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Comparative Analysis of BMI, Glycaemic Status,and Serum Creatinine in Diabetic and Non-Diabetic

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ABSTRACT

Introduction: *Diabetes mellitus is a major global health concern, strongly associated with metabolic, renal, and skeletal complications. Body mass index (BMI), glycaemic control, and serum creatinine are key indicators for assessing overall health and disease burden, particularly in postmenopausal women. This study aims to compare body mass index (BMI), glycaemic status, and serum creatinine levels between diabetic and non-diabetic postmenopausal women.*

Methods:*This cross-sectional study was conducted in the Medicine Department of Sir Salimullah Medical College and Mitford Hospital, from July 2023 to June 2024. A total of 120 cases were included in this study according to the selection criteria. Data were processed and analyzed by SPSS 22.0. A p-value of <0.05 was considered statistically significant.*

Result:*BMI was similar between groups (24.60 ± 4.87 vs. 25.26 ± 3.40 kg/m², p=0.397). Diabetic women had significantly higher fasting blood sugar (8.36 ± 3.36 vs. 4.92 ± 0.69 mmol/L, p<0.001), 2-hour blood glucose (14.03 ± 6.72 vs. 7.53 ± 0.29 mmol/L, p<0.001), HbA1c (7.03 ± 1.25 vs. 5.85 ± 0.29%, p<0.001), and serum creatinine (1.20 ± 0.06 vs. 1.16 ± 0.14 mg/dl, p=0.046). Osteoporosis was also more frequent in diabetics (63.3%) compared to non-diabetics (40.0%, p=0.033).*

Conclusion:This study showed that postmenopausal diabetic women had significantly higher fasting blood sugar, 2-hour blood glucose, HbA1c, serum creatinine, and prevalence of osteoporosis compared to non-diabetics, despite similar BMI.

KEYWORDS:*BMI,Glycaemic Status, Serum Creatinine, Diabetic*

I. INTRODUCTION

Diabetes mellitus—predominantly type 2 diabetes (T2D)—continues to rise globally, with an estimated 537 million adults affected in 2021 and projections reaching 783 million by 2045, underscoring the need for integrated risk stratification using anthropometric, metabolic, and renal measures [1]. At the same time, the worldwide distribution of adiposity has shifted unfavourably over recent decades; pooled analyses show steady increases in adult BMI since 1975 across almost all regions, amplifying population exposure to diabetes and kidney disease risk [2].BMI, while an imperfect proxy for adiposity, is consistently and linearly associated with incident T2D in cohort studies, and indices of central adiposity (e.g., waist circumference and waist-to-hip ratio) independently elevate diabetes risk beyond overall body mass [3]. From a clinical perspective, glycaemic status spans normal glycaemia through prediabetes to diabetes and is routinely classified using fasting plasma glucose (FPG), 2-h plasma glucose during an oral glucose tolerance test (OGTT), and glycated haemoglobin (HbA1c) thresholds defined by the American Diabetes Association (ADA) [4]. Accurate categorization is not merely semantic; it informs prevention, therapeutic intensity, and surveillance for complications [4].Kidney involvement is one of the most consequential complications linked to dysglycaemia. Diabetic kidney disease (DKD) is a leading cause of chronic kidney disease (CKD) and end-stage kidney disease (ESKD) worldwide, with pathophysiology spanning hyperfiltration, glomerulosclerosis, tubulointerstitial injury, and accelerated atherosclerosis [5,6]. Contemporary epidemiology confirms the burden: among US adults with diabetes, manifestations of kidney disease—including albuminuria and reduced estimated glomerular filtration rate (eGFR)—remain highly prevalent, despite therapeutic advances [7]. Clinically, serum creatinine is the most widely used endogenous filtration marker to estimate GFR, serving as an accessible indicator of renal function along the glycaemic continuum. Yet creatinine has limitations—its concentration is influenced by muscle mass,

diet, and tubular handling—which can confound cross-group comparisons, particularly when BMI and body composition differ [8,9]. To mitigate bias and improve accuracy, newer CKD-EPI equations that incorporate creatinine and/or cystatin C and remove race coefficients have been proposed and validated, offering better risk classification across diverse populations [6].Adiposity also intersects directly with kidney risk. Beyond its diabetogenic effects, higher BMI independently increases the odds of incident CKD and albuminuria, with meta-analyses demonstrating graded associations between excess body weight and renal outcomes—even after accounting for traditional metabolic factors [10]. This convergence of evidence suggests that a comparative assessment of BMI, glycaemic measures (FPG, HbA1c, OGTT categories), and renal indices (serum creatinine and derived eGFR) in people with and without diabetes can illuminate: (i) how adiposity gradients translate into dysglycaemia; (ii) the extent to which glycaemic categories track with early renal function changes; and (iii) whether creatinine-based assessments capture differential kidney risk across metabolic phenotypes.Such a comparison is clinically pertinent for several reasons. First, early identification of high-risk individuals enables targeted lifestyle and pharmacologic interventions that can delay or prevent T2D and DKD, as endorsed in contemporary guidelines [4,5]. Second, interpreting creatinine alongside BMI and glycaemic status may reduce misclassification: individuals with lower muscle mass (e.g., some older adults or those with sarcopenic obesity) may display deceptively low creatinine despite impaired kidney function, whereas muscular individuals may have higher baseline creatinine unrelated to GFR [8,9]. Third, given that excess adiposity contributes to CKD both indirectly (via hyperglycaemia, hypertension, dyslipidaemia) and directly (through haemodynamic and inflammatory pathways), disentangling these effects across diabetic and non-diabetic groups can refine risk prediction and monitoring strategies [6,10].

II. METHODS

This cross-sectional study was carried out in the Department of Medicine of Sir Salimullah Medical College and Mitford Hospital, over 12 months from July 2023 to June 2024, involving 120 postmenopausal women—60 with type 2 diabetes mellitus (case group) and 60 age-matched non-diabetic women (control group). Postmenopause was defined as the absence of menstruation for at least 12 consecutive months, and type 2 diabetes mellitus was diagnosed according to the American Diabetes Association (ADA) criteria, with diabetic participants receiving either oral antidiabetic drugs (OAD) alone or OAD in combination with insulin for at least one year. Women with secondary causes of osteoporosis (e.g., endocrine disorders, chronic kidney disease), those on medications affecting bone metabolism (such as corticosteroids, bisphosphonates, or hormone replacement therapy), with surgical or premature menopause (<40 years), chronic inflammatory diseases, or malignancies were excluded. Data were collected using a structured proforma, recording socio-demographic information, age at menarche, age at menopause, duration since menopause, and for the diabetic group, duration of diabetes, glycemic control (assessed by HbA1c), and treatment modality. Anthropometric measurements were obtained to calculate body mass index (BMI). Bone mineral density (BMD) at the femoral neck and lumbar spine was measured for all participants using dual-energy X-ray absorptiometry (DXA), and T-scores and Z-scores were recorded. Statistical analyses were performed using appropriate software, with continuous variables expressed as mean ± standard deviation and categorical variables as frequency and percentage; comparisons between groups were made using unpaired t-tests and chi-square tests, and a p-value <0.05 was considered statistically significant.

III. RESULTS

Table 1: Demographic profile of the study subjects (n=120)

	Diabetic (n=60) n (%)	Non diabetic (n=60) n (%)	p-value
Age (years)			
50 – 59	8 (13.3)	19 (31.7)	
60 – 69	32 (53.3)	32 (53.3)	
≥70	20 (33.3)	9 (15.0)	
Mean ± SD	65.83 ± 8.75	62.17 ± 7.67	0.016

Age of menarche (years)	14.78 ± 0.69	14.63 ± 0.64	0.219
Age at menopause (years)	46.90 ± 3.39	46.95 ± 3.04	0.932
Duration since menopause (years)	19.70 ± 7.82	15.15 ± 8.27	0.002
Body Mass Index (kg/m^2)	24.60 ± 4.87	25.26 ± 3.40	0.397

Data were expressed as frequency,percentage, and mean (± Standard Deviation).
An unpaired t-test was done to measure the level of significance.
The table shows the demographic profile of the study subjects.. Mean age of the patients was 65.83 ± 8.75 years and 62.17 ± 7.67 years in diabetic and non diabeticpost menopausal patients. There was no significant difference in the age of menarche and age at menopause. But the duration since menopause was significantly higher in diabetic patients than in non-diabetic patients. There was also no significant difference in BMI between thetwo groups.

Table 2: Biochemical variables of the study subjects (n=120)

	Diabetic (n=60) (Mean±SD)	**Non diabetic (n=60) (Mean±SD)**	**p-value**
Fasting Blood Sugar (mmol/L)	8.36 ± 3.36	4.92 ± 0.69	<0.001
2HBF (mmol/L)	14.03 ± 6.72	7.53 ± 0.29	<0.001
HbA1c (%)	7.03 ± 1.25	5.85 ± 0.29	<0.001
Serum Creatinine (mg/dl)	1.20 ± 0.06	1.16 ± 0.14	0.046

Data were expressed as frequency and mean (± Standard Deviation).
An unpaired t-test was done to measure the level of significance
The table shows biochemical parameters of the study subjects. Fasting blood glucose, 2hABF, HbA1c, and serum creatinine were significantly higher in the diabetic group than non-diabetic group.

Table 3: Osteoporosis in Diabetic and Non diabetic patients (n=120)

	Diabetic (n=60) n (%)	**Non diabetic (n=60) n (%)**	**p-value**
Osteoporosis	38 (63.3)	24 (40.0)	0.033
Osteopenia	20 (33.3)	31 (51.7)	
Normal	2 (3.3)	5 (8.3)	

Data were expressed as frequency and percentage.
A chi-square test was done to measure the level of significance
The table shows osteoporosis in diabetic and non diabetic post menopause patients. Osteoporosis was found to be significantly higher in diabetic patients than in non-diabetic patients.

Table 4: BMI, glycaemic status, and serum creatinine in Diabetic and Non-diabetic (n=120)

	Diabetic (n=60) (Mean±SD)	**Non diabetic (n=60) (Mean±SD)**	**p-value**
Body Mass Index (kg/m^2)	24.60 ± 4.87	25.26 ± 3.40	0.397
Fasting Blood Sugar (mmol/L)	8.36 ± 3.36	4.92 ± 0.69	<0.001

2HBF (mmol/L)	14.03 ± 6.72	7.53 ± 0.29	<0.001
HbA1c (%)	7.03 ± 1.25	5.85 ± 0.29	<0.001
Serum Creatinine (mg/dl)	1.20 ± 0.06	1.16 ± 0.14	0.046

The table shows BMI, glycaemic status, and serum creatinine in Diabetic and Non-diabetic post menopause patients. Mean BMI was almost similar in both groups. Fasting blood glucose, 2hABF, HbA1c, and serum creatinine were significantly higher in the diabetic group than non-diabetic group.

IV. DISCUSSION

In this study mean age of the patients was 65.83 ± 8.75 years and 62.17 ± 7.67 years in diabetic and non diabeticpost menopausal patients, respectively. In the study of Anaforoglu et al. [11] mean age was 61.9±8.6 years and 60.1±9.3 years in diabetic and non-diabetic post menopause women, respectively. As we can see, the mean age of the cases in our study is more than the average of other similar studies.Mean age of menarche was 14.78 ± 0.69 years and 14.63 ± 0.64 years in diabetic and non-diabetic post menopause women in this study. The mean age of menarche was almost similar in the study of Hadzibegovic et al. [12]. Mean age at menopause was 46.90 ± 3.39 years and 46.95 ± 3.04 years in diabetic and non-diabetic post menopause women in our study. A similar menopause age was observed in the study of Anaforoglu et al. [11] and Hadzibegovic et al. [12]. Duration since menopause in this study is 19.70 ± 7.82 years and 15.15 ± 8.27 years in the diabetic and non diabetic group, respectively. Another study shows a higher duration since menopause in diabetic women than non-diabetic women [11,13], which is similar to our study.Mean BMI was 24.60 ± 4.87 kg/m^2 and 25.26 ± 3.40 kg/m^2 in diabetic and non-diabetic postmenopausal women in this study. BMI was significantly higher in diabetic women than in non-diabetic women [11,13]. This study result was dissimilar tothe above findings.Serum creatinine was significantly higher in diabetic patients than in non-diabetic post menopause women in this study (1.20 ± 0.06 years vs 1.16 ± 0.14). Raska Jr et al. [13] revealed that serum creatinine was almost similar in both diabetic and non-diabetic women.In this study, osteoporosis was 38 (63.3%) and osteopenia was 20 (33.3%) in the diabetic group, and osteoporosis was 24 (40.0%) and osteopenia was 31 (51.7%) in the non-diabetic group. Osteoporosis was significantly higher in the diabetic group in this study. A similar finding was observed in the study of Moghimi et al. [14], where they found significantly higher prevalence of osteoporosis in diabetic women compared to non-diabetic women.Femoral and lumbar T-scores were significantly lower in diabetic patients with HbA1c>7.0. In the study done by Karimifar et al. [15],it was shown that in diabetic women, bone loss was more common in those with HbA1C ≥7 compared to those with HbA1C <7, which is similar to our study.

Limitations of The Study

The study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community.

V. CONCLUSION

This study showed that postmenopausal diabetic women had significantly higher fasting blood sugar, 2-hour blood glucose, HbA1c, serum creatinine, and prevalence of osteoporosis compared to non-diabetics, despite similar BMI.

VI. RECOMMENDATION

Regular monitoring of glycaemic status, renal function, and bone health should be prioritized in postmenopausal diabetic women. Early lifestyle modification, strict glycaemic control, and timely therapeutic interventions are recommended to reduce the risk of renal impairment and osteoporosis in this high-risk group.

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