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Original Research Article

RISK FACTORS OF CHRONIC KIDNEY DISEASE

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Abstract: *The prospective study was conducted in Tertiary Care Hospitals from June 2022 to June 2023 to evaluate risk factors for CKD in the local population. Six hundred subjects were included in the study who were screened for the risk factors of chronic kidney disease. The participants were screened for CKD using a questionnaire. CKD-EPI equation was used for exploring disease burden. Results showed that CKD subjects were more likely male, older, urban residents, were obese or overweight, and had cardiovascular disease, hypertension, and diabetes compared to those without CKD. In subjects with CKD, the most common risk factors were diabetes(32%), hypertension (65%), and anemia (40%). Sensitivity analysis was done using CKD – EPI equation, and results were compared with the MDRD-3 equation. The prevalence of CKD, according to CKD-EPI, was 16%. Prevalence of CKD stages I, II, III, IV, and V was 9%, 4.5%,4.5%,1%, and 1%, respectively. People were not well aware of the status of their condition. Primary care centers should screen patients with diabetes and hypertension for kidney disease. Early detection can retard progression and improve outcomes.*

Keywords: Chronic Kidney Disease, End Stage Renal Disease, Risk Factors

Introduction

End-stage renal disease (ESRD) is a major public health concern. There is no substantial data on the potential risk factors of ERSD. To obtain a reliable estimate of chronic kidney disease (CKD) risk, it is important to conduct detailed studies on the prevalence of risk factors, including smoking, diabetes, and hypertension, in patients with ESRD (McCullough et al., 2019). In South Asia, the prevalence of CKD is variable in different regions. It has variable causes, and some regions have a high prevalence of obstructive nephropathy and glomerulonephritis that leads to CKD (Abraham et al., 2016). The increasing prevalence of CKD is associated with increased hypertension and diabetes(Ampofo and Boateng, 2020). In Pakistan, its increasing incidence is posing major challenges for healthcare. In Pakistan, more than 100,000 patients enter renal support programs annually, and the end-stage renal disease incidence rate is 229 per million (Lv and Zhang, 2019). A study reported a significant graded association between hypertension and CKD(Sun et al., 2020). Different studies have also shown an association between smoking and the development of diabetic and non-diabetic renal disease (Jdiaa et al., 2022; Rodríguez-Almaraz et al., 2021). There are no local screening programs because patients are diagnosed at an advanced stage. Collecting and analyzing data for assessing risk factors in CKD patients is important. Thus, this study aims to evaluate risk factors for CKD in the local population.

Methodology

The prospective study was conducted in Tertiary Care Hospitals from June 2022 to June 2023. The study included any male/female individuals aged > 18 who were screened for CKD. Individuals with a history of dialysis and kidney transplants were excluded. Informed consent of the participants was taken. The ethical board of the hospital approved the study. The participants were screened for CKD using a questionnaire. Data including age, gender, waist-to-hip circumference ratio (WHR), body mass index (BMI), and blood pressure were collected. The American Heart Association guidelines were used for measuring standardized BP (Muntner et al., 2019). Blood and urine samples of all the participants were

collected. The Jaffe Colorimetric method was used for measuring serum creatinine. The Dipstick method was used to detect urine protein. A modified MDRD-3 equation was used(Chancharoenthana et al., 2019). The glucose oxidase peroxidase method was used to measure plasma glucose.

Hypertension was defined as systolic BP/ diastolic BP ≥ 149/90 mmHg or when the patient was taking anti-hypertensive medication(Barua et al., 2019). Diabetes was defined as normal blood sugar ≥ 200 or fasting blood sugar ≥126(Petrov and Basina, 2021) or if the patient was taking anti-diabetic medication. Abdominal obesity was defined as a waist circumference of≥80 cm for females and ≥94 cm for males (Wang et al., 2020). NKF-KDOQI guidelines define CKD stages (Kistler et al., 2021). The CKD-EPI equation explored disease burden(Miller, 2021). Data regarding the history of coronary artery bypass surgery (CABG), percutaneous coronary angioplasty, and myocardial infarction was recorded.

SPSS version 23.0 was used for data analysis. Continuous data were presented as mean, standard deviation, and categorical data as frequency and percentages. CKD groups were compared using the Pearson chi-square test, unpaired student t-test, and Mann–Whitney U test for categorical data, normally distributed continuous data, and non-normally distributed continuous data, respectively. The association of eGFR with other study variables was evaluated using Spearman correlation analysis. P value <0.05 was considered statistically significant.

Results

Six hundred subjects were included in the study who were screened for the risk factors of chronic kidney disease. The baseline data of the participants are shown in Table I. The mean age of subjects was 45.12 ± 15.1 years. There were 330 (55%) males and 270 (45%) females. The mean BMI was 23.81 ± 5.1 kg/m2. 258 (43%) cases were hypertensive, while 114 (19%) were diabetic. The prevalence of obesity and overweight was 12% and 26%, respectively. 37% of participants had abdominal obesity. Mean eGFR using CKD-EPI and MDRD-3 equations was 105.1 ± 25.41 and 112.21 ± 43 mL/min/1.73 m^2, respectively. Laboratory data of the participants are shown in Table II.

According to the MDRD equation, the prevalence of CKD was 17.1%. Mean eGFR in CKD and non-CKD groups was 84.31 ± 76.51 and 115.85 ± 44.62c mL/min/1.73 m2, respectively. In the CKD group, 78% of subjects had proteinuria. Prevalence of CKD stages I, II, III, IV, and V was 8%, 5%,5%,1%, and 1%, respectively. There were more males in all stages. CKD subjects were more likely male, older, urban residents, were obese or overweight, and had cardiovascular disease, hypertension, and diabetes compared to those without CKD. In subjects with CKD, the most common risk factors were diabetes (32%), hypertension (65%), and anemia (40%). The correlation between eGFR and study variables is shown in Table III.

Sensitivity analysis was done using CKD – EPI equation, and results were compared with the MDRD-3 equation. The prevalence of CKD, according to CKD-EPI, was 16%. Prevalence of CKD stages I, II, III, IV, and V was 9%, 4.5%,4.5%,1%, and 1%, respectively. Comparison of CKD and non-CKD groups had the same results as the MDRD-3 equation.

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Table I: Demographic data and risk factors in study patients

	MDRD equation		P-Value	CKD-EPI		P-Value
	CKD	Non-CKD		CKD	Non-CKD	
Age	51.1 ± 13.6	42.6 ± 13.7	<0.0001	51.0 ± 13.7	42.7 ± 13.7	<0.0001
Gender						
Male	360 (60%)	320 (53.3%)	<0.0001	375 (62.5%)	321 (53.5%)	<0.0001
Female	240 (40%)	280 (46.6%)		230 (38.3%)	279 (46.5%)	
Smokers	130 (21.6%)	120 (20%)	0.220	129 (21.5%)	120 (20%)	0.149
Over-weight	190 (31.6%)	150 (25%)	<0.0001	190 (31.6%)	150 (25%)	<0.0001
Obese	100 (16.6%)	60 (10%)	<0.0001	102 (16.8%)	61 (10.1%)	<0.0001
Abdominal obesity	290 (48.3%)	220 (36.6%)	<0.0001	285 (47.5%)	220 (36.6%)	<0.0001
Diabetes	191 (31.8%)	97 (16.1%)	0	195 (32.5%)	97 (16.1%)	<0.0001
HTN	380 (63.3%)	250 (41.6%)	<0.0001	385 (64.1%)	255 (42.5%)	<0.0001
Anemia	245 (40.8%)	191 (31.8%)	<0.0001	250 (41.6%)	191 (31.8%)	<0.0001
History of kidney stones	30 (5%)	25 (4.1%)	0.189	31 (51.6%)	26 (4.3%)	0.248
History of stroke	15 (2.5%)	6 (1%)	<0.0001	14 (2.3%)	6 (1%)	0.001
History of tuberculosis	19 (3.1%)	28 (4.6%)	<0.009	20 (3.3%)	28 (4.6%)	0.028
History of ischemic heart disease	40 (6.6%)	29 (4.8%)	<0.005	41 (6.8%)	29 (4.8%)	0.005
History of PVD	18 (3%)	17 (2.8%)	0.840	18 (3%)	17 (2.8%)	0.967
History of hypercholesterolemia	45 (7.5%)	29 (4.8%)	<0.0001	44 (7.3%)	29 (4.8%)	0.001

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Table II: Clinical data

	MDRD equation		P-Value	CKD-EPI		P-Value
	CKD	**Non-CKD**		**CKD**	**Non-CKD**	
Hemoglobin	11.88 ± 2.1	12.16 ± 1.5	0.001	11.88 ± 2.1	12.16 ± 1.5	0.001
Fasting blood sugar	129.55 ± 73.29	101.54 ± 34.85	0.068	129.45 ± 74.1	101.67 ± 34.86	0.105
Random blood sugar	130.85 ± 69.5	112.33 ± 54.4	<0.0001	131.96 ± 70.24	112.37 ± 54.47	<0.0001
Serum creatinine	1.22 ± 1.69	0.65 ± 0.15	<0.0001	1.23 ± 1.71	0.65 ± 0.15	<0.0001
eGFR (MDRD)	84.31 ± 76.51	115.85 ± 44.62	<0.0001	-	-	-
eGFR (CKD-EPI)	-	-	-	81.15 ± 33.86	108.23 ± 19.35	<0.0001
Urine protein	470 (78.3%)	0	<0.0001	500 (83.3%)	0	<0.0001
Hematuria	175 (29.1%)	100 (16.6%)	<0.0001	180 (30%)	100 (16.6%)	<0.0001
Urine glucose	80 (13.3%)	45 (7.5%)	<0.0001	85 (14.1%)	45 (7.5%)	<0.0001
Urine white blood cells	120 (20%)	61 (10.1%)	<0.0001	130 (21.6%)	60 (10%)	<0.00001

Table III: Association of variables with eGFR

	Total cohort		CKD patients	
	Spearman's rho	**P value**	**Spearman's rho**	**P-value**
Age	-0.445	<.0001	-0.290	<0.0001
Weight	-0.200	<.0001	0.035	0.238
BMI	-0.230	<.0001	0.010	0.639
Waist circumference	-0.279	<.0001	0.001	0.918
Hip circumference	-0.230	<.0001	0.02	0.141
Random blood sugar	-0.149	<.0001	-0.041	0.169
Hemoglobin	-0.058	<.0001	0.259	<0.0001
SBP	-0.229	<.0001	-0.190	<0.0001
DBP	-0.155	<.0001	-0.110	<0.0001
Fasting blood sugar	-0.20	<.0001	0.829	0.829
Waist-hip ratio	-0.189	<.0001	-0.049	0.09

Discussion

The results of this study showed that the prevalence of CKD was 16%. Prevalence of CKD stages I, II, III, IV, and V was 9%, 4.5%,4.5%,1%, and 1%, respectively. Most common risk factors for diabetes, hypertension, and anemia. Moreover, decreased eGFR was associated with low hemoglobin, hypertension, and old age in the CKD group. A study reported the prevalence of early stages (I, II, III) to be 13% to 15%, which is close to our results, though we studied leukocyturia, hematuria, and microproteinuria as disease indicators(Goto et al., 2020). Another study was conducted to assess the prevalence of CKD using a cluster sampling method. Their results showed a .79% prevalence, quite contrasting to ours. However, 4.4% of subjects had proteinuria and were excluded from the CKD group(O'Callaghan-Gordo et al., 2019). Different studies have been conducted to screen different populations for CKD. A Thailand-based study reported the prevalence of CKD to be 17.1%(Cha'on et al., 2022). A study in Saudi Arabia reported a 5.6% prevalence(Alobaidi, 2021). In the current study, 6% of subjects had reduced GFR. Moreover, there was a higher prevalence of early stages of the disease compared to late stages. Similar results were reported by a previous study, which demonstrated that higher prevalence of early CKD stages(Assiry et al., 2022).

Despite the high prevalence of CKD, only 8% of subjects were aware that they had kidney disease, compared to 7.1%, as reported by a previous study(Mok et al., 2019). It reflects a lack of primary healthcare facilities. In our study, the prevalence of CKD according to MDRD-3 was 17.1%. In the CKD group, 78% of subjects had proteinuria. Prevalence of CKD stages I, II, III, IV, and V was 8%, 5%, 5%, 1%, and 1%, respectively. The CKD-EPI equation was used in the sensitivity analysis. It showed the prevalence of CKD to be 16%, Prevalence of Stage I

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was 9%, which was higher than demonstrated by the MDRD-3 equation. The prevalence of stages II and III was 4.5% each, which is lower than calculated by as MDRD-3 equation. The previous study also compared similarly, suggesting that CDI-EPI was more accurate(Diao et al., 2023). In the current study, 32% of cases were diabetic, and 65% were hypertensive. The prevalence of hypertension and diabetes in Pakistan varies from 14 to 59% and 7 to 21 %, respectively(Akhtar et al., 2019; Riaz et al., 2021). Demographic characteristics of the subjects were also assessed for risk analysis. 53% of subjects in the CKD group did not have access to higher education, contributing to unchecked disease progression. A previous study also reported that lack of education and poverty are the risk factors for CKD.

This study has a few limitations. First, a convenience sampling design was used, which may not be accurate for assessing true prevalence. Second, urine albumin and serum creatinine were measured once; repeated measurements would have improved precision. Moreover, detecting proteinuria, not albuminuria, may have overestimated the prevalence.

Conclusion

In this study, we screened patients for CKD using proteinuria and e GFR as indicators. The prevalence of CKD was 16%, and the most common risk factors were diabetes, anemia, and hypertension. People were not well aware of the status of their condition. Primary care centers should screen patients with diabetes and hypertension for kidney disease. Early detection can retard progression and improve outcomes.

Conflict of interest

The authors declared the absence of a conflict of interest.

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