

## Link between Chronic Kidney Disease (CKD) and Known Risk Factors: A Hospital-based Study in Pakistan

Running Title: Chronic Kidney Disease (CKD) and Known Risk Factors: A Pakistani Study

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### ABSTRACT

**Background and objective:** Chronic kidney disease (CKD) is a progressive disease which is not curable with high morbidity and mortality rate. Despite the harmful consequences of CKD, few studies have been conducted in Pakistan regarding CKD which are also outdated. So, the objective of the study was to determine the socio-demographic and preventable clinical risk factors associated with CKD.

**Methods:** Patients visiting the outdoor department of Nephrology or those admitted in ward between Feb-Nov 2019 were selected for the study. A questionnaire including demographic information and risk factors for CKD was filled after informed consent. Data was analyzed on SPSS software. Main outcome measures: Risk factors including hypertension, diabetes, positive history of CKD and kidney stone were found to be associated with CKD development.

**Results:** A total of 200 patients participated in the study in which 131 (65.5%) were female. Risk factor data revealed older age (p-value 0.02), hypertension (p-value 0.02), diabetes (p-value 0.03) and positive family history of CKD (p-value 0.01) to be associated with disease development. Logistic regression revealed that old age increases the odds of CKD by 3 times followed by positive family history of CKD (OR: 2.2) and history of renal stone (OR: 1.8).

**Conclusion:** Numerous risk factors are associated with the progression of CKD. Our findings are the first to provide a quantitative estimate of the risk posed by different factors on CKD in Pakistan. Our findings emphasize the pressing need for designing early detection and treatment plans for CKD followed by its prevention policies in Pakistan.

**Keywords:** Chronic kidney disease; Diabetes; Hypertension; Kidney disease; Risk factors

## 1. Introduction

Chronic kidney disease (CKD) is a progressive disease characterized by a change in the structure or function of the kidneys which is not curable with high morbidity and mortality rate commonly seen in adult population<sup>1</sup>.

CKD has become a global concern over the years however; people from developing countries are affected more by this disease compared to developed countries. The overall prevalence of CKD among Pakistani adults is 21.2% which makes this disease an excessive burden on the healthcare resources of Pakistan<sup>2,3</sup>.

Diabetes, hypertension, and obesity are considered to be the traditional risk factors of CKD; however, nontraditional risk factors of the disease including exposure to nephrotoxin, presence of kidney stones, acute kidney damage, fetal or maternal factors, numerous infections along with some environmental factors, are also considered as threats to kidney health globally. CKD prevention requires a broad approach which begins with the identification of basic factors including incidence, overall prevalence, and distribution of clinical risk factors which is then followed by the development of treatment strategies. Individuals at risk must be screened and treated as soon as possible to prevent onset of the disease or delay in its progression<sup>4,5</sup>.

Despite the harmful consequences of CKD, the disease is not studied thoroughly specially in developing countries of Asia and Africa. Few studies have been conducted in Pakistan regarding CKD<sup>6-9</sup> but they are also outdated. Therefore, the objective of this study was to determine the socio-demographic and preventable clinical risk factors associated with CKD.

## 2. Methods

### 2.1 Study population

A total of 200 patients visiting the outdoor department of Nephrology or those admitted in ward between Feb-Nov 2019 were selected for the study. Verbal consent was taken from the patients who were willing to participate in the study. With a 95% confidence interval and 4% margin of error, the sample size was calculated in accordance with World Health Organization's standard procedure. A routine physical examination was performed and the following information was collected using a carefully designed questionnaire: (i) sociodemographic variables (age, sex, residence), (ii) smoking status and (iii) co-morbidities (history of CKD in family, kidney stone, cardiovascular disease, known diabetes, known hypertension). A trained medical doctor conducted the interview in which the above mentioned information was collected. The study was approved by the institutional review board (IRB).

### 2.2 Definitions

Hypertension was defined as persistent elevation of SBP  $\geq 140$  mm Hg or DBP  $\geq 90$  mm Hg or taking antihypertensive medications.

Diabetes was defined as fasting blood glucose  $\geq 7.0$  mmol/L, or taking anti-diabetic medications.

### 2.3 Statistical analysis

SPSS® version 14 was used to analyze the various risk factors and demographic variables related to CKD. Frequencies and percentages were calculated and recorded. Chi-square test was performed for demographic variables and each risk factor to check for its significance and role in the development of CKD. Logistics Regression was also performed to find the odds

ratio against each variable. A p-value of  $<0.05$  was considered significant.

## 3. Results

Data from a total of 200 patients was collected during the period between Feb-Nov 2019 from the outpatient department and ward of the nephrology department. Mean age of the patients was 43.95 years. (Figure 1) show the age distribution of the study population. The main age group in this study was between 49-58 years.

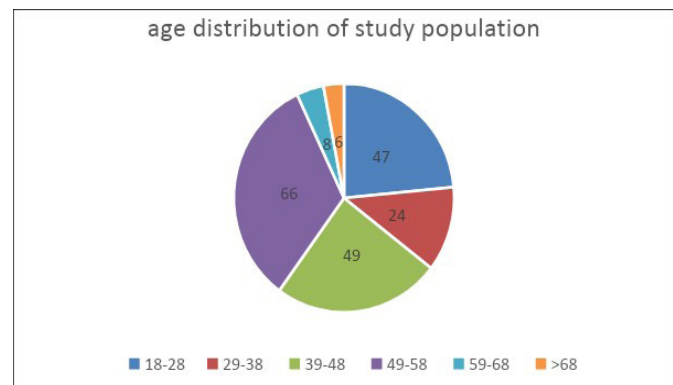


Figure 1: Age Distribution of study participants.

Data related to the CKD of the patients and history of hypertension, DM and cardiovascular diseases among the patients and adjusted ratio of the factors related to CKD has been shown below.

(Table 1) shows information related to various risk factors of CKD. Majority of the patients in the study were females. Almost all the risk factors were found in the patients reporting to the renal department with the majority of the patients already suffering from Diabetes and hypertension.

Table 1: Frequency of Risk Factors in Study Participants.

Variable	Frequency n (%)
Sex	
Female	131 (65.5)
Male	69 (34.5)
History of HTN	
No	49(24.5)
Yes	151(75.5)
History of DM	
No	23(11.5)
Yes	177(88.5)
History of cigarette smoking	
No	125(62.5)
Yes	75(37.5)
History of NSAIDs	
No	30(15)
Yes	170(85)
History of CKD in family	
No	90(45)
Yes	110(55)
History of renal stone	
No	179(89.5)
Yes	21(10.5)

HTN: Hypertension, DM: Diabetes mellitus, NSAIDs: Non-steroidal anti-inflammatory drugs, CKD: Chronic kidney disease

To confirm if the demographic variables and known environmental factors actually played a significant role in the development of chronic kidney disease (CKD), Chi-square test was performed and  $P < 0.05$  was considered significant (**Table 2**). Results Revealed that factors including age between 39-48, history of hypertension, DM, use of drugs and positive history of CKD in family were statistically significant for their role in the development of CKD (**Table 2**).

**Table 2:** Risk Factors for Chronic Kidney Disease.

Variables	Frequency of patients (n)	P-value
Age		
18-28	47	0.07
29-38	24	0.08
39-48	49	0.01
49-58	66	0.28
59-68	8	0.19
>68	6	0.02
History of HTN		
No	49	0.02
Yes	151	
History of DM		
No	23	0.03
Yes	177	
History of cigarette smoking		
No	125	0.75
Yes	75	
History of NSAIDs		
No	30	0.01
Yes	170	
History of CKD in family		
No	90	0.01
Yes	110	
History of renal stone		
No	179	0.79
Yes	21	

HTN: Hypertension, DM: Diabetes mellitus, NSAIDs: Non-steroidal anti-inflammatory drugs, CKD: Chronic kidney disease

These factors were further evaluated through logistic regression for calculation of odds ratio (**Table 3**). Old age showed the highest odds of increasing CKD by 3 times followed by positive family history of CKD (OR: 2.2) and history of renal stone (OR: 1.8).

#### 4. Discussion

Chronic kidney disease (CKD) is a progressive disease which is not curable with high morbidity and mortality rate<sup>10</sup>. Our study is the first to quantify the risk posed by socio-demographic and preventable clinical risk factors associated with CKD.

Age is documented as an independent risk factor for the development of renal disease<sup>11</sup> and our findings of high prevalence of CKD in older people were consistent with previous studies<sup>9,12</sup>. Hypertension and Diabetes are considered strong predictors for kidney dysfunction progression<sup>13,14</sup>. We found strong association

of HTN and DM with CKD in our study which is consistent with previous studies done in other countries<sup>15,16</sup>. Our results are also consistent with findings from a study done by Jessani et al., in 2014<sup>9</sup>. Another important risk factor was positive family history of CKD. We found that the odds of CKD increase 2.2 times if the disease is already present in the family. Previous studies have also demonstrated positive family history as predictors of CKD<sup>17</sup>. Okwuonu et al., 2017 found that the odds of CKD increase by 4.5 times in these cases<sup>18</sup>. This is the first study from Pakistan that has provided a quantitative estimate of the risk posed by positive family history on the development of CKD.

**Table 3:** Logistic Regression for Risk Factors of CKD.

Variables	AOR (95% CI)
Age	
18-28	1.46(1.05,2.03)
29-38	1.50(0.95,2.36)
39-48	2.40(1.59,3.65)
49-58	0.77(0.49,1.23)
59-68	1.40(0.85,2.32)
>68	3.16(1.36,7.35)
History of HTN	
1.26(0.97,1.64)	
History of DM	
0.70(0.51,0.96)	
History of cigarette smoking	
1.05(0.76,1.45)	
History of NSAIDs	
0.48(0.37,0.61)	
History of CKD in family	
2.22(1.65,2.98)	
History of renal stone	
1.76(1.34,2.31)	

HTN: Hypertension, DM: Diabetes mellitus, NSAIDs: Non-steroidal anti-inflammatory drugs, CKD: Chronic kidney disease

Kidney stones have long been associated with elevated risk for chronic renal disease. Our study shows that the risk of CKD increases by almost 1.8 times in patients with a positive history of kidney stones. A study from Taiwan<sup>19</sup> also found an association between kidney stones and poor CKD prognosis. Two recent studies have also highlighted the strong association between kidney stone and CKD<sup>20,21</sup>. Hence, it can be said that HTN, DM, positive history of CKD and kidney stones are among the major causes of CKD in Pakistan.

Smoking is also associated with CDK. Our results of 1.05 odds ratio are comparable with an American study done in 2018 which also showed odds ratio of 1.02 for CKD progression<sup>22</sup>. However, detailed studies need to be done in this area for comprehensive results.

The present study had its limitations that are worth mentioning. Firstly, serum creatinine level was used for the diagnosis of CKD in which albuminuria was not taken into consideration. Diet, total muscle mass, and comorbidities can affect creatinine levels which can in turn lead to a misclassification of the outcome. However, other studies have also used single measurement for epidemiological research<sup>23</sup>. Secondly; the study was conducted in Lahore so findings can be different in other areas of Pakistan. However, healthcare services provided in other areas are not better than Lahore. We recommend comprehensive studies to be conducted for exact identification of the burden posed by CKD and controlling its risk factors in different areas of the country for disease prevention. Only then, effective policies to control CKD can be formulated.

## 5. Conclusion

Numerous risk factors are associated with the progression of CKD. Our findings are the first to provide a quantitative estimate of the risk posed by different factors on CKD in Pakistan. Our findings emphasize the pressing need for designing early detection and treatment plans for CKD followed by its prevention policies in Pakistan, and other developing countries with high CKD burden.

## 6. Acknowledgement

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## 7. Conflicts of Interest

None declared

## 8. Financial Support & Sponsorship

None received

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