



RESEARCH ARTICLE

SERUM CALCIUM AND IRON IN PREGNANCY

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ABSTRACT

Aim and Objective: To check the serum calcium and iron levels in women during the second trimester of pregnancy.

Background: The maternal diet must provide sufficient energy and nutrients to meet the mother's usual requirements, as well as the needs of the growing fetus. In the second and third trimester of pregnancy, there are increasing iron demands due to an expanded red cell volume and demands of the developing fetus and placenta. Deficiency of calcium and iron during pregnancy can lead to complications like preeclampsia, preterm labour, increased incidence of cesarean section, intra-uterine growth restriction and even intra-uterine death.

Materials and Methods: Twenty-five apparently healthy pregnant women in second trimester and twenty-five apparently healthy non-pregnant women were included in the study. Serum iron and serum calcium estimation were done.

Results: Serum iron and serum calcium was found to be significantly decreased in pregnant women in the second trimester.

Conclusion: It is necessary that women gets prophylactic calcium and iron supplementation during pregnancy.

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INTRODUCTION

Optimal nutrition supply to the developing fetus is paramount in achieving appropriate fetal growth and development. During pregnancy, dietary energy and nutrient requirements are generally increased to support increased maternal metabolism, blood volume and red cell mass expansion, and the delivery of nutrients to the fetus. Key nutrients including folate, iron, zinc, calcium, vitamin D, and essential fatty acids function to promote red blood cell production, enzyme activity, bone development, and brain development. Deficiency of micronutrients during pregnancy may give rise to complications such as anaemia and hypertension, as well as impairing fetal function, development and growth. (Chi EungDanform Lim *et al.*, 2009) Pregnancy is a physiological condition and usually has no effect on general health of a pregnant woman. However pregnancy results in hormonal, haemodynamic and haematological changes. These physiological changes need to be viewed as normal adaptations determined by nature. Increased total blood volume and haemostatic changes help to combat the hazards of haemorrhage at delivery. The increase is less in iron deficient women than in those with iron reserves. In some iron deficient women this inability to expand plasma volume may mask a decrease in haemoglobin concentration.

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The normal haemoglobin in the healthy non-pregnant woman is defined as 12 g/dl. The World Health Organization (WHO) recommends that haemoglobin ideally should be maintained at or above 11.0 g/dl, and should not be allowed to fall below 10.5 g/dl in the second trimester. (World Health Organization, 1991) Iron absorption during pregnancy is determined by the amount of iron in diet, its bioavailability (meal composition) and the changes in iron absorption that occur during pregnancy. Iron requirements are greater in pregnancy than in non-pregnant state. The net iron requirements for pregnancy are 840 mg approximately. (World Health Organization, 1991) Iron deficiency can be defined as that moment when body iron stores become depleted and a restricted supply of iron to various tissues becomes apparent. (Karthiga Devi and JothiPriya, 2016) Iron deficiency is one of the most common. Nutritional deficiencies worldwide. A high proportion of women in both industrialised and developing countries become anaemic during pregnancy. Estimates from the WHO report that 35–75% (average 56%) of pregnant women in developing countries and 18% of women from industrialised countries are anaemic. (De Maeyer and AdielsTegman, 1985) Deficiency of iron in pregnant women limits oxygen delivery to cell resulting in fatigue, poor work performance and decreased immunity. Iron deficiency anaemia early in a pregnancy can double or even triple the risk of having a premature delivery or a low birth weight baby. (World Health Organization, 1991) Iron deficiency also puts the pregnant women at risk for

developing abruptio placenta, postpartum haemorrhage, which can be disastrous. Worldwide, it is estimated that about 20 per cent of maternal deaths are caused by anaemia; in addition, anaemia contributes partly to 50 per cent of all maternal deaths. (Padmavathi and Hephzibah, 2015)

Calcium, the most abundant mineral in the human body, has several important functions. More than 99% of total body calcium is stored in the bones and teeth supporting their structure. The remaining 1% is found throughout the body in blood, muscle, and the fluid between cells needed for muscle contraction, blood vessel contraction and expansion, secretion of hormones and enzymes, and sending messages through the nervous system so that these vital body processes function efficiently. (Bassam Hanna *et al.*, 2009) Inadequate dietary calcium intakes during pregnancy and lactation may affect pregnancy outcome, lactational performance, and child growth. Calcium deficiencies result in bone loss and increased inflammation, which are well recognised symptoms of periodontal disease. (Harsha *et al.*, 2015; Samyukta, 2015) Periodontal disease is a risk factor for preterm birth, intrauterine growth retardation. (Chandrapooja *et al.*, 2016; Jaiganesh Ramamurthy and Fathimalrfana, 2017) Calcium deficiency during pregnancy also puts the pregnant women at risk for developing preeclampsia. (Santo Grace and Reema Lakshmanan, 2014; Misrath Banu and Jaiganesh Ramamurthy, 2014) Adaptation to low intakes and adjustments to increased requirements may take place by changes in calcium absorption and excretion. Mobilization of calcium from maternal bone could support fetal growth and breast-milk production if calcium intakes were insufficient. (Bassam Hanna *et al.*, 2009) From all of the above it's clear that both iron and calcium are essential during pregnancy for the health of both mother and the fetus.

MATERIALS AND METHODS

A total of fifty women were included in the study, divided into two groups. The study group comprised of twenty-five pregnant women in second trimester. The control group comprised of twenty-five apparently healthy non-pregnant women in the same age group.

Inclusion Criteria: Apparently healthy pregnant women in second trimester of pregnancy and apparently healthy non-pregnant women in the same age group.

Exclusion Criteria: Patients with severe anaemia, cardiac disease, hypertension, diabetes, thyroid disorders, liver disorders and pregnant women in first and second trimester. Serum iron was estimated by Ferrozine method. Serum calcium was estimated by Arsenazo method.

Statistics

Statistical analysis was done using Microsoft Excel. The mean and standard deviation were obtained. Comparison of mean was analysed using student's t-test. P values <0.05 were considered to be statistically significant.

RESULTS

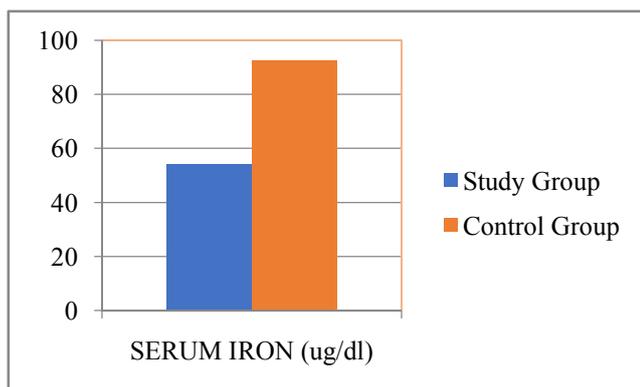
The mean serum iron in pregnant women in second trimester was 54.2 ± 9.68 ug/dl. The mean serum iron in non-pregnant women was 92.6 ± 16.02 ug/dl. The serum calcium in pregnant women in second trimester is 8.28 ± 0.40 mg/dl. The serum calcium in non-pregnant women was 10.01 ± 0.20 mg/dl. These are represented in table 1 and in the graphs below. There was a statistically significant decrease in both serum iron and serum calcium in pregnant women when compared to age-matched non-pregnant women ($p < 0.05$).

DISCUSSION

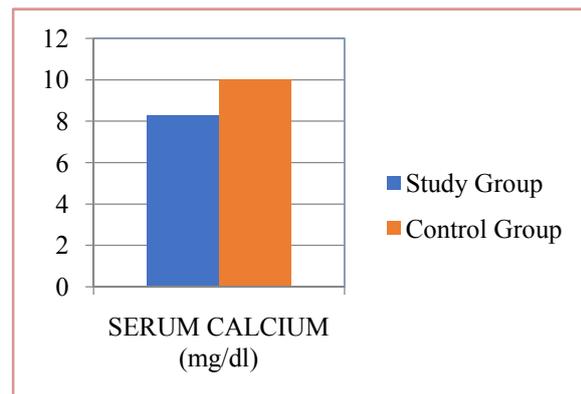
From the present study it was observed that the serum iron was decreased in pregnant women when compared to non-pregnant women. Hemangini Chaudhari *et al.* reported that serum iron was considerably decreased in pregnant women in second and third trimester when compared to non-pregnant women. (Hemangini Chaudhari *et al.*, 2013) According to WHO expert group anaemia is considered to exist when serum iron level is < 50 ug/dl. Pregnancy is a major drain on the limited iron reserve of young women. The increased iron requirement during pregnancy cannot be met with diet alone, particularly in developed countries like India. To meet the iron requirements

Table 1. Serum iron & serum calcium in study and control group

	Serum Iron (ug/dl)	Serum Calcium (mg/dl)
Pregnant women in II trimester N=25	54.2 ± 9.68	8.28 ± 0.40
Non-pregnant women N=25	92.6 ± 16.02	10.01 ± 0.20
P value	<0.001	<0.001



Graph 1. Comparison of serum iron in study and control group



Graph 2. Comparison of serum calcium in study and control group

during pregnancy, it becomes essential to supplement iron during pregnancy. The present study also shows a significant decrease in serum calcium levels in second trimester of pregnancy when compared to non-pregnant women. In a study by Naghaa *et al*, serum calcium was significantly reduced in first and second trimesters. (Nagah A.A. Mohammed *et al.*, 2016) Also many studies have reinforced the importance of calcium supplementation during pregnancy, as there is insufficient dietary intake in addition to increase in the fetal demand specially during the third trimester. (Bassam Hanna *et al.*, 2009; Nagah A.A. Mohammed *et al.*, 2016) A pregnant woman requires 25-30g of calcium to support the developing fetal skeleton. Significant changes may occur in maternal skeletal system during the pregnancy that may result in osteoporosis and osteomalacia. If the pregnant mother does not take enough calcium then she is at risk of poor bone health. Hence it is recommended that pregnant women should be supplemented with calcium and also advised to take diet rich in calcium.

Conclusion

The present study concludes that iron and calcium deficiency are highly prevalent during pregnancy. To meet the higher demands of iron and calcium during pregnancy especially in developing countries like India, both iron and calcium supplements are essential to decrease maternal and fetal morbidity and mortality.

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