

Study of Serum Creatinine in Female Type 2 Diabetes Mellitus Patients

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Abstract

Diabetes mellitus is a chronic illness that affects millions of individuals worldwide. In the present study serum creatinine was estimated in female type 2 diabetes to observe the frequency of increase serum creatinine level in these patients. A cross-sectional, descriptive study was carried out in the Department of Physiology, Mymensingh Medical College, Bangladesh, between July 2016 and June 2017. A total of 210 subjects were selected and were grouped as: control group (group I) having 70 healthy female of reproductive age (21-45 years) and study group (group II), which was again subdivided to group IIA (70 diabetic female of reproductive age (21-45 years) and group IIB (70 diabetic female of post-menopausal age, 45-70 years). Laboratory analysis of serum creatinine was done by enzymatic colorimetric method. A comparison in serum creatinine concentration was done in between group I and group II and in between Group IIA and Group IIB. The results were calculated and analyzed by using SPSS. For statistical analysis students unpaired 't' test was performed. Our study revealed that serum creatinine was increased among females of the study group and the result was statistically significant. In the control group serum creatinine was within the normal physiological range.

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Introduction

Diabetes mellitus is one of the most common metabolic disorder of great impact worldwide.¹ It is one of the major global health problems, affecting 382 million people & accounting for 5.3 million deaths in 2013.² By 2035 the number of affected people is expected to increase to 592 million globally.³ In the South Asian region, Bangladesh has the second largest number of adults with diabetes (5.1 million adults, 6.31%).⁴

End stage renal disease and diabetic nephropathy are mainly associated with renal disorders in diabetic patients.^{5,6} 25-45% of diabetic patients clinically develop diabetic nephropathy in their lifetime.⁶ Glycosylation of tissue proteins causes deterioration of the structure and function of kidney which finally leads to Diabetic nephropathy (DN). In many countries, DN affects 30% of all diabetics which is the leading cause of end stage renal disease (ESRD).⁷⁻¹⁰

Abnormal renal functions like abnormal blood urea, serum creatinine and macro albuminuria are some of the characteristic features of Diabetic Nephropathy. In uncontrolled diabetes, there may be hyperglycemia associated abnormal increase of blood urea and serum creatinine. So, urea and creatinine are the two important factors to find any abnormality in the kidney. Serum creatinine when it alters, there will be more reliable reflection in GFR whereas urea formation

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depends on factors like liver function, protein intake, and rate of degradation of proteins. So, measurement of blood urea and serum creatinine helps in the early detection and prevention of diabetic kidney diseases and prevents the progression of end stage renal disease.^{11,12} As renal complications are more common in diabetic patients, we aimed to measure the serum creatinine levels in female type I diabetic patients and correlate this parameter with female non-diabetic patients. This study aimed to determine the prevalence of serum creatinine in female type 2 diabetes mellitus periods. The findings suggest that increase serum creatinine is likely to occur in patients with diabetes with renal insufficiency, particularly when it is poorly controlled. It is therefore believed that presentation of the outcome will help increase the level of awareness and understanding of the level of serum creatinine among patients with diabetes, which will eventually lead to the development of interventions to optimize treatment outcomes in them.

Methods

This cross-sectional, descriptive study was carried out in the Department of Physiology of Mymensingh Medical College, Mymensingh, Bangladesh from July 2016 to June 2017. A total of 210 patients participated in this study. They were grouped as Group-I (control group) consists of 70 apparently healthy women of reproductive age of 21-45 years of age, while group-II (study group) consists of 140 diabetic women of both reproductive age group (21-45 years) and post-menopausal age group (45-70 years). Group-II was again subdivided into: Group IIA and Group IIB. Group IIA had 70 diabetic females of reproductive age group, while Group IIB had 70

diabetic females of post-menopausal age group. Age more than 70 years or less than 25 years, women undergo hysterectomy or receiving hormone replacement therapy, pregnant women, diagnosed case of hypothyroidism, Cushing's syndrome, polycystic ovary, antipsychotic drug users, regular steroid users, those that have history of smoking and alcohol consumption, known case of any type of cardiac disease, such as heart failure, myocardial infarction, any type of systemic illness, such as tuberculosis, hepatitis, known case of malignancy, patient with thalassemia, hemophilia, known case of blood loss such as recent surgery, trauma or overt gastrointestinal hemorrhage and acute infectious illness conditions were excluded from the study. After selection the subjects were requested to attend the concerned center in the morning on a particular day. Under strict aseptic precaution about 3 ml of venous blood was collected from antecubital vein by disposable syringe with a gentle pull and the blood was taken in a test tube labeled with name of subject, with date and time of blood collection. Laboratory analysis of serum creatinine was done by enzymatic colorimetric method.

Data was expressed as mean \pm SE. For statistical analysis, Students unpaired 't' test was performed. The results were calculated and analyzed by using SPSS software, version 23.0 (Statistical Package for the Social Science).

The study was approved by the Ethical Review Committee of Mymensingh Medical College, Mymensingh, Bangladesh.

Results

The mean serum creatinine levels of control group I and study group IIA were 1.051 \pm 0.25

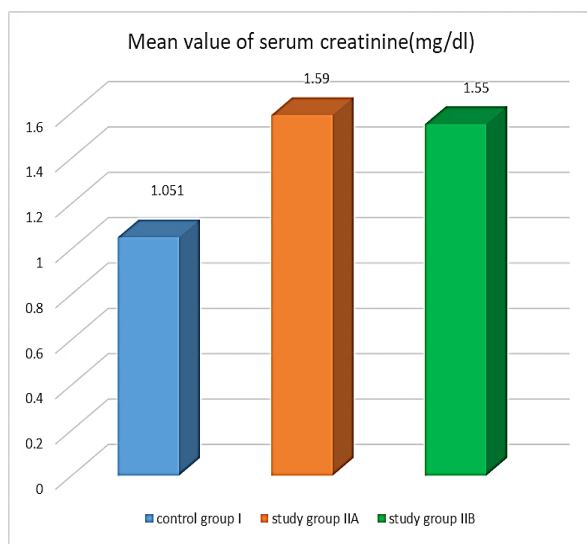
mg/dl and 1.59 ± 0.67 mg/dl respectively. In study group IIA serum creatinine was increased. Result is statistically highly significant ($P < 0.001$). The mean of serum creatinine of study group IIA and study group IIB were 1.59 ± 0.67 mg/dl & 1.55 ± 0.67 mg/dl respectively. Here the result is statistically not significant ($P > 0.05$) (Table-I & Fig. 1). Serum creatinine was found increased in the study group and the result was statistically significant. Serum creatinine remaining in that control group female is within normal physiological range.

Table-I: Comparative study of serum creatinine (mg/dl) between control and study groups

Control group	Study group		P value
Group I (n=70)	Group IIA (n=70)	Group IIB (n=70)	<0.0001
1.051 ± 0.25	1.59 ± 0.67	1.55 ± 0.67	

Data was expressed as mean \pm SE. Unpaired student's 't' test was performed to reach the P-value

Fig. 1: Bar diagram showing mean value of serum creatinine in different groups



Discussion

In our study, mean serum creatinine of control group reproductive female (group I) and study group, diabetic female of reproductive age (group IIA) and diabetic female of post-menopausal age (group IIB) were 1.051 ± 0.25 mg/dl, 1.59 ± 0.67 mg/dl and 1.55 ± 0.67 mg/dl respectively. There was significantly increased serum creatinine in study group (IIA) in comparison to control group and the result is statistically significant at 1% level of probability ($p < 0.001$). But there was no significant change of serum creatinine between study group IIA and study group IIB. The result is consistent with that of Ghasemi *et al.*,¹³ this study proposed that serum creatinine levels were higher in menopausal women, aged over 50 years. Shrestha S *et al.*, 2008 stated that Diabetes mellitus is the major cause of renal morbidity and mortality, and diabetic nephropathy is one of chronic kidney failure. After many years of diabetes the delicate filtering system in the kidney becomes destroyed, initially becoming leaky to larger blood proteins such as albumin which are then lost in urine.¹⁴ According to Negri, Lombas and Zanchetta, a recent study on data from the NHANES III (Third National Health and Nutrition Examination Survey 1988-1994) found that prevalence of severe renal impairment was greater for women than men (24% vs 11%).¹⁵ Earlier research done by Shilpak *et al.* demonstrated that women were categorized as having normal renal function (creatinine < 1.2 mg/dl), mild renal insufficiency (1.2-1.4 mg/dl) and moderate renal Insufficiency (> 1.4 mg/dl).¹⁶ After menopause the incidence of renal disease increase suggesting that the loss of sex hormones contribute to the development and progression of kidney disease.¹⁷ A more recent

study showed that estrogen helped to protect against kidney disease and may exert certain cellular effects on the kidney because it can suppress the growth of scar tissue as well as effect various growth factors which impact the kidney.¹⁸ Moreover, Herrera *et al.* reported that the risk of development of hypertensive kidney disease is less common in women compared to men, however this gender protective effect diminishes and tends to disappear with the onset of diabetes and menopause.¹⁷ These data are important for future planning and management for female patients suffering from type 2 diabetes mellitus in our country.

Conclusion

From the present study, it may be concluded that serum creatinine is significantly increased in female diabetic patients in comparison to normal healthy female. It is also seen that type 2 diabetic persons are considered to have significant positive relation for increase serum creatinine and number of metabolic abnormalities that have high morbidity and mortality. So, prevention of type 2 diabetes mellitus by taking necessary steps like regular physical exercise, intake of a healthy diet and behavior therapy may help in prevention of type 2 diabetes mellitus related complication. Therefore, it is important to consider each and every post-menopausal woman to undergo screening test at regular basis. As Type 2 diabetes affects serum creatinine concentration in women significantly, specific health education strategies are needed in order to prevent the emerging cardiovascular, metabolic and renal diseases.

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