

Plasma Proteins in Type 2 Diabetes Mellitus

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Abstract:

Introduction: Insulin resistance in type 2 diabetes mellitus is known to alter fractional synthetic rates of different plasma proteins. Objective of our study was to compare plasma total proteins and albumin in type 2 diabetics with that of non-diabetic controls.

Methodology: This retrospective study was conducted in a medical college hospital in coastal Karnataka. Data of plasma proteins and demographic profiles of 81 type 2 diabetes mellitus patients was compared with that of 72 healthy non-diabetics. Student's independent t test was used to compare the data.

Results: A significantly high ($p=0.0013$) total proteins, extremely significantly ($p=0.0001$) elevated globulins were observed in type 2 DM. However an insignificantly lowered albumin levels were noted in patients. Albumin/globulin ratio was found to be low very significantly ($p=0.0006$) in patients.

Conclusion: We conclude high levels of total proteins and hyper gamma globulinemia were observed in patients of type 2 DM in our study as compared to non-diabetics.

Keywords: total protein, albumin, globulin, type 2 DM

Running Title: Plasma proteins and type 2 DM

I. Introduction

Type 2 diabetes mellitus is a known state of insulin resistance affecting metabolism of carbohydrates, lipids as well as proteins. It has been reported that during insulin deficiency, fractional synthetic rate of albumin was decreased significantly and concomitantly fibrinogen synthesis was increased. Lowered albumin levels are widely reported by various studies (1). Total proteins are reported to be elevated in diabetics (2).

However only limited number of studies are available on plasma total proteins, albumin and globulins in type 2 diabetes in our settings. Hence the present retrospective study was conducted to assess the levels of plasma total proteins and albumin levels in type 2 diabetes cases.

Primary objective of the study was to compare plasma total proteins and albumin in type 2 diabetics with that of non-diabetic controls. However we also aim to calculate eGFR in our study subjects to assess whether there is an associated nephropathy in them as it influences albumin levels.

II. Methodology

The retrospective, case control study was conducted in Karwar institute of Medical Sciences, Karwar. The approval of institutional ethics committee was obtained prior to the study. Data of plasma proteins and demographic profiles of 81 type 2 diabetes mellitus patients had attended the teaching hospital due to various illnesses was collected from clinical biochemistry laboratory in the year 2015. Data of 72 normal healthy controls was also collected. 32% of diabetics were females and 68% of them were males whereas control group had 46% females and 54% males. Mean age of patients was 52.84 ± 2.04 years and that of controls was 49.21 ± 2.47 years, expressed as mean \pm SEM.

We excluded cases of liver disorders, congestive heart diseases, malnutrition, acute and chronic inflammatory conditions, fever and hyperthyroidism.

Data was obtained from our clinical biochemistry laboratory attached to the medical college teaching hospital. Total protein, albumin, creatinine and blood sugar were estimated using automated chemistry analyzer, Transasia XL-640. Diabetes mellitus was diagnosed based the criteria of American diabetes association(ADA)(3).

Estimated GFR (eGFR) was calculated using MDRD formula, as follows:

$$eGFR = 186 \times [\text{serum creatinine}]^{-1.154} \times [\text{Age}]^{-0.203} \times 0.742$$

(Multiplied by 0.742 only in females)

eGFR was taken as a tool to diagnose renal disease associated with diabetes mellitus.

Statistical analysis was done with graph pad Instat software. Student's independent t test was used to compare the data.

III. Results

A significantly high (p= 0.0013) total protein level was found in diabetics as compared to the control group. Globulin was extremely significantly elevated (p =0.0001) in type 2 DM. However an insignificantly lowered albumin levels were noted in patients. A/G ratio was lowered in extremely significant (p=0.0006) manner in patient group in comparison to the control group. Serum creatinine was significantly high (p=0.0078) and eGFR was lowered extremely significantly (P<0.0001) in patients. Data comparing the two groups is represented in Table 1.

Table 1: Comparison of Plasma Proteins in Type 2 DM with Non-Diabetics

	T2DM (n=81)	Controls (n=72)	p value
Total proteins (g/dl)	7.31±0.93	6.8±0.81	0.0013*
Globulin (g/dl)	3.47±0.94	2.84±0.93	0.0001**
Albumin (g/dl)	3.89±0.69	3.97±0.78	0.468
A:G ratio	1.23±0.51	1.55±0.56	0.0006**
Creatinine (mg/dl)	1.52±0.16	1.14±0.2	0.0078**
eGFR (ml/min)	68.32±3.99	95.62±5.79	0.0001**

*highly significant

**extremely significant

IV. Discussion

We found that total protein and globulin levels were high in diabetics compared to controls. Extent of elevation of globulin was 1.22 times and that of total proteins was 1.1 times as compared to non-diabetics. Low albumin levels were noted in patients, compared to controls. However the difference was not statistically significant.

Mean eGFR was extremely significantly low in diabetics suggesting an associated nephropathy. It is a well known fact that diabetic nephropathy is associated with albuminuria, micro albuminuria being the earliest indicator of development of diabetic nephropathy. Low albumin levels observed in our patients can be attributed to the associated renal disease. However we do not have data on urine analysis for protein detection, which is the limitation of this study.

Study by Schmidt et al suggest lowered albumin levels in diabetics(4).When we analyze eGFR levels in our patients, we expect a significant fall in albumin levels. But on the contrary, mean albumin was in the normal reference range and there was no significant difference between albumin levels in patients and control group. This finding can be attributed to compensatory increase in albumin synthesis in diabetics with albuminuria. Tessari and

colleagues suggests that albumin and fibrinogen synthesis are increased in type 2 diabetics with albuminuria as compared to those without albuminuria, due to up-regulation of hepatic secretory proteins (5).

Comparatively high total proteins found in our study is supported by findings of various studies (1,6). This elevation could be attributed to the elevation of various acute phase proteins, fibrinogen and globulins in DM which contribute to the elevation in plasma proteins.

In diabetics, reports are available which suggest an elevation in acute phase proteins CRP, α 1-acid glycoprotein, plasminogen, complement C3, ceruloplasmin etc. (7-10). Fibrinogen levels are reported to be increased in type 2 DM due to increased synthesis (2,11). Study by Ardavi and colleagues suggests that diabetics might exhibit hypergamma globulinemia (12). This fact justifies hyperglobulinemia found in our study.

V. Conclusion

We conclude high levels of total proteins and hyper gamma globulinemia were observed in patients of type 2 DM in our study as compared to non-diabetics. Non-availability of data on fibrinogen levels and urine albumin reports are the limitations of our study.

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