

Assessment of Level of Serum Urea and Creatinine in Non-Diabetics and Diabetics in Odisha, India**Chhatray Marndi¹, Saubhgya Chhotaray², Ashok Kumar Behera³, Sabitri Beshra⁴, Gopabandhu Patra⁵**¹Assistant Professor, Department of General Medicine, Bhima Bhoi Medical College and Hospital, Balangir, Odisha, India²Assistant Professor, Department of Emergency Medicine, Bhima Bhoi Medical College and Hospital, Balangir, Odisha, India³Associate Professor, Department of General Medicine, Bhima Bhoi Medical College and Hospital, Balangir, Odisha, India⁴Assistant Professor, Department of Pharmacology, Bhima Bhoi Medical College and Hospital, Balangir, Odisha, India⁵Assistant Professor, Department of Orthopaedics, Bhima Bhoi Medical College and Hospital, Balangir, Odisha, India

Received: 25-09-2023 / Revised: 23-10-2023 / Accepted: 18-11-2023

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Conflict of interest: Nil

Abstract:**Objectives:** The study aims to assess the correlation between blood glucose, serum urea, and serum creatinine levels in non-diabetic and diabetic patients. Additionally, the study also investigated the variations in these biomarkers concerning the duration and severity of diabetes.**Methods:** The present study took place at Bhima Bhoi medical college and Hospital, Balangir for a period of 1 year and involved 100 participants, consisting of 50 diabetics and 50 controls, with blood samples collected to measure blood glucose, serum urea, and serum creatinine levels. These biomarkers were analyzed using the GOD-POD method for blood sugar and the Cobas Integra fully automated analyzer for urea and creatinine.**Results:** The study involved 100 participants, divided into two groups: 50 diabetics, and 50 control. The diabetic patients with a duration > 6 years exhibited heightened levels of serum creatinine and urea compared to those with a shorter diabetic history. The average fasting and postprandial blood sugar levels were notably elevated in patients with diabetic in contrast to other non-diabetic individuals with fasting glucose at 132.5 and postprandial glucose at 167.07.**Conclusion:** The study compares the levels of serum creatinine and urea in diabetic and non-diabetic patients and indicates that vigilant monitoring of serum creatinine and urea levels is essential for assessing kidney function in poorly controlled diabetic individuals. Effective blood glucose control is crucial in preventing diabetic nephropathy, a significant cause of chronic renal failure. Regular evaluation of these biomarkers provides a practical approach to assess renal health in diabetics.**Keywords:** Intertrochanteric femur fractures, elderly patients, cementless Bipolar Hip Arthroplasty (BHA), Proximal Femoral Nail (PFN).

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Introduction

Diabetes mellitus is defined by consistent elevation of blood glucose levels, stemming from disruptions in the metabolism of carbohydrates, fats, and proteins [1]. It arises due to inadequacies in insulin action, its secretion, or due to both factors [1]. India is experiencing a surge in diabetes cases, with a current count surpassing 62 million diagnosed individuals [2]. Diabetic nephropathy, impacting 30% of diabetics, stands out as a major predisposing factor to advanced renal failure [2].

The assessment of renal function serves a dual purpose: diagnosing impaired renal function and pinpointing the deterioration in kidney function. Diabetic nephropathy manifests through substantial proteinuria, a decrease in glomerular function rate, high blood pressure, and an elevated risk of cardiac complications [3]. Biomarkers such as serum urea and creatinine, readily accessible tests, are heightened in poorly managed diabetics and align with the intensity of renal function impairment. Monitoring these biomarkers aids in the rapid

identification and prophylaxis of renal disease due to diabetes, potentially arresting the advancement to advanced renal failure [3, 4]. Creatinine, originating from creatinine phosphate in skeletal muscle, acts as a dependable indicator, reflecting both muscle mass and glomerular filtration rate. Individuals with juvenile diabetes, displaying higher renal filtration rate levels, offer a fitting cohort for investigating the progression of renal function loss [5-7].

Our study aimed to assess the correlation between serum creatinine and urea levels in diabetic patients and non-diabetic individuals within a tertiary hospital, exploring variations in relation to blood glucose levels and disease duration in type-2 diabetes. We examined the utility of estimating these levels as a tool for diagnosing and predicting the prognosis of diabetic nephropathy.

Methods

The study cohort comprised 50 individuals with diabetes while the control group included 50 non-diabetic individuals. All the patients were consulting at the outpatient department at Bhima Bhoi medical college and Hospital, Balangir from January to December 2022. Diabetes diagnosis followed WHO criteria, and participants aged between 25 and 80 years were included. Exclusions encompassed individuals with urethral obstruction, cardiac insufficiency, renal diseases, muscle disorder, or degenerative muscle disorder.

A 5 ml blood sample drawn from the vein was collected to assess blood glucose, serum urea and creatinine levels. GOD-POD method helped to determine blood glucose levels, while creatinine estimation employed the modified Jaffe's method. Urea analysis was done using Urease-Berthelot's technique [8-11]. Normal ranges for biomarkers were defined as 70 to 110 mg per dl and 110 to 140 mg per dl for fasting and post-meal glycemia, 15 to

40 mg per dl for serum urea, and 0.6 to 1.2 mg per dl and 0.5 to 1.1 mg per dl for serum creatinine in men and women, respectively. The average patient age in the control cohort was correlated to that of the diabetic individuals.

Statistical Methods

Standard deviations for serum creatinine, urea, as well as blood glucose concentrations were computed via EPI INFO 7 software. The correlation coefficient or 'r' value was determined via the Primer of Biostatistics software.

Results

This study comprised 100 patients, subdivided into 50 diabetics and 50 controls. Among the control group, 14 were women and 36 were men, while in the diabetic group, 16 were women and 34 were men. Within the control subjects, all exhibited normal urea levels, although 1 had unusual creatinine concentrations in the serum, which is likely attributed to enhanced muscular density and protein-rich meal. Among the diabetic subjects, 9 showed high urea concentrations in the serum, and 7 showed heightened creatinine concentrations in serum.

Patients with diabetes lasting > 6 years demonstrated elevated levels of serum urea and creatinine compared to those with a shorter diabetic history. Notably, a prominent rise in serum urea levels was observed in diabetic patients with the illness persisting for 11 to 15 yrs, while no notable changes were evident in the serum creatinine concentrations. The average fasting and post-meal glucose levels in the control cohort were 87.02 and 123.9, respectively, whereas in diabetic patients, they were 132.5 and 167.07, respectively. Consequently, both fasting and after-meal blood sugar concentrations were elevated in diabetic patients compared to non-diabetic individuals (Table 1).

Table 1: Findings from both cohorts

Tests	Control group N = 50	Diabetic patient N = 50
	Average value	Average value
Age	47.6	53.5
Fasting blood glucose	87.02	132.5
Post-meal blood glucose	123.9	167.07
Serum Urea	17.6	25.1
Serum Creatinine	0.78	1.11

The average urea level in the control cohort measured 17.6, while in diabetic individuals, it was recorded at 25.1. Likewise, the average creatinine levels in the control cohort were 0.78, and in diabetics, they were 1.11. Consequently, both serum creatinine and urea levels are noticeably higher in patients with diabetes when compared to the latter. A robust positive association was identified amongst the urea levels and both fasting and postprandial

glucose levels, with "r values" of 0.76 and 0.83, respectively. Conversely, a modest positive correlation was observed between serum creatinine levels and fasting as well as postprandial blood sugar levels, with "r values" of 0.28 and 0.40, respectively.

The r value for serum creatinine levels in men is 0.78, indicating a strong positive correlation, likely influenced by higher muscular density and protein-

rich diet in men. However, the "r values" for other parameters, such as blood glucose levels and urea concentration in serum, when compared to sex, were found to be insignificant and demonstrated a negative correlation.

Discussion

The correlation between blood glucose and urea concentrations in serum of diabetic individuals reveals a robust connection, indicated by the "r values" of 0.76 for fasting blood glucose and urea concentrations and 0.83 for postprandial blood glucose and serum urea levels, establishing a strong relationship. Conversely, a weaker connection exists between glucose levels and creatinine concentration. The current study underscores that uncontrolled blood sugar levels can elevate serum urea levels, increasing the risk of diabetic nephropathy. This aligns with previous research indicating that hyperglycemia is a significant contributor to progressive kidney damage [6, 8]. An elevation in urea level signifies kidney damage, particularly in the presence of hyperglycemia in patients with diabetes, consistent with findings from studies on diabetic rats [6].

In this study, the length and severity of diabetes demonstrated a strong association with serum urea levels, whereas such an association was not as prominent with serum creatinine levels. This aligns with the acknowledged understanding that urea and creatinine concentrations in serum are accepted indicators of renal filtration rate. Serum creatinine, being a more sensitive measure of renal function, surpasses serum urea in meeting the criteria for an optimal filtration marker [12, 13].

In our investigation, higher levels of serum creatinine were observed in men in contrast to women, likely due to the accumulation of creatinine in muscular density. This is consistent with previous findings indicating higher muscular density in men [12, 14]. No apparent relationship between sex and blood glucose levels was identified, and no significant relationship of sex with urea concentration was also observed. Similar observations have been reported in studies carried out by Shrestha et al. and Idonije et al. [8, 15]. Our study results are in line with existing research suggesting that increased urea and plasma creatinine concentrations in patients with diabetes could be a potential pre-renal concern [12, 16].

Creatinine and urea serum concentrations prove to be valuable prognostic indicators and predictors of kidney impairment in individuals with diabetes [12]. Effectively managing blood glucose concentrations can halt the transition to diabetic-induced renal impairment, significantly reducing associated disease and fatality linked with this disorder. The trend of renal function test results approaching higher reference limits in type-2 diabetes cases

signals the changes in renal function. Estimating kidney function tests provides a straightforward, dependable, cost-efficient, and sensitive approach, now considered an adjunct in managing and providing extended treatment for Type-2 diabetes mellitus [17, 18,19].

Conclusion

The current study comparing the serum urea and creatinine in diabetic and non-diabetic patients underscores the significance of monitoring serum urea and creatinine levels in diabetic individuals for assessing renal function. Effective control of blood glucose is pivotal in preventing diabetic nephropathy, a major contributor to chronic renal failure. These simple and accessible biomarkers offer valuable insights, particularly when microalbuminuria screening is not feasible. Regular evaluation of serum creatinine and urea levels emerges as a practical approach for assessing renal health in diabetics with suboptimal control.

Limitations

The retrospective design of the study and short follow-up period, which may impact the comprehensive assessment of long-term outcomes are some of the limitations of this study. Additionally, the sample size is modest, potentially limiting the generalizability of the findings.

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