Risk factor stratification in chronic kidney disease - A tertiary care analysis

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ABSTRACT

Chronic kidney disease (CKD) has become recognized as an important issue affecting the health of millions around the world. It has been found to be highly prevalent in many countries, including India, accounting for massive health expenditure as well. The burden of CKD is on the rise in both developed and developing countries. The objectives were to identify and study the risk factors for CKD among patients attending Saveetha Medical College and Hospital, Chennai and to study the association between risk factors and CKD. The case-control study was conducted on 110 cases and 110 controls. A semi-structured questionnaire was used to collect information. Statistical Analysis was done using MS Excel 2007, and Chi-Square test was also used. Of the parameters studied, age, residence, family history, smoking and alcohol were found to be associated with CKD and were statistically significant (p<0.05). The findings suggest that positive family history, smoking and alcohol may have an impact on chronic kidney disease in patients of South India. Hence screening and creation of awareness may help in decreasing mortality.

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INTRODUCTION

Chronic kidney disease refers to the condition affecting the kidney's structure and or function, has to be present for at least 3 months (Levey *et al.*, 2012; Eknoyan *et al.*, 2013). It poses an important health issue accounting for high morbidity and mortality (Schoolwerth *et al.*, 2006). There has been significant growth in the awareness for need to identify the disease at an early stage. It is often undetected in early stages, thus contributing to an increase in the number of late referrals. It can proceed to end stage renal disease and is associated with a higher risk of cardiovascular morbidity and mortality. CKD is known to affect 10-16% of adults around the world (Coresh *et al.*, 2007). It is vital that the predisposing factors for CKD are identified as it is essential in terms of community and personal health because some risk factors are modifiable and can help curtail the progression to ESRD and the need for dialysis (Levin, 2001). There is an expected variation seen between the population of developed countries and those of developing countries with regard to the epidemiology of CKD. Communicable diseases such as toxic exposures and infections seem to also be involved in the etiology of CKD in developing countries, apart from non communicable diseases (Wanigasuriya, 2014). There is a lack of the various factors influencing CKD, especially in India. The data collected on the diseased population, their etiology/risk factors and associated comorbidities would be of immense value to the health care personnel and policymakers in their strategies to pre-

vent and manage CKD. The present study attempts to identify some of the various risk factors of chronic kidney disease in a tertiary care hospital in India.

MATERIALS AND METHODS

The study was an observational, cross-sectional study, conducted at Saveetha Medical College and Hospital in Chennai over a period of 3 months from Jan 2019 to Mar 2019. Prior approval and ethical clearance were obtained from the Institutional Review Board. Written informed consent was acquired from all the participants (or their primary caretakers wherever applicable). Sample size was calculated to be 220 by simple random stratification method, based on existing literature. Chronic Kidney Disease was defined based on the KDIGO 2012 clinical practice guideline for the evaluation and management of CKD as either of following criteria present for a duration greater than or equal to 3 months: (a) Markers of kidney damage or dysfunction (one or more): albuminuria (Albumin Excretion Rate (AER) >30 mg/24 hours; Albumin to Creatinine Ratio (ACR) >30 mg/g [>3 mg/ mmol]), electrolyte abnormalities, urine sediment abnormalities, abnormalities detected by histology, structural abnormalities detected by imaging or (b) Reduced GFR <60 ml/ min/1.73 m2 (GFR categories G3a-G5).
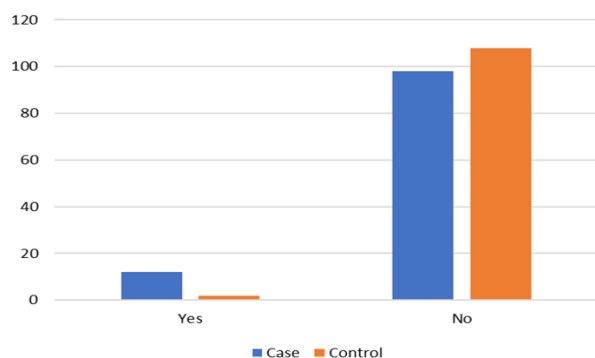

Figure 1: Association of family history with CKD.

110 Patients, of the age 18 and above, attending the hospital who met the criteria for CKD were included in the study. Those who were younger than 18 years, did not give their consent or had undergone renal transplantation were excluded from the study. 110 individuals were recruited as controls. The controls were free from known diseases, as implied by history, clinical examination and basic laboratory investigations. The anthropometric measurements (height and weight) were measured for all of the participants. The body mass index (BMI) of every participant was also calculated. A predesigned proforma was used to obtain the data on the social and demographic profiles, presumed cause of CKD,

associated co-morbid conditions, and hematological and biochemical parameters. Data entry was done in MS Excel 2007. The continuous variables were expressed as mean $\pm$ SD and categorical variables were expressed as frequency and percentage. The association between risk factors and chronic kidney disease was studied with the help of the Chi-square test. A p-value of <0.05 was considered significant.

RESULTS AND DISCUSSION

A total of 220 patients were included in the study, 110 patients with CKD and 110 patients as controls. Table 1 shows the results of the statistical analysis. The mean $\pm$ SD age of cases and controls were found to be 50 $\pm$ 8.9 years and 46 $\pm$ 10.3 years, respectively. There were no significant differences seen between the cases and controls with respect to the income, marital status, BMI, and educational level. Among the cases, CKD was found to be significantly associated with those who had a family history of the disease when compared to those who had no family history of CKD, and the association was found to be significant, as shown in Figure 1 (p<0.05).

Age was also found to be significantly associated with chronic kidney disease (p<0.05). When compared to those residing in the city, those who were residing in town and villages had a higher risk for CKD. Those who had a history of smoking and alcohol consumption had increased risk of attaining the disease as compared to those who had no such habits, and the association was found to be significant, as shown in Tables 2 and 3 (p<0.05).
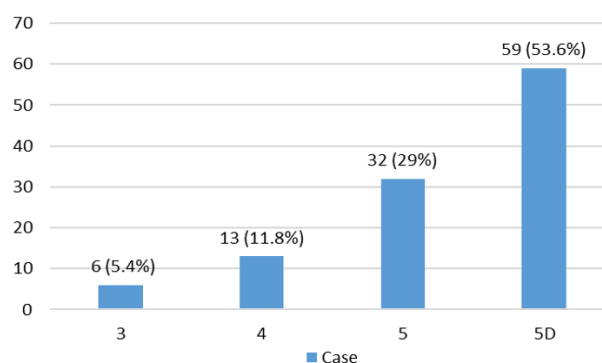
Figure 2: Distribution of patients based on stages of CKD.

Chronic glomerulonephritis (38.1%) was found to be the most common cause of the disease in the studied population, followed by diabetes mellitus (30.9%), and hypertension (19%). Figure 2 displays the distribution of the participants with regard to the stages of the disease. A majority of the participants were in CKD stage 5 (32, 29%), and stage 5D (59, 53.6%). CKD was found to be asso-

Table 1: Results of Statistical Analysis.

Parameter		Cases	Controls	P-Value
Sex	Male	76	82	0.80
	Female	34	28	
Age (in years)	≤39	21	42	<0.05
	40-49	18	14	
	50-59	62	46	
	≥60	9	8	
	Mean ± SD	50 ± 8.9	46 ± 10.3	
	Median (Range)	52 (25 – 69)	49 (25 – 69)	
Educational Status	Illiterate	36	34	0.18
	Primary	38	29	
	Secondary	32	36	
	University	4	11	
Residence	City	10	18	<0.05
	Town	22	52	
	Village	78	40	
Monthly Family Income (In Rupees)	1-500	2	6	
	500-1000	18	24	
	>1000	90	80	
Marital Status	Married	96	86	0.21
	Unmarried	3	2	
	Divorced	1	2	
	Single	10	20	
BMI	<18.5	2	1	0.45
	18.5-24.9	33	44	
	25-29.9	32	28	
	30-34.9	43	37	
Family History	No	98	108	<0.05
	Yes	12	2	
Smoking	Yes	74	58	<0.05
	No	36	52	
Alcohol	Yes	68	45	<0.05
	No	42	65	
Etiology	Chronic glomerulonephritis	42	38.1%	
	Diabetes mellitus	34	30.9%	
	Hypertension	21	19%	
	Obstructive nephropathy	7	6.3%	
	Others	3	2.7%	
Stage	3	6	5.4%	
	4	13	11.8%	
	5	32	29%	
	5D	59	53.6%	
Co-morbid Conditions	Coronary Artery Disease	11	10%	
	Heart Failure	5	4.5%	
	Stroke	3	2.7%	
	Chronic Liver Disease	2	1.8%	
Lab (Mean ± SD)	Haemoglobin	8.7±1.7	-	<0.05
	Albumin	33.7±5.3	-	<0.05
	Phosphorus	4.8±1.3	-	<0.05
	Vitamin D	27.8±12.7	-	0.86

Table 2: Association of smoking with CKD.

Smoking	Cases	Controls	Total
Yes	74	58	132
No	36	52	88
Total	110	110	220

$X^2 = 4.848$; p= 0.027

Table 3: Association of alcohol with CKD.

Alcohol	Cases	Controls	Total
Yes	68	45	113
No	42	65	107
Total	110	110	220

$X^2 = 9.625$; p =0.001

ciated with coronary artery disease in 11 patients (10%), heart failure in 5 (4.5%), stroke in 3 (2.7%), chronic obstructive pulmonary disease in 2 (1.8%) and chronic liver disease in 2 patients (1.8%). The laboratory markers, hemoglobin, albumin and phosphorus had a significant association with the disease (p<0.05). However, the other variables did not exhibit a significant association with chronic kidney disease. CKD is increasingly becoming recognized as a major public health problem around the world due to its associated morbidity and mortality (Schoolwerth *et al.*, 2006). However, there is a difference in the distribution of the disease and its etiology between various countries (Wanigasuriya, 2014; Hamat *et al.*, 2016). In our study, we found that age was significantly associated with CKD (p<0.05) and the diseased population was young (mean age ± SD = 50 ± 8.9 years). Studies from other countries such as Africa and Saudi Arabia showed similar results (Hamat *et al.*, 2016; Alsuwaida *et al.*, 2010). This was in contrast to studies from developed countries, which showed that the affected population was comparatively older, and the average age found to be above sixty (Jiwa *et al.*, 2016). This is because, in the Western countries, there is regular screening & early detection of patients at risk of attaining the disease (diabetics and hypertensive patients), greater access to health care and better longevity. In the present study, males were found to be affected more compared to females, and this was found to be in line with other studies (Singh *et al.*, 2013; Rajapurkar *et al.*, 2012). We observed that nearly 67% of the cases were smokers, and around 62% of the individuals consumed alcohol on a regular basis. They had an increased risk of attaining the disease as compared to those who had no such habits, and the association was found to be significant (p<0.05). These findings were found to be consistent with other reports (Haroun *et al.*, 2003; Menon *et al.*, 2010). With non-communicable diseases such as CKD on the rise, promotion of healthy lifestyles and campaigns on smoking cessation could help curb the increasing trend. In our study, Chronic Glomerulonephritis (38.1%) was discovered to be the most common etiology of CKD. However, this finding was found to be in contrast to studies conducted in developed parts of the world, where diabetes remained the most common etiological factor of the disease (Koye *et al.*, 2018). The high prevalence of chronic kidney disease as a result of chronic glomerulonephritis (CGN) in developing countries could be due to chronic inflammation because of repeated infections. Diabetes mellitus (30.9%) and hypertension (19%) were observed as major etiological factors of the disease, reflecting the consequences of non-communicable diseases in developing countries, like India. A majority of the participants were in CKD stage 5 (29%), and stage 5D (53.6%). It is known that End-Stage Renal Disease (ESRD) substantially increases the risk of cardiovascular disease and death (Go *et al.*, 2004).

In the present study, we observed that out of 110 patients, 11 patients (10%) had coronary artery disease and 5 patients (4.5%) had heart failure. The comparatively lower prevalence of cardiovascular comorbidities is again explained by the observations that CGN being the more common etiological factor rather than diabetes and the relatively younger age of the population. The late stages of CKD usually manifest with major complications such as infections, abnormalities of bone metabolism and anemia (Nigwekar *et al.*, 2014). The laboratory parameters which were measured to investigate the disease and its complications involved haemoglobin, albumin, phosphorus and vitamin D. Out of these, and there was a significant associa-

tion between hemoglobin, albumin and phosphorus with CKD (p<0.05). Anemia played a major role in the morbidity of CKD patients (Zimmermann and Hurrell, 2007; Levin *et al.*, 2007). These findings were found to be in line with numerous other studies and are explained by the pathophysiology of the disease (Chandyo *et al.*, 2007; Baral and Onta, 2009).

CONCLUSIONS

It is essential that all patients who have a positive family history of chronic kidney disease should be screened. Following a healthy lifestyle should be promoted and habits like smoking and alcohol should be condemned. There should be awareness spread on the modifiable risk factors of CKD. In developing countries, like India, chronic kidney disease causes a heavy toll on the lives of the people. Thus, effective screening and rising of awareness can help curb the disease. The associations may differ in other parts of the world and require further investigation.

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Conflict of Interest

The authors declare that they have no conflict of interest for this study.

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