# Maternal Serum Magnesium Level and Low Birth Weight Neonate

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Brief Communication

## ABSTRACT

**Background:** The aim of study was to compare the serum level of magnesium in mothers having low birth weight with those having normal birth weight neonates.

**Methods:** In a case-control study, women who delivered low birth weight neonate (cases), compared with normal birth weight (controls) in serum concentration of magnesium. Blood samples collected within 24 h after delivery. Concentration of magnesium assessed by standard atomic absorption spectro-photometry. Multiple linear regression analysis was performed to control of potential confounding variables.

**Results:** A total of 116 mothers (67 cases and 49 control) were studied. Mothers in two groups did not differ in age, body mass index, and socioeconomic or demographic factors. Maternal magnesium concentration did not differ between two groups 0.86 ± 0.11 m. mol/l versus 0.94 ± 0.22 m.mol/l respectively ($P = 0.09$).

**Conclusion:** There is no significant difference between serum magnesium levels of low birth weight infants' mother and normal weight infants' mother.

**Keywords:** Low birth weight, magnesium, maternal serum

## INTRODUCTION

Magnesium is the second most common intracellular cation, doing an essential role in many physiologic functions. It is important in energy requiring metabolic processes, protein synthesis, membrane integrity, nervous tissue conduction, neuromuscular excitability, muscle contraction, hormone secretion and intermediate metabolism.[1] The normal plasma magnesium concentration is 1.5-2.3 mg/dl (1.2-1.9 meq/l; 0.62-0.94 m mol/l) with some variation between clinical laboratories.[2] Magnesium has been used as a tocolytic agent since 1969.[3] A randomized trial resulted magnesium sulfate could effectively prevent preterm birth.[4] Another study showed successful tocolysis in more than 92% of patients by using larger doses of magnesium sulfate.[5] In a study, 46% of pregnant mothers had deficiency of magnesium as exposed by serum level.[6]

It has been studied that intake of magnesium may be insufficient for many women during pregnancy.[7] However, it uses for eclampsia and sometime for preeclampsia.[8] Almone and colleague findings have implicated magnesium as being an essential element for fetal well-being and supplementation of magnesium may be benefited to fetal outcome.[9] Magnesium supplementation during pregnancy was associated with significantly fewer maternal hospitalizations, a reduction in preterm delivery, and less frequent referral of the newborn to the neonatal intensive care unit. The results suggest that magnesium supplementation during pregnancy has a significant influence on fetal and maternal morbidity both before and after deliver.[10] Trials have documented that oral supplementation of magnesium in physiological amounts during pregnancy reduces pregnancy hypertension, miscarriage, premature birth and fetal growth Retardation.[11]

Limited data is available on the nutritive effect of magnesium among pregnant mothers in Iran. The aim of this prospective case-controlled study was to determine the relationship between maternal magnesium concentrations and neonatal birth weight in a group of mothers having low birth weight (LBW) deliveries and compared with a group who delivered normal birth weight infants. If magnesium is found to be involved in the pathogenesis of LBW, then supplementation of magnesium during pregnancy could possibly be considered to ameliorate this serious morbidity.

## METHODS

We conducted this prospective case-control study at the maternity ward since May 2006 for 1 year. The study protocol was approved by the research office and written informed consents were obtained from each subject before enrollment. Mother-infants pairs were included if a) maternal age was 17 to 35 years at the time of delivery, and b) she had uncomplicated singleton pregnancy.

"Cases" were considered if the birth weight of the newborn was <2500 g without any known underlying risk factors that could explain the reason for the LBW. A "Control" subject was enrolled when a subsequent mother delivered an infant with birth weight ≥2500 g.

Mothers were not considered for the study if any of the following *exclusion criteria* were present: A previous history of LBW delivery, twin and multiple pregnancies, pre-eclampsia and eclampsia, uterine cervical abnormalities, antenatal bleeding, oligo-and polyhydramnios, maternal disorders prior pregnancies; such as systemic lupus erythematosus, chronic hypertension, diabetes mellitus, seizure disorders, malignancies, and drug or alcohol abuse.[12]

The investigator did a thorough physical examination of every infant recruited into the study. The infant's weight was taken to the nearest 10 g and the length was recorded to the nearest 0.1 cm. The gestational age was assessed clinically by new Ballard score.[12] Medical and social data on mothers were obtained from available information in their records and by direct interviews.

In the first 24 h after delivery, blood from antecubital vein was drawn from the subjects and collected in previously labeled polypropylene tubes. Blood was transported in ice packs to the central laboratory for separation of serum. The samples were centrifuged at 3500 rpm at 4°C for 30 min for the collection of serum. Maternal serum magnesium was determined by the standard atomic absorption spectro-photometry method.[13]

All specimens were de-identified before processing, therefore, laboratory staff was masked to clinical conditions. The data were analyzed by using the SPSS version 11.5 software. If the data had normal distribution, analytic statistical methods were applied, including $\chi^2$ for the qualitative variables and a student *t*-test for quantitative variables. Moreover, in the case of having had abnormal distribution, a nonparametric test was used. Multiple linear regression analysis was performed to control of potential confounding variables. Statistical significance was considered when $P < 0.05$.

## RESULTS

One hundred and sixteen mothers have been included in study of that 67 mothers had neonate with birth weight more than 2,500 g (case) and 49 mothers had a neonate less than 2,500 g (control). The demographic and clinical characteristics of the population have been listed in Table 1.

Mean concentrations of magnesium levels in case group was 0.86 ± 0.11 m mol/L, and

**Table 1:** Demographic and clinical characteristic of the study population (*n*=116)

| Variable | Case (*n*=67) | Control (*n*=49) | *P* value |
|---|---|---|---|
| A. Maternal | | | |
| Age (year) | 24±4 | 25.7±5.4 | 0.06 |
| BMI | 23.4±3.4 | 22.9±3.2 | 0.45 |
| Education (%) | | | |
| Illiterate | 4 | 11 | |
| Primary | 47 | 53 | 0.34 |
| Intermediate | 43 | 32 | |
| University | 6 | 4 | |
| Income (%) | | | |
| Monthly income <150$ | 21 | 34 | |
| Monthly income <150-500$ | 69 | 66 | 0.03 |
| Monthly income >500$ | 10 | 0 | |
| B. Infant | | | |
| Gender | | | |
| Female (%) | 43 | 53 | |
| Male (%) | 57 | 47 | 0.28 |
| Birth weight (g) | 1845±472 | 3167±435 | <0.001 |
| Apgar | | | |
| 1 min | 8 | 9 | >0.001 |
| 5 min | 9 | 9 | >0.001 |
| Gestational age (week) | 33.4±2.9 | 39.3±1.4 | <0.001 |

Data are expressed as mean±SD, and %, except with median (interquartile range)

mean magnesium levels in control group was 0.94 ± 0.22 m mol/L. There is no significant difference between two groups. ($P = 0.09$)

We divided cases in two groups. Forty-five mothers who have low birth weight infants (1,500 to 2,499 g) and 22 mothers who have very low birth weight infants (less than 1500 g). Mean concentrations of magnesium levels in mothers with LBW was 0.88 ± 0.12 m mol/L. There is no significant difference between two groups too ($P = 0.39$).

We tried to show difference between magnesium levels of 22 mothers, with very low birth weight infants and 49 mothers with normal weight infants (2,500 g more). However, there is no difference also ($P = 0.47$).

On regression analysis, magnesium concentrations do not differ significantly between cases and controls after we controlled them for various confounders such as maternal age, body mass index, educational levels, income, neonatal gender, birth weight, gestational age and Apgar score.

There are not correlations between mean concentrations of magnesium levels and birth weight (R = 0.14, $P = 0.12$), and gestational age (R = 0.17, $P = 0.15$).

## DISCUSSION

Magnesium is an ion with several reactions in human body. Therefore, variations in its concentrations, beyond physiologic levels, can have important clinical repercussions. In order to identity these changes, it is necessary to have standard references. The presence of upsets in intrauterine nutrition, such as intrauterine growth retardation can potentially lead to deviations in the homeostasis of magnesium, which have not yet fully clarified.[14]

In a study was demonstrated magnesium status was not associated with risk of low birth weight.[15] The meta-analysis of some trials indicated that oral magnesium treatment from before the twenty-fifth week of gestation resulted in lower frequencies of preterm birth, low birth weight and small for gestational age compared with placebo treatment.[16] A double blind study by Saibai and colleague showed a positive correlation between magnesium intakes in the first trimester of pregnancy with the birth weight. But, magnesium supplementation during II and III trimester had no effect on the outcome of pregnancy.[17]

Nutritional magnesium therapy is useful for prevention of prematurity.[18] In this study, results show there are not difference significantly between mothers with low birth weight and normal weight infants. This could be related to the recent mandate by the ministry of health in our country to provide multivitamins and minerals supplementations to all pregnant women. The present study indicate a need of longitudinal studies with larger sample size need to be undertaken in different parts of the country to assess the magnitude of element deficiencies amongst pregnant mothers.

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## REFERENCES


1. Rigo J, Crurtis M. Disorders of calcium, phosphorous and magnesium metabolism. In: Martin R, Fanaroff A, Walsh M, editors. Fanaroff and martins neonatal-perinatal medicine. 8thed. Philadelphia: Mosby; 2006. p. 1491-523.
2. Greenbaum L. Pathophysiology of body fluid and fluid therapy. In: Kliengman R, Behrman R, Jensen H, Stanton B, editors. Nelson Textbook of pediatrics 17th ed. Philadelphia: Saunders; 2004. p. 191-252.
3. Martin RW, Perry KG Jr, Martin JN Jr, Seago DP, Roberts WE, Morrison JC. Tocolysis with oral magnesium. AM J Obstet Gynecol 1987;156:433-40.
4. Cox SM, Sherman ML, Leveno KJ. Randomized investigation of magnesium sulfate for prevention of preterm birth. Am J Obstet Gynecol 1990;163:767-72.
5. Wilkins IA, Lynch L, Mehalek KE, Berkowitz GS, Berkowitz RL. Efficacy and side effects of magnesium sulfate and ritodrine as tocolytic agent. Am J Obstet Gynecol 1988;159:685-9.
6. Kapil V, Pathak P, Singh P, Singh C. zinc and magnesium nutriture amongst pregnant mothers of urban slum communities in Delhi: A pilot study. Indian Pediatr 2002;39:365-8.
7. Ashe JR, Schofield FA, Gram MR. The retention of calcium, iron, phosphorus and magnesium during pregnancy: The adequacy of prenatal diets with and without supplementation. Am J Clin Nutr 1979;32:286-910.
8. Fawcett WJ, Haxby EJ, male DA. Magnesium: Physiology and pharmacology. Br J Anesth 1999;83:302-20.
9. Almonte RA, Heath DL, Whitehall J, Russell MJ, Patole S, Vink R. Gestational magnesium deficiency is deleterious to fetal outcome. Biol Neonate 1999;76:26-32.
10. Splating L, Splating G. Magnesium supplementation in pregnancy. A double blind study. Br J Obstet Gynaecol 1988;95:120-5.
11. Wynn A, Wynn M. Magnesium and other nutrient deficiencies as possible causes of hypertension and low birthweight. Nutr Health 1988;6:69-88.
12. Stoll BJ, Chapman I. The high risk infant. In: Kliengman R, Behrman R, Jensen H, Stanton B, editors. Nelson textbook of pediatrics. 18th ed. Philadelphia: Saunders; 2007. p. 698-711.
13. Elmer P, Conn N. Analytical Methods for Atomic Absorption Spectrophotometry. London: Oxford Press; 1975. p. 273-90.
14. Barbosa N, Okay T, Leonec. Magnesium and Intrauterine Growth Restriction's. Am Coll Nutr 2005;24:10-5.
15. Bogden JD, Thind IS, Kemp FW, Caterini H. Plasma concentrations of calcium, chromium, copper, iron, magnesium, and zinc in maternal and cord blood and their relationship to low birth weight. J Lab Clin Med 1978;92:455-62.
16. Markrides M, Crowther CA. magnesium supplementation in pregnancy (review): The cochrane collaboration: Australia: Weily; 2012;10.
17. Sibai BM, Villar MA, Bray E Am. Magnesium supplementation during pregnancy: A double blind randomized controlled clinical trial. J Obstet Gynecol 1989;161:115-9.
18. Durlach J. New data on the importance of gestational mg deficiency. J Am Coll Nutr 2004;6:694S-700.


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