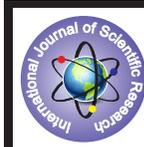


Role of Albumin In Estimation of HbA1c In South Indian Subjects



Medical Science

KEYWORDS : HBA1C, Serum albumin, glycation, serum glucose

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ABSTRACT

Background: Diabetes is a common endocrine disorder characterized by hyperglycemia leading to non enzymatic glycation of free amino groups of protein (of lysine residues) and leads to their structural and functional changes resulting in complication of diabetes. Albumin which is extensively glycated in diabetes its level could regulate plasma hemoglobin glycation. Aim: The present study aimed to evaluate the relation between Sr albumin and glycohemoglobin. Material and Methods: A total of fifty subjects aged >35 years were included in the study. All the study groups including control groups were attending Chalmeda Anand Rao Institute of Medical Sciences (CAIMS) Hospital, Karimnagar, Telangana State, India. Results: There was a significant negative correlation between HBA1C and Serum albumin concentration. The mean and S.D. of fasting blood sugar of Group I subjects 83 ± 17.6 , where mean and SD of Sr. albumin and HBA1C of Group I subjects 4.29 ± 0.41 and 5.7 ± 1.45 respectively. In Group II subject fasting plasma glucose 125.68 ± 23.97 where concentrations of Sr albumin and HBA1C are 3.29 ± 0.41 and 7.73 ± 0.8 respectively. Where the p value < 0.00. Conclusion: Serum albumin negatively correlates with HBA1C. So, an average glucose levels from the HBA1C concentration, which may efficiently inform patients their glyceamic control needs to be further investigated.

INTRODUCTION

The WHO reports suggests that the prevalence of diabetes in worldwide would increase to 300 million in the year 2025.^[1] It is one of the main threats to human health in the 21st century and is the fifth leading cause of death in most developed countries.^[2]

In diabetes the elevated levels of glucose starts forming covalent adducts with plasma proteins through a non enzymatic process known as glycation. The non enzymatic reaction between the free amino groups of protein and carbonyl groups of reducing sugars is known as Maillard reaction^[3].

About 50% of plasma protein are protein albumin is a single polypeptide chain consisting of 585 amino acid residues having a molecular weight of 66,460 Daltons^[4].

Proteins seem to be at first sight the target of the glucose molecules circulating at high level in diabetes. Glycation of protein interferes with their normal function by disrupting molecular conformation, altering enzyme activity, and interfering with receptor recognition^[5]. The mechanism by which glycation alters the cell function include denaturation and functional decline of the target protein^[6], thus decreasing the albumin levels in diabetes.

HBA_{1c} is typically used as a glyceamic marker in diabetic patients. However, HBA_{1c} is influenced by factors other than blood glucose^[7,8]. It has also been suggested that low plasma albumin predict the glycated hemoglobin HBA_{1c} in type 2 diabetes^[9] this strongly implicating albumin in regulation of plasma protein glycation and HBA_{1c}.

The purpose was to determine whether low albumin levels may be associated with higher HBA_{1c} levels and vice versa.

MATERIAL AND METHODS

This study was a retrospective study, a total of fifty subjects aged >35 years were included in the study. All the study groups including control groups were attending Chalmeda Anand Rao Institute of Medical Sciences (CAIMS) Hospital, Karimnagar, Tel-

angana State, India.

Inclusion Criteria:

History of obesity in family
Family History of diabetes
Age >35 years
BMI >26 kg/m²
Waist circumference >102 cm.

Exclusion Criteria:

Anemia
Renal Impairment
Pregnancy
Chronic Liver Disease
Hypertriglyceridemia
Iron or Vitamin B₁₂ deficiency

Blood samples are collected (3ml) after 12hrs of fasting and were dispensed into a clean dry test tube. FBS and Sr albumin were performed in fully automated analyzer (DS-302). Glucose was estimated by "GOD-PAP", enzymatic photometric test methodology. Sr albumin was estimated by photometric test using bromocresol green methodology. HBA_{1c} is estimated in the Fine CareTM HBA_{1c} Rapid Quantitative Test which is based on fluorescence immunoassay technology, that uses a sandwich immunodetection method to measure percentage of HBA_{1c} in human blood. Sample for HBA_{1c} is collected in a capillary tube from package with the clip. The local ethical committee of the hospital of Chalmeda approved the study protocols.

STATISTICAL ANALYSES

Difference in mean values between groups were evaluated by student's t-test. Two-paired p-values were used and statistically significance was considered at p<0.00. The association between variables was evaluated by linear regression. Data was expressed as mean± standard error of mean.

RESULTS:

We studied the results of 50 subjects (Male= 32, Female=18) with simultaneous Measurement of serum albumin, FPG and HBA_{1c}. The subjects were divided into two groups. Group I subjects fast-

ing plasma glucose 83.56±17. Where concentrations of

Sr albumin and HBA_{1c} are 4.29±0.35 and 5.78±1.45. In Group II subjects fasting plasma glucose 125.68±23.97 where concentrations of Sr. albumin and HBA_{1c} are 3.29±0.41 and 7.73±0.8.

Table:1 The stastical comparision of HBA_{1c} and fasting plasma glucose, Sr. albumin in two groups.

	Group I (mean, SD)	GroupII (mean, SD)	T value
Fasting blood Glucose	83.56±17	125.68±23.97	7.35
Sr. albumin	4.29±0.35	3.29±0.41	9.32
HBA _{1c}	5.78±1.45	7.73±0.8	4.96

We compared the results of two groups by doing paired sample stastics. Where the serum albumin concentration was low in Group II subjects where HBA_{1c} was high 7.73±0.8, fasting plasma glucose was 125.68±23.97. The serum albumin concentration was high in group I subjects where HBA_{1c} was low 5.78±1.45 and fasting plasma glucose was 83.5±17.6.

This study suggests that higher serum albumin levels may decrease HBA_{1c} levels and that lower sr albumin levels may raise HBA_{1c} levels.

DISCUSSION

Our study demonstrates that there is a statistically negative correlation between HBA_{1c} and Serum albumin levels. Traditionally glycosylated hemoglobin (HBA_{1c}) has been used to monitor glyemic control in diabetes mellitus (DM) patients HBA_{1c} reflects glyemic control during the preceding 1-3 months [10-11] But this HBA_{1c} levels are underestimated in patients with poor glyemic control because survival of erythrocytes is shortened under hyperglycemic conditions [12] and this HBA_{1c} is also influenced by anemia [13] and uremia [14-15] The conditions that interfere with HBA_{1c} estimations anemias renal failure are excluded.

According to Shalbha Tiwari et al & Santiago Rodriguez – Segade et al higher Serum albumin levels may decrease HBA_{1c} levels and that lower serum albumin levels may raise HBA_{1c} levels which was reported earlier in western studies [15] In this study also there was significant negative correlation between HBA_{1c} and serum albumin noted this may be due to serum albumin was to compete with hemoglobin for glycation and lower HBA_{1c} negatively, It is possible that other proteins could be designed that may become progressively glycated and therefore, prevent tissue glycation, and alter the prevalence of complication. Indeed this has been tested in vitro and invivo with some suggestions of benefit [16, 17]

Albumin because of its long half-life time and high concentration as compared to other proteins, it is highly sensitive to glycation [18]. Moderate hyperglycemia in type 2 diabetes is associated with greater nitrogen flux, body protein synthesis and degradation [19] thus decreasing the albumin levels in diabetes.

CONCLUSION

In conclusion the glucose control of patients with albumin levels significantly above or below average may not be properly reflected by the standard classification in terms of HBA_{1c} measurements alone. Because there is statistically increasing HBA_{1c} with low albumin levels suggest that albumin could be one more factor that alters HBA_{1c} on pre diabetic subjects. So, HBA_{1c} may not be reliable in diagnosing pre diabetes. There also may be a discrepancy between the degree of glyemic control suggested by HBA_{1c} measurements and evaluation of diabetic complications.

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