International Journal Dental and Medical Sciences Research
Volume 5, Issue 2, Mar - Apr 2023 pp 481-485 www.ijdmsrjournal.com ISSN: 2582-6018

Prevalence of Cardiovascular risk factors in Chronic Kidney Disease: A cross sectional, Observational Study.

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Date of Submission: 16-03-2023 Date of Acceptance: 28-03-2023

ABSTRACT:
Background :Chronic Kidney Disease(CKD) is an important public health issue and a leading cause of morbidity and mortality in the general population. In patients with CKD, the leading cause of mortality is Cardiovascular Disease(CVD). There is a need to better understand the prevalence of CVD risk factors so that effective intervention may be done .
Methods: A cross sectional analysis is carried out of the clinical, socio demographic and laboratory parameters on patients with CKD and the prevalence of the CVD risk factors is studied.
Results: The analysis revealed younger population (mean age:50 yrs),High prevalence of Diabetes Mellitus (38%) and similarly most common cause as Diabetic Kidney disease(38%).
There is a high prevalence of positive family history for CVD risk factors in patients with CKD .
Conclusion: The present study reveals the necessity of better control of CVD risk factors .
Keywords: Chronic Kidney Disease, Cardiovascular risk factors, Diabetes mellitus, Hypertension

I. INTRODUCTION:

Chronic Kidney disease (CKD) is a worldwide health problem. India is home to 17% of Earth's population on approximately less than 3% of the total land mass. Many factors including poverty, low GDP and low monetary allocations for healthcare have led to suboptimal diagnostic and treatment outcomes in patients suffering from CKD.

The reported prevalence of CKD in different regions ranges from less than 1% to 13%, and recently, data from the international society of nephrology's Kidney disease data center study reported the prevalence of 17%[1]

The true burden of CKD in India is not known. Even today, over 90% of patients requiring renal replacement therapy in India die because of inability to afford the treatment , and even in those who do start Renal replacement, 60% stop for financial reasons. Among the patients who undergo kidney transplantation ,unexpected complications have the potential to impose serious financial hardships.

Chronic kidney disease is a risk factor for Cardiovascular Disease (CVD) and is associated with an increase in all cause mortality. Among those with in stage renal disease, 50% of all dates are due to CVD and the risk of CVD is 10 to 20 times higher than the general population[2]

The etiology of the increased risk of CVD in CKD is unknown but may in part be due to shared CVD risk factors including diabetes, hypertension ,obesity, lipid abnormalities and smoking [3]
Less is known regarding the prevalence of CVD risk factors among individuals with chronic kidney disease suggesting a need to better understand the burden of risk factors .

The purpose of this study is to assess the prevalence and impact of cardiovascular disease (CVD) risk factors in patients with chronic kidney disease (CKD) who are receiving outpatient services from both a Nephrologist and a Cardiologist in a tier two city in Maharashtra. By examining the burden of CVD risk factors in this population, we hope to better understand the relationship between CKD and CVD and inform strategies for prevention and management.

II. STUDY DESIGN AND METHODS:

The study, cross sectional and observational, was carried out in 150 patients with Chronic Kidney Disease receiving outpatient services at "Premier Heart and Kidney care clinic" in Nashik, Maharashtra ,India.
Details of socio-demographic status, family history, history of CKD risk factors, CVD, comorbidities and other treatment details were recorded
Kidney function was estimated by glomerular filtration rate using the simplified modification of diet in renal disease (MDRD) study equation.

The definition of CKD was based on the National Kidney Foundation Disease Outcome Quality Initiative Working Group definition of

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Kidney disease, which defines CKD as eGFR of less than 60 ml/min per 1.73 m2.

Serum creatinine was measured using the modified Jaffe method. Participants with a fasting blood glucose level of at least 126 mg/dl or who were receiving insulin and/ or oral hypoglycemic treatment for diabetes were defined as having Diabetes. Participants with a systolic blood pressure of at least 140 mmHg or diastolic blood pressure of at least 90 mmHg or receiving medication for treatment of hypertension were defined as having hypertension. Cholesterol levels were measured after an overnight fast. High Triglyceride levels were defined as at least 150 mg per decilitre. Smoking status was defined as smoking one or more cigarettes a day in a year preceding the examination. Body mass index was defined as weight in kilograms divided by the square of height in meters.Prevalent CVD was defined as coronary artery disease, stroke, transient ischemic attack, aur intermittent claudication.

III. STATISTICAL ANALYSIS:

Descriptive and quantitative analyses were performed showing socio-demographic, clinical and biochemical characteristics of participants. Distribution based on gender has been presented in the study.Data for continuous variables are expressed as mean and standard deviation(SD) or median and interquartile range, as appropriate. In the case of categorical variables, data is presented in terms of count and percentage. All the presented data are based on the available values only and percentages have been calculated from the total number of available values.

IV. RESULTS

Table 1:Socio- demographic characteristics of the participants in the study

Characteristics	**Male(n=91)**	**Female(n=59)**	**Total(n=150)**
Age, in Years	55±10	45±10	50.3 ± 11.8
Duration of kidney disease	37.1 ± 51.6	40.8 ± 55.6	38.3 ± 53.0
BMI (Body Mass Index)	25.3 (22.1–29.0)	24.0 (21.5–26.7)	24.4 (21.6–27.4)
Place of residence			
Rural	60 (65.9%)	39(66.1%)	99(66%)
Urban	31(34.0%)	20(33.8%)	51(34%)
Smoking	22(24.5%)	4(6.7%)	26(17.3%)

Data presented as mean ± SD, n (%) and median (25–75th percentile).

Table 2 :Clinical Characteristics and diagnosis of CKD in study cohort

Characteristics	**Females (n=59)**	**Males (n=91)**	**Total (n=150)**
Clinical Characteristics			
Hypertension	51(86.4%)	80(87.9%)	131(87.3%)
Diabetes	22(37.3%)	35(38.5%)	57(38%)
Cardiovascular Disease(CVD)	11(18.6%)	21(23.0%)	32(21.3%)
Family History			
Hypertension	24(40.6%)	37(40.6%)	61(40.6%)
Diabetes	23(39%)	33(36.2%)	56(37.3%)

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Cardiovascular Disease(CVD)	12(20.3%)	21(23%)	33(22%)
Chronic Kidney Disease	5(8.4%)	8(8.7%)	13(8.6%)
Cause of CKD			
Diabetic Kidney disease	22(37.3%)	35(38.5%)	57(38%)
Chronic Glomerulonephritis	9(15.2%)	14(15.3%)	23(15.3%)
Unknown	21(35.5%)	28(30.7%)	49(32.6%)
Hypertensive Nephrosclerosis	4(6.7%)	8(8.7%)	12(8.0%)
Polycystic Kidney Disease	3(5.0%)	6(6.5%)	9(6%)

Data presented as n (%)

Table 3:Laboratory Characteristics

Characteristics	**Female (n=59)**	**Male (n=91)**	**Total (n=150)**
Systolic Blood Pressure ,mmHg	140 (120–150)	150(120-160)	140(120-160)
Diastolic Blood Pressure,mmHg	90(80-100)	90(80-94)	90(80-94)
eGFR(Mean)	36.3 (30.7–45.3)	42.9 (35.7–52.3)	40.5 (33.7–50.8)
Anemia (a)	48(81%)	67(73.6%)	115(76.6%)
Total Cholesterol	174 (140–203)	162 (130–198)	166 (133–200)
Uric Acid	6.5 (5.0–7.3)	6.5 (5.4–7.7)	6.4 (5.2–7.6)
Urea	60 (45–80)	70 (50–90)	65(45-98)
Creatinine	3(1.8-4.5)	4(2.0-5.0)	3(1.8-5.0)
Triglycerides	140 (110–180)	136 (108–180)	138 (110–180)

Data presented as median (25–75th percentile) or n(%).

(a) Anaemia was defined as per World Health Organization criteria:Hb<13g/dl for males and <12.0g/dl for females.

Table 4 :Stages of Chronic Kidney disease and presence of Risk Factors

Chronic Kidney disease stages(eGFR in ml/min/1.73m2) →	**I (≥90)**	**II (60-89)**	**III (30-59)**	**IV (15-29)**	**V (<15)**
Prevalence of Risk Factors ↓					
Hypertension(n=131)	11 (8.3%)	14 (10.6%)	20 (15.2%)	61 (46.6%)	25 (19.0%)

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Diabetes(n=57)	3 (5.2%)	10 (17.5%)	6 (10.5%)	18 (31.5%)	20 (35.0%)
Dyslipidemia(n=60)	12 (20%)	8 (13.3%)	10 (16.6%)	20 (33.3%)	10 (16%)
Smoking(n=26)	10 (38.4%)	5 (19.2%)	9 (34.6%)	1 (3.8%)	1 (3.8%)
High BMI(*)(n=30)	15 (37.5%)	10 (25%)	5 (12.5%)	0	0
Family History of CVD(n=33)	12 (36.3%)	7 (21.25)	4 (12.1%)	2 (6.0%)	8 (24%)

Data presented as n(%).

(*)Body Mass Index (BMI) is as defined as per ICMR and High BMI is $\geq$ 25Kg/m2

V. DISCUSSION:

The present paper provides a comprehensive description of the cohort of patients with moderate to severe chronic kidney disease and associated cardiovascular risk factors. The present cohort is representative of the general Indian population in terms of age, sex ratio ,representation of rural population and other socio-economic characteristics according to the national census [4]

Mean age of the study population is 50 years . This finding is consistent with the Indian CKD(ICKD) study cohort where the mean age was around 50.3 years [5] . It also shows the younger age of Indian patients presenting with chronic kidney disease than Western cohorts by 5 to 20 years . This could be due to a number of factors such as maternal malnutrition, differences in genetic background or delayed recognition leading to faster disease progression [6]

Approximately 60% of participants in our study cohort are males which is similar to the multicentric hospital -based registry of patients with CKD in India.[7]. This might reflect a systematic barrier in presentation to healthcare facilities for females in India, likely due to socio-cultural reasons.

The average BMI noted is 24.4 which is lower than that reported in western Cohorts but is consistent with Indian CKD study.[8,9] Of the 26 patients reporting tobacco consumption in the form of smoking approximately 58% were in stage I and II of CKD .The prevalence of smoking in the study population is 17% which is lower than that reported in Chronic Renal Insufficiency Cohort (CRIC)[8] and German Chronic Kidney Disease (GCKD)[9] cohort. The possibility of underreporting by the patients cannot be denied considering the social aspect of smoking in India.

Diabetes is the most common cause of chronic kidney disease in the present study (38%) followed by chronic kidney disease of unknown etiology (32.6%). Usually, patients with no apparent risk factors are assigned a diagnosis of 'unknown' and it implies the late presentation in most cases where the window of ascertaining the cause by means of renal biopsy and other investigations is already closed.

Hypertension is the most common finding in the present study population .The prevalence of Hypertension was highest in CKD stages III and above (81%) as compared to earlier stages of CKD (stage I and II). This is consistent with the hypothesis of secondary hypertension due to chronic kidney disease and its pathophysiology of salt retention. The diagnosis of Hypertensive Nephrosclerosis was made in the presence of uncontrolled hypertension of more than 5 years duration with normal renal function to start with and other end organ damage consistent with microvascular damage (HT retinopathy). The blood pressures in the study population were usually controlled with three (average) anti hypertensives . The close follow up and the dietary salt restriction appears to be consistent with the effective blood pressure control as it is regularly emphasized to the patients in each follow up visit.The rural population (66%) has larger representation in the present study which is in contrast with the general awareness about the non communicable disease in the urban population. This may be reflecting the referral pattern for the

specialist consultation by the general medical practitioners in rural as against urban population.

The mean duration of the kidney disease is 3 years which is consistent with the ICKD study. The majority of the patients are referred late and this forms a barrier/ hurdle in effective management of the chronic kidney disease and its attendant complications.

The prevalence of established CVD is found to be approximately 21% in the present study population. This finding is consistent with the ICKD cohort .

There is a strong tendency of positive family history for Hypertension(40.6%),Diabetes Mellitus(37.3%) and established CVD (22%) . This is supportive of the significant role played by various genetic factors in Chronic Non communicable diseases . The genetic factors predisposing the patients for CVD complications are not well studied .

The analysis of prevalence of risk factors for CVD in patients of CKD shows the overall significant presence and strong tendency with worsening stages of CKD.

The present study is not without its limitations as the sample size is not large and only those patients were studied who presented to the doctor and this may underestimate the true prevalence.

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