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Original Article

Assessment of Renal Diseases Associated with Obesity in a Tertiary Care Hospital

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Abstract

Background: *The global obesity epidemic is a major independent risk factor for chronic kidney disease (CKD) via hemodynamic, metabolic, and inflammatory pathways. However, data on its specific renal manifestations within Bangladeshi tertiary care populations remains scarce, highlighting a critical need for localized clinical assessment. The objectives of this study were to assess the spectrum and frequency of renal diseases associated with obesity among patients attending a tertiary care hospital in Bangladesh.* ***Materials and Methods:*** *A prospective cross-sectional study was conducted at Eastern Medical College and Hospital, Cumilla, from July 2023 to June 2024. A purposive sample of 53 adult obese patients (BMI≥30 kg/m²) was enrolled. Participants underwent detailed clinical evaluation and laboratory investigations, including serum creatinine, estimated glomerular filtration rate (eGFR), urine albumin-creatinine ratio (UACR), and ultrasonography. Statistical analyses were performed using SPSS version 23.0.* ***Results:*** *The study of 53 obese patients revealed a high burden of renal disease: 43.4% had reduced eGFR and 58.5% had albuminuria. Obesity-related glomerulopathy was the most common diagnosis (26.4%). A significant association was found between higher BMI class and increased albuminuria prevalence (p=0.007). Participants with both hypertension and diabetes had a significantly higher rate of reduced eGFR (p=0.032).* ***Conclusion:*** *This study confirms the high prevalence of renal dysfunction in obese individuals, strongly linked to BMI severity and comorbidities. Obesity must be recognized as a major renal risk factor, necessitating routine renal screening and targeted public health interventions for weight management.*

Keywords: Albuminuria, Glomerular filtration rate, Obesity, Renal insufficiency, Weight loss.
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Introduction

Obesity, characterized by excessive adipose tissue accumulation, has escalated into a global health crisis of epidemic proportions. The World Health Organization defines obesity as a body mass index (BMI) of 30 kg/m² or higher, and its prevalence has nearly tripled since 1975 worldwide[1]. This pandemic is not confined to high-income nations; low- and middle-income countries, including Bangladesh, are witnessing a rapid epidemiological transition with a surge in obesity rates due to urbanization, sedentary lifestyles, and dietary shifts[2]. Beyond its well-established links to cardiovascular disease and diabetes, obesity is now recognized as a potent independent risk factor for the development and progression of chronic kidney disease (CKD), imposing a substantial burden on healthcare systems[3,4]. The pathophysiological nexus between obesity and renal disease is multifaceted. The renal consequences are mediated through both direct and indirect mechanisms. Hemodynamically, obesity induces glomerular hyperfiltration and renal plasma flow elevation, leading to increased glomerular capillary wall tension and subsequent glomerulomegaly, a hallmark of obesity-related glomerulopathy (ORG)[5]. Metabolic derangements, including insulin resistance and activation of the renin-angiotensin-aldosterone system (RAAS), further propagate hypertension and sodium retention, creating a vicious cycle of renal injury[6]. Additionally, adipose tissue, particularly visceral fat, acts as an endocrine organ secreting adipokines such as leptin and adiponectin, and pro-inflammatory cytokines like interleukin-6 and tumor necrosis factor-alpha. This creates a state of chronic low-grade inflammation and oxidative stress, which contributes to endothelial dysfunction, podocyte

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injury, and eventual fibrosis of renal tissue[7,8]. These interconnected pathways ultimately manifest as albuminuria, declining glomerular filtration rate (GFR), and heightened risk of end-stage renal disease (ESRD). The clinical spectrum of obesity-associated renal disease is broad. ORG is a distinct entity characterized by focal segmental glomerulosclerosis (FSGS) or glomerulomegaly in the absence of other primary renal pathologies[9]. More commonly, obesity acts synergistically with its frequent comorbidities-hypertension and type 2 diabetes mellitus-to accelerate the course of hypertensive nephrosclerosis and diabetic kidney disease (DKD)[10]. Early detection is challenging, as renal impairment in obese individuals often remains asymptomatic until advanced stages, underscoring the critical need for proactive screening using parameters like estimated GFR (eGFR) and urine albumin-creatinine ratio (UACR)[11].

In Bangladesh, the rising tide of obesity presents a looming public health challenge. Recent national surveys indicate an alarming increase in the prevalence of overweight and obesity, particularly among adults in urban and semi-urban areas[12]. Concurrently, CKD is emerging as a significant cause of morbidity and mortality[13]. However, there is a paucity of localized clinical data delineating the specific impact of obesity on kidney health within the Bangladeshi population, especially in tertiary care settings, which manage complex cases. Most existing studies are from Western populations, and their findings may not be fully generalizable due to ethnic, genetic, and lifestyle differences. Therefore, this study was conceived to address this knowledge gap. The primary aim was to assess the spectrum, frequency, and pattern of renal diseases associated with obesity among patients presenting to a tertiary care hospital in Bangladesh. By elucidating the local clinical profile, this research seeks to inform clinical practice guidelines, emphasize preventive strategies, and contribute to the growing body of literature on the cardiorenal metabolic syndrome in South Asia.

Materials and Methods

Study design: A prospective cross-sectional study was conducted at the Department of Nephrology and Medicine, Eastern Medical College and Hospital, Cumilla, Bangladesh, from July 2023 to June 2024. The study population comprised adult patients (≥18 years) attending the outpatient and inpatient departments who were identified as obese.

Inclusion criteria: Participants were included if they had a body mass index (BMI) of 30 kg/m² or higher, calculated from measured weight and height. Willingness to provide informed written consent was mandatory for enrollment.

Exclusion criteria: Individuals with a known history of primary glomerular diseases (e.g., IgA nephropathy), congenital renal anomalies, active urinary tract infection, pregnancy, or those with a history of prior renal replacement therapy were excluded from the study.

Study procedure and data collection: After obtaining consent, detailed history, clinical examination, and anthropometric measurements were recorded. Blood samples were collected for serum creatinine, fasting blood sugar, and lipid profile. A spot urine sample was analyzed for albumin-creatinine ratio (UACR). Renal ultrasonography was performed for all participants, and the estimated glomerular filtration rate (eGFR) was calculated using the CKD-EPI 2021 equation.

Data analysis: All collected data were entered into and analyzed using the Statistical Package for the Social Sciences (SPSS), version 23.0. Descriptive statistics were presented as mean ± standard deviation for continuous variables and frequency (percentage) for categorical variables. Associations between categorical variables were evaluated using the Chi-square test, with a p-value < 0.05 considered statistically significant.

Results

The study comprised 53 obese participants with a mean age of 48.9 ± 10.4 years. A slight male predominance was observed (54.7%, n=29). The anthropometric and baseline clinical characteristics revealed a mean BMI of 33.8 ± 3.1 kg/m². Hypertension was the most prevalent comorbidity, affecting 62.3% of the cohort, followed by type 2 diabetes mellitus (41.5%) and dyslipidemia (39.6%) (Figure-1,2,3).

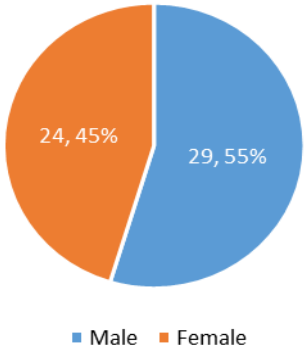

Figure-1: Gender-wise distribution of study participants (n=53)

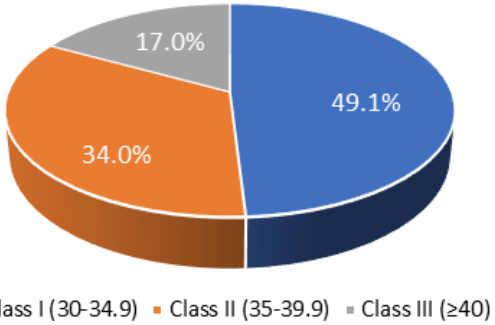

Figure-2: Obesity class distribution (n=53)

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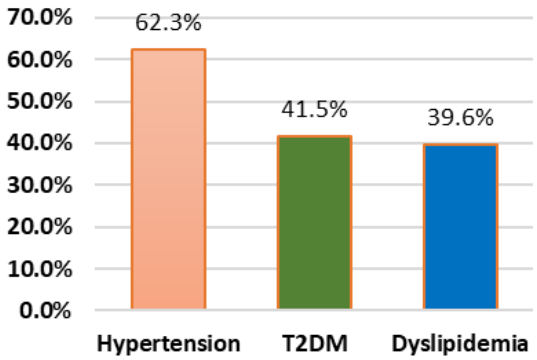

Figure-3: Comorbidities distribution (n=53)

A significant proportion of participants were already on antihypertensive (58.5%) and antidiabetic (37.7%) medications. Renal functional assessment showed a significant burden of impairment. The mean eGFR was 78.4 ± 22.6 mL/min/1.73m². Overall, 43.4% of participants had an eGFR below 90 mL/min/1.73m², with 15.1% classified as having CKD stage 3a (eGFR 45-59) and 9.4% in stage 3b (eGFR 30-44). Albuminuria was highly prevalent, present in 58.5% of the study population. Of these, 30.2% had microalbuminuria and 28.3% had macroalbuminuria (Table-I). In Table-II the spectrum of diagnosed renal conditions was dominated by obesity-related glomerulopathy, identified in 26.4% of patients. Hypertensive nephrosclerosis and diabetic kidney disease were present in 22.6% and 20.8% of participants, respectively. A notable 18.9% of patients exhibited features of combined hypertensive and diabetic renal disease. Other conditions, including nephrolithiasis and simple renal cysts, accounted for the remaining cases. The analysis showed statistically significant associations.

Table-I: Distribution of renal function parameters (n=53)

Parameter	Value
	Mean ± SD
Serum creatinine (mg/dL)	1.2 ± 0.4
eGFR (mL/min/1.73m²)	78.4 ± 22.6
eGFR Category	**n (%)**
≥90 (Normal/High)	30 (56.6%)
60-89 (Mild reduction)	15 (28.3%)
45-59 (CKD Stage 3a)	8 (15.1%)
30-44 (CKD Stage 3b)	5 (9.4%)
Albuminuria Status	**n (%)**
Normoalbuminuric	22 (41.5%)
Microalbuminuria	16 (30.2%)
Macroalbuminuria	15 (28.3%)

Table-II: Spectrum of diagnosed renal conditions (n=53)

Renal diagnosis	n (%)
Obesity-related glomerulopathy	14 (26.4%)
Hypertensive nephrosclerosis	12 (22.6%)
Diabetic kidney disease	11 (20.8%)
Combined hypertensive & DD	10 (18.9%)
Nephrolithiasis	3 (5.7%)
Simple renal cyst	3 (5.7%)

DD: Diabetic disease, some patients had more than one concurrent diagnosis

Table-III: Association of albuminuria with obesity class (n=53)

Obesity class	Normoalbuminuria n (%)	Albuminuria (Micro+Macro) n (%)	p-value
Class I (n=26)	16 (61.5%)	10 (38.5%)	0.007
Class II (n=18)	5 (27.8%)	13 (72.2%)	
Class III (n=9)	1 (11.1%)	8 (88.9%)	

p-value obtained from Chi-square test

Ultrasonographic findings indicated that 32.1% of participants had increased renal echogenicity, a marker of parenchymal disease. Renal length was within the normal range for the majority, though 13.2% showed unilateral or bilateral reduced renal size, suggesting chronic parenchymal loss (Table-V).

The prevalence of albuminuria showed a strong positive correlation with increasing BMI categories, rising from 38.5% in Class I obesity to 84.6% in Class III obesity. The trend showed statistical significance. Furthermore, participants with both hypertension and diabetes had a significantly higher prevalence of reduced eGFR (<60 mL/min/1.73m²) compared to those with either condition alone or neither. The presence of metabolic syndrome, defined using modified NCEP ATP III criteria, was also significantly associated with a lower mean eGFR (Table-III, IV).

Table-IV: Association of comorbidities with reduced eGFR (<60 mL/min/1.73m²) (n=53)

Comorbidity group	eGFR ≥60 n (%)	eGFR <60 n (%)	p-value
HTN & DM both (n=15)	8 (53.3%)	7 (46.7%)	0.032
HTN or DM only (n=25)	21 (84.0%)	4 (16.0%)	
Neither HTN nor DM (n=13)	11 (84.6%)	2 (15.4%)	

p-value obtained from Chi-square test

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Table-V: Renal ultrasonography findings

Ultrasonographic Finding of kidney	n (%)
Increased renal echogenicity	17 (32.1%)
Normal size of both kidney	46 (86.8%)
Reduced size (Unilateral/ Bilateral)	7 (13.2%)
Nephrolithiasis	3 (5.7%)
Simple cortical cyst	3 (5.7%)

Discussion

This prospective cross-sectional study, conducted in a Bangladeshi tertiary care hospital, reveals a substantial burden of renal dysfunction among obese individuals, aligning with the global narrative of obesity as a critical nephrotoxic risk factor. The finding that 43.4% of participants had an eGFR below 90 mL/min/1.73m² and 58.5% exhibited albuminuria underscores the silent yet pervasive nature of early kidney disease in this population. These figures are notably higher than those reported in some community-based studies of general obese populations, likely reflecting the referral bias inherent to a tertiary care setting where patients present with more advanced or symptomatic disease[14]. The high prevalence of comorbidities, particularly hypertension (62.3%) and diabetes (41.5%), creates a synergistic milieu for renal injury, accelerating the progression from obesity-related metabolic derangements to overt kidney damage[6,10].

The spectrum of renal diagnoses highlights the direct and indirect pathways of injury. Obesity-related glomerulopathy (ORG) was the most frequently identified specific condition (26.4%), consistent with its pathognomonic link to severe obesity through mechanisms of glomerular hyperfiltration and hypertrophy[5,9]. However, the considerable proportions of hypertensive nephrosclerosis (22.6%) and diabetic kidney disease (20.8%) emphasize that in clinical practice, obesity often exacerbates traditional risk factors. This supports the concept of obesity as a central driver of the cardiorenal metabolic syndrome, where intertwined pathologies culminate in end-organ damage[15]. The 18.9% with features of combined hypertensive and diabetic renal disease represent a particularly high-risk subgroup requiring aggressive multifactorial intervention. A key finding of this study is the significant association between the severity of obesity and the prevalence of albuminuria. The rise from 38.5% in Class I to 88.9% in Class III obesity (p=0.007) provides strong clinical evidence of a dose-response relationship. This correlation reinforces the hemodynamic and inflammatory theories of obesity-induced renal disease, where greater adiposity amplifies RAAS activation, glomerular capillary pressure, and systemic inflammation[7,16].

Furthermore, the significantly higher prevalence of reduced eGFR (<60 mL/min/1.73m²) in patients with both hypertension and diabetes (46.7%) compared to those with either condition alone or neither (p=0.032) illustrates the compounding detrimental effect of these comorbidities, a phenomenon well-documented in other cohorts[17]. The ultrasonographic finding of increased renal echogenicity in 32.1% of participants serves as a structural correlation to the functional impairment observed. This sign, indicative of underlying parenchymal fibrosis or sclerosis, validates the clinical and laboratory assessments and confirms that the observed abnormalities are not merely functional but represent structural renal damage[18]. Our findings carry important implications for the Bangladeshi healthcare context. The alarming rates of renal impairment in a relatively young cohort (mean age 48.9 years) forecast a potential future surge in CKD burden, which the resource-constrained health system is ill-prepared to handle[13,19]. This study strongly advocates for the integration of routine renal screening-using eGFR and UACR-into the standard evaluation of all obese patients, particularly those with Class II/III obesity or additional cardiometabolic risk factors[11,20]. While this study provides valuable local insights, certain limitations must be acknowledged.

Limitations

The purposive sampling from a single tertiary center limits generalizability to the broader community-based obese population. The cross-sectional design establishes associations but cannot infer causality. The sample size, though adequate for an initial assessment, may limit the power for more complex multivariate analyses.

Conclusion

This study demonstrates a high burden of renal dysfunction, including reduced eGFR and albuminuria, among obese individuals in Bangladesh, with severity linked to higher BMI and comorbidities. Obesity must be recognized as a primary renal risk factor. Implementing routine renal screening in obese patients and promoting public health strategies for weight management are imperative to curb the rising epidemic of obesity-related kidney disease.

Recommendation

Future longitudinal studies with larger, population-based cohorts are needed to establish causality and progression rates. We also recommend integrating routine renal screening (eGFR and UACR) into the clinical evaluation of all obese patients in Bangladesh. Public health initiatives should prioritize weight management and education on obesity-related renal risks to mitigate future CKD burden.

Conflict of Interest

The authors declared that they have no conflicts of interest.

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