Low levels of magnesium in plasma will be responsible for low levels of same in uterus causing a significant influence. Hypomagnesaemia also causes neuromuscular irritability which makes uterus hyperactive initiating cervical dilatation. It may affect the flow of blood through the uterus bringing release of prostaglandins which also initiates uterine contractions.[5] It changes the basic biological functions of the body at the cellular level.[6] The normal range of Magnesium in pregnant women varies from 1.8 to 4 mg/dl.

Hypomagnesaemia is said to occur when serum

magnesium level is lower than (the mean −2 SD), i.e., 1.03 mEq/L.[7]

Magnesium inhibits myometrial contractions, its deficiency thereby causes preterm labor. It antagonizes calcium mediated uterine contractions. High concentrations of extracellular magnesium prevent calcium entrance into myometrial cells by inhibiting calcium channels resulting in high intracellular magnesium concentration.[8]

Hence, hypomagnesaemia causes excitability of neuromuscular tissues resulting in muscle cramps and uterine hyperactivity. The hyper excitability of uterine musculature induced by hypomagnesaemia leads to increased cervical dilatation accelerating colonization of pathological vaginal micro-organisms into cervix altering vaginal discharge [9,10]

Various studies conducted around the world have shown that estimation of serum magnesium levels in pregnancy with preterm onset of labor can be an important means by which preterm onset of labour can be predicted.[4] A cross sectional case control study conducted in India at Lady Goschen Hospital showed mean±S.D of serum magnesium level of preterm women 1.47±0.49.[1]

Study on Serum magnesium levels in preterm labor has not been conducted locally. The aim of this study was to look for mean serum magnesium levels which may be valuable in predicting preterm onset of labor. This will help in reducing perinatal morbidity and mortality related to prematurity. Serum Magnesium level is a cheap test if hypomagnesaemia proves to be occurs in preterm labor this will decrease burden of NICU admissions due to complications of preterm birth. Therefore Prophylactic oral magnesium supplementation can be given to women who have an increased possibility of preterm labor.

METHODOLOGY

This is a cross sectional study conducted in the Obstetrics and Gynecology unit of Zaiuddin University Hospitals from 8th December 2015 to 7th June 2016. A non-probability consecutive sampling was used for the study. The sample size was calculated by taking mean and standard deviation 1.47±0.49, 95% Confidence interval, margin of error 0.245. The sample size of this study was 40.

The patients included were age 18 to 40 years primi and second gravida having a singleton pregnancy with a gestational age between 28-36 weeks. (Assessed on Ultrasound Scan) with established preterm labour and cervical dilatation less than 3cm.

The women with history of PROM (Premature Rupture of Membranes) multiple gestations, having parity more than 2 or suffering from some obstetrics complications suchas high blood pressure or Diabetes Mellitus or vaginal infection are excluded from the study, similarly patients with established preterm labor with a cervical dilatation more than 3 cm are excluded.

Data Collection Procedure

A total of 40 patients with established preterm labor presented to labor room or OPD, registered at Ziauddin Hospital were selected. After taking informed consent a detailed clinical history was taken, physical and obstetric examination was performed. Confounding variables as well as biasness were controlled by strictly following the inclusion and exclusion criteria.

5 ml sample of blood was collected from the forearm vein. These samples were evaluated in the Biochemistry department at Ziauddin Hospital Karachi. Final Outcome in terms of Mean Standard Deviation was noted in Predesigned Proforma by Researcher herself.

Data Analysis Procedure

The data feeding and analysis were on SPSS (Statistical Packages of Social Sciences) version 19.0. Mean and standard Deviation were calculated for Quantitative Variables i.e. Age, Gestational age, Parity, Cervical Dilatation and Mean serum magnesium level. Frequency and Percentages were calculated for (Primi and second Gravida). Effect modifiers (Age, Parity, Gravida) were calculated through stratification.

Post stratification Student t test was applied and p-value ≤0.05 was considered as significant.

RESULT

Total 40 female patients with age 18 to 40 years meeting inclusion criteria of study were evaluated to find out mean serum magnesium level in women with preterm labor. The overall mean age of study subjects was 26.25±2.38 years. The overall mean gestational age of study subjects was 32.77±2.11 weeks. While the overall mean cervical dilatation of study subjects was 1.85±0.39 cm.72.5% of the women were referred from OPD while 27.5% patients were admitted in Labor room with preterm labor.

The mean serum magnesium level was found 1.43±0.25 mg/dl. (Table-I) Comparison of Mean serum magnesium level with age, gestational age, cervical dilatation, and gravida was done by Independent t-test and ANOVA, as appropriate. P value ≤0.05 was considered as significant.

The results showed that there was significant difference in mean serum magnesium level for gestational age (p=0.000) but there was no significant difference in mean serum magnesium level for age (p=0.469), cervical dilatation (p=0.594), parity (p=0.076) and gravida (p=0.539). The detailed results of mean comparisons of serum magnesium level are presented from Table-II.

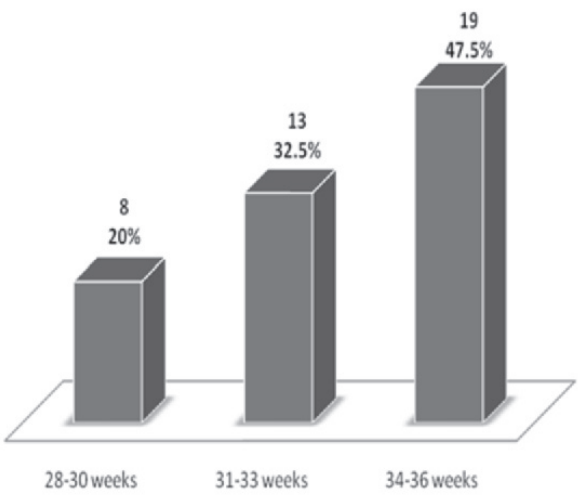

Figure-1. Percentage of patients according to gestational age (n=40)

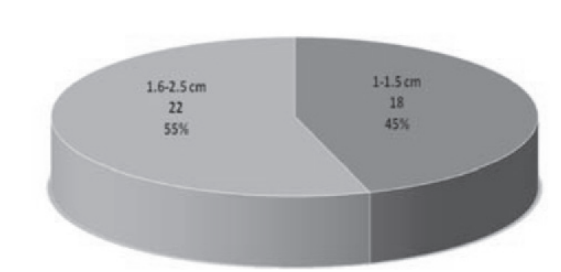

Figure-2. Percentage of patients according to cervical dilatation group (n=40)

Mean ±SD	1.43±0.25
95%CI	1.35 To 1.51
Median (IQR)	1.41 (0.31)
Range	1.09
Minimum	0.98
Maximum	2.07

Table-I. Descriptive statistics of serum magnesium level (n=40)

DISCUSSION

The purpose of this research was to study the serum magnesium levels in preterm labor and to find associated signs and symptoms. Numerous new studies have highlighted the importance of magnesium in human biology.[11] There is proof that changes and alterations in magnesium metabolism have an undesirable effect on pregnancy and its outcome.

Kurzel[12] found significant depressed serum magnesium levels in women with preterm labor with the mean of 1.60 ± 0.466. Rao and Gupta[13] also found similar levels. They took below 1.8 mg/dl as a critical level. Kamal et al in their recent study found the mean serum magnesium level in preterm labor cases was 1.4 mg/dl ± 0.22 SD and established serum magnesium level as an important mean by which preterm labor can be predicted.[13]

Kehinde[8] found a statistically significant difference of preterm labor in women with low serum magnesium levels.

Begum et al.[14] also noticed significant drop (p < 0.001) of serum magnesium (mean 1.77±0.36) in females with preterm labor.

	Mean	Range	Minimum	Maximum	P-Value
Age					
<25(n=16)	1.47±0.20	0.78	1.05	1.83	0.469
>25(n=24)	1.41±0.28	1.09	0.98	2.07	
Gestational Age					
28-30(8)	1.80±0.176	0.53	1.54	2.07	0.000
31-33(13)	1.43±0.146	0.48	1.18	1.66	
34-36(14)	1.28±0.175	0.55	0.98	1.53	
Cervical Dilation					
1.5cm	1.46±0.26	1.02	1.05	2.07	0.594
2.5 cm	1.41±0.25	0.86	0.98	1.84	
Gravida					
PrimiGravida (n=19)	1.46±0.18	0.65	1.18	1.83	0.593
Second Gravida (n=21)	1.41±0.30	1.09	0.98	2.07	

Table-II. Comparison of serum magnessium according to age, gestational age, cervical dilatation and gravida

Another study[15] showed that women with preterm labor have proportionally low serum magnesium levels (60%) compared to women having normal labor (32%). This was statistically significant ($p < 0.001$).

Shahid et al[2] discovered that the percentage of women with serum magnesium level less than 1.9 mg/dl were more likely to go into preterm labor compared to those who had serum magnesium level 1.9 mg/dl or more. He calculated the relative risk and found3.188 times more risk of preterm labour in women with low serum magnesium level than those who had the normal serum magnesium level. Decreased serum magnesium level therefore shows an inclination towards preterm labor.

In a recent study the basal Magnesium level was significantly lower in this preterm group (1.6 versus 1.9, respectively, $p < 0.001$).[16] Shatha A[17] also founded mean magnesium level of 1.552±0.658 mg/d in those with preterm labour in comparison of 1.81±0.735mg/dl in those with term delivery,

Our result of 1.43±0.25 mg/dl. Is analogous to and reinforced by the research results found by others. In a study done by Puspo and Jagdish, in women with preterm labor, serum magnesium level was established to be 1.67±0.23 mg/dl.18. A Nigerian study also found a significant link between low serum magnesium and pre-term birth.[6]

Our study also assesses the relationship of serum magnesium with age, gravidity, gestational age and cervical dilatation. No significant association was found with age parity and cervical dilatation, however, we could establish that women with lower gestational age have decreased serum magnesium levels compared to those whp had a higher gestational age.

Former studies state that the serum magnesium level is mildly decreased or unchanged during first and second trimester of pregnancy, but considerably decreases during third trimester specifically in the last two months of pregnancy.[12] Shatha A[17] also observed a decrease in serum magnesium with progression of pregnancy in women with both preterm and term pregnancy. Regarding age Cunningham et al.[19] in 2005 found that there is a relationship between preterm labour and maternal ages and low socioeconomic status, such a finding was not obvious from our study neither from study done by KehindeS.[8]

Our study backed up by previous studies, establishes a link between magnesium and preterm labor enabling it to be used as an indicator of preterm labor. The aim of this study was to frame a proposalin decreasing perinatal mortality and morbidity by avoiding preterm birth.

Prophylactic magnesium supplementation in such cases are useful but is disputed with some authors favoring it[20,21,22] while others show it's lack of effect in preventing preterm labour.[23,24]

Uludağ EÜet al[16] demonstrated stoppage of uterine contractions in women with preterm labor who were administered magnesium sulphate. A recent French study[25] recommended administering magnesium sulfate to the women at high risk of imminent preterm birth before 32 weeks gestation.

LIMITATION OF THE STUDY

The small sample size of this study does limit its applicability. A multicenter trial is required to further prove these findings. The main limitations of the present study include a single-center experience and nonrandomized study design. It was conducted with small sample size and in urban environment therefore, the results might not be generalizable to larger populations.

CONCLUSION

Serum magnesium levels can be used to predict preterm labor. And its estimation can be done during pregnancy to prevent preterm labor. Magnesium supplementation may be considered in patients with low serum magnesium levels to prevent preterm labor.

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The person attempting to travel two roads at once will get nowhere.

– Xun Kuang –

AUTHORSHIP AND CONTRIBUTION DECLARATION

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2	Habiba Sharaf Ali	SUpervisor Writer of the manuscript	