Original Article

Prevalence of Chronic Kidney Disease in Patients with Diabetes and Hypertension: A Cross-Sectional Study

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ABSTRACT

Background: Chronic kidney disease (CKD) arises from a GFR lesser than 60 ml/min/1.73 m². Diabetes and hypertension together put an individual at significant risk of CKD. The early detection of CKD is a primary preventive measure for kidney disease and its future complications. Hence, creating an awareness campaign and providing sustainable means for early detection of kidney disease are significant hits on the public health agenda. The study aimed to determine CKD prevalence in patients with Diabetes Mellitus and hypertension.

Methods: The multi-centric study was conducted from October 2023 to August 2024. The cross-sectional study covered 322 patients selected through convenience sampling. A health camp was established at the hospital site to facilitate the smooth handling of data collection. Patients with an age of >40 years with diagnosed cases of diabetes mellitus and/or hypertension, CKD, and with GFR report were recruited into the study. Variables were analyzed and processed through SPSS software version 22.0. Data entry and analysis were performed using SPSS software version 22.0. A p-value of <0.05 is considered statistically significant.

Results: The mean age of the participants was 62.10±11.57. Of them, 265 (58.0%) were males, and 192 (42.0%) were females. The prevalence of CKD among patients with diabetes mellitus was noted to be standing at 31.94%, whereas it was reported at 55.79% for hypertension.

Conclusion: Our study demonstrates a substantial prevalence of CKD among patients with diabetes and hypertension, with many of them having moderate-to-severe renal dysfunction.

Keywords: Chronic kidney disease, Diabetes mellitus, Hypertension, Prevalence.

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INTRODUCTION

Chronic Kidney Disease (CKD) is a progressive disease leading to end-stage renal disease (ESRD), which requires either dialysis or kidney transplantation[1]. It is further categorized by glomerular filtration rate of less than 60 ml/min/1.73m² or the existence of any other biological markers of kidney damage, including albuminuria[2]. Among the many risk factors for CKD, diabetes mellitus and hypertension are two of the most common and established contributors[3-4]. The burden of CKD is expected to continue to rise globally due to the increasing prevalence of diabetes, the leading cause of CKD worldwide1, with 1 in 3 diabetic and 1 in 5 hypertensive individuals in high-income countries diagnosed with CKD. Hence, working with the management of diabetes and cardiovascular disease, as they already have contributed to the burden of developing CKD[5].

This growing prevalence will have the most impact in Asia[6], where 60% of the world's population, or >4.5 billion, reside. According to some studies, the prevalence of diabetes in South Asia is projected to increase from approximately 400 million to 600 million by 2035, with the majority of this rise occurring in low- to middle-income countries[7]. It is also observed that two of the most populated countries of South Asia, i.e. China and India, will hold the most people with diabetes by the year 2035 (251.7 million in number)[1]. These statistics suggest an increasingly heavy burden of CKD in Asia. Still, data about the prevalence of CKD currently across this continent to more

meaningfully inform projections into the future have been sparse. At the same time, Asian kidney registries have largely limited systematic data collecting for patients who need kidney replacement therapy due to kidney failure[8]. The prevalence of CKD in the Asia-Pacific region ranges from 4.7% to 17.4%, with the highest disease burden observed in China and India[9]. Crude prevalence of chronic kidney disease among hypertensive adults three times compared to non-hypertensive adults (24.4% vs. 7.5%)[10].

Diabetic nephropathy is a common microvascular complication. Prolonged hyperglycemia in diabetic patients leads to glomerular hyperfiltration, increased renal workload, and subsequent damage to the nephrons[11]. The persistent elevation of blood glucose levels results in the glycation of proteins, oxidative stress, and activation of inflammatory pathways, all of which contribute to renal dysfunction. The early stages of diabetic nephropathy often go unnoticed due to the asymptomatic nature of mild kidney impairment. However, as the disease advances, patients experience worsening kidney function, which ultimately leads to ESRD if appropriate interventions are not implemented.

Epidemiological studies indicate that approximately 40% of individuals with diabetes develop CKD[12]. Research has also shown that hypertensive nephropathy is a major contributor to CKD, with studies estimating that 80% of CKD cases with hypertension[3]. The coexistence of hypertension and diabetes further amplifies the risk, as these conditions interact synergistically to accelerate kidney damage. Moreover, CKD itself can lead to secondary hypertension due to fluid retention and RAAS activation, creating a vicious cycle of progressive renal impairment and worsening blood pressure control.

The co-occurrence of diabetes and hypertension is significantly associated with CKD and an increased risk. Epidemiological studies have established a very high prevalence of CKD among diabetic patients. The situation is most severe in low- and middle-income countries, where patients have limited access to health facilities, delayed diagnosis, and inadequate treatment interventions. Public health efforts must now shift to increasing awareness and developing sustainable solutions for the early detection of kidney disease. The present study aims to determine the prevalence of chronic kidney disease among patients with diabetes mellitus and hypertension.

METHODOLOGY

Study Setting and Design

This cross-sectional study was conducted from October 2023 to August 2024 at Tehsil Headquarters Hospital, Waris Hospital, Habib Hospital, Zia Fatima Hospital, and Tarar Hospital in Rahim Yar Khan, Punjab, Pakistan. The study was conducted in secondary and tertiary care hospitals with specialized nephrology departments.

Sample Size

A sample of 322 participants visiting the nephrology departments of selected hospitals was calculated, keeping the population of 100,000 with the anticipated frequency of 29.9% reported in a study conducted in 2023, 95% Confidence Interval and power of test of 80%. The sample was increased to 457 for more generalizability.

Selection Criteria

Patients aged > 40 years with diagnosed cases of diabetes mellitus and/or hypertension, CKD, along with GFR report, were recruited in the study.

Those participants with known ESRD on dialysis, with acute kidney injury, or those with incomplete responses on the proforma were excluded from the study.

Study Protocol

Data was collected in secondary and tertiary care hospitals with specialized nephrology departments. The health camp was set up on the premises of the nephrology department. The research adhered strictly to the principles of the STROBE initiative, ensuring transparency and complete coverage of the investigation methodology.

Permissions were obtained from hospital administrations, and a team of trained healthcare professionals facilitated the process. Patients who presented to the nephrology department during the study period were recruited, and those fulfilling

the inclusion criteria were taken with informed consent. A structured proforma in English and Urdu was used to gather demographic details, medical history, and severity of GFR. All the proforma filled were checked for accuracy before manually entering the data into an Excel sheet and analyzing it with SPSS version 22.0. Participants were given educational material on the prevention of CKD and lifestyle modification.

Ethical Considerations

The institutional review committee of the Tehsil Headquarters Hospital, Rahim Yar Khan approved the study. Informed consent was taken from all participants before data collection, ensuring confidentiality and anonymity.

Data Analysis

The data were processed and analyzed by using SPSS software version 22.0. Categorical variables are reported in tabular form along with descriptive statistics. Continuous variables, such as age, were represented as a mean. CKD prevalence was determined in diabetics and hypertensives. Associations between groups were found by performing a chi-square test and determining the statistically significant difference at <0.05.

RESULTS

The mean age of the participants was 62.10±11.57, out of which 265 (58.0%) were males and 192 (42.0%) were females. The overall prevalence of chronic kidney disease was 67.83%, whereas the prevalence of diabetes mellitus and hypertension was 47.92% and 84.02%, respectively, as shown in Table-1.

Table-1 Prevalence of CKD, Diabetes Mellitus and Hypertension

Variables	No. of Participants *(n)*	Prevalence *(%)*	Chi-square	p-value
CKD	310	67.83	58.138	0.000
Diabetes	219	31.94%.	0.790	0.374
Hypertension	384	84.02%	211.643	0.000

The prevalence of CKD among patients with diabetes mellitus was found to be 31.94%, whereas for hypertension, it was reported to be 55.79%.

Table-2 presents the prevalence of kidney function among the study participants based on glomerular filtration rate (GFR) categories. The findings indicate that 147 participants (32.2%) had normal kidney function (GFR >90), while 36 individuals (7.9%) exhibited mildly reduced kidney function (GFR 60–89). A substantial proportion of participants, 146 (31.9%), were classified as having moderately reduced kidney function (GFR 30–59), whereas 128 participants (28.0%) had severely reduced kidney function (GFR 15–29).

Table-2 Severity of Kidney Function on GFR

Kidney Function *(GFR)*	No. of Participants *(n)*	Percentage *(%)*
Normal *(>90)*	147	32.2%
Mildly reduced *(60-89)*	36	7.9%
Moderately reduced *(30-59)*	146	31.9%
Severely reduced *(15-29)*	128	28.0%

DISCUSSION

Our findings revealed an overall CKD prevalence of 67.83%, with a substantial proportion of participants exhibiting varying degrees of kidney dysfunction based on GFR classification. Among patients with diabetes mellitus, the prevalence of CKD was found to be 31.94%. This prevalence was significantly higher among hypertensive patients, reaching 55.79%. These findings underscore the substantial burden of CKD in individuals with these coexisting conditions.

Our reported prevalence rates in the study corroborate published literature and show a strong association among three conditions. CKD, DM, and hypertension. The International Diabetes

Federation states that approximately 40% of type-2 diabetes mellitus patients are possibly developing CKD. In contrast, CKD prevalence rates of 38.4% and 64.5% in hypertensive patients were reported in two studies conducted in Malaysia and India, respectively. Differences in sample demographics, healthcare access, or diagnostic criteria variations could account for our study's slightly higher prevalence. The mean age of participants in our study was 62.10±11.57 years, which indicates that older persons are at greater risk for CKD. This finding corresponds with the observations made by Chen et al.[16] of higher CKD prevalence in those above 60 years of age. Declining renal function due to ageing and prolonged exposure to metabolic risk factors might explain this.

Regarding the distribution of kidney function, our study indicated that 32.2% of participants had normal kidney function, while 7.9% had mildly reduced kidney function. On the contrary, most patients had moderate (31.9%) to severe (28.0%) impairments in kidney function. This finding agrees with Bello et al.[17], which stated that 60% of patients with CKD had moderate-to-severe renal dysfunction. The high proportion of severely affected cases in our study could be because of a delayed diagnosis and poor routine screening practices in high-risk populations[18-19]. The prevalence of HTN was relatively high among our study population, at 84.02%, which reinforces the notion that hypertension is the principal risk factor for the advancement of CKD. This also supports other studies[20], which have shown that uncontrolled HTN accelerates the decline in kidney function, warranting early intervention. There were some limitations despite these findings. Due to its cross-sectional design, a causal relationship between CKD, DM, and HTN cannot be established. The study was conducted within a specific geographical region, and the results cannot be generalized to broader populations. Longitudinal designs should be incorporated in future studies to enable observation of disease progression and possible preventive strategies.

Given the wide prevalence of CKD among patients with DM and HTN, routine screening and early intervention programs should be encouraged to retard disease progression. Lifestyle modifications, strict control of blood pressure and glycemic levels, and raising public awareness would help reduce the burden of CKD in risk groups.

CONCLUSION

A high occurrence of CKD among patients with diabetes and hypertension, with a considerable proportion presenting with moderate-to-severe renal dysfunction, was revealed in our study. The results provide more opportunities to heighten awareness of early detection and intervention measures against CKD progression to improve patient outcomes ultimately.

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None.

Author Contributions
Kashmala Ijaz was responsible for conceptualization, study design, and manuscript drafting. **Rabia Bilal** handled data collection and analysis, while **Talha Rauf** contributed to methodology and statistical analysis. **Muhammad Adnan Yasin** conducted the literature review and assisted in manuscript editing. **Farhan Rasheed** played a key role in data interpretation and critical revision. **Sharjeel Ashraf** provided supervision and gave final approval for the manuscript.

Ethical Approval
This study received approval from the Institutional Review Board (Ref No: THQ-HOSP/IRB/2023-035) of Tehsil Headquarters Hospital, Rahim Yar Khan, Punjab, Pakistan.

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None.

Conflict of Interests
None.

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