

Original Article

Serum Albumin Level in Third Trimester of Pregnancy and Non-Pregnant Women: A Comparative Study

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Abstract

Background: Serum albumin level is an predictor for preeclampsia and eclampsia. **Objective:** The purpose of the present study was to compare the levels of serum albumin in third trimester of pregnancy with non-pregnant women of same age range. **Methodology:** This analytical type of cross-sectional study was carried out in the Department of Physiology, Mymensingh Medical College, Mymensingh, Bangladesh over one year. A total number of 140 subjects, age range between 20 to 35 years were included in this study. Among them, 70 healthy subjects were taken as control group (Group I) and 70 pregnant women of third trimester were taken as study group (Group II). The results were calculated and analyzed by using SPSS. Quantitative data were expressed as mean (\pm SE) and statistical significance of difference among the group was calculated by unpaired student's 't' test. **Results:** In this study we found that Serum albumin level of group I (Control group) was 4.03 ± 0.36 gm/dl and group II (Study group) was 3.03 ± 0.48 gm/dl. In group II Serum Albumin level was decreased in comparison to group I. The difference of mean Serum Albumin level between the groups was statistically highly significant ($p < 0.001$). **Conclusion:** In conclusion, Serum Albumin significantly decreased in study group in comparison with control group.

Key Words: Third trimester of pregnancy; serum albumin; non-pregnant women

Received: 02 April 2025; **Accepted:** 20 May 2025; **Published:** 1 June 2025

DOI: <https://doi.org/10.3329/jmomc.v11i1.82374>

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How to cite this article: Noor F, Tasnim N, Yeasmin F, Nishi MK, Rahman R. Serum Albumin Level in Third Trimester of Pregnancy and Non-Pregnant Women: A Comparative Study. J Monno Med Coll. 2025 June;11(1):39-43

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Introduction

Pregnancy is a biological stress associated with many complex and interrelated physiological, anatomical and biochemical alterations happening in the body¹. Serum albumin is produced by liver and comprises about half of the total protein in blood². The physiological changes during pregnancy predispose women to increased blood volume, hormonal fluctuations, and changes in vascular permeability. Serum albumin, a critical plasma protein responsible for maintaining oncotic pressure and regulating fluid balance, plays a key role in these processes³.

They sum-up to about 55.0% to 60.0% of the protein in human serum and thus ensure normal water balance between blood and tissues via osmotic mechanisms. They also function as blood transport protein for less soluble substances that can bind to them⁴. More so, in the blood, albumin aids to prevent the escape of fluid into the body tissues. In addition, albumin in urine could be an indication of kidney disease⁵. More often, some people experience high levels of protein in their urine during pregnancy. When it's accompanied by high blood pressure, it's likely a sign of preeclampsia⁶. Albumin is decreased under many other

circumstances, such as presence of stress or disease, malnutrition or Kwashiorkor⁷. Hypoalbuminaemia occurs before the early stage of toxemia of pregnancy⁸. WHO estimates incidence of preeclampsia to be seven times higher in developing countries than in developed countries⁹. A study by Chien et al¹⁰ evaluated that in severe hypoalbuminemia during pregnancy hypertension, ascites and abruption occurred more frequently. In another study by Taimoor et al⁶ serum albumin level was significantly reduced in 3rd trimester preeclampsia and there was also a significant difference in albumin levels in both cases and controls in 2nd and 3rd trimesters⁶. This is in accordance with another study which determined decrease in albumin levels in preeclampsia in 3rd trimester compared to controls¹¹.

Albumin possesses a long half-life and a large pool in the circulation, and the serum concentration has been widely tested in clinical sites for the evaluation of long-term variations in protein nutritional status¹². Low birth weight (LBW) acts as a critical risk factor for infant morbidity and mortality¹³. Maternal low serum albumin level in the third trimester was found to be associated with low birth weight in a study done by Tabata et al¹⁴. In the findings of a study by Akter et al¹⁵ suggest that pregnant women with low serum albumin level carry higher risk of giving LBW newborns than women with normal serum albumin level¹⁵. Birth weight of babies correlated between half-siblings of the same mother but not of the same father because of the possible contribution of maternal albumin¹⁶. It has been argued that the likely effects of maternal albumin deficiency on the birth weight of babies depend on the stage of gestation. Xiong et al¹⁷ concluded in his study that a higher maternal serum albumin in the late trimester is associated with a lower risk of infant birth weight. The data suggests that maternal serum albumin in the late trimester may serve as a simple and effective tool for the assessment of the low-birth-weight risk in clinical practice¹⁷.

Thus, the purpose of the present study was to find and compare the difference between serum Albumin level in Pregnant women of third trimester and non-pregnant women of same age range for further better management in clinical aspect for a pregnant women and her baby's valuable life.

Methodology

Study Settings and Population: The study was a cross-sectional analytical study. It was conducted in the Department of physiology, Mymensingh Medical College, Mymensingh from January 2019 to December 2019 for a

period of one year. The subjects were obtained from the Department of Gynecology and Obstetrics Mymensingh Medical College & Hospital, Mymensingh, Model Family Planning clinic, Mymensingh and locality of Mymensingh. **Study Procedure:** The subjects were selected by convenient sampling. After proper counseling, written informed consent was taken. Ethical permission was taken from the Institutional Review Committee of Mymensingh Medical College. A total number of 140 subjects, age range between 20-35 years were included in this study. Among them, 70 apparently healthy women were taken as control group (Group II) and 70 pregnant women of third trimester were taken as study group (Group I). Those who were diagnosed case of pregnancy with gestational diabetes mellitus, hypertension, and women with other chronic diseases, renal or cardiovascular disease, drug induced abnormal liver function test and women over age 35 and less than 20 years were excluded from the study. Patients who disagreed to donate blood samples were also excluded. Laboratory analysis of Serum Albumin was done by Bromocresol Green Method. Data were expressed as mean (\pm SD) and statistical significance of difference among the group was calculated by unpaired students' test.

Statistical Analysis: Statistical analysis was done by using Statistical package of social service (SPSS) for windows version 21.00. P value <0.05 was considered as significant. **Ethical Clearance:** The work approval was taken from the Ethical Review committee of Mymensingh Medical College, Bangladesh. Written informed consent was obtained from the participants to ensure their voluntary participation before preceding the questionnaire and specimen collection.

Results

Those women (in both Control and study group) who were diagnosed case of diabetes mellitus, gestational diabetes mellitus, hypertension, and women with other chronic diseases, renal or cardiovascular disease, drug induced abnormal liver function test and women over age 35 and less than 20 yrs age were excluded from the study. Subjects' ages were ranged from 20 to 35 years and the mean age of Group I was 26.01 ± 3.54 years and Group II was 25.06 ± 3.67 years (Table 1).

Table 1: Distribution of Age of Both Control and Study Groups

Group	Mean \pm SD
Group I	25.06 ± 3.67
Group II	26.01 ± 3.54

The mean (\pm SD) of Serum Albumin of group I and group II were 3.03 ± 0.48 gm/dL and 4.03 ± 0.36 gm/dL respectively. In group II Serum Albumin level was decreased in comparison to group I. The difference of mean Serum Albumin between the groups was statistically highly significant ($p < 0.001$) (Table 2).

Table 2: Statistical Analysis of Serum Albumin Level between Control Group (Group I) and Study Group (Group II) of two groups (n=140)

Groups	n	Mean \pm SD	Mean difference	P value
Group I	70	3.03 ± 0.48	-0.994	<0.001
Group II	70	4.03 ± 0.36		

Group I = Control group (non-pregnant women aged 20-35 yrs); Group II = Study group (Pregnant women of third trimester aged 20-35 yrs); n= Total numbers of subjects in each group

Discussion

This study was carried out to compare the levels of serum Albumin between third trimester of pregnancy age ranged 20 to 35 years and non-pregnant women of same age range. In this study decrease in level of serum albumin in pregnant women was significantly proved by comparing the level of serum albumin with non-pregnant control group. This association of decrease in level of albumin in pregnant women was analyzed by applying T- test for comparing case and control groups. In this study, decrease in serum albumin is very much significant in third trimester of pregnancy ($p < 0.001$).

The liver produces serum albumins which are dissolved in blood plasma, containing about 55.0%, and the most abundant blood protein. Albumin serve as transport of lipids, hormones, vitamins and minerals, and also assist immune systems with maintaining 80.0% of colloidal osmotic pressure¹⁸. In the current study, there were significant heterogeneity of level of serum albumin between third trimesters and the non-pregnant women. The current work corroborates with the views of Abbasi et al¹⁸, Shakhmatova et al¹⁹, Cassaza and Yazdi²⁰ respectively. Similar findings also reported from a study of Agbeca et al¹¹ where he found serum albumin level was significantly lower in pregnant group compared to the controls and also revealed a significant lower serum albumin in third trimester group than in second trimester and controls. Ogbodo et al²¹ found in his study that significant decrease in serum albumin occurred in third trimester than non- pregnant control group. The postulated mechanism of decreased

serum albumin may be due to increased albuminuria during pregnancy²². The sum effect of volume expansion, increases in cardiac output and pulse rate, reduced systemic vascular resistance, renal vasodilation and increased renal plasma flow. This is considered a major contributor to the hyperfiltration and increase in glomerular filtration rate observed during pregnancy²³. The hyperfiltration combined with the reduction of tubular reabsorption is thought to increase urine albumin excretion²⁴. Another cause of hypoalbuminemia during pregnancy may be the mild systemic inflammation that occurs in normal pregnancy due to multitude secretion of inflammatory factors as cytokines and growth factors from the placenta into the maternal circulation²⁵.

During pregnancy, the protein synthesis and protein breakdown in the body increase of pregnant woman, whereas they generally possess a positive nitrogen balance²⁶⁻²⁷. Under the effect of blood dilution during pregnancy, plasma protein begins to be reduced from early pregnancy, mainly manifested as a decrease in albumin²⁸. The half-life of serum Albumin in women during pregnancy is 21 days. Moreover, its concentration acts as a typical marker of (protein energy) malnutrition, which is likely to mirror the quality of diet⁵. The above-mentioned observations were consistent with our finding that no pronounced difference existed in serum Albumin concentration in third trimester.

Albumin can maintain the constant osmotic pressure of plasma colloid and ensure sufficient blood supply of uterus and placenta²⁹. Albumin, a non-specific transport protein, is capable of transporting different nutrients from the mother to the fetus and promote its growth and development²⁰. Yemane et al³⁰ in his investigation about level of homocystine during normal pregnancy found that Homocystine levels were directly correlated with albumin levels, which decreased during pregnancy.

The reduction of albumin concentration is easy to shorten gestational age, such that there might be a close correlation of birth weight and albumin level in these studies³¹. Changes in level of serum albumin during pregnancy have been well documented in number of studies³². These changes in level of serum albumin have been attributed to many factors. In a study decrease in level of serum albumin during pregnancy has found to be caused by harmonic changes which occurs during pregnancy³³. Estrogen and Progesterone increase progressively during whole period of gestation. These hormones reach maximum at third trimester. Most of the metabolic and biochemical changes

are attributed to these harmonic changes³⁴. Liver function is also affected which itself bring about changes which are manifested in number of biochemical, physiological and metabolic changes.

Conclusion

In conclusion, pregnancy has an appreciable effect on serum albumin level compared to non- pregnant. Therefore, it is important to consider undergoing screening of serum albumin for prevention of complication related to low serum albumin level for prevention of complication related to pregnancy for wellbeing of both mother and foetus. Adequate and proper dietary habit may also prevent complication related to low serum Albumin.

Acknowledgement: None

Contributions to authors: Noor F, Tasnim N were involved in conceptualization, data collection, literature collection and data analysis. Yeasmin F, Nishi MK, Rahman R were involved in manuscript writing and manuscript revision.

Funding: This research project was not funded by any group or institution.

Conflict of Interest: There is no conflict of interest relevant to this paper to disclose.

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