ORIGINAL ARTICLE

Role of C-reactive Protein and Serum Magnesium in Preterm Labor

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Abstract

Aim: The present study was planned to evaluate C-reactive protein and serum magnesium in preterm labor compared to healthy subjects.

Introduction: Preterm labor is defined as the onset of labor before the completion of 37 weeks of gestation in a pregnancy beyond 20 weeks of gestation. Preterm is one of the leading causes of perinatal morbidity and mortality. It has approximately 70% of newborn deaths and 50% long-term neurological sequelae. The main cause of preterm labor is the preterm rupture of the membrane. In addition to that, there are some other risk factors too, such as multiple gestations, hypertension, anemia, cervical incompetence, prepartum hemorrhage, anomalies of fetus or uterine, heavy work, and smoking.

Materials and methods: Fifty diagnosed preterm labor patients and 50 healthy subjects were enrolled for the study and subjected to analysis, including C-reactive protein and serum magnesium using Vitros 5600- Dry Chemistry Analyzer.

Result: The present study reported significantly low levels of serum magnesium and higher levels of serum C-reactive protein in preterm labor patients when compared to healthy subjects.

Conclusion: Findings of the present study suggest that serum C-reactive protein and serum magnesium levels can be used as a predicting tool of preterm labor.

Keywords: C-reactive protein, Hypomagnesemia, Inflammatory biomarker, Perinatal morbidity, Preterm labor.

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Introduction

Preterm labor is defined as the onset of labor before the completion of 37 weeks of gestation in a pregnancy beyond 20 weeks of gestation.[1] According to the World Health Organization (WHO), preterm labor is defined as labor occurs with regular and frequent uterine contractions causing progressive cervical changes before 37 completed weeks of gestation.[2]

Late preterm births (between 34 weeks and 0 days and 36 weeks and 6 days) account for about 74% of all preterm births, while the severe preterm birth (<32 weeks) rate has remained relatively constant during the last two decades.[3]

Preterm is one of the leading causes of perinatal morbidity and mortality. It has approximately 70% of newborn deaths and 50% long-term neurological sequelae. The main cause of preterm labor is the preterm rupture of the membrane. In addition to that, there are some other risk factors such as multiple gestations, hypertension, anemia, cervical incompetence, prepartum hemorrhage, anomalies of fetus or uterine, heavy work, and smoking.[4,5] Preterm infants are at a greater risk of short-term and long-term complications, including disabilities and impediments in growth and mental development. Preterm delivery major cause of perinatal mortality and morbidity.[6]

C-reactive protein (CRP) is a sensitive inflammatory biomarker whose serum level increases during the infectious and inflammatory processes. CRP measurement is noninvasive and risk-free which can be used as a diagnostic test for evaluating the risk levels and also anticipating the morbidity of both mother and fetus.[7] C-reactive enzyme is an annular (ring-shaped) pentameric protein in blood plasma. It is one of the sensitive markers of systemic inflammation and is synthesized by the liver in response to infection and tissue injury in the body.[8]

Maternal serum concentrations of high-sensitive C-reactive protein (hs-CRP) can be studied as a marker of subclinical infection in pregnant women who end up with preterm labor or premature rupture of membrane.[9]

Magnesium is an important intracellular cation in the body. Its level falls during pregnancy with gestational age, and a decrease of it plays an important role in the physiology of parturition. Decrease of magnesium in plasma may be responsible for the decrease of the same in myometrium, leading to initiation of uterine contractions and labor.[10]

Magnesium is a cofactor in more than 300 enzyme reactions. It activates those enzymes and plays an important role in the mechanism of nerve conduction, uterine contractility, and contractile response of other smooth muscles.[11]

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The present study was planned to evaluate C-reactive protein and serum magnesium in preterm labor compared to healthy subjects.

Materials and Methods

The study was conducted at the Department of Biochemistry in association with the Department of Obstetrics and Gynecology of Mahatma Gandhi Medical College and Hospital, Jaipur.

A total of 50 preterm labor patients and 50 healthy subjects were enrolled for the study. Institutional Ethics Committee approval and informed consent were obtained from all participants before enrollment in the study.

Inclusion Criteria

- Pregnant women aged 18–40 years
- Gestational age between 28 and 36 weeks
- Patients with established preterm labor
- Singleton pregnancy

Exclusion Criteria

- After 37 completed weeks of gestation with labor pain
- Pregnant women having any major disease, such as diabetes and preeclampsia/eclampsia
- History of taking prior tocolytic agents
- Placenta praevia
- Multifetal gestation and presence of infection

Blood samples for all subjects (preterm labor patients) were collected using standard aseptic technique and analyzed for serum CRP and serum magnesium using Vitros 5600- Dry Chemistry Analyzer.

The results obtained shall be presented as mean + SD and subjected to statistical evaluation. A *p* value of <0.05 shall be considered as statistically significant.

Results

The mean age of preterm labor patients was 36.98 ± 3.94 and healthy controls was 33.96 ± 3.32 years; it was found to be statistically nonsignificant.

Serum CRP levels were significantly higher (31.62 ± 49.30 mg/dL) in preterm labor patients when compared to (6.60 ± 0.97 mg/dL) healthy subjects (*p* value <0.001) (Table 1 and Fig. 1).

Mean serum magnesium levels were significantly lower (1.99 ± 0.25 mg/dL) in preterm labor patients when compared to (2.77 ± 1.76 mg/dL) healthy subjects (Table 1 and Fig. 2).

Table 1: Distribution of variables between control and preterm labor patients

Parameter	*Control (n = 50)*	*Preterm labor patients (n = 50)*	*t value*	*p value*
Age (years)	33.96 ± 3.32	36.98 ± 3.94	2.35	0.062
Serum CRP (mg/dL)	6.60 ± 0.97	31.62 ± 49.30	−3.58	0.001
Serum magnesium (mg/dL)	2.77 ± 1.76	1.99 ± 0.25	3.11	0.002

To check the dependence of serum CRP levels on magnesium, a chi-square test was conducted to the study group. The selected patients were grouped based on serum magnesium levels as normal, i.e., serum magnesium <1.6 mg/dL (*n* = 15), and hypermagnesemia, i.e., serum magnesium ≥1.6 (*n* = 35). Distribution of subjects in the above group was further analyzed based on serum CRP levels as CRP-negative, i.e., CRP ≤10 mg/dL, and CRP positive, i.e., CRP >10 mg/dL.

In all, 33.30% of patients with hypomagnesemia exhibit negative CRP levels, whereas 66.67% of patients with hypomagnesemia showed positive CRP levels (Table 2).

Discussion

C-reactive protein plays an important role in the inflammatory process. CRP removes pathogens by binding to surface antigen and opsonizes them for uptake by phagocytes and also activates the classic complement pathway. CRP is found to appear in the blood during a variety of reactions of tissue destruction or inflammation and has served as a useful clinical index of this process. It increases inflammation by induction of cytokines and tissue factor in monocytes. However, its main function is to reduce inflammation by decreasing the migration of neutrophils to the site of inflammation, preventing neutrophils adhesion to the endothelial cells and also helps in removal of nuclear antigens produced from necrotic and apoptotic cells.[12–14]

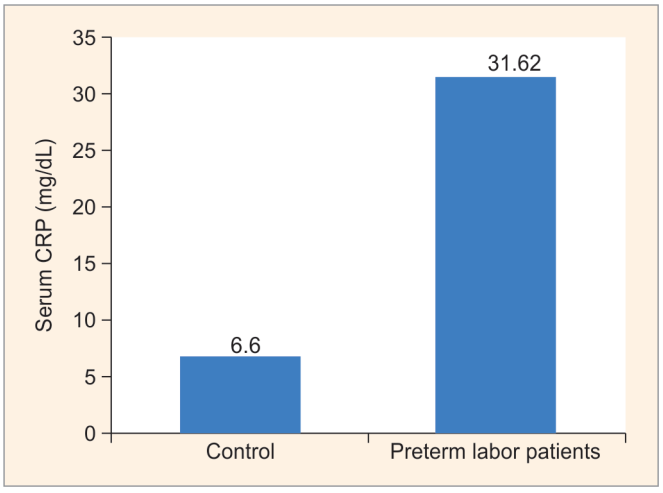

Fig. 1: Comparison of serum CRP between control and case group

Table 2: Dependence of serum CRP levels on magnesium in the study group

	Magnesium (>1.6 mg/dL) (n = 35)	*Magnesium (<1.6 mg/dL) (n = 15)*	*X^2 value*	*p value*
CRP (≤10 mg/dL) Negative	20 (57.1%)	5 (33.3%)	10.687	0.001
CRP (>10 mg/dL) Positive	15 (42.9%)	10 (66.7%)		

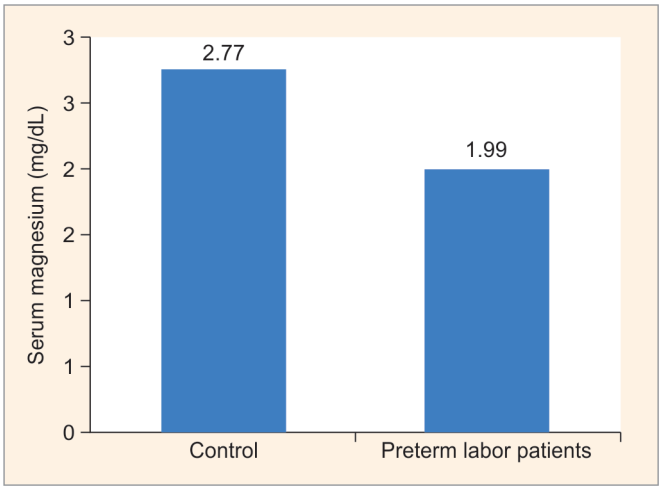

Fig. 2: Comparison of magnesium between control and case group

In the present study, Serum CRP levels were significantly higher (31.62 ± 49.30 mg/dL) in preterm labor patients when compared to (6.60±0.97 mg/dL) healthy subjects (*p* value <0.001).

Keshav et al. reported the highest association between CRP positive in cases and gestational weeks. *p* value of 0.000 was highly significant.

Hvilsom et al. observed a significant association of increased levels of serum CRP elevated risk of delivery before 37 weeks gestation.[15]

Magnesium is one of the trace elements, a divalent cation, necessary for life. Magnesium plays a vital role in preterm labor. It is a cofactor in more than 300 enzyme reactions. It activated those enzymes and plays an important role in the mechanism of nerve conduction, uterine contractility, and contractile response of other smooth muscles.[11] Hypomagnesemia during pregnancy decreases the magnesium level in myometrium, and a low magnesium concentration in pregnant human myometrium could be a cause of preterm labor.

In the present study, it was observed that serum magnesium level was decreased in preterm labor patients compared to healthy subjects. Shaheena et al. indicated that there was low serum magnesium level in preterm labor. Kurzel et al. reported significantly low levels of serum magnesium in females with preterm labor with a mean of 1.60 ± 0.466.[10] In all, 33.30% of patients with hypomagnesemia exhibit negative CRP levels, whereas 66.67% of patients with hypomagnesemia showed positive CRP levels.

Conclusion

Findings of the present study suggest that serum CRP and serum magnesium levels can be used as a predicting tool of preterm labor. Regular screening of preterm labor patients for magnesium and C-reactive protein is recommended to diagnose at risk of developing preterm labor and magnesium supplementation also advice to prevent preterm labor.

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