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Original Article

HYPOALBUMEANEMIA AND EARLY EFFECTS OF PREGNANCY INDUCED HYPERTENSION.

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ABSTRACT:

Background: Pregnancy consists of a series of small, continuous physiologic adjustments that affect the metabolism of all nutrients. An important external risk factor for pregnant women and newborn health is unbalanced nutrition of pregnant women.
Study Setting: This comparative study was conducted in the department of Biochemistry Liaquat University of Medical and Health Sciences Jamshoro with collaboration of Gynecological and Obstetrics department of Liaquat University Hospital, Jamshoro / Hyderabad and Muhammad Medical College.
Study Design: Case control and comparative study
Duration of study: One year from August 2008 to July 2009.
Sample size: 120 cases
Inclusion criteria: Women who were confirmed Primigravida (1st Pregnancy) with age ranged 20 to 35 years. Non pregnant women (control group) with age ranged 20 to 35 years.
Exclusion criteria: Pregnant women having any history of hypertension, renal disease, diabetes or any other complication like toxemia of pregnancy were excluded from the study.
Results: Total 120 women were selected in this study, 90(75.0%, n = 120) were pregnant and 30 (25.0%, n = 30) were non pregnant. 112 (93.3%) woman had regular diet, the Mean + SD of serum albumin was 4.405 + 0.57 and 08 (6.66%) women were non vegetarian the Mean + SD of serum albumin was 4.212 + 0 .35. No significant difference was noted. (P value 0.38).
Of these 90 pregnant women, there were 26(28.88%) women in First Trimester with Mean + SD gestational weeks 9.0 + 1.87, 20(22.22%) women were seen in second trimester with Mean + SD gestational week 20.3 + 3.68 and 44(48.88%) women were found in third trimester with Mean + SD gestational weeks 31.5 + 2.74. There was highly significant difference among the means of these trimesters (P value < 0.001)
Conclusion: The evidence that during pregnancy level of albumin is decreased in comparison to control group. This change in level of serum albumin is dependent on various factors as period of gestation, dietary habits, education, socio-economic status and age.

Keywords: Serum albumin, Trimesters of pregnancy, Hypoalbumeanemia

INTRODUCTION

Albumin is the most abundant protein in plasma, which accounts for about 55-60% of the total plasma proteins.[1] It is produced exclusively in liver. A healthy liver can synthesize 10-15gm of albumin/day, for this reason serum albumin level is determined to assess liver function.

In hepatic disorders fall of serum albumin occurs due to decreased synthesis and altered metabolism. Human albumin has a molecular weight of 69,000 and it consists of a single poly peptide chain of 585 amino acid with 17 disulphide bonds. Due to its low molecular weight it is one of the first proteins to appears in the urine after renal damage. Half-

life of albumin is 20-25 days. [1]

Normal albumin loss from the plasma is thought to be minimized by a number of mechanisms, including charge repulsion with the capillary wall and an intracellular rescue pathway. Albumin is excreted in the urine as a mixture of intact albumin and albumin-derived low-molecular-mass (<10,000 Da) fragments.[2]

Albumin is a hepatically synthesized protein frequently used to estimate overall nutritional status. However, many potential factors may contribute to hypoalbuminemia, including malnutrition, severe hepatic dysfunction, acute infection, malignancy, renal disease, and burns.[3] As a result, hypoalbuminemia may serve as a marker of underlying systemic disease and not always reflect inadequate oral intake. Overall body protein status is usually assessed through the levels of total production in serum or plasma, which include two major protein fractions; albumin and globulins.

Normal pregnancy is characterized by a reduction in peripheral resistance in order to increase blood flow and facilitate supply of oxygen and nutrients to the peripheral tissues. This decrease in resistance is achieved by both peripheral vasodilatation and reduction in blood viscosity. The latter is accomplished mainly by the increase in plasma volume that compensates for the increasing mass of the red cells and several plasma protein.[4]

Albumin is the major circulating protein. It plays a fundamental role maintaining intravascular oncotic pressure and carrying many endogenous and oxogenous substances. Variation of plasma albumin levels can be physiologic and pathologic and both qualitative and quantitative (more frequent) disorders are regrouped under the name "dysalbuminemia".[5] pregnancy represents the most anabolic period of the female lifecycle. During pregnancy, protein as a nutrient is an essential component and growing fetus.[6] Several studies have found that low concentration of serum albumin, a measure of nutritional or anti-inflammatory status, are related to greater all-cause mortality. Low serum albumin also correlates with impaired activities of daily living in community-dwelling individuals, poor lower extremity function, and low skeletal muscle mass, especially in elderly people. Several prospective studies have similarly identified a relationship between low blood cholesterol level, which might also reflect depleted nutritional status, and non-coronary mortality and physical disability. Moreover, Roche et al.[7] states that albumin represents a very abundant and important circulating antioxidant.

Eclampsia affects 3-5% of pregnancies and can have a significant impact on health for both mother and fetus. Eclampsia is one of the major causes of maternal and perinatal mortality. There is a varied incidence of eclampsia worldwide. Proteinuria is a major component of preeclampsia and is associated with a lower fetal birth weight, lower 5 minute Apgar score and an increased risk of adverse fetal outcome. Increase in blood pressure, a clinical feature of pre-eclampsia plays an increased risk of perinatal outcome by significantly lowering the 5 minute Apgar score. The combination of hypertension and proteinuria in preeclampsia acts as a primary cause of maternal and perinatal mortality.[8]

METHODOLOGY

The objectives of this study were to compare serum albumin level, during progression of pregnancy and to assess Hypoalbumeanemia and early effects of pregnancy induced hypertension.

STUDY SETTING: Study was conducted in the Departments of Biochemistry and Liaquat University of Medical and Health Sciences Jamshoro with collaboration of Gynecological and Obstetrics department of Liaquat University Hospital, Jamshoro / Hyderabad and Muhammad Medical College, Mirpurkhas.

STUDY DESIGN: Case control and comparative study

DURATION OF STUDY: One year from August 2008 to July 2009.

Sample size: 120 cases

INCLUSION CRITERIA**:** Women who were confirmed Primigravida (1st Pregnancy) with age ranged 20 to 35 years. Non pregnant women (control group) with age ranged 20 to 35 years.

EXCLUSION CRITERIA**:** Pregnant women having any history of hypertension, renal disease, diabetes or any other complication like toxemia of pregnancy were excluded from the study.

DATA COLLECTION PROCEDURE: Depending on stage of pregnancy, the pregnant subjects were divided into three groups designated as Groups I (women with first trimester comprised 26 women), Group II (women with second trimester comprised 18 women) and Group III (Third Trimester had 44 women) of pregnancy. Diagnosis of pregnancy was based on history of the subjects, their physical examination by competent gynecologists and laboratory investigations. Samples were taken from subjects by means of sterilized disposable syringe from the anterior cubital vein by venipuncture. Collected blood was transferred into test tube and allowed to clot and then centrifuged.

All the data were collected on a structured proforma based on inclusion and exclusion criteria.

Laboratory analytical procedure: Serum albumin level was analyzed by spectrophotometer 4010 using albumin kit by Merck at 578nm wavelength.

STATISTICAL ANALYSIS: The data were evaluated in statistical program SPSS version 16.0. Qualitative data (Frequency and percentage) were presented as n(%). Pearson's correlation was applied to determine the significant correlation between gestational age (all trimesters of pregnancy) and serum albumin levels. Numerical parameters were expressed Mean + Standard Deviation and student "t" test (2 tailed) and one way ANOVA were applied to compare the means among the all trimesters and groups (case and control) of women. All the data was calculated on 95% confidence interval. A p-value < 0.05 was considered as statistically significant level for the all comparisons.

RESULTS

One hundred and twenty women were analyzed in this study based on inclusion criteria and were divided into two groups i.e. 90(75.0%) case (pregnant women) and 30(25.0%) controls (non-pregnant women). Out of 120 women, majority of the women 63(52.5%) were found in the age group of 26 to 30 years. The overall mean age + SD (range) was 27.83 + 3.47 (20 – 35). Most of the women were from poor socio-economic class at our study area. Eighty seven (72.5%) women were poor, 22(18.3%) women were from middle class and 11(9.2%) were from upper class. Out of 120 women, 19 (15.8%) women were working by profession and 101(84.2%) women were house wives. Out of 120 women, 116 (16.07%) women were Muslims and rest were non- Muslims. Out of these 120 women, 81(67.5%) were came from rural areas and 39(32.5%) were came from urban areas. One hundred and twelve (93.3%) women had regular dietary habits, 08(6.7%) women were irregular. Majority of women, had non-vegetarian dietary habits. Out of 120 women, 112 (93.3%) woman had regular diet, the Mean + SD of serum albumin was 4.405 + 0.57 and 08

TABLE NO1

DIETARY HABITS
(n = 120)

	Vegetarian n = 17	Non-vegetarian n = 103	P value
Serum Albumin Level	3.83 + 0.42	4.485 + 0.52	< 0.001*

Results are presented as Mean + Standard Deviation
* P value is statistically highly significant

TABLE NO. 2

DIFFERENT STAGES OF PREGNANCY
(n = 90)

Different stages of pregnancy	n (%)	Mean + SD (Range)
First Trimester	26(28.88%)	9.0 + 1.87 (7 – 12 weeks)
Second Trimester	20(22.22%)	20.3 + 3.68 (14 – 24 weeks)
Third Trimester	44(48.88%)	31.5 + 2.74 (28 – 36 weeks)

P value < 0.001 is statistically highly significant calculated by one way ANOVA test

TABLE NO. 3

SERUM ALBUMIN LEVEL IN COMPARISON OF CASE AND CONTROL SUBJECTS

(n = 120)

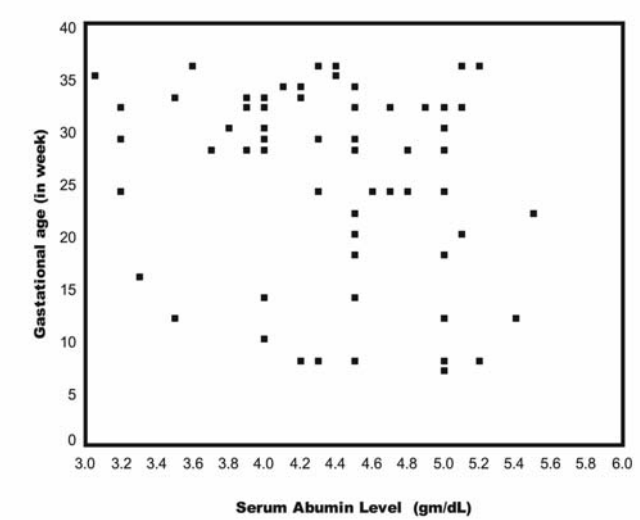
Variable	Case (Pregnant women) n = 90	Control (Non-pregnant women) n = 30	P value
Serum Albumin (gm/dL)	4.458 + 0.56	4.196 + 0.52	0.02†

Results are presented as Mean + Standard Deviation
† P value is statistically significant calculated by student t test

GRAPH NO. 1

PEARSON'S CORRELATION OF SERUM ALBUMIN AND GESTATIONAL AGE

(n = 90)



(6.66%) women had irregular diet the Mean + SD of serum albumin was 4.212 + 0 .35. No significant difference was noted. (P value 0.38). Out of 120 women, 17 (14.16%) woman were vegetarian the Mean + SD of serum albumin was 3.83 + 0.42 and 103(85.83%) women were non vegetarian the Mean + SD of serum albumin was 4.485 + 0.52. There was highly significant difference of albumin level between groups. (P value < 0.001). Table No. 1

This study reveals that among the pregnant women (n = 90), as gestational age increase, the level of serum albumin is lower. There was negative correlation between gestational age and serum albumin levels with significant difference (P value 0.001). Graph No. 1

Negative correlation between Serum Albumin levels of pregnancy and mean length of gestational age. Lower Serum albumin levels correlate with higher length of gestation with a significant p-value of 0.001 and an r-value of -0.340. The gestational age of 90 pregnant women was categorized into three groups such as Group I (First trimester), Group II (Second Trimester) and Group III (Third Trimester). Of these 90 pregnant women, there were 26(28.88%) women in First Trimester with Mean + SD gestational weeks 9.0 + 1.87, 20 (22.22%) women were seen in second

TABLE NO. 4

CROSS TABULATION OF AGE GROUPS IN DIFFERENT TRIMESTERS OF PREGNANCY (n = 90)

Variable	First Trimester n = 26	Second Trimester n = 20	Third Trimester n = 44	P value
Age groups:				
20 to 25	12 (46.2%)	5(5.0%)	0	0.0001†
26 to 30	14 (53.8%)	11(55.0%)	16(36.4%)	
31 to 35	0	4(20.0%)	28(63.6%)	

†P value is statistically significant calculated by Pearson's test of X^2

trimester with Mean + SD gestational week 20.3 + 3.68 and 44 (48.88%) women were found in third trimester with Mean + SD gestational weeks 31.5 + 2.74. There was highly significant difference among the means of these trimesters (P value < 0.001) Table No. 2

The serum albumin level was also compared among the pregnant and non pregnant women to assess the difference. The mean + SD of serum albumin level was 4.458 + 0.56 in pregnant women and 4.196 + 0.52 in the non pregnant women. The significant difference was noted (P value 0.02) Table No. 3

Out of 90 pregnant women, 26(28.8%) were seen in the first trimesters and 14(53.8%) women were seen of the age group 26 to 30 years in majority, 20(22.22%) women were found in the second trimester, of which, 11(55.0%) women were seen in the age group of 26 to 30 in majority and 44(48.88%) women of third trimester, 28(63.6%) were seen in the age group of 31 to 35 year in majority. Table No. 4

DISCUSSION

Maternal and child health is a burning issue of public health, influencing the development of the family and the community. Mother and infant protection is a priority in the health field because these population groups are the most exposed to the sickness and death, consequently to their low reactivity to the environmental factors and to their high responsiveness to the disorders.[9]

The results obtained from present study, are in accordance with similar studies carried out by various researchers for example in this study such as correlation of serum albumin level with gestational period was negative by applying Pearson's correlation co-efficient (Cr = -0.34, P < 0.001) with period of gestation. Same observation was claimed by Krauer et al.[10] in their study showed a negative correlation of serum albumin level with increasing period of gestation. In the present study, changes in level of serum albumin in pregnancy throughout gestational period of pregnancy was significantly low progressively by comparing with non-pregnant control group in contrast to the study of Kristensen et al.[11] showed decreased albumin levels in the second and third trimesters, whereas the levels of à2-macroglobulin were unchanged, which is compatible with a virtually unaltered transfer of à2-macroglobulin between the intra- and extravascular space during pregnancy and a significantly increased extravascular fraction of albumin. [12, 13]

The results of this study showed that the serum albumin level was lower in the first trimester (up to 12 weeks) of pregnancy. The mean + SD, 9.0 + 1.87 weeks up to 12 weeks in the first trimester, 20.3 + 3.68 in the second trimester and 31.5 + 2.74 in the third trimester.

Changes in level of serum albumin during pregnancy throughout gestational period and decrease in level of serum albumin in pregnant women was significantly proved by comparing the level of serum albumin level with non-pregnant control group. Regular antenatal checkup should include monitoring of serum albumin level so that any abnormality can be detected at early stage and proper measures can be taken accordingly.[14,15] Appropriate measures should be taken to prevent fluctuation in serum albumin level which ultimately causes high maternal and neonatal mortality.[16]

CONCLUSION

This study has provided us the evidence that during pregnancy level of albumin is decreased in comparison to control group. This change in level of serum albumin is dependent on various factors as period of gestation, dietary habits, education, socio-economic status and age. Impact of various factors cause changes in level of serum albumin, which is related with outcome of pregnancy. Hypoalbumeanemia is also associated with high maternal and fetal mortality and morbidity.

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