

Assessment of Risk Factors for Chronic Kidney Disease: A Case Control Study from Visakhapatnam, Andhra Pradesh, India

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Abstract

Background: Chronic kidney disease (CKD) is a worldwide public health problem with an increasing incidence, prevalence and often associated with poor outcome. The approximate prevalence of CKD is 800 per million population and the incidence of End Stage Renal Disease (ESRD) is 150 – 200 per million population.

Objective: To identify risk factors for Chronic Kidney Disease among patients undergoing dialysis in a tertiary care hospital.

Methodology: An observational case control study was carried out in the Hospital during August –October 2018, among 60 subjects of whom 30 were cases and 30 were controls. Cases and controls were matched for age and gender. Data was collected using Pretested semi structured interview schedule after taking informed consent. Data was entered in MS EXCEL. SPSS version 16 was used to calculate ODDs ratio.

Results: Among both cases and controls 22 were males and 8 were females. Modifiable risk factors like hypertension (OR 32.5), diabetes (OR 10.5), smoking (OR 2.75), alcoholism (OR 2.4) family H/o CKD (OR 3.2) and analgesic abuse were observed to be more among cases compared to controls.

Conclusion: There is a need for better care in patients with diabetes and hypertension. Periodic check-ups in subjects with known risk factors can lead to early detection of chronic kidney disease.

Keywords: Chronic Kidney Disease, Risk Factors, Case Control Study, Visakhapatnam.

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Introduction

Chronic kidney disease is a worldwide public health problem with an increasing incidence, prevalence and poor outcomes [1]. The approximate prevalence of Chronic Kidney

Disease (CKD) is 800 per million population and the incidence of End Stage Renal Disease (ESRD) is 150 – 200 per million population [2]. In the 2015 Global Burden of Disease

Study, kidney disease was the 12th most common cause of death, accounting for 1.1 million deaths worldwide [3]. There are currently over 1.4 million patients receiving renal replacement therapy worldwide [1]. Chronic kidney disease (CKD) is an important public health issue because these patients have an increased risk of end-stage renal disease (ESRD) [4].

Diabetes and hypertension are strong predictors for development and progression of chronic kidney disease [5,6]. An uncontrolled diabetic and/or hypertensive patient can easily and quickly progress to an end-stage kidney disease patient. Diabetes mellitus (DM) is the leading cause of chronic kidney disease and End Stage Renal Disease in both developed and developing countries.

Smoking, a well-known risk factor for many diseases, was recently proven to play an important role in renal diseases. Studies showed that cigarette smoking is a risk factor for the development and progression of chronic kidney disease (CKD) in community [7,8].

Family history of kidney disease are considered to be strong risk factors for chronic kidney disease. Family members of CKD patients have a high prevalence of CKD and its risk factors [9,10]. Effects of chronic kidney disease in the individual and the family are multifold. CKD patients have physical suffering and poor quality of life. Untreated CKD rapidly progresses to end stage kidney disease which requires dialysis. This will lead to deterioration of the economic status of the family in addition to the psychosocial stress.

One way to reduce the burden of chronic kidney disease would be early Intervention. In order to achieve this, we should be able to identify individuals with increased risk of renal disease. This hospital-based case control study was taken up keeping in mind the limited information on risk factors for

CKD in our country. The main objective of this study is to assess risk factors for chronic kidney disease among patients.

Material and Methods

A case control study of 30 patients with chronic kidney disease (End Stage Renal Disease) and 30 apparently healthy control subjects who were matched for gender and age were studied. For every case one control was taken (cases: controls - 1:1).

Sample size was obtained using statistical package ausvet EpiTools Epidemiological calculator, by taking expected proportion of exposure in the controls (0.09) which is the prevalence of diabetes (risk factor) according to NFHS 4 and assumed odds ratio was taken as 10 and the desired level of confidence level of 0.95 and power 0.8 and was estimated to be 25 samples in each group. Hence 30 cases and 30 controls were taken.

Cases were CKD patients with End Stage Renal Disease newly registered in the month of August – October 2018 for dialysis in the Nephrology department. Case participants were enrolled after being diagnosed with chronic kidney disease. Control participants were selected by matching them for gender and age. Eligible control participants were attendees of patients admitted in other departments and who had no medical history of kidney disease.

Information was gathered from the participants after taking consent. A Pretested semi structured interview schedule included questions regarding socio demographic details hypertension, diabetes, smoking, alcoholism, analgesic abuse and family history of chronic kidney disease.

Anthropometric measurements which include height and weight were measured. BMI of participants was calculated according to WHO classification. Data was collected and entered in MS EXCEL 2007 and analyzed in SPSS version 16. Associated risk

was calculated by Odds ratio and logistic regression analysis was done to look for individual risk factors for chronic kidney disease.

Operational definitions of Variables in the study:

Chronic kidney disease (CKD) is defined as glomerular filtration rate (GFR) < 60 mL/min/1.73 m² for > 3 months [11].

End Stage Renal Disease: defined as glomerular filtration rate (GFR) < 15 ml/min per 1.73 m², when renal replacement therapy in the form of dialysis or transplantation has to be considered to sustain life [12].

Participants were considered to have diabetes mellitus if previously they had been recognized by the doctor as having DM or any documents in favour of DM or they reported taking insulin or oral antidiabetic drug or random plasma glucose ≥ 11.1 mmol/Lsi with symptom. Hypertension was defined as systolic BP ≥ 140 mmHg or diastolic BP ≥ 90 mmHg or use of medication for hypertension irrespective of the blood pressure [13].

Smoker

The person who reported smoking any form of tobacco products like cigarettes, cigars, pipes etc in the previous year.

Consumption of alcohol

The person who consumed alcohol in previous 12 Months was assumed to have alcohol use.

Body Mass Index (BMI)

In the study, the participants were classified based on WHO international Classification for BMI(as per WHO STEP protocol) [14].

Socio-Economic Classification

The socio economic status of participants was based on Updated B G Prasad's classification 2016 .^[15] The categories are

upper, upper middle, middle, lower middle and lower . For the purpose of study, the socio –economic classification was clubbed into two groups namely lower middle & below and middle & above which included upper middle, middle and lower middle respectively.

Family history of chronic kidney disease

Any member of the family i.e. mother, father and siblings who were diagnosed with chronic kidney disease.

Literate For the study the operational definition of literate was a person who could read and write with understanding in any language.

Results

Study was done among 60 subjects, among whom 30 were cases and 30 were controls. Among both cases and controls 22 were males and 8 were females.

Mean age of cases was 43.8 \pm 12.7. Mean age of controls was 44.5 \pm 12.9 years. Standard error of difference between means was calculated. The difference among cases and controls was not statistically significant. (p value- 0.833). Socio demographic details of the study subjects were studied. Table 1 shows that, among cases 60% of the study subjects were residing in urban areas, 40% were residing in rural areas. Among controls 54% of the study subjects were residing in urban areas, 46% of study subjects were residing in rural areas. (OR 1.3, CI 0.47-3.65, p = 0.602)

Among cases 87% of the study subjects were Hindus by religion, 13% were Christians and among controls 93% were Hindus by religion and 7% were Christians. (OR 0.46, CI 0.07 – 2.75, p= 0.38). Ninety seven percent of cases and ninety six percent of controls were married. (OR 2.0, CI 0.17- 24.14, P= 0.55)

Among cases 57% were illiterates and 43% were literates and among controls 43% were

illiterates and 57% were literates. When compared with controls more number of illiterates were among those with chronic kidney disease. (OR 1.7, CI 0.61 – 4.74, P = 0.302).

As per Modified BG Prasad classification, among cases 63.3% belonged to lower middle class, 36.7% belonged to upper middle and middle class. Among controls 66.6% belonged to upper middle and middle class, 33.3% belonged to lower middle class. (OR 3.4, CI 1.19 – 9.99, P= 0.02)

Table 2 shows that Hypertension is seen among 83.3% of cases and 13.3% among controls. (OR 32.5, CI 7.81–135.1, p= 0.000). Diabetes is present among 26.6% of cases and 3.3% among controls. (OR 10.5, CI 1.22 – 90.6, p = 0.01)

Smoking is present among 50% of cases and 26.6% of controls. (OR 2.75, CI 0.93 – 8.1, p = 0.06) and alcoholism is present among 46.6% cases and 26.6% controls. (OR 2.4, CI 0.81 – 7.09, p = 0.1).

Family history of CKD is present among 10 % of cases and 3.3% of controls. (OR 3.2, CI

0.31 – 32.8, p = 0.3). Analgesic abuse is seen among 16.7% of cases.

Table 3 shows that BMI of study subjects among cases was 36.6% were underweight, 60% were normal weight and 4.4% were overweight. Among controls 10% were underweight, 80% were normal weight and 10% were overweight. Chi-square test was applied to test for any statistical significance and found that it is statistically significant. (Chi-square – 6.429, p value – 0.04).

On univariate analysis(table 4), comparison of risk factors of cases versus controls revealed that cases were almost 32.5 times more likely to be hypertensive and 10.5 times more likely to be diabetic. The final multivariable multinomial logistic regression was built including only those factors that were statistically significant in univariate analysis.

On multivariate logistic regression (table 5) revealed that hypertension was independently associated with chronic kidney disease. (AOR 29.4, 95% CI 6.21 – 139.7, p value - 0.000).

Table 1: Socio – Demographic Risk Factors for Chronic Kidney Disease

Socio demographic details	Cases	Controls	Odds ratio	P value
	n(%)	n(%)		
Residence				
Urban	18(60%)	16(54%)	1.3	0.6
Rural	12(40%)	14(46%)		
Religion				
Hindus	26(87%)	28(93%)	0.4	1.38
Christians	4(13%)	2(7%)		
Marital status				
Married	29(97%)	28(96%)	2.07	0.55
Unmarried	1(3%)	2(4%)		
Education				
Illiterate	17(57%)	13(43%)	1.7	0.3
Literate	13(43%)	17(57%)		
Socioeconomic status (BG prasad)				
Lower middle & below	19(63.3%)	10(33.3%)	3.4	0.02
Middle & above	11(36.7%)	20(66.6%)		

Table 2: Odds ratios of known risk factors for CKD

Risk factors	Cases	Controls	OR	95% CI	P value
Hypertension					
Yes	25 (83.3%)	4 (13.3%)	32.5	7.81-135.1	0.000
No	5 (16.7%)	26 (86.7%)			
Diabetes					
Yes	8 (26.6%)	1 (3.3%)	10.5	1.22-90.66	0.01
No	22 (73.4%)	29 (96.7%)			
Smoking					
Yes	15 (50%)	8 (26.6%)	2.75	0.9-8.1	0.06
No	15 (50%)	22 (73.4%)			
Alcoholism					
Yes	14 (46.6%)	8 (26.6%)	2.4	0.8-7.09	0.1
No	16 (53.4%)	22 (73.4%)			
Analgesic abuse					
Yes	5 (16.7%)	0			
No	25 (83.3%)	30			
Family h/o CKD					
Yes	3 (10%)	1 (3.3%)	3.2	0.31-32.8	0.3
No	27(90%)	29 (96.7%)			

Table 3: Distribution of study subjects based on Body Mass Index (BMI)

BMI	Cases	Controls	Chi square	P value
Underweight	11(36.6%)	3(10%)	6.429	0.04
Normal	18(60%)	24(80%)		
overweight	1(4.4%)	3(10%)		

Table 4: Univariate logistic regression of Risk Factors

cs	Crude Odds ratio	95% CI	p value
Hypertension	32.5	7.818 - 135.103	0.000
Diabetes	10.5	1.22 – 90.66	0.03
Smoking	2.75	0.933- 8.1	0.06
Alcoholism	1	0.36- 2.75	1
Family h/o CKD	3.22	0.31 – 32.8	0.32

Table 5: Multivariate logistic regression of Risk Factors

Group	AOR	95% CI	p value
Hypertension	29.4	6.21- 139.7	0.000
Diabetes	1.41	0.12 – 15.78	0.780

Discussion

Chronic kidney disease (CKD) is a clinical syndrome secondary to the definitive change in function and/or structure of the kidney and is characterized by its irreversibility and slow and progressive evolution. Another important

aspect is the pathology represents a higher risk of complications and mortality.[16]

Our study indicates that residing in urban areas increase the risk by 1.3 times. And Illiteracy increases risk by 1.7 times. Among cases 63.3 % belonged to lower middle class

and below when compared to 33% of controls. Lower socio-economic status increases risk by 3.4 times. The cost of health care in Chronic kidney disease is often high especially when the patient is having end stage renal disease. When the disease occurs in lower socioeconomic groups, its effect on the family economy could be catastrophic. wang *et al* have in their article draw attention that the societal direct and indirect costs of CKD and ESRD are substantial and increase with disease progression. [17]

The results of this study found that there is significant risk for chronic kidney disease from diabetes, hypertension, smoking, alcoholism and family H/O Chronic Kidney Disease.

Our results found that hypertension is statistically significant risk factor for chronic kidney disease (OR 32.5) which is similar to “The MRFIT study” which looked at over 330,000 men and found that higher BP is associated with a higher incidence of end-stage renal disease. [18,19]

The present study showed that diabetes (10.5) and hypertension (32.5) were significantly more frequent in patients with kidney disease, which is similar to Alam *et al* study. [20]

According to the result of another study, diabetic nephropathy and hypertensive nephrosclerosis were the most common causes of ESRD, or diabetes mellitus and hypertension are the leading causes of chronic kidney disease. [21] The study based on NHI dataset showed that diabetes, hypertension and female sex were associated with a higher risk of developing CKD.[4]

Our data shows that smoking is associated with a 2.75 times greater risk of developing CKD which is similar with Melanie K. Haroun *et al* study showed a graded increase in the incidence of ESRD by number of cigarettes smoked in men. [22]

In Huda MN *et al* study the role of smoking as a risk factor for kidney disease is being increasingly recognized and also diabetes mellitus and hypertension were present in significant proportions in CKD group compared to the normal population. [13]

And also there is a study where 7476 nondiabetic participants were enrolled, smoking >20 cigarettes per day increased the risk of CKD.[7]

A prospective cohort study by Wen *et al.* further demonstrated that older age, diabetes, hypertension, smoking were more common in the CKD group. [23] Kwakernaak *et al.*, study shows that high BMI, carrying excess weight around the abdomen is linked to an increased risk of CKD.[24] In our study as cases included were in End Stage Renal Disease, 60% of cases were normal BMI and 36.6% were underweight.

To conclude CKD risk factors were similar to those reported in earlier studies. Hypertension, Diabetes, Smoking, alcoholism, family H/o Chronic Kidney Disease and analgesic abuse are the significant risk factors associated with chronic kidney disease. It should be stressed to all primary care physicians taking care of hypertensive and diabetic patients to screen for early kidney damage. Early intervention may retard the progression of kidney disease. Increasing our understanding of risk factors for the occurrence and progression of CKD poses substantial challenges.

Ethical approval: The study was approved by the institutional ethics committee.

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