

## Original Article

# Study on Association of Serum Magnesium Level with Preterm Labour

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## ABSTRACT

**Introduction:** Pregnancy portrays a crucial time when a woman can be reached under a diversity of mechanisms with interventions aimed at lessening her risk of preterm birth. The long-term concerns of a premature birth bear behind both economic and social problems. Preterm labour may be due to amendments in basic biochemical functions of the body at the cellular level. **Aim of the study:** The study aims to investigate the association of serum magnesium levels with preterm labour. **Methods:** An observational cross-sectional study was carried out in

the Department of Obs & Gynae, BSMMU Hospital from March 2013 to August 2013. A total of 30 patients (N=30) were enrolled in this study following the inclusive criteria. Data were collected using the predesigned semi-structured questionnaire. Verbal consent was taken before recruiting the study population. Completed data forms were reviewed, edited, and processed for computer data entry. The data analysis was performed using Statistical Package for the Social Sciences (SPSS) Version 25.0. **Result:** Among the study population (N=30), the mean age was 26.03(±5.37) years and the minimum age was 19 and the maximum age was 35 years, around two-fifth of the study population completed SSC, ten patients completed HSC and 8 patients were graduated. The mean serum magnesium (mg/dl) level was 1.70±SD, around three-fifth of the study population (19, 63.3%) magnesium level was < 1.9 and eleven patients (11, 36.7%) magnesium level was ≥ 1.9. (p<0.05) that was statistically significant. The mean magnesium level according to socioeconomic status in the higher class was 1.88±SD, in the middle class was 1.70±SD and in the lower class was 1.61±SD mean magnesium level significantly decreased

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in the poor class was statistically significant. **Conclusion:** Serum magnesium levels can be used as a predicting tool for preterm labour and serum magnesium estimation must be done in cases of pregnancy to prevent preterm labour. To avoid preterm birth in some extent oral supplementation of magnesium can play a crucial role.

**Keywords:** Preterm birth, Magnesium, Serum, etc.

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## INTRODUCTION

A preterm baby means a live-born infant delivered before 37 completed weeks of gestation from beginning to last menstruation defined by WHO [1]. An essential but under-recognized issue for all countries is the inability of survivors of preterm birth. It is well established that preterm infants also constitute a potential risk group for an impaired outcome. [2,3]. Pregnancy portrays a crucial time when a woman can be reached under a diversity of mechanisms with interventions aimed at lessening her risk of preterm birth and enhancing her health and the health of her unborn baby [4]. Despite technological advancements and the efforts of child health specialists over the previous generation, preterm newborns are still at high risk for mortality and weakness, with 30-50 percent mortality and at least a 20-50 percent morbidity danger [5]. Many states have described increased preterm birth rates over the past two spans, and this overall inclination was currently established WHO global survey. The preterm birth rate for multiples is 40-60%, in contrast with 5-10% for singletons [6,7,8]. Premature birth can happen suddenly with no known cause in 50% of cases it is spontaneous and idiopathic, although several potential risk factors have been identified, such as

premature rupture of membrane (PROM), multiple pregnancies, chronic diseases, preeclampsia, vaginal bleeding or infection during pregnancy, hypertensive disorder of pregnancy, cervical incompetence, antepartum haemorrhage, fetal and uterine anomalies, anaemia, heavy work, drug or alcohol abuse [9,10,11]. The long-term consequences of a premature birth bear behind not only economic but also social problems [12]. Preterm labour may be due to alteration in basic biochemical functions of the body at the cellular level. Hypomagnesaemia during pregnancies decreases the magnesium level in the myometrium and a low magnesium concentration in pregnant women's myometrium could be the cause of preterm labour [10]. Rising serum magnesium levels help to relax the uterine smooth muscle, allowing magnesium sulphate to be used as a tocolytic drug. As a result, this low blood magnesium concentration during pregnancy might be a cause of premature labor [13]. Because the aetiology of preterm labor is complicated, efforts to predict it are ineffective and inaccurate. The predictors can be used to manage women who are at high risk for preterm labor, such as those who have had past preterm labor, and they can also be utilized as part of a management

protocol to individualize patient care [14]. There is a link between hypomagnesaemia in pregnancy and premature labor beginning, and blood magnesium measurement in pregnancy has proven to be a useful technique in predicting preterm labor onset [15]. Excess magnesium can alter a variety of enzyme systems, implying that it is necessary to exercise caution while estimating the safety and effect of exogenous magnesium. Magnesium nutritional status can be influenced by several factors, but, the easiest is accurate magnesium intake [16]. Magnesium intake depends to a certain extent on the socioeconomic background of the person. The diets rich in magnesium are whole grain, lean meat, low fat, low sugar, skimmed milk, and abundant fruits and vegetables. An attempt has been made to compare the levels of magnesium concerning dietary intake, socioeconomic status, the rural or urban origin of the population and antenatal care [17].

## OBJECTIVES

To find out the association of serum magnesium level with preterm labour.

### Specific Objectives

To measure the serum magnesium level with preterm labour.

## METHODS

An observational cross-sectional study was carried out in the Department of Obs & Gynae, BSMMU Hospital from March 2013 to August 2013. A total of 30 patients (N=30) were enrolled in this study following the inclusive criteria. After taking a careful history, enough

clinical examinations were taken for confirmation. All observations were noted in the clinical data sheet. The results were calculated and interpreted through appropriate statistical analysis with the help of a statistician and presented in a table with other illustrations. Verbal consent was taken before recruiting the study population. Ethical clearance was taken from the hospital. The information was kept confidential only to be used for the study purpose.

### Inclusion criteria:

- Singleton pregnancy
- More than 20 weeks gestational age having clinical features of labour.
- Non-Diabetic

### Exclusion Criteria

- Multiple pregnancies
- PIH
- Gestational diabetes Mellitus
- Gestational age >37 weeks

### Method of collection of samples for the estimation of serum magnesium levels:

A blood sample was collected from the antecubital vein of the study group with a disposable syringe taking full aseptic precaution. Blood was drawn once from each subject. Collected blood samples were kept in 5ml screw-capped vials, these were immediately brought to the department of Biochemistry, BSMMU. The serum was separated by centrifugation (at 3000rpm, at 20<sup>o</sup>, for 10 minutes ). This serum was then analysed for serum magnesium levels in a special magnesium kit.

**Data analysis:**

The study coordinators performed random checks to verify data collection processes. Completed data forms were reviewed, edited, and processed for computer data entry. Frequencies, percentages, and cross-tabulations were used for descriptive analysis.  $\chi^2$  test, Student 't' test (unpaired) and one-way ANOVA test were used to analyze statistical significance. The data analysis was performed using Statistical Package for the Social Sciences (SPSS) Version 25.0. The significance level of 0.05 was considered for all tests.

**RESULT**

Among the study population (N=30), the mean age was 26.03( $\pm$ 5.37) years and the minimum age was 19 and the maximum age was 35 years, around two-fifth of the study population completed SSC, ten patients completed HSC and 8 patients were graduated. More than half of the study population (16,53.3%) came from the middle class, four (4,13.3%) belonged to the higher class and ten patients (10,33.3%) were poor, and most of the study population (21,70%) were multigravida and around one-third (9,30.0%) were primi gravida [Table I]. Based on the history of previous preterm labour, of twenty-one patients, seven patients (7,33.33) had a history of previous preterm labour and fourteen patients (14,66.67%) had no previous history of preterm labour [Table II]. The mean serum magnesium (mg/dl) level was 1.70 $\pm$ SD, around three-fifth of the study population (19,63.3%) magnesium level was < 1.9 and eleven patients (11, 36.7%) magnesium level

was  $\geq$  1.9. ( $p < 0.05$ ) that was statistically significant [Table III]. Mean serum magnesium level was 1.67 $\pm$ SD (mg/dl) up to 20 years age group, 1.68 $\pm$ SD (mg/dl) in the 21-30 years age group, and 1.75 $\pm$ SD (mg/dl) in >30 years age group & comparison of the mean serum magnesium level between them not statistically significant ( $p > 0.05$ ). The mean magnesium level according to socioeconomic status in the higher class was 1.88 $\pm$ SD, in the middle class was 1.70 $\pm$ SD and in the lower class was 1.61 $\pm$ SD mean magnesium level significantly decreased in the poor class was statistically significant. The mean serum magnesium level was 1.65 $\pm$ SD in primi gravid and 1.71 $\pm$ SD in gravid [Table IV].

**Table I: Distribution of the study population based on characteristics (N=30)**

Age group	(N,%)
Up to 20 years	09, 30.0%
21-30 years	14, 46.7%
>30 years	07, 23.3%
Mean ( $\pm$ SD)	26.03( $\pm$ 5.37)
<b>Educational status</b>	
SSC	12, 40.0%
HSC	10, 33.3%
Graduation	08, 26.7%
<b>Economic status</b>	
Higher class	04, 13.3%
Middle class	16, 53.3%
Poor class	10, 33.3%
<b>Gravida</b>	
Primi gravid	09, 30.0%
Multi gravid	21, 70.0%

**Table II: Distribution of the study population based on the history of previous preterm labour (n=21)**

Preterm Labour	(N,%)
History of preterm labour	07, 33.3%
No history of preterm labour	14, 66.6%

**Table III: Distribution of the study population based on mean serum magnesium (mg/dl) level**

Serum magnesium (mg/dl)	(N,%)
Abnormal (< 1.9)	19, 63.3%
Normal ( $\geq$ 1.9)	11, 36.7%
Mean $\pm$ SD	1.70( $\pm$ 0.13)

**Table IV: Distribution of the study population based on mean serum magnesium (mg/dl) level, in case of age, socioeconomic status and gravida.**

Age group	Mean $\pm$ SD	<i>p-value</i>
21-30 years	1.68 $\pm$ SD	0.20
>30 years	1.75 $\pm$ SD	
Up to 20	1.67 $\pm$ SD	0.86
>30 years	1.75 $\pm$ SD	
Up to 20	1.67 $\pm$ SD	0.30
21-30	1.68 $\pm$ SD	
Socio economic status	Mean $\pm$ SD	<i>p-value</i>
Middle	1.70 $\pm$ SD	0.006
Poor	1.61 $\pm$ SD	
Higher	1.88 $\pm$ SD	0.03
Poor	1.61 $\pm$ SD	

Higher	1.88 $\pm$ SD	0.03
Middle	1.70 $\pm$ SD	
Gravida		
Primi	1.65 $\pm$ SD	0.28
Multi	1.71 $\pm$ SD	

## DISCUSSION

Preterm birth is when a baby is born too early. A baby born prematurely has a huge physical and emotional impact on the mother and the entire family. Women who underwent preterm labour were more likely to have: anxiety, and postpartum depression. The present study aims to find out the association of serum magnesium levels with preterm labour. The study was conducted in the Department of Obs & Gynae BSMMU. In this study mean age was 26.03 $\pm$ SD years and the minimum age was 19 and the maximum age was 35 years. Mean serum magnesium level according to age group up to 20 years was 1.67 $\pm$ SD (mg/dl), in 21-30 years were 1.68 $\pm$ SD (mg/dl), and >30 years 1.75 $\pm$ SD (mg/dl). The comparison of the mean serum magnesium level between them was not statistically significant ( $p > 0.05$ ). Another study found no significant influence of age on serum magnesium levels [18]. In this present study majority, 53.3% were middle class, 33.3% were poor and 13.3% were higher. Serum magnesium levels were compared for various socio-economic classes using one-way ANOVA with a posthoc test, to make multiple comparisons. The comparison of serum magnesium levels between high 1.88  $\pm$ SD and middle 1.70  $\pm$ SD socio-economic classes revealed a statistically significant difference ( $p < 0.05$ ). The difference in serum magnesium levels

between high socio-economic class  $1.88 \pm \text{SD}$  and low socioeconomic class  $1.61 \pm \text{SD}$  was found to be statistically highly significant ( $p < 0.05$ ). Similarly, the difference in serum magnesium levels between middle  $1.70 \pm \text{SD}$  and low socioeconomic class  $1.61 \pm \text{SD}$  was statistically highly significant ( $p < 0.05$ ). There was a relationship between low socioeconomic status and poor nutrition with preterm labour. An analysis found that, low serum magnesium levels in preterm labour cases. The serum magnesium level was also found to be low in patients belonging to low socioeconomic status, relating the low level of magnesium to a diet deficient in magnesium [19]. In the present study majority (70%) were multigravida and 30% were primi gravida. Mean serum magnesium levels of  $1.65 \pm \text{SD}$  were in primi gravid and  $1.71 \pm \text{SD}$  in gravid. Another analysis revealed that most of the patients included in this study belong to primigravida's which was 51% [20]. In the present study 07(33.33) had a history of previous preterm labour and 14(66.67%) had no previous history of preterm labour. It shows the risk of preterm labour is increased with a history of preterm labour. A relevant study conducted in Tanzania and Norway described that recurrent preterm birth was mostly responsible for perinatal death [21]. In this study mean serum magnesium (mg/dl) level  $1.70 \pm \text{SD}$ , 63.3% were  $< 1.9$  and 36.7%  $\geq 1.9$ . ( $p < 0.05$ ) that was statistically significant. Other related findings demonstrated that serum magnesium concentration was lower in preterm labour which was  $1.65 \pm \text{SD}$ . It was considered serum magnesium

levels below 1.8 mg/dl to be hypomagnesaemia which may lead to preterm labour [18]. A study carried out in Bangladesh, found that serum magnesium level in preterm labour was  $1.77 \pm \text{SD}$  [22]. In an epidemiologic study, it was stated that prophylactic oral magnesium supplementation to the patient at threat of preterm labour was successful in lowering the rate of preterm birth. Prevention of preterm labour by intake of magnesium should be sufficient to maintain serum magnesium levels in the range of 2.0-3.5 mg/dL. Whether magnesium level drops preceding the development of preterm labour is unknown. Hypomagnesaemia may be either a causative factor or simply reflect the process involved with the development of uterine irritability in preterm labour [18]. While some threats of premature birth cannot be avoided, there must be some ways to prevent preterm birth, such as, stop taking drugs or smoking, getting prenatal care, practising oral hygiene, practice stress reduction [23].

## CONCLUSION

From the present study, it may be concluded that serum magnesium level was significantly low in women having preterm labour. The serum magnesium level was significantly low in low socioeconomic status. No significant difference in serum magnesium level with age and parity was observed. Serum magnesium levels can be used as a predicting tool for preterm labour and serum magnesium estimation must be done in cases of pregnancy to prevent preterm labour. Magnesium supplementation may be considered in

patients with decreased serum magnesium levels to prevent preterm labour.

## RECOMMENDATIONS

Public health efforts in Bangladesh should address the complications of preterm birth. There is a necessity for setting a screening docket to cover all age groups for early detection and treatment of cases. Furthermore, strategies should be implemented to accelerate government programs. To get robust data, multicenter studies are in great need of policymakers to interpret the demonstrable scenario and to take necessary steps towards mitigating this problem. Further research is also needed to detect the burden of preterm birth and facilitate the prognosis of such a condition.

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**Conflict of interest:** None declared

**Ethical approval:** The study was approved by the Institutional Ethics Committee

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