Serum Albumin in First and Third Trimester of Pregnancy

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Various hormones can cause marked changes in pregnant woman's appearance. Decreased level of serum albumin occurs in first and third trimester of pregnancy, which may be associated with increased maternal and fetal mortality and morbidity. So, this study was carried out to evaluate and assess the level of serum albumin in first and third trimester of pregnancy. This cross sectional study was carried out in the Department of Physiology of Mymensingh Medical College, Mymensingh from July 2014 to June 2015. For this purpose, total 300 women with age ranged from 18 to 35 years were selected from Mymensingh district and divided into100 healthy non pregnant women as control group and 200 normal aged matched pregnant women as study group. Study group was further divided into 100 in first trimester and 100 in third trimester of pregnancy. Serum albumin was evaluated by the Bromocresol green (BCG) method in 1st and 3rd trimester of pregnant women and in non pregnant women. Statistical analysis of data was done by unpaired student's t test. The results showed that the serum albumin levels decreased significantly both in first and third trimester and maximum decrease seen in third trimester. The lower level of serum albumin in third trimester of pregnancy is the major concern of development of physiological edema during pregnancy and may be associated with pre-eclampisia.

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Introduction

The pregnant woman experiences physiological changes to support fetal growth and development.[1] Although it is in the reproductive system mainly most others system of the mother's body participate in the adjustment of pregnancy. Many of the changes are due to increased hormonal activity. Both estrogen and progesterone are required for the initiation and maintenance of pregnancy.[2] Pregnancy brings about important changes in structure, metabolic & endocrine functions of the mother.[3]About 80% of the total colloid osmotic pressure of plasma results from the albumin fraction, 20% from the globulins, and almost none from fibrinogen. Therefore, from the point of view of capillary and tissue fluid dynamics, it is mainly albumin that is important.[4]During pregnancy; the serum estrogen and progesterone levels increase progressively and reach a maximum during the third trimester. The sex steroids have effects on metabolic, synthetic and excretory hepatic functions. The increase in plasma volume that occurs during pregnancy leads to hemodilution and decreases the serum protein concentration.[5] Increased water retention is one of the most characteristic biochemical

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changes of later pregnancy. The retention of water is not completely explained but a fall in plasma protein concentration of 10gm/L of plasma (particularly of albumin) reduces the colloidal osmotic pressure of plasma by about 20% and would favour retention of water in the tissue.[6] Total plasma protein increase from normal 180 gm (non pregnant) to 230 gm at term. However, due to hemodilution, the plasma protein concentration falls from 7 gm% to 6 gm %. This results diminished viscocity of the blood and reduce colloid osmotic tension. Because of marked fall in albumin level of 4.3 gm % to 3 gm % - a fall of about 30 % and only slight rise of globulin (mainly α globulin) , the normal albumin : globulin ratio of 1.7 : 1 is diminished to 1:1.[7] Though the cause of low plasma albumin is thus unexplained , its reduce concentration lowers plasma oncotic pressure and predisposes towards loss of fluid from the vascular compartment . This explains the formation of edema in severe pre - eclampsia and identifies a process which may further reduce the circulating plasma volume.[8] Sudden expansion of plasma volume increased albumin loss from the capillaries into the extra-vascular space.[9] Hypoalbuminaemia could be due to protein loss through urine, capillary leak, or hepatic involvement in pre-eclampsia.[10]

Although some work on plasma protein was done in our country, but a very little is known about serum albumin level in first and third trimester of pregnancy. Therefore the present study has been undertaken to estimate the serum albumin in first and third trimester of pregnancy. It is anticipated that this study would give a guideline to the Obstetricians for better management of pregnant mother and reduces the maternal and fetal complications.

Methods

This cross sectional study was carried out in the Department of Physiology of Mymensingh Medical College, Mymensingh from July 2014 to June 2015. This period included the time for selection of study places, seeking permission from the appropriate authority, development of research instrument, its pre-testing and printing, interviewing, physical examination and measurement of serum albumin level for both the women of first and third trimester of pregnancy (study groups) and non pregnant women of reproductive age (control), editing, compilation, tabulation, analysis of data and report writing. The subjects were obtained from the Department of Gynecology and Obstetrics Mymensingh Medical College & Hospital, Mymensingh, Model Family Planning clinic, Mymensingh and from the locality with due permission of the proper authorities of the concerned centers. Total number of 300 (three hundred) subjects participated in this study. The study population were divided in control group (Group-I) and study group (Group-II) depending on pregnancy that means non-pregnant women and the pregnant women respectively. Again pregnant women (Group II) were divided into first trimester of pregnancy (Group II A) and third trimester of pregnancy (Group II B). After selection, the subjects were requested to co-operate for collection of blood. Under strict aseptic precaution for estimation of serum albumin about 3 ml of venous blood was collected from anticubital vein by disposable syringe with a gentle pull and the blood was taken in a test tube labeled with the name of subject, with date and time of blood collection. The blood samples were carried to the laboratory within 2 hours of collection of samples. The blood sample (2.98 ml) in test tubes was centrifuged at 3000 rpm for 5 minutes.

After centrifugation the supernatant serum was collected and experiment was carried out immediately after sampling. Serum albumin levels were estimated by Bromocresol green (BCG) method in laboratory. Statistical analysis of data was done by unpaired student's t test by using SPSS.

Results

The study included the Serum albumin in gm/dl . Data was expressed as mean ±SE.

Table I: Shows the Serum albumin in control and study groups

Groups	Serum albumin Mean±SE
Group I(control group)	3.83± 0.027
Group IIA(First trimester of pregnancy)	3.57± 0.044
Group IIB (Third trimester of pregnancy)	3.31 ± 0.05

Table I and figure 1 show the mean (±SE) of Serum albumin in control group I and study groups (II A, II B) were 3.83± 0.027, 3.57± 0.044 and 3.31 ± 0.05 respectively. In study group II A mean (±SE) of serum albumin was decreased in comparison to control group I and the mean difference was statistically highly significant ($p<0.01$) and in study group II B the mean (±SE) of Serum albumin was 3.31± 0.05 and the mean difference was also statistically highly significant ($p<0.01$).The mean (±SE) of serum albumin was decreased in study group II B in comparison to study group II A and the mean difference was statistically highly significant($P<0.01$).

Table II: Statistical analysis of Serum albumin between control group and study groups and within the study groups by unpaired student's t test

Groups			Mean difference	t	p
I	VS	IIA	0.26	5.036^{**}	P<0.01
I	VS	IIB	.5244	9.819^{**}	P<0.01
IIA	VS	IIB	.2639	4.144^{**}	P<0.01

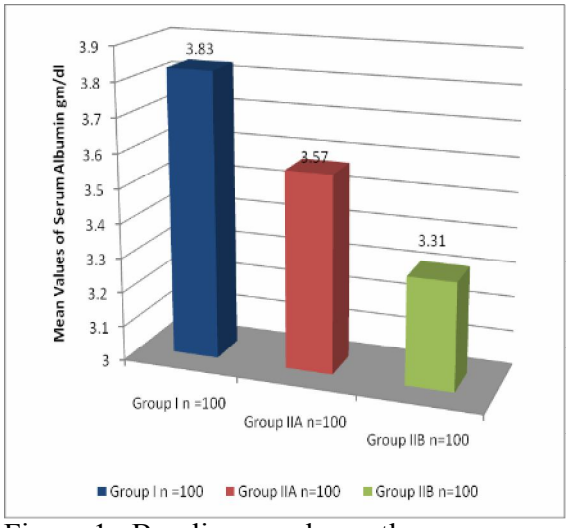

Figure 1. Bar diagram shows the mean serum albumin in different groups

Discussion

Present study showed serum albumin of control group of non-pregnant women in reproductive age (group I) and women in first and third trimester of pregnancy (group II A and II B) were 3.83±0.027, 3.57±0.044 and 3.31 ±0.05 respectively. Serum albumin was decreased in first and third trimester of pregnancy than in non pregnant women and maximum decrease seen in third trimester.

This study affirms with that of the study done by Gohel et al. in 2013. They found that serum albumin level is significantly lower in all three trimester compared to non pregnant women. Late in pregnancy albumin concentration reduced much compared to early pregnancy.

Maryam in 2009 shows that serum albumin level decreased from the first trimester and became progressively more accentuated as the pregnancy advanced.

Yannick et al. compared liver function tests in 103 pregnant women and 103 age-matched control and found that serum albumin levels were significantly lower during all three trimesters.

Salako et al. in 2003, they concluded in their study that, mean serum albumin level was significantly higher in those who developed pre-eclampsia. This finding is not similar to present study. Serum albumin levels were significantly lower during first, second and third trimester compared to controls. Plasma albumin decreases in pregnancy and is reduced further in pregnancies complicated by pre-eclampsia.

Opposite statement found on a study by Bagga et al. in 1966. According to that study mean value of serum albumin concentration before 20 weeks of pregnancy were lower in normal group than pre-eclamptic group. Serum albumin was significantly higher in those who develop pre-eclampsia.

The increase in plasma volume that occurs during pregnancy lead to hemodilution and decreased the serum protein concentration. Plasma volume increased by approximately 50% from the 6^{th} to 36^{th} weeks of gestation.

Though the cause of low plasma albumin is thus unexplained, its reduce concentration lowers plasma oncotic pressure and predisposes towards loss of fluid from the vascular compartment . This explains the formation of edema in severe pre - eclampsia and identifies a process which may further reduce the circulating plasma volume . Honger PE in 1960 claimed that the synthesis of albumin is inhibited by progesterone and or estrogen.

Conclusion

From the present study, it may be concluded that during first trimester of pregnancy mainly due to hemodilution and third trimester of pregnancy progressive hemodilution, increasing capillary permeability, dietary protein deficiency and increase loss of albumin through urine attribute hypoalbuminaemia. These remarkable changes due to physiological adaptation that can be misinterpreted as pathological . So understanding of these adaptations to pregnancy remains a major goal of antenatal check-up. Without such knowledge, it may be difficult to understand the disease process that can be threaten the life of mother as well as fetus during pregnancy.

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