

STUDY OF SERUM ZINC LEVEL IN FULL TERM WOMEN

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ABSTRACT

Background: Micronutrient deficiency is a major problem in many developing countries. Micronutrient especially Zn deficiency may affect pregnancies, delivery, and outcome of pregnancy. Objectives: To study serum Zn level in full term mother and non pregnant women in order to compare with those of non pregnant women as reference value. Method: This cross sectional study was carried out in the Department of Physiology, Sir Salimullah Medical College Mitford Hospital, Dhaka, during the period of 1st January 2009 to 31st December 2009. A total number of 55 subjects were included in this study, among them 27 were full term delivery mothers (group B), treated as study group. Age range of full term mother was from 20-40 years. Again, 28 non pregnant women with age range from 20-30 years were taken as a control group. Statistical analysis was done by using appropriate method as applicable. Results: Mean serum Zn level were significantly lower ($p < 0.001$) in full term pregnant mother in comparison to those of non pregnant women. Conclusions: The present study revealed a lower level of zinc in full term mother than non pregnant women. The decreased serum Zn level may be due to poor nutritional status during pregnancy as serum total protein and albumin levels were also lower in this group of subjects.

Key Words: Zinc, full term

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INTRODUCTION

Nutritional deficiencies are common during pregnancy, especially in pregnant women from economically disadvantaged settings where diets with low minerals and vitamins are consumed. Pregnancy is associated with extraordinary metabolic demands on both the mother and developing fetus. Adequate maternal Zn is essential for normal embryogenesis, growth and development of human body. Zinc is important for protein synthesis, and an integral parts of several enzymes and co-factors¹. Physiological changes during pregnancy include a gradual decrease of maternal serum zinc concentration. The decrease of maternal serum zinc level reflects maternal fetal transfer of zinc^{2, 3} and the fetus is dependant on its own synthesis of transport proteins which are required for transport of zinc to all organs of its body.

Pregnant women are at higher risk of acquired Zn deficiency because of high uptake of Zn by the fetus and associated tissues. Deficiency of this may affect pregnancies, delivery and outcome of pregnancy⁴.

Disturbances of micronutrient status specially zinc status in pregnant mother may occur due to severe protein calorie malnutrition, malabsorption states and prolonged diarrhea or gastrointestinal (GIT) disturbance and which contributes to the depletion of the hepatic stores of zinc. But insufficiencies may result in a reduced accumulation of these elements in storage organs of the fetus such as liver and bone⁵. Some studies have reported that maternal plasma zinc decreases during pregnancy from 24-33 week of gestation^{5, 6}.

Micronutrient deficiency is a major problem in many developing countries⁷. Deficiency of Zn may cause various reproductive health problem⁸ and may have some role on this regard. Some study has been done regarding this matter in abroad^{3, 9}. But no published data is available in our country on this aspect. Again, the findings of this study may give a proper guideline and may create awareness among the obstetrician for early diagnosis of hypozincemia in pregnant women and thereby prevent the complications of pregnancy.

MATERIALS AND METHODS

The present cross sectional study was carried out in the Department of Physiology, Sir Salimullah Medical College, Mitford Hospital, Dhaka, during the period of 1st

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January 2009 to 31st December 2009. A total number of 55 subjects were included in this study, and all of them belonged to lower socioeconomic status. Among them 27 were full term delivery mothers (group B), treated as study group. Age range of full term mother was from 20-40 years. Again, 28 non pregnant women with age range from 20-30 years were taken as reference value (group A). Protocol of this study was approved by the ethical committee of SSMC. Subjects having history of any microbial and metabolic diseases were excluded from the study. All the pregnant mothers were selected from emergency labor ward in Sir Salimullah Medical College, Mitford Hospital and non-pregnant women were selected from personal contact. After selection of the subjects, the objectives and benefits of the study were explained and written informed consent was taken from the subjects. All ethical norms were maintained. Institutional permission was taken from the Director of the Hospital. Detail personal, dietary, medical, family, socio economic, occupational histories were taken and a thorough clinical examination was done and all information was recorded in a standard prefixed questionnaire. With all aseptic precautions 5ml of maternal blood were drawn from medial cubital vein by disposable syringe. Blood was centrifuged at 3000 rpm for 20 minutes. After that supernatant serum was collected in labeled eppendroff tube and from it 1 ml of serum was transferred in a plain glass test tube for estimation of serum total protein and albumin by standard laboratory technique¹⁰ in the laboratory of Physiology Department, SSMC, Dhaka. Another 1 ml was taken in deionized tube for estimation of serum zinc level by spectrophotometric method¹¹ in the laboratory of Atomic Energy Commission. The statistical analysis was done by Independent-samples t test and Pearson's correlation by using SPSS, Version-15.

RESULTS

Table I shows the concentration of Serum Zinc (Zn) and Hemoglobin (Hb) in group B (pregnant) and group A (control). The full term pregnant women had significantly ($p < 0.001$) lower concentration of mean serum Zn level than control. Again, mean blood Hb concentration was significantly ($p < 0.001$) lower in group B when compared to that of group A.

Table-I
Mean ± SD of Serum Zinc (Zn) and Hemoglobin (Hb) concentration in different groups (n=55)

Groups	n	Zn(µg/dl)	Hb(g/dl)
A	28	74.32 ± 9.13	11.16 ± 0.80
B	27	62.70 ± 7.18	8.89 ± 0.65

Statistical analysis		p value	
A vs B		0.001***	0.001***

Group A = Apparently healthy non-pregnant women (Control group)
Group B = Healthy full term delivery mother (Study group)

Table II shows the Serum Total Protein, Albumin, Globulin and Albumin/Globulin ratio in group B (pregnant) and group A (control). Mean total protein, albumin and A/G ratio were higher in group B in comparison to that of control group but it was not statistically significant. On the other hand, mean serum globulin levels were almost similar and no statistically significant difference was observed between groups A vs B.

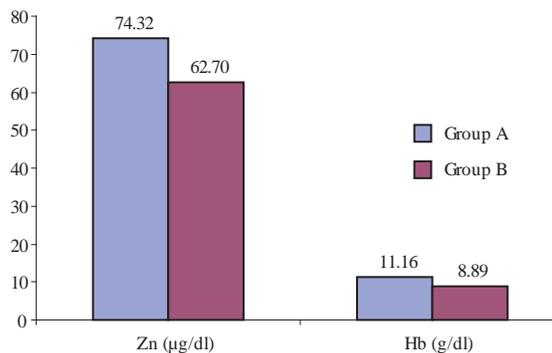


Fig.-1: Mean of Serum Zinc (Zn) and Hemoglobin (Hb) concentration in different groups

Table II: Serum Total Protein, Albumin, Globulin and Albumin/Globulin ratio in different groups (n=55)

Groups	n	Total Protein (g/dl)	Albumin (g/dl)	Globulin (g/dl)	A/G ratio
A	28	7.18 ± 0.91	4.79 ± 0.88	2.39 ± 0.75	2.23 ± 0.87
B	27	7.40 ± 1.52	4.81 ± 1.14	2.58 ± 1.13	2.26 ± 1.16

Statistical analysis		p value			
A vs B		0.528 ^{ns}	0.938 ^{ns}	0.462 ^{ns}	0.907 ^{ns}

Group A = Apparently healthy non-pregnant women (Control group)
Group B = Healthy full term delivery mother (Study group)

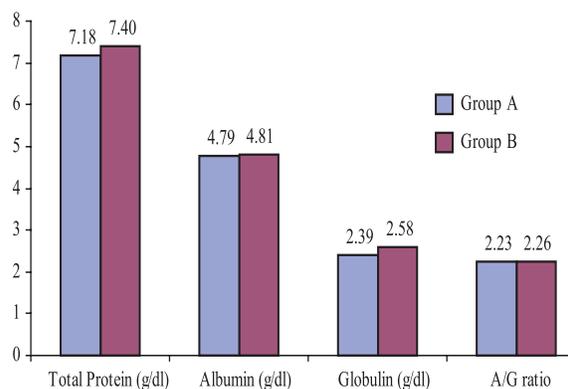


Fig.-2: Mean serum total protein, albumin, globulin and A/G ratio in different groups

DISCUSSION

The present study was undertaken to observe zinc (Zn) status in full term delivery mother and non-pregnant women by measuring their serum concentrations. In addition, their hemoglobin (Hb) concentration was estimated to find out the malnourished mother. Moreover, serum levels of total protein, albumin, and globulin were also estimated and A/G ratio was done to observe the availability of binding proteins for zinc. Again, all these parameters were also studied in the full term mother and in apparently healthy non pregnant women in order to get an idea about their normal range in our population.

In this study, all the parametric variables in healthy non pregnant women were almost similar to the reference values reported by various investigators of different countries^{3,4,12} and also in our country^{13,14}.

Pregnant women in developing countries consume diets with a lower quantity of protein, minerals and vitamins¹⁰. An inadequate dietary intake before and during pregnancy is high risk factor both for mother as well as for low birth weight of the neonates¹¹. However, there are some postulated mechanisms suggested by various investigators of different countries.

Various investigators suggested that lower level of serum Zn in pregnant mother might be due to its low dietary intake, increased body demand, malabsorption, increased urinary excretion and impaired utilization^{10,15}. Grain products containing dietary fiber and phytate decrease its absorption¹⁶. Again, increased urinary excretion due to decreased availability of binding protein causes lower serum Zn level¹⁷. It has also been suggested that low serum Zn concentration during pregnancy might be due to physiological hemodilution, decreased in Zn binding capacity, increase transfer of Zn from the mother to the fetus^{2, 3,18}. In addition to fetal accumulation, Zn is also deposited in placenta and amniotic fluid, leading to the lowering of maternal serum Zn^{15,19}.

Zn status and pregnancy outcome:

It has been suggested that Zn deficiency may lead to defective function of estrogen, which may impair uterine contractions, cervical dilation and amniotic fluid integrity²⁰. Furthermore, low maternal Zn status during pregnancy causes premature rupture of amniotic membrane, which in turn induces preterm labor²¹.

Several investigators demonstrated the relationship between low serum Zn concentration during pregnancy and small for gestational age²². It has also been suggested that low serum Zn concentration is closely related to adverse pregnancy outcome such as congenital malformation, fetal dysmaturity, intrauterine growth retardation and poor APGAR score^{18,23}. In the present

study, decreased serum Zn level was observed in fullterm delivery mother than non pregnant women. The decreased serum Zn level in fullterm delivery mother of the present study is most likely due to decreased levels of binding protein as the observed levels of them were lower and increase metabolic demand. Again poor socio-economic status of the subjects also indicates inadequate food intake especially low dietary protein.

CONCLUSION

In this study, hypozincemia were observed in fullterm mother than non pregnant women. The decreased serum Zn level may be due to poor nutritional status during pregnancy as serum total protein and albumin levels were lower in this group of subjects.

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