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ASSESSMENT OF THE CLINICAL PRESENTATION AND PREVALENCE OF DIABETIC NEPHROPATHY WITH AND WITHOUT HYPERTENSION: A CROSS-SECTIONAL STUDY

General Medicine

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ABSTRACT

Diabetic nephropathy (DN), a major microvascular complication of Type 2 Diabetes Mellitus (T2DM), is one of the leading causes of chronic kidney disease and end-stage renal disease worldwide, with hypertension acting as an important factor accelerating renal damage. This hospital-based cross-sectional study aimed to assess the clinical presentation and prevalence of diabetic nephropathy among T2DM patients with and without hypertension. A total of 130 patients with T2DM were included and categorized into Group A (T2DM with hypertension, n=82) and Group B (T2DM without hypertension, n=48). Diabetic nephropathy was diagnosed based on persistent albuminuria using urinary albumin-to-creatinine ratio (UACR ≥30 mg/g). Clinical, glycemic, and renal parameters were compared using Student's t-test and chi-square test. The overall prevalence of diabetic nephropathy was 49.23%. DN was significantly more prevalent among hypertensive diabetic patients (64.63%) compared to normotensive diabetic patients (22.91%) (χ^2=22.68, p<0.0001). Hypertensive patients demonstrated significantly higher fasting blood glucose (FBG), postprandial blood glucose (PPBG), glycated hemoglobin (HbA1c), serum creatinine, blood urea, and UACR levels, along with significantly lower estimated glomerular filtration rate (eGFR) values (p<0.05). The findings indicate that hypertension significantly increases both the prevalence and severity of diabetic nephropathy in patients with T2DM. Early screening and aggressive management of blood pressure and glycemic status are essential to delay renal disease progression and reduce diabetic complications.

KEYWORDS

Diabetic Nephropathy, Type 2 Diabetes Mellitus, Hypertension, Albuminuria, Uacr, Egfr

INTRODUCTION

Diabetic nephropathy (DN) is one of the most serious and common microvascular complications of Type 2 Diabetes Mellitus (T2DM) and represents a major cause of chronic kidney disease (CKD) and end-stage renal disease (ESRD) worldwide. The global burden of diabetes continues to rise, with T2DM accounting for nearly 90–95% of all diabetes cases, thereby substantially increasing the population at risk for diabetic kidney disease [1,6]. According to the International Diabetes Federation, the number of adults living with diabetes is projected to increase dramatically in the coming decades, amplifying the public health impact of its renal complications [6].

Diabetic nephropathy is clinically characterized by persistent albuminuria (≥30 mg/g creatinine), progressive decline in glomerular filtration rate (GFR), and increased cardiovascular morbidity and mortality [2]. Microalbuminuria is often the earliest detectable marker of renal involvement and serves as a predictor of both renal and cardiovascular outcomes [4]. The natural history of DN typically involves progression from normoalbuminuria to microalbuminuria, overt proteinuria, declining GFR, and eventually ESRD if left untreated.

Hypertension is highly prevalent among patients with T2DM and is both a contributing factor to and a consequence of diabetic kidney disease. Elevated systemic blood pressure increases intraglomerular pressure, leading to endothelial dysfunction, mesangial expansion, and glomerulosclerosis. The coexistence of chronic hyperglycemia and hypertension exerts a synergistic deleterious effect on renal microvasculature, accelerating the onset and progression of nephropathy [3,5]. Evidence from the UK Prospective Diabetes Study (UKPDS) demonstrated that tight blood pressure control significantly reduces the risk of microvascular complications, including diabetic nephropathy, in patients with T2DM [3].

Current clinical practice guidelines from the American Diabetes Association and the Kidney Disease: Improving Global Outcomes emphasize routine annual screening for albuminuria and aggressive management of both glycemia and blood pressure to delay renal progression [1,2]. Despite these recommendations, a substantial proportion of patients remain inadequately controlled, particularly in resource-limited settings, leading to preventable renal morbidity.

Although the association between hypertension and diabetic nephropathy is well established, comparative evaluation of clinical presentation, glycemic profile, and renal function parameters among hypertensive and normotensive T2DM patients remains important for risk stratification and early intervention. Therefore, the present study aims to assess the prevalence and clinical characteristics of diabetic nephropathy in T2DM patients with and without hypertension.

MATERIALS AND METHODS

This hospital-based cross-sectional observational study was conducted at a tertiary care center among 130 patients with Type 2 Diabetes Mellitus (T2DM). Patients were divided into Group A (T2DM with hypertension, n=82) and Group B (T2DM without hypertension, n=48). Patients with more than 2 year duration of T2DM who provided informed consent were included, while those with Type 1 diabetes mellitus, non-diabetic chronic kidney disease, acute infections, or severe systemic illness were excluded.

Diabetic nephropathy was diagnosed based on persistent albuminuria with urinary albumin-to-creatinine ratio (UACR) ≥30 mg/g creatinine. Hypertension was defined as previously diagnosed hypertension or blood pressure ≥140/90 mmHg on two separate occasions.

Clinical and biochemical parameters including fasting blood glucose (FBG), post-prandial blood glucose (PPBG), HbA1c, serum creatinine, blood urea, estimated glomerular filtration rate (eGFR), and UACR, were assessed.

Data were analyzed using appropriate statistical software. Continuous variables were expressed as mean ± SD and compared using Student's t-test, while categorical variables were analyzed using chi-square test. A p-value <0.05 was considered statistically significant.

RESULTS

1. Prevalence of Diabetic Nephropathy

Out of 130 T2DM patients, 82 (63%) were hypertensive and 48 (37%) were normotensive. Diabetic nephropathy was observed in 64 patients (49.23%) (Table 1).

Table 1. Prevalence of Diabetic Nephropathy in T2DM patients with and without hypertension

Group	Total	DN Cases	Prevalence (%)
T2DM with Hypertension	82	53	64.63%

T2DM without Hypertension	48	11	22.91%
Total	130	64	49.23%

The difference was highly significant (χ^2=22.68, p<0.0001).

2. Glycemic Parameters

Hypertensive T2DM patients had significantly higher glycemic levels (Table 2).

Table 2. Glycemic Parameters in T2DM patients with and without hypertension

Parameter	With HTN	Without HTN	p value
FBG (mg/dL)	162.8 ± 38.6	148.4 ± 34.9	0.032
PPBG (mg/dL)	248.2 ± 62.3	227.6 ± 58.7	0.047
HbA1c (%)	8.44 ± 1.18	7.92 ± 1.06	0.013

3. Kidney Function Parameters

Hypertensive patients demonstrated significantly worse renal function (Table 3)

Table 3: Kidney Function Parameters in T2DM patients with and without hypertension

Parameter	With HTN	Without HTN	p value
Serum Creatinine (mg/dL)	1.24 ± 0.38	1.02 ± 0.31	0.0015
Blood Urea (mg/dL)	31.6 ± 10.8	26.4 ± 9.2	0.007
eGFR (mL/min/1.73m²)	71.6 ± 18.5	87.6 ± 13.3	<0.001
UACR (mg/g)	142.8 ± 41.5	68.4 ± 26.9	<0.001

UACR Distribution

Microalbuminuria was significantly more common in hypertensive patients (χ^2=21.20, p=0.000025).

5. Age, Sex and Duration

No statistically significant differences were observed in mean age (p=0.76), sex distribution (p=0.698), or duration of diabetes (p=0.269) between the groups.

DISCUSSION

The present study demonstrated that hypertension significantly increases the prevalence and severity of diabetic nephropathy in T2DM patients. The prevalence of DN among hypertensive patients (64.63%) was nearly three times that in normotensive patients (22.91%). The findings align with established pathophysiological mechanisms where elevated systemic blood pressure increases intraglomerular pressure, promoting proteinuria and progressive nephron damage. Additionally, hypertensive patients in this study had poorer glycemic control, further amplifying renal injury. Previous studies have demonstrated that hypertension increases intraglomerular pressure and enhances protein leakage, thereby accelerating nephron damage [7,8]. The approximately threefold increased risk observed in the present study is in agreement with earlier epidemiological findings [9].

Reduced eGFR and elevated UACR in hypertensive patients reflect early renal impairment. These findings are in concordance with previous studies showing that hypertension contributes to faster decline in GFR and increased albuminuria in diabetic patients [7,9]. The strong association between hypertension and microalbuminuria highlights the importance of routine UACR screening in T2DM patients. Early identification and combined management of hyperglycemia and hypertension can substantially reduce progression to advanced diabetic kidney disease.

CONCLUSION

Hypertension is strongly associated with increased prevalence and severity of diabetic nephropathy in T2DM patients. Integrated management focusing on blood pressure control and optimal glycemic control is crucial in preventing renal complications.

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