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RESEARCH ARTICLE

PREVALENCE OF DIABETES AND HYPERTENSION IN PATIENTS WITH CHRONIC KIDNEY DISEASE AT A TERTIARY CARE HOSPITAL

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ABSTRACT

Background: Chronic Kidney Disease (CKD) represents a significant global health challenge, with diabetes mellitus and hypertension emerging as prevalent comorbidities contributing to its progression and complications. Understanding the prevalence of diabetes and hypertension among CKD patients is crucial for informing effective management strategies and improving patient outcomes. **Methods:** A convenience sampling study was conducted on 218 CKD patients, focusing on their clinical characteristics and co-morbidities. The diagnosis of CKD is made by laboratory testing, most often by estimating glomerular filtration rate (GFR) from a filtration marker, such as serum creatinine, using various formulas. **Results:** The majority of patients were male, comprising 129 (59.2%) of the total. The most prevalent age was around 40 years. The number of diabetics was found to be 122 (55.96%), and that of hypertensives was found to be 181 (83.03%). The combined number of diabetics and hypertensives was 303 (45.87%). **Conclusion:** This study highlights the urgent need for proactive measures aimed at early detection through screening tools, risk assessment, and targeted interventions to mitigate disease progression and improve patient outcomes. Thereby reducing the burden of these comorbidities and enhancing the quality of life for individuals living with CKD.

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INTRODUCTION

Chronic kidney disease (CKD) is defined as a gradual loss of kidney function lasting for more than 3 months, characterized by structural or functional abnormalities of the kidney. CKD affects >10% of the general population worldwide, amounting to >800 million individuals. Clinically, CKD is defined based on the "chronicity criterion" i.e., low eGFR or elevated urine albumin for at least 90 days, which demands the need for repeated measurements over time. The Global Burden of Disease (GBD) studies have shown that CKD has developed as a leading cause of mortality worldwide[1]. Over half of the patients living with CKD present to the health care facilities in the advanced stages, where the eGFR is <15 mL/min /1.73 m2. This indicates a need for improved screening programs for all those at risk of acquiring CKD[2]. Diabetes and hypertension are recognized as primary etiological factors contributing not only to the development but also to the progression of CKD[3]. Both of these co-morbidities create a vital challenge in the management of patients with CKD. This demands a proper understanding of the prevalence of these co-morbidities to include them as a factor for screening in CKD.

The prevalence of diabetes among CKD patients is notably higher compared to the general population, with estimates suggesting that diabetes is the leading cause of CKD globally[4]. Similarly, hypertension, both as a cause and consequence of CKD, is highly prevalent among individuals with impaired kidney function. The coexistence of these conditions complicates the clinical management of CKD, exacerbating the risk of cardiovascular events, renal deterioration, and overall morbidity and mortality rates[5]. Despite advancements in medical care and therapeutic interventions, the burden of diabetes and hypertension among CKD patients continues to escalate[6]. Addressing the prevalence of these comorbidities necessitates a multifaceted approach, encompassing early detection, comprehensive risk assessment, and targeted interventions aimed at mitigating disease progression and improving patient outcomes[7]. Hypertension is the major reason why CKD patients present with end-stage renal disease and have high rates of mortality. Cardiovascular disorders are the major cause of mortality in CKD patients; they manifest as dysrhythmias, heart failure, and sudden death[8]. Epidemiologic studies examining CKD in diabetics have found the fact that the diabetic population often experiences other comorbid conditions, such as hypertension, which are themselves

independent risk factors for CKD. The complications and high mortality rates of these non-communicable diseases are more prevalent in rural areas due to inadequate screening and treatment facilities[9]. CKD was not significantly associated with diabetes or hypertension, suggesting the possibility of an alternative cause. The present study seeks to provide an overview of the prevalence of diabetes and hypertension among CKD patients, with the basis on existing literature and epidemiological data. This research aims to notify healthcare practitioners, policymakers, and stakeholders about the critical need for dedicated efforts in the prevention, management, and treatment of CKD patients with diabetes and hypertension. Increasing the sample size enhances the generalizability of findings, while well-defined inclusion and exclusion criteria maintain consistency in participant selection. In the analysis phase, adjusting for confounders using statistical methods like multivariable regression helps control for potential biases. Multicenter studies on CKD and its trends would enhance the validity, reliability, and generalizability of the present study. By involving multiple locations, these studies increase the sample size and diversity of participants, making the findings more representative of the broader population. This reduces selection bias and strengthens the external validity of the results.

MATERIALS AND METHODS

Before commencing the study, approval was obtained from the Institutional Ethics Committee. Participants' details were gathered from the Medical Records Department, and anthropometric measurements such as height, weight, and waist circumference were also recorded. A comprehensive clinical history was obtained for each patient, and case report sheets were filled accordingly. Patients meeting the criteria for CKD along with diabetes and hypertension were identified, and comparisons were drawn with those who did not meet these criteria. The primary aim of this study was to identify patients with Chronic Kidney Disease (CKD) and classify them based on co-morbidities (like diabetes mellitus and hypertension), utilizing blood sugar, blood pressure, serum sodium, and serum creatinine reports for comprehensive analysis. The study also aimed to stage hypertensive patients and assess the relationship between CKD and hypertension, diabetes, and other associated conditions.

The study followed a hospital-based, cross-sectional design conducted from 3rd October 2023 to 3rd December 2023 at the Institute of Internal Medicine, Rajiv Gandhi Government General Hospital in Chennai. The target population consisted of adult patients admitted during this period, with a sample size of 218 patients selected through convenience sampling, as we did not sample any patient who wasn't admitted to the ward. The inclusion criteria were open to patients of any age, diagnosed with CKD based on the Kidney Disease Outcomes Quality Initiative (KDOQI) Clinical Practice Guidelines, regardless of their medical history, while there was no specific exclusion criterion other than the prevalence of other etiologies for CKD in the population. For the diagnosis of CKD, the study adhered to the Kidney Disease Outcomes Quality Initiative (KDOQI) Clinical Practice Guidelines, which included markers such as albuminuria, urine sediment abnormalities, electrolyte imbalances, structural abnormalities, and a glomerular filtration rate (GFR) of less than 60 mL/min/1.73 m². Hypertension was diagnosed based on the ICMR critera[10], including systolic blood pressure above 140 mm Hg or diastolic blood pressure over 90 mm Hg on two different days. The diagnosis of diabetes was followed by the same study, utilizing parameters like blood sugar levels and HbA1C values. Data entry was done on the Microsoft Excel 2016 software and analysis with IBM SPSS (International Business Machines Corporation - Statistical Package for the Social Sciences) v.26.1 Windows package. Descriptive statistics were used, and continuous variables were expressed as Mean ± SD. Categorical variables were expressed in percentages with a 95% Confidence interval (CI). Chi square test as performed and a p-value of < 0.03 was obtained, which is considered statistically significant. The study aimed to determine the prevalence of hypertension and diabetes among CKD patients, providing valuable data for clinical research. This approach allowed for a thorough understanding of the prevalence and progression of CKD in relation to diabetes and hypertension, contributing to a better clinical understanding of the interactions between these diseases.

RESULTS

The present study successfully identified a total of 218 CKD patients. The participants in this study had an average age (mean ± SD) of 40.1 ± 12.9 years, providing a representative sample of adults suffering from CKD. Among the study participants, 129 were men (comprising 59.2% of the entire sample), while 89 were women (making up 40.8% of the group).

Table 1. Summary of results obtained in the present study

Comorbidity	Prevalence
Diabetes mellitus	122 (56%) ; 95% CI : 48.9 % to 62.1%
Systemic hypertension	181 (83%) ; 95% CI : 78 % to 88%

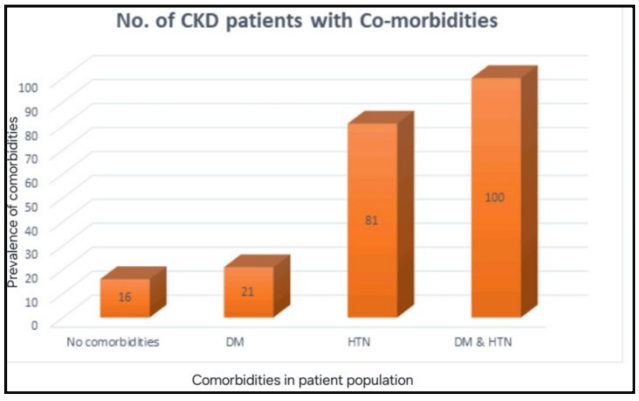

Figure 1. Prevalence of diabetes and hypertension in the patient population

This gender distribution allowed for a balanced assessment of CKD in both male and female patients. Additionally, the study recorded the prevalence of diabetes and hypertension, which is crucial in understanding the relationship between them and CKD, as shown in [Figure 1]. Blood glucose levels (mean ± SD) were found to be 143 ± 61.6 gm/dL in the study population, indicating a significant presence of hyperglycemia among CKD patients. The value ranged from 81.4 gm/dL to 204.6 gm/dL. The mean value of HbA1c was found to be 6.8%. The proportion of diabetic patients in the cohort was also derived from the data and is presented in [Figure 2]. This highlights the importance of diabetes as a common co-

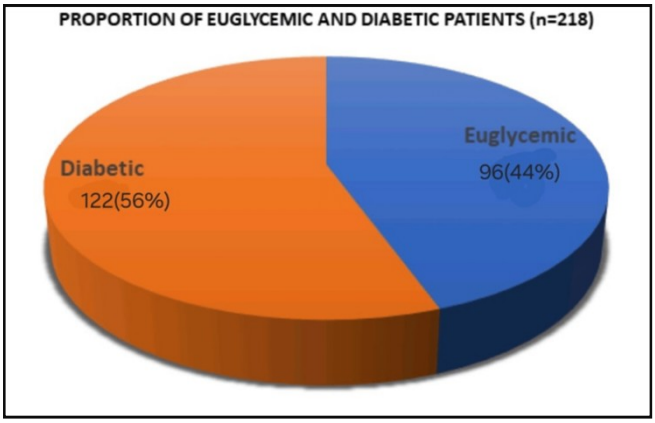

Figure 2. Proportion of euglycemic and diabetic patients

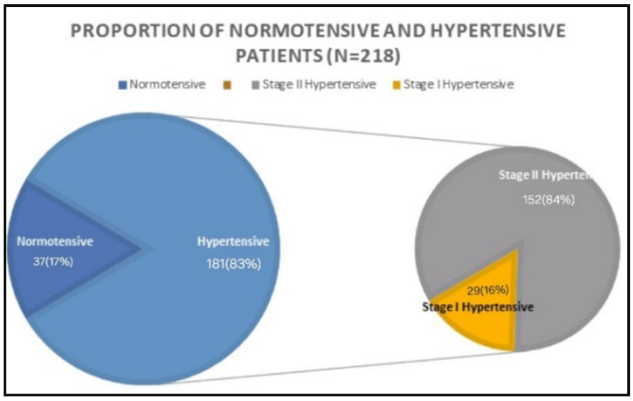

Figure 3. Proportion of hypertensive patients in the study population

morbidity in CKD patients, which can further complicate the management of kidney disease. The study also measured various blood pressure parameters, with the mean systolic blood pressure recorded at 149.9 ± 28 mm Hg and the mean diastolic blood pressure at 84.1 ± 9.6 mm Hg. The value of systolic BP ranges from 121.9 mm Hg to 177.9 mm Hg and diastolic BP ranges from 74.5 mm Hg to 93.7 mm Hg. Serum sodium levels were measured to be 135 ± 5 mEq/dL (mean ± SD), which falls within the expected range but is essential in evaluating the electrolyte balance in these patients. The mean eGFR value was found to be 47.9 mL/min/1.73m², which also indicates defective kidney function. The serum sodium and creatinine data are presented below [Figure 3]. Finally, the data collected throughout the study were systematically summarized for further analysis and discussion, providing valuable insights into the health profiles of CKD patients. A detailed summary of these findings is presented in [Table 1], which serves as a basis for further discussion and interpretation of the study's results. This approach highlights the complex interplay between CKD and diabetes & hypertension, aiding in a better understanding of the condition's overall impact on patients.

DISCUSSION

The prevalence of diabetes and hypertension among CKD patients is high, with both conditions serving as primary etiological factors for CKD development and progression. Effective control of hypertension requires a comprehensive approach, including medication adherence and regular monitoring by reducing risk factors and use of medication[11]. Pharmacological interventions such as angiotensin-converting enzyme (ACE) inhibitors and angiotensin II receptor blockers (ARBs) have proven beneficial in delaying CKD progression by reducing proteinuria and controlling blood pressure. However, non-adherence to antihypertensive therapy remains a major challenge, often due to a lack of awareness, financial constraints, or medication side effects. Additionally, lifestyle modifications such as reducing sodium intake, increasing physical activity, and managing stress play a crucial role in controlling hypertension and improving overall cardiovascular health.

Managing diabetes effectively requires a holistic approach that primarily includes consistent blood sugar monitoring, stress management[12]. Factors such as lifestyle changes, urbanization, unhealthy dietary habits, and sedentary lifestyles contribute significantly to the increasing prevalence rates[13]. Uncontrolled diabetes leads to hyperglycemia-induced oxidative stress and inflammation, which exacerbate kidney damage over time[14]. Intensive glycemic control using insulin therapy or oral hypoglycemic agents, along with a personalized diet plan, is essential to slow disease progression. Furthermore, lifestyle interventions, such as weight management and smoking cessation, have been shown to improve insulin sensitivity and reduce the risk of CKD complications[15]. Implementing evidence-based strategies for prevention, education, and treatment plans is imperative for a better public health[17,18]. There is a compelling need for continued research and innovation to identify novel therapeutic targets, develop personalized treatment strategies, and implement evidence-based interventions to improve the quality of life for individuals living with CKD.

Additionally, multicenter studies help minimize location-specific biases, such as differences in patient characteristics, healthcare practices, or environmental factors, ensuring that the findings are not limited to a single setting. They also improve the statistical power of the study, allowing for more precise estimates and stronger conclusions. Collaboration between multiple centers promotes standardization of protocols, data collection methods, and analysis, reducing variability and improving data quality. It also enables researchers to compare results across different settings, identifying potential regional variations and increasing the study's applicability in diverse populations. Moreover, multicenter studies enhance credibility by involving multiple independent investigators and institutions, which can reduce the risk of bias and improve peer acceptance. They also facilitate resource sharing, allowing access to specialized equipment, expertise, and funding that may not be available at a single center. The present study has some limitations that should be considered. First, the cross-sectional design captures only a snapshot of CKD patients at one point in time, making it difficult to establish causal relationships or understand the progression of CKD and its comorbidities. Additionally, while comorbidities were recorded, the study may not have accounted for all potential confounding factors, such as lifestyle choices or genetic predispositions, which could influence CKD outcomes. Management/Treatment intervention of these patients could have caused deviations in the data. The convenience sampling, short study duration, or regional demographics may limit generalizability. Lastly, the present study does not provide detailed information on treatments or interventions the participants were receiving, which could significantly impact the observed health parameters and CKD

progression. These factors underscore the need for future research to address these gaps in order to better understand the complexities of CKD.

CONCLUSIONS

The study revealed a high prevalence of diabetes and hypertension among CKD patients, both of which are significant contributing factors to the development and progression of chronic kidney disease. This is likely driven by lifestyle changes, urbanization, unhealthy diets, and sedentary habits. Addressing these conditions requires a multifaceted approach, including public health interventions, early detection, effective management strategies, and improved access to affordable healthcare. Such efforts are crucial in curbing the rising incidence of CKD and its associated comorbidities. Changes to policy, clinical workflow, or research design beyond generalities need to be made to effectively screen for CKD. Ongoing research and innovation are essential to discovering new therapeutic targets and personalized treatments, ultimately improving the quality of life for individuals with CKD.

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