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Original research article: Measurement of level of serum albumin, creatinine and blood urea level in Indian patients with type 2 diabetes mellitus

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Abstract
Background: Diabetes mellitus (DM) is a group of disorders of carbohydrate metabolism in which glucose is underutilized producing hyper glycemia.
Objective: To estimate plasma levels of urea nitrogen, creatinine and albumin in Indian patients with Type 2 Diabetes Mellitus.
Methods: A total of 120 patients with type 2 diabetes mellitus and 50 age and gender matched healthy controls were included in this study. Blood specimens were collected from both groups and measurement of the plasma levels of urea nitrogen, creatinine, albumin, fasting glucose was done and compare results with the study group.
Results: urea and creatinine were significantly elevated with significant positive correlation with blood sugar level. While Albumin was significantly reduced with significant negative correlation with duration of diabetes.
Conclusion: plasma levels of urea, creatinine, and albumin can be used as prognostic markers and predictors of renal failure in diabetic patients especially those with complications such as hypertension and ischemic heart disease.

Keywords: Albumin, Type 2 Diabetes Mellitus; Urea Nitrogen; Creatinine

1. Introduction

Diabetes is the most common cause of kidney failure, accounting for nearly 44 percent of new cases [1]. Even when diabetes is controlled, the disease can lead to chronic kidney disease (CKD) and kidney failure. Kidney failure is the final stage of chronic kidney disease. Nearly 24 million people in the United States have diabetes and nearly 180 000 people are living with kidney failure as a result of diabetes [2]. The prevalence of nephropathy in India was less (8.9% in Vellore, 5.5% in Chennai) when compared with the prevalence of 22.3% in Asian Indians in the UK [3]. In chronic renal failure patients the prevalence of diabetic nephropathy was 30.3% followed by chronic interstitial nephritis (23%) and chronic glomerulonephritis (17.7%) [4]

2. Materials and Methods

This study was conducted at govt medical college and attached new civil hospital Surat, Gujarat after obtaining informed consent of the patients.

Inclusion criteria: 120 patient 30-60 year age of Diagnosed cases of DM as a Case Group and 60 age and sex match healthy control.

Exclusion criteria: patient suffering from thyroid disease, malignancy or any major illness are excluded from the study.
About 6 ml of venous blood was obtained from each participant and put into 2 containers, one with fluoride for fasting blood glucose (FBG), and one plain container for separation of plasma to measure BUN, creatinine and albumin.
Estimation of biochemical parameter was done on semi-automated analyzer with using standard reagent kit along with QC sera.
All obtained data were analysed stastatically by calculating p-value by using online student t-test calculator. p value less than 0.05 was considered as a difference of significance.

3. Results

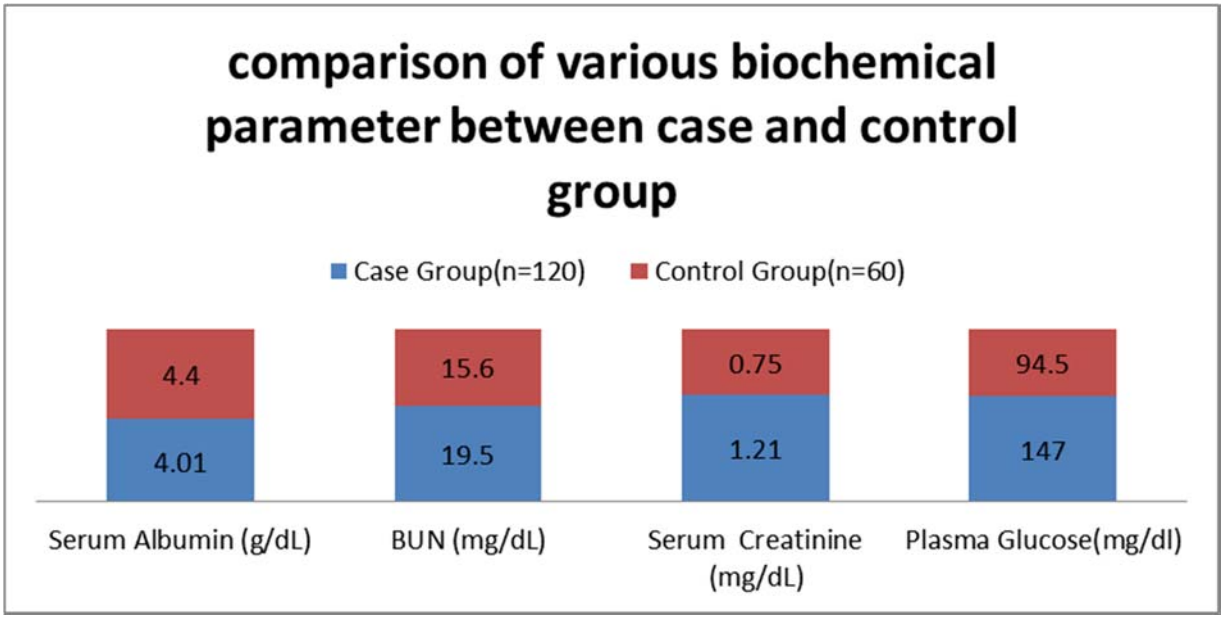
Among total 120 participiants in case group, the ratio of male: female is 70:50 while in control group among 60 particpiants the ratio of male: female is 30:30.
The mean age of participants in case group is 45±5.2 year while in control group is 43±4.5 year.

Table 1: Age and sex wise distribution of the participants

Variable	Case Group (n=120)	Control Group (n=60)
Age (yr)	45±5.2	43±4.5
Sex(M:F)	70:50	30:30

Table 2: comparison of various biochemical parameter between case and control group

Parameter	Case Group (n=120)	Control Group (n=60)	p-value
Serum Albumin (g/dL)	4.01 ± 1.2	4.4 ± 0.9	>0.05
BUN (mg/dL)	19.5 ± 1.2	15.6 ± 1.3	<0.05
Serum Creatinine (mg/dL)	1.21 ± 0.33	0.75 ± 0.41	<0.05
Plasma Glucose(mg/dl)	147 ± 5.6	94.5 ± 3.6	<0.05

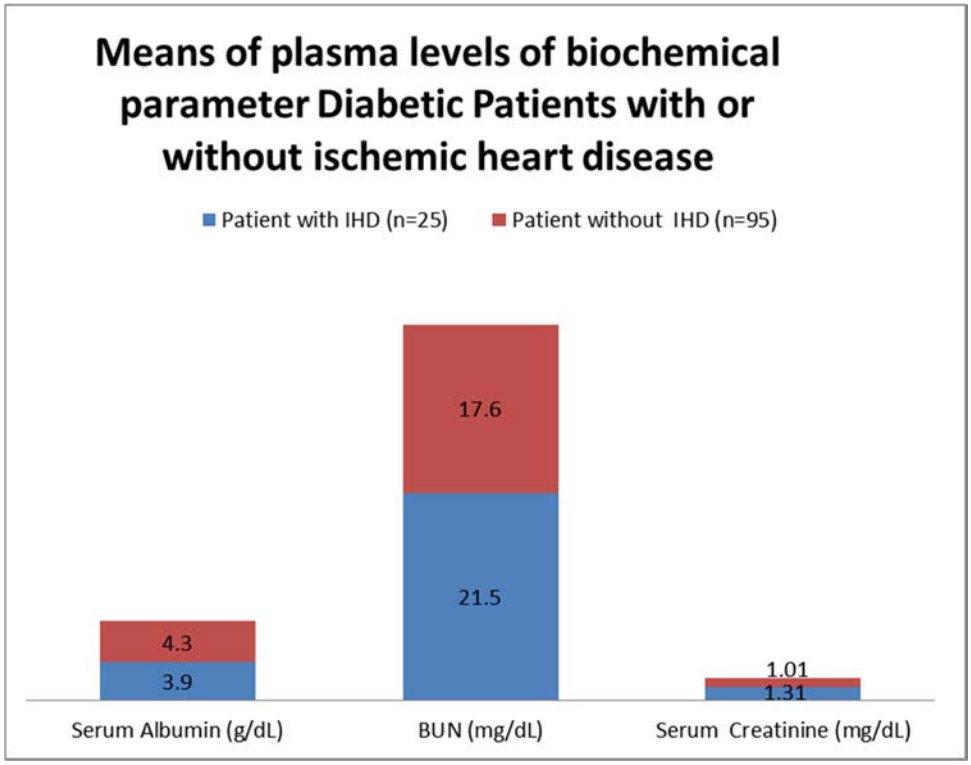


Graph 2: Graphical presentation of comparison of various biochemical parameter between case and control group

Table 3: Means of plasma levels of BUN, creatinine and albumin of Diabetic Patients with or without ischemic heart disease.

Parameter	Patient with IHD (n=25)	Patient without IHD (n=95)	p-value
Serum Albumin (g/dL)	3.9 ± 1.2	4.3 ± 0.9	**<0.05**
BUN (mg/dL)	21.5 ± 1.2	17.6 ± 1.3	**<0.05**
Serum Creatinine (mg/dL)	1.31 ± 0.33	1.01 ± 0.41	**<0.05**

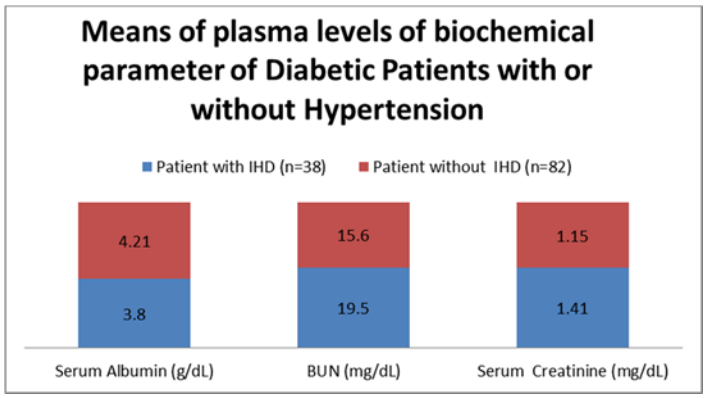
Plasma levels of BUN and creatinine were significantly raised in patients with type 2 DM either with or without ischemic heart disease and/or hypertension; whereas albumin was significantly reduced in these patients (Table 2, 3, 4)



Graph 3: Graphical presentation of Means of plasma levels of BUN, creatinine and albumin of Diabetic Patients with or without ischemic heart disease.

Table 4: Means of plasma levels of BUN, creatinine and albumin of Diabetic Patients with or without Hypertension

Parameter	Patient with IHD (n=38)	Patient without IHD (n=82)	p-value
Serum Albumin (g/dL)	3.8 ± 1.2	4.21 ± 0.9	**<0.05**
BUN (mg/dL)	19.5 ± 1.2	15.6 ± 1.4	**<0.05**
Serum Creatinine (mg/dL)	1.41 ± 0.33	1.15 ± 0.31	**<0.05**



Graph 4: Graphical presentation Means of plasma levels of BUN, creatinine and albumin of Diabetic Patients with or without Hypertension

4. Discussion

Impairment of renal function due to type 2 diabetic mellitus was assessed by measurement of plasma concentrations of creatinine and urea in both tests (type 2 diabetic patients) and controls (non-diabetic subjects). Fasting blood glucose concentration, plasma creatinine and urea concentrations were observed to be significantly higher diabetic patients (test subjects) compared to non-diabetic control subjects. Results obtained showed no significant difference in the test parameters between male and female test subjects.

Plasma creatinine and urea are established markers of Glomerular Filtration Rate (GFR). Though plasma creatinine is a more sensitive index of kidney function compared to plasma urea level. This is because creatinine fulfills most of the requirements for a perfect filtration marker. [5]

According to Mitch and Walser (1986) if a graph of reciprocal of plasma creatinine is plotted over time a straight line will be obtained. Thus, if a patient is losing kidney function at a constant rate, one could be able to extrapolate the graph out of time and get a rough idea of when kidney will fail completely and when initiation of dialysis may be required and to determine efficacy of treatment to halt progression of renal failure. [6] Plasma creatinine is also helpful in recognizing when there is an acute drop in kidney function in addition to chronic loss. Thus, plasma creatinine is used for monitoring disease progression (Mitch, 1986; Mitch and Walser, 1986) [7]

Results obtained from the present study showed that in addition to elevated blood sugar level in type 2 diabetes mellitus, plasma creatinine and urea concentration are also significantly increased in male and female diabetics compared with their levels in apparently healthy non-diabetic male and female controls.

This observation is in accord with the reports of Aldler *et al.* (2003) [8], Judykay (2007) [9] and Wagle (2010) [10]. Aldler *et al.* (2003) [8] in their report submitted that raised plasma creatinine and urea levels in diabetic patient may indicate a pre-renal problem such as volume depletion. Judykay (2007) [9] in his submission suggested that high creatinine levels observed in diabetic patients may be due to impaired function of the nephrons. Researcher also posited that high urea levels in diabetes mellitus patients could be attributed to a fall in the filtering capacity of the kidney thus leading to accumulation of waste products within the system.

5. Conclusion

From my study conclusion is that the Plasma levels of BUN, creatinine, and albumin in type 2 diabetic patients can be considered as important prognostic markers for evaluation of renal disease, especially in those with complications such as hypertension or ischemic heart disease.

6. References

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