A Longitudinal Observational Study on Micronutrient (Zinc) in Antenatal Women in Tertiary Center of Central Hospital, Bhopal

Seema Tamrakar¹, Shailesh Kumar², Rakesh Singh Gadhwal³, Jaidev Singh⁴

¹Assistant Professor, Department of Biochemistry Mahaveer Institute of Medical Science Bhopal, ²Professor, (designated), Department of Physiology NSCB Medical College Jabalpur, ³Associate Professor, Department of Physiology NSCB Medical College Jabalpur, ⁴Associate Professor (designated), Department of Biochemistry NSCB Medical College Jabalpur.

How to cite this article: Seema Tamrakar, Shailesh Kumar, Rakesh Singh Gadhwal et al. A Longitudinal Observational Study on Micronutrient (Zinc) in Antenatal Women in Tertiary Center of Central Hospital, Bhopal. Indian Journal of Public Health Research and Development 2023;14(3).

Abstract

Background: Zinc is the crucial micronutrient that is essential for the normal embryogenesis process. It also supports fetal brain development during pregnancy, as well as with being an assist to the mother during labour. Changes in zinc homeostasis have been related to several outcomes in pregnancy including prolonged labour, fetal growth restriction, fetal death, preeclampsia, and preterm birth.

Aim: Aim of this study was to evaluate the level of zinc in 1st to 3rd trimester of pregnant women.

Material and Methods: The present study conducted at Department of Biochemistry and collaboration with the Department of Obs. & Gynaecology LN Medical College & J.K.Hospital. Total 300 cases attended from ANC Clinic were screened for the study. Estimation of serum zinc concentration was done by automated colorimetric kit method.

Results: Findings were, that there was significantly decrease in serum zinc concentration (p<0.05) in 1st to 3rd trimester of pregnancy period.

Conclusion: Zinc is most important micronutrient for the proper course of pregnancy and fetal development. Any changes in their concentrations can leads to adverse pregnancy outcomes. Therefore serum zinc concentration should be investigated, thereby reducing adverse pregnancy outcome.

Key Words: Pregnancy. Zinc level, Trimester period.

Introduction

Zinc is the second most abundantly distributed trace element in the body after iron. It is found in a wide range of foods, including beef, poultry, seafood, and grains [1, 2]. Zn is a co-factor of more than 300 enzymes that regulate a variety of cellular processes and cellular signaling [3]. Zn is an essential micronutrient that is is required for a variety of biological processes such as enzyme activity, immune function, neurological function, and reproduction. It is essential for cellular division and differentiation and is important for many aspects of metabolism due to its incorporation in antioxidant proteins (Cu/Zn superoxide dismutase). Zinc is also known as an “intelligence” element.

Corresponding Author: Jaidev Singh, Associate Professor (designated), Department of Biochemistry NSCB Medical College Jabalpur.

E-mail: Jsingh.gmc@gmail.com
Mobile: 9981978978
It plays a dynamic role in a diversity of enzymes, like as carbonic anhydrase, DNA polymerase, RNA polymerase, etc., participating in important biochemical nucleic acids, proteins and other metabolic processes [4]. It is the crucial nutrient that is essential for the normal embryogenesis process [5]. It also supports fetal brain development during pregnancy, as well as with being an assist to the mother during labour [6]. Changes in zinc homeostasis have been related to several outcomes in pregnancy including prolonged labour, fetal growth restriction, fetal death, preeclampsia, and preterm birth [7-8]. Zn plays an important role in the absorption, synthesis, and biological activation of folate; thus, Zn deficiency during pregnancy may result in folate deficiency, which can lead to neural tube defects (NDTs) and other fetal disorders [9-10]. Zn is involved in the formation of the fetus, its deficiency may result in impaired development and affect the final phenotype of the newborn’s organs [11, 12]. During progression of pregnancy circulating zinc level decline due to decrease in zinc binding and increased transfer of zinc from the mother to the fetus [13, 14]. As a result, zinc deficiency in pregnant women can directly or indirectly impact the fetus’s growth and development. Pregnant women who are zinc deficient may experience loss of appetite, which invariably affects nutrient intake and leads to poor fetal development [15]. Therefore monitoring of serum zinc levels in pregnant women during pregnancy is essential to ensure proper fetal development.

**Material and Methods**

This was a Longitudinal observational study conducted at Department of Biochemistry and collaboration with the Department of Obs. & Gynaecology LNMC & J.K. Hospital, Bhopal. The study period was 2019 to 2021.

Present study included total 300 cases attended ANC Clinic at the department of Gynaecology LNMC & J.K. Hospital, Bhopal. Pregnant women divided in three groups. Group A: n = 100 pregnant women of 1st trimester of pregnancy. Group B: n = 100 pregnant women of 2nd trimester of pregnancy, Group c: n = 100 pregnant women of 3rd trimester of pregnancy. Pregnant women were taken from 20-40 years of age group. In this study included, pregnant women first to third trimester of pregnancy, excluded pregnant women of thyroid disease and suffering from asthma / hypertension / diabetes mellitus and / any other systemic disease. Study was approved by the Ethical committee, dated on 31/05/2019, Ref: LNCTU/Ph.D./2019/BC/055, L.N. Medical College, Kolar road, Bhopal M.P. Informed written consent was obtained from all patients.

Total 3-5 ml of blood sample was withdrawn from the anticubital vein, and the blood sample was collected in plain vacutainers. The blood sample was centrifuged for 15 minute, at 3000 rpm at room temperature. The serum was stored at 4°C for biochemical investigations. Estimation of serum zinc was done by automated colorimetric kit method. Statistical analysis was done by Graph Pad Prism version 5. Analysis was done by Anova followed by Tukey test. p<0.05 was considered as statistically significant.

**Distribution of Pregnant Women at Different Trimester**

![Figure 1: Number of pregnant women included in the detection at different trimesters.](image-url)
Observation and Results

Table 1: Serum Zinc Concentration 1st to 3rd Trimester Of Pregnant Women (Mean ± SD)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Pregnant women -1st trimester</th>
<th>Pregnant women -2nd trimester</th>
<th>Pregnant women -3rd trimester</th>
<th>P value (&lt;0.05)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Zn ug/dl Mean ±SD</td>
<td>Zn ug/dl Mean ±SD</td>
<td>Zn ug/dl Mean ±SD</td>
<td></td>
</tr>
<tr>
<td>Zn ug/dl Level</td>
<td>78.54 ±3.05</td>
<td>75.62 ± 2.05</td>
<td>69.04 ± 4.05***</td>
<td>&lt; 0.05</td>
</tr>
</tbody>
</table>

Compared with 1st to 3rd trimester of pregnancy p <0.05

Table 1:

In 1st trimester, serum zinc (Zn) level was (78.54 ± 3.05) ug/dl, 2nd trimester (75.62 ± 2.05) ug/dl while in 3rd trimester serum zinc (Zn) level was (69.04 ± 4.05) ug/dl.

Although, difference between 1st trimester to 3rd trimester zinc level was significant.

Serum Zinc level (Zn) was significantly decreased in 1st trimester to 3rd trimester.

Discussion

In this study the concentration of Zn significantly decreased 1st trimester to 3rd trimester (<0.05). This is an agreement with previous studies by Tamura T et al (2000) [16], Reyes H et al (2000) [17], Gibson et al (2007) [18], Tabrizi et al (2014) [19], Choi R et al (2016) [20], Lewicka et al (2017) [21] showed in these study serum zinc concentration significantly decreases in 1st to 3rd trimesters.

There are several causes of a decrease in serum or plasma Zn level during pregnancy, like first, low serum albumin and high estrogen levels; second, increased maternal blood volume has been suggested as a factors lowering plasma Zn level, and other reasons due to low Zn levels were prominent in women with dietary Zn deficiency [22]. Due to the fact that intestinal absorption is not increased during pregnancy, an additional Zn requirement for fetal and placental tissues must be covered by increased intake and from maternal tissues. As a result, daily requirements for Zn during pregnancy range from 7.3 to 13.3 mg [23]. Zn deficiency causes low dietary bioavailability [31], or very high amounts of copper or iron in the diet that compete with zinc at absorption sites [24].

Conclusion

Zinc is most important micronutrient for the proper course of pregnancy and fetal development. Any changes in their concentrations can cause interactions that are dangerous to the health of the mother and fetus. The present article highlights the importance of role played by micronutrient zinc during pregnancy and its outcome. Therefore, during pregnancy should maintain nutritional balance; have regular medical examination; serum zinc concentration should also be investigated, thereby reducing adverse pregnancy outcome.

Source of Funding: Self

Conflict of Interest: Nil

References


