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**Original Article**

# Study of Correlation Between Serum Albumin and Hba1c in Type 2 Diabetes Mellitus Patients

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## ABSTRACT

**Background**: ADA recommends HbA1c testing in diabetic patients as initial assessment and a part of continuing care. HbA1c reflects average glycemic status over 2-3 months and predicts diabetic complications. In diabetes, albumin synthesis, secretion is decreased due to insulin deficiency. It is expected that albumin levels decrease in diabetes and may affect plasma protein glycation and HbA1c is a measure of high glucose levels [5-7]. Despite a significant negative correlation between serum albumin and HbA1c in diabetes mellitus, serum albumin is not monitored in diabetes. **Objectives**: To study the correlation between Hba1c and serum albumin levels in type 2 diabetes mellitus patients. **Methods**: 50 Study participants with Diabetes mellitus attending K R hospital were included in this study. FBS, PPBS, HbA1c and serum albumin were estimated **Results**: The mean age of the subjects was 62.43 ± 11.58 years. 58% of the study subjects were males. The mean HbA1c and serum albumin of the subjects was 7.89±0.54 and 3.35±0.71 respectively. HbA1c was found to be negatively correlated with serum albumin level. The association was found to be statistically significant between HbA1c and serum albumin. **Conclusion**: Serum albumin can mirror insulin secretory reserve, which influences glycemic control and ketosis risk.

**Key Words**: *HbA1c, Albumin, T2DM*

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## INTRODUCTION

Glycated hemoglobin is an important marker of glycemic control as it estimates average blood glucose of the previous 3 months. It roughly correlates with average plasma glucose and the progression of diabetes complication.[1] There are several biological, ethnic and therapeutic factors that affect HbA1c values. Despite a significant negative correlation between plasma albumin levels and HbA1c in type 2 diabetes, levels of albumin are not routinely monitored in diabetes. Only in diabetic nephropathy, albumin levels are routinely monitored. Monitoring of fasting plasma glucose (FPG) and glycated hemoglobin (HbA1c) are the main factors used to achieve optimum sugar control in diabetic patients as well as to screen diabetes.[2] High HbA1c can strongly predict diabetic complications [3] and cardiovascular morbidity in both diabetic and non-diabetic patients. [4] Plasma proteins are the primary targets of glycation following elevated levels of glucose in diabetes.[5] Amongst plasma proteins, albumin is one of the heavily glycated proteins because of its abundance, comparatively longer half-life and a higher number of free lysine and arginine residues.[6] Glycation accelerates albumin degradation via increasing catabolic rate and decreasing protein half-life,[7] thus decreasing the albumin levels in diabetes. It has been shown that albumin competes with other proteins for glycation[8] and low albumin level was associated with increased plasma protein glycation in diabetes.[9] It has also been suggested that low plasma albumin predicts the glycated hemoglobin (HbA1c) in type 2 diabetes,[10] thus, strongly implicating albumin in regulation of plasma protein glycation and HbA1c. This study aims at finding out the association between serum albumin level and HbA1c value and assessed the degree of influence that albumin has when levels exceed the HbA1c thresholds that are commonly employed for diagnosis and management of diabetes.

## METHODOLOGY

### Source of Data

The study will be carried out on patients visiting the General Medicine department in K R hospital. Patients who are diabetics will be selected. Ethical clearance will be taken. After taking appropriate consent regarding study, patient will be subjected to the study.

### Method of Collection of Data

Study Design- A Hospital based cross- sectional comparative study.
Study Period- a period of two months between August 2022 and October 2022
Sample size: 50

**Human Ethics**

The study was approved by Institutional Ethical committee (IEC) Mysore medical college and Research Institute (MMCRI) Mysore.

**Personal Information, Specimen Collection and Laboratory.**

Information on demographic including age, sex was collected after obtaining informed consent.

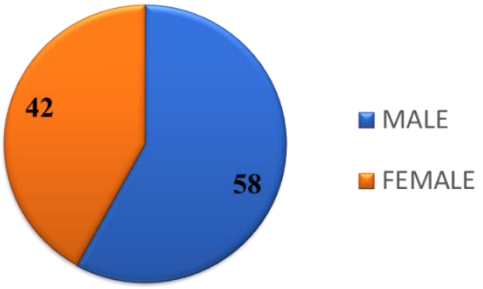
Blood samples were collected by trained nurses. Venous blood samples werestored in a refrigerator at 4°C prior to analysis in the hospital laboratory. LFT (Direct bilirubin, indirect bilirubin, AST, ALT, Alp, albumin), FBS, PPBS, HbA1c were measured using blood sample collected from each participant in a hospital laboratory.

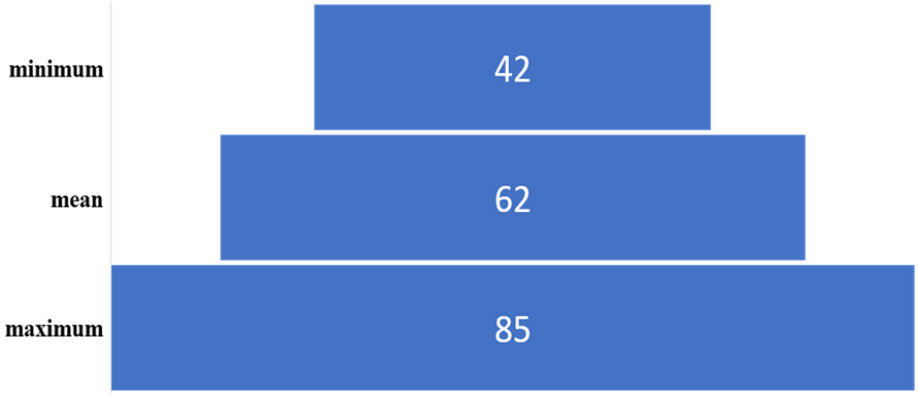
**Statical Analysis**

Data obtained from the study will be entered in excel sheets and it will be double checked. Data analyzed using SPSS software version 22.0 and will be presented as descriptive statistics in the form of frequency tables, figures and graphs.

**RESULTS**

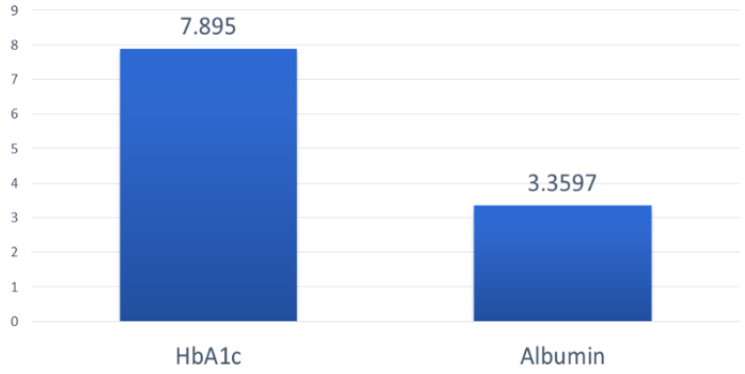
In this study, 100 subjects with type 2 diabetes mellitus were included with minimum age of 42 and maximum age of 85 with mean of 62.43 ±11.58 out of which 58 were males and 42 were females. The mean HbA1c was 7.89 ±1.54 and mean albumin was 3.35 ± 0.7. With p value of 0.015, there is negative correlation between serum albumin and HbA1c with pearson correlation of -0.242.



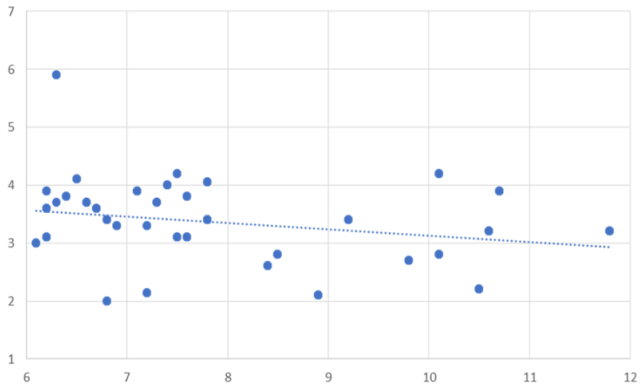

HbA1C AND SERUM ALBUMIN

| | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|
| HbA1c | 6.1 | 11.8 | 7.895 | 1.5461 |
| Albumin | 2.00 | 5.90 | 3.3597 | 0.71058 |




CORRELATION BETWEEN HbA1C AND SERUM ALBUMIN

| HbA1c | Albumin |
|---|---|
| Pearson Correlation | -0.242* |
| P Value | 0.015 |



**DISCUSSION**

The results of our study showed a statistically significant negative correlation between HbA1c and serum albumin levels. In a study done by Feng et al HbA1c levels were found to be inversely associated with serum albumin ($p < 0.0001$) and had a threshold effect in the HbA1c defined diabetic population and the association was stronger when albumin level fell below 41.4 g/L.

In another study conducted by S Tiwari et al, they also found a negative correlation with $p<0.001$ between HbA1c and albumin and it was also observed that HbA1c decreases with increasing albumin concentration in those having FPG between 100 to <126mg/dl.

HbA1c levels negatively correlated with serum albumin levels due to competitive glycation inhibition by albumin. In accord with this, the present study determined that HbA1c decreased as serum albumin increased

Several limitations of this study should be considered such as this being a retrospective study, it is possible that potential interfering factors were not entirely controlled and limited sample size.

**CONCLUSION**

HbA1c increased with decreasing serum albumin levels. There is statistically significant negative association between HbA1c and serum albumin. So serum albumin concentration should be monitored as it potentially mirrors an individual's insulin secretory reserve, which subsequently influences glycemic control.

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