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Blood proteins in different trimester of pregnancy

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Abstract
Background: Pregnancy is a physiological state accompanied by complex metabolic and biochemical adjustments essential for foetal development and maternal adaptation. One of the significant physiological alterations during pregnancy involves protein metabolism. Proteins, particularly serum albumin and globulin, play crucial roles in maintaining plasma volume, osmotic balance, and immune function. Studies have reported a decline in serum protein concentrations during pregnancy, which may be attributed to hemodilution, increased metabolic demands, and the transfer of amino acids to the fetus. Despite the importance of maintaining normal plasma protein levels for maternal and fetal health, data on trimester-wise protein variation in pregnant women remain limited.
Objectives: The present study aimed to evaluate changes in serum total protein, albumin, and globulin levels during different trimesters of pregnancy and to compare them with those of non-pregnant women.
Methodology: A follow-up study was conducted on 40 women aged 25-35 years, including 20 healthy non-pregnant controls and 20 pregnant women from the middle socioeconomic group. Blood samples were collected during the first (11-12 weeks), second (23-24 weeks), and third (35-36 weeks) trimesters. Total protein, albumin, and globulin levels were determined using standard spectrophotometric methods. Statistical analysis was performed to determine the significance of variations (p<0.001).
Results: The mean total protein levels decreased progressively from the first to the third trimester (6.7 g%, 6.5 g%, and 6.2 g%, respectively) compared to controls (7.2 g%). Serum albumin levels also showed a marked decline (3.5 g%, 3.2 g%, and 2.8 g%), while globulin levels increased gradually (3.2 g%, 3.3 g%, and 3.4 g%). The changes were statistically significant (p<0.001).
Conclusions: The study demonstrates a significant decline in serum total protein and albumin levels and a compensatory rise in globulin concentration during pregnancy. The findings suggest that hypoalbuminemia in pregnancy may result from increased fetal protein demands, hemodilution, and amino acid redistribution. Monitoring serum protein profiles during pregnancy is essential to ensure optimal maternal and fetal outcomes through appropriate nutritional interventions.

Keywords: Pregnancy, serum proteins, albumin, globulin, hypoalbuminemia, maternal metabolism, fetal growth, nutritional status

Introduction

It is well recognised that pregnancy is a physiological and normal phenomenon in which healthy women have no ill effect on the general health system. As pregnancy is a physiological stress so some alteration in maternal metabolism is necessary. Marked protein anabolism occurs in pregnancy to meet the requirement of fetal growth and to increase uterine, placental and breast tissues (Elango *et al*. 2016) [2]. Therefore the change in serum proteins is to be expected. The nutritional status of women before and during pregnancy is a major factor in maternal and neonatal health outcomes (Mousa *et al.*, 2016) [6]. The pregnant women experience significant anatomical and physiological changes (Soma-Pillay *et al.*, 2016) [9]. It has been described that low and high protein intake during pregnancy are associated with a determinative effect on both pregnant women and developing fetuses (Maslova *et al.* 2014) [5]. Hypo albumenia has been observed in pregnancy by some workers (Shah *et al*. 2006) [8]. The fall in serum proteins has principally confined to serum albumin, Hypoalbuminemia in pregnancy may be due to lack of amino acids. The dietary & metabolic amino acids may be transferred to the fetus through placenta tor cell development (Sita Devi, 1969) [7]. Jain *et al.* (1968) [4] reported that serum proteins decreased in Pregnancy, Faupel *et al.* (2007) [3] have reported that concentration of blood biomarker in pregnancy influenced by plasma volume

expansion; DeHaas *et al.* (2007) [1] also reported that the cause of hypo albumenia in pregnancy can be varied by hemo dilution increased kidney clearance and higher use of proteins on behalf of the foetus and maternal organs.

Despite the importance of maintaining plasma protein level in pregnancy to avoid illeffed on both fetus & mother, there are not enough studies on prevalence of this deficit. Thus, the scanty and divergent reports rather than specific reports are available. Hence it was thought worth-while to take the present study to determine the "Blood proteins in different trimesters of Pregnancy".

Materials and Methods

The present follow up study was undertaken in 45 vegetarian married women aged between 25 to 35 years belonging to the middle socioeconomic group, comprising of 20 non pregnant controls and 25 pregnant women. They were randomly selected irrespective of their caste and creed. They were willing themselves on the basis of personal relationship, friendship, with the eagerness to know any adverse situation in relation to blood protein during pregnancy. Detailed history was taken to exclude any major illness likely to affect the fetus history of bleeding, drug intake and radiation etc. Originally 45 women were registered for follow up study in the first trimester. Incomplete follow up study was discarded. Even premature deliveries were not included in the present study. Thus, 20 cases were included in the present study who cooperated till delivery. The blood samples in pregnant women were collected between 11th to 12th week of Pregnancy (I trimester) and at the same time blood samples of non-pregnant women were also collected. Thereafter, blood samples of pregnant women were collected between the 23rd to 24th week of pregnancy in the second trimester and finally collected between the 35th to 36th week of pregnancy in the third trimester. Total proteins, albumin and globulin were determined by standard technique of spectrophotometer using test kits Results are tabulated in Table 1.

Table 1: The mean values of total proteins albumin and global in normal women and in different trimesters of pregnancy

S. No	Contents	Control (20) Mean± S.D value	I Trimester (20) Mean ± S.D value	II Trimester (20) Mean ± S.D Value	III Trimester (20) Mean ± S.D value
1	Total proteins gram%	7.2±0.7	6.7±0.6	6.5±0.5	6.2±0.8, p< 0.001
2	Albumin gram%	4.5±0.5	3.5±0.8	3.2±0.7	2.8±0.6, p<0.001
3	Globulin gram%	2.7±0.8	3.2±0.7	3.3±0.8	3.4±0.8, p<0.001

Figures in parenthesis indicate the number of subjects

Results and Discussion

The total blood protein level decreased from I to III trimester of pregnancy as compared to that of the control group as shown in table I. The decrease was statistically significant as evident by p-value (p<0.001). The decrease of blood proteins in pregnancy might be due to alteration of protein metabolism, to meet the requirement growth of fetus and to increase placental and breast tissues. The study has shown a high prevalence of hypo albumenemia and hypo proteinuria in pregnancy. It might be possible to fall in total proteins confined to serum albumin.

Hypo albuminemia in pregnancy might be perhaps due to unavailability of amino acids to the liver for synthesis of albumins. Amino acids might be transferred to the fetus by way of placenta for its development during pregnancy (Sita Devi, 1969) [7] Serum globulins levels were raised progressively from I to III trimester of pregnancy. The increase was statistically significant as shown by p value (p<0.001). The progressive increase in serum globulin during pregnancy might be due to compensatory phenomenon to the fall of albumin. A lesser increase of serum globulin in the first and second trimester of pregnancy as compared to that of third trimester might be due to transfer of lesser gamma globulin (antibodies) from mother to fetus in the early stage of pregnancy.

Summary and Conclusions

- It is well established that pregnancy is a physiological stress. So, some interactions in maternal metabolism are essential.
- Protein anabolism occurs throughout pregnancy to meet the requirement of fetal growth and to increase placental and breast tissues. So, the changes in blood proteins in pregnancy are to be expected.
- The present follow up study was conducted on 40 women, comprising 20 normal healthy non pregnant and 20 pregnant women.
- All the subjects were vegetarian and belonged to the middle socioeconomic group.
- Blood samples were collected between 11th to 12th week in I semester, between 23rd to 24th week in II semester and between 35 to 36th weeks in III trimester of pregnancy and analyzed for total proteins, albumin and globulin.
- Significant decrease in total proteins from I to III semester was observed in pregnant women as compared to that of normal control group. A decrease of total proteins in pregnancy might be due to utilization of maternal proteins for fetal growth.
- A significant decrease of albumins also recorded throughout the pregnancy might be due to unavailability of amino acid to liver to synthesize albumin. The amino acid might be transferred through placenta for fetal development.

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