Original Article

Risk of Renal Failure in Family Members of Dialysis Patients: Implication of Surveillance and Awareness Activities

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Abstract

A prospective observational study was conducted to identify high-risk populations for chronic kidney disease, create awareness through public education, and reduce the disease burden. Active screening was performed on 714 participants, including 357 first-degree relatives of patients with chronic kidney disease as the test group and 357 spouses as the control group. The test group showed higher average values for systolic blood pressure (140.10 ± 19.38 millimeters of mercury) and diastolic blood pressure (86.23 ± 5.11 millimeters of mercury) compared to the control group (123.70 ± 7.13 millimeters of mercury and 75.13 ± 4.91 millimeters of mercury, respectively). Fasting blood sugar levels and serum creatinine levels were elevated in the test group (2.10 ± 6.66 milligrams per deciliter) compared to the control group (0.93 ± 0.35 milligrams per deciliter). Additionally, the average urine albumin level in the test group (26.05 ± 8.04 milligrams) and the albumin-to-creatinine ratio were significantly higher than in the control group (13.23 ± 2.80 milligrams).

The study findings indicated that individuals with a family history of kidney failure, especially first-degree relatives, are at an increased risk of developing kidney disease compared to those without such a history. This emphasizes the importance of familial predisposition as a significant risk factor. Despite this, awareness of kidney disease was observed to be low among participants, highlighting the urgent need for targeted education and early screening programs to prevent the progression of kidney disease in high-risk groups.

Keywords: Chronic kidney disease, Family history, Hereditary, Awareness

Introduction

Chronic kidney disease (CKD) is a growing public health issue that is typified by high treatment costs in low-resource environments and early death. The 2015 Global Disease Burden Report revealed that, with a 37.1% increase in mortality over ten years, CKD is now the 12th leading cause of death. Even in the West, CKD causes a huge and unsustainable financial burden and health care costs [1]. It is a condition in which the kidneys are damaged or cannot filter blood as much as healthy kidneys. This results in the accumulation of excess fluid and waste in the body and leads to other disease conditions. CKD is evenly affecting low- and middle-income countries including India, mainly due to increased life expectancy, lifestyle changes, and a high prevalence of non-communicable diseases. The healthcare system of India is not well established with the management of CKD and patients face death due to lack of appropriate treatment. Lack of knowledge and access to treatment facilities only allows for diagnosis in the later stages of stages 4 or 5.

Kerala has a high incidence of type 2 diabetes mellitus, hypertension, and associated risk factors, which have an early beginning and make the population susceptible to CKD. The state is also well-known for its strong healthcare-seeking behavior [1-3]. A significant risk factor for renal disease is a family history of CKD. It is unclear what causes familial violence in CKD, although there is strong evidence that genetic variables may make family members more likely to develop ESRD. However, a variety of risk factors for progression have been identified, including lifestyle variables, higher blood creatinine levels, proteinuria, environmental factors such as smoking and alcohol use, obesity, dyslipidemia, and anemia. Type 2 diabetes is three times more common in persons with CKD than in non-diabetic patients, and in many regions of the world, type 2

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diabetes accounts for the majority of ESRD cases [4]. In a community-based cross-sectional study, Singh *et al*. found that 17.2% of people had CKD, with around 6% having stage 3 or worse CKD [5]. Patients with CKD of stages 1-3 are frequently asymptomatic.

The study was to identify high-risk populations by making use of a questionnaire, to create awareness among the identified population by providing public classes and supplementary brochures. Through early intervention, it may be able to address this issue by detecting kidney illness early through community-based screening programs. In addition to having a higher risk of cardiovascular disease (CVD), which is directly correlated with the degree of renal disease, the vast majority of individuals with CKD pass away before developing end-stage kidney disease (ESKD) [6].

Materials and Methods

A cross-sectional study was carried out on hereditary and environmental factors in family members of dialysis patients with CKD. The study was approved by the Ethical Committee and certified as per letter no. KAS/IEC/Pharm D/2019-04. It was carried out at KIMS Al Shifa Hospital, Perinthalmanna, from November 2019 to April 2020, and included a diagnostic campaign with awareness classes for kidney disease and pain and palliative care. The sample size was determined to be 714.

Conduct of Study

Informed consent was obtained from each individual with assurance of anonymity and confidentiality prior to their participation. Participants were given the right to refuse to continue the study at any point. The World Medical Association's Declaration of Helsinki was followed when conducting the research. A total of 714 participants were recruited, out of which 357 test subjects with family history of ESRD, and the remaining 357 were considered control since they had no family history of the same (i.e., spouses were included). Samples for the test and control were identical for ease of comparison. Inclusion criteria consist of first and second-degree relatives of an ESRD patient on dialysis, with an age above 25 years, who present with concomitant illnesses such as diabetes, hypertension, hyperlipidemia, albuminuria, impaired kidney function, patients under nephrotoxic medication (NSAIDs & Steroid) and ayurvedic medication, obese, chronic smokers, and alcoholics. Individuals with an age of less than 25 years and ESRD patients without dialysis were excluded from the study [7].

Data was collected with the help of a data collection form. The data included demographic details, current medical status, medication history, lifestyle behavior, primary causes for renal failure, complete blood count and urine analysis (if available), and subjects of nephrotoxic medication to identify high-risk individuals. Awareness and educational classes were provided to high-risk individuals depending on the collected information. The subjects were followed up after 3 months.

Statistical Analysis

Employing the statistical tool for social science [SPSS] 20.0 for Windows, all of the data gathered throughout the research period was statistically examined to create the conclusion. Pearson Chi-square test and t-test are used for analyzing the data. Mean and standard deviation of age, gender, family history of ESRD, subject have ESRD, education, working hours, the responsibility of own medication, food style, water intake, exercise, alcohol, smoking, hypertension, DM, cholesterol, anemia, heart disease, obesity, water overload, hyperkalemia, metabolic acidosis, bone disorder, anorexia, nausea, vomiting, bleeding, and nephrotoxic medications were calculated. Using MS Excel, the acquired data and the patient-related parameters were calculated. The percentage or proportion of the results was shown either in tabular form or as a visual representation using a box plot and bar diagram. Frequencies and percentages were calculated using the t-test and person chi-square test for the categorical variables. Each result's significance was deduced from its p-value. Using the p-value, or likelihood of adopting the null hypothesis, the results were evaluated. The significance threshold was set at <0.05.

Results and Discussion

A total of 714 participants were recruited. Out of them, 357 test subjects had a family history of ESRD, and the remaining 357 were controls with no family history of ESRD (i.e., spouses were included). There is a significant statistical difference in the distribution based on family history as shown in **Figure 1**. A statistically significant proportion of test subjects 41.2% (n=147) had hypertension when compared to that of the control subjects 8.1% (n=29, χ^2=104.995, p-value =0.000). Hereditary diabetes was seen among 26.6% and 6.2% of test and control respectively (χ^2=54.473, p value=0.000). 20.7% were on a balanced diet, while 79.3% were not as shown in **Figure 2**. It was found that the percentage of alcohol consumption (26.1%) and smoking (21.3%) were higher in test subjects when compared to control subjects as shown in **Figure 3**. The distribution of test and control with respect to the positive response to regular exercise were 28.6% and 71.4% respectively (χ^2=1.119, p-value = 0.290) as shown in **Figure 4**. The mean values of the serum creatinine in test subjects and control subjects were 2.16 ±0.66mg/dl and 0.93± 0.34mg/dl respectively (p value=0.000), this shows test subjects had increased levels of serum creatinine compared to controls. Mean DM was found to be 129.96 ± 30.74 mg/dl while, that of control subjects was 114 ± 45.82mg/dl. There was a statistically significant difference among the groups (p value=0.000). Likewise, the mean value of systolic hypertension in test and control was 140.1 ±19 and 123.7 ± 7.12mmHg and the diastolic BP of test and control was 86.23 ± 5.11 and 75.12± 4.91mmHg. A statistically significant difference among the groups was found (p value=0.04). Mean urine albumin in test and control

were 26 ± 8.07and 13.23 ± 2.82mg respectively (p value=0.000) and the mean albumin-creatinine ratio of test and control were 29.87 ± 5mg and 19.13 ± 4.70mg (pvalue=0.000) as shown in **Table 1**. The results of both the urine albumin and albumin creatinine ratio showed that the test subjects had a higher chance of developing CKD compared to the control.

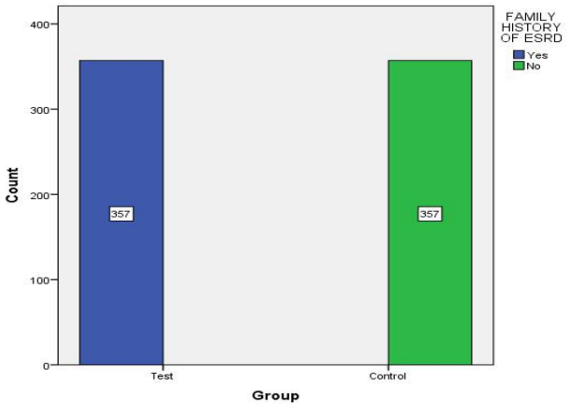

Figure 1. Family History of ESRD

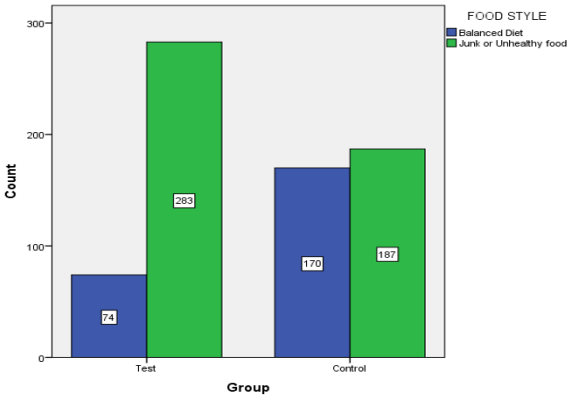

Figure 2. Food style distribution

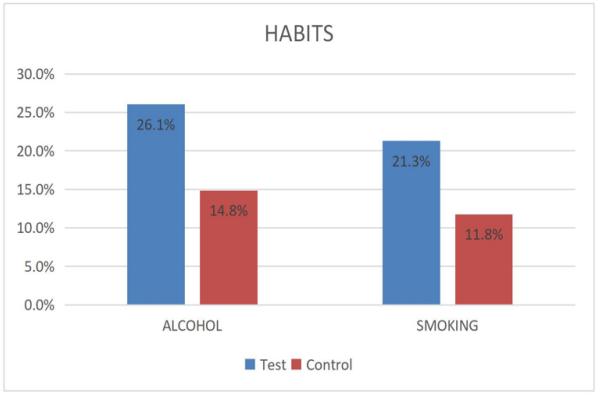

Figure 3. Habits Distribution

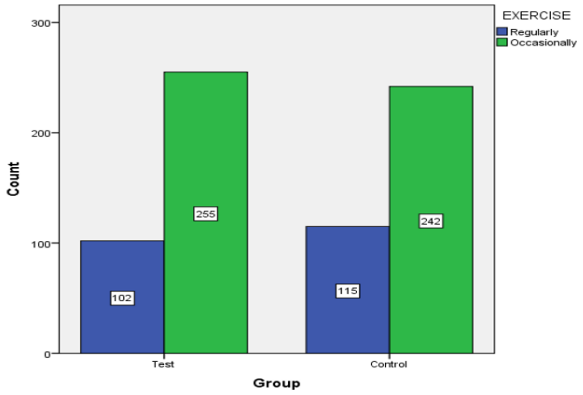

Figure 4. Exercise distribution

Table 1. Lab values comparison distribution

Group		N	Mean	Std. Deviation
Weight	Test	357	63.7983	11.70944
	Control	357	66.2465	10.85066
Height	Test	357	167.3445	8.39252
	Control	357	166.07	8.17939
BMI	Test	357	22.6131	2.69084
	Control	357	23.954	3.14816
Hb	Test	357	13.1629	1.36538
	Control	357	13.3751	1.58701
Serum Creatinine	Test	357	2.1016	5.7826
	Control	357	0.9347	0.34727
Serum Albumin	Test	357	3.342	0.64949
	Control	357	3.9601	0.47913
FBS	Test	357	129.9654	30.74528
	Control	357	114.0801	45.82616
SBP	Test	357	140.1008	19.38481
	Control	357	123.7003	7.12744
DBP	Test	357	86.2353	5.11064
	Control	357	75.1289	4.91217
Urine Albumin	Test	357	26.0549	4.03757
	Control	357	13.2336	2.82536
Albumin Creatinine Ratio	Test	357	35.0675	3.21623
	Control	357	19.1308	4.70191
Total Cholesterol Level	Test	357	184.7626	34.25575
	Control	357	158.6227	33.04895
LDL	Test	357	92.4818	20.09424
	Control	357	79.3625	19.71813
TG	Test	357	122.605	25.77775
	Control	357	116.749	28.05293

The worldwide CKD pandemic has become a significant public health challenge. CKD has become more common in both industrialized and developing nations in recent years. This is linked to higher rates of morbidity and death as well as exorbitant medical expenses, especially in developing nations. The community's lack of knowledge about kidney illness, lifestyle choices, and genetic factors are the main causes of this issue. In this study, family history was considered a major contributing factor for the development of CKD in family members of dialysis patients (test) who account for 50% (n=357) within the study population. Their spouses (control) without positive family history account for 50% (n=357) of the study population. In order to lessen the prevention and burden of this illness in our environment, this study will thereby advance our understanding of the prevalence of CKD, its risk factors, and other clinical features in families of patients with CKD, particularly the FDRs. A similar study conducted by Barry L. Freedman *et al*. reported prevalence of CKD among the family history of ESRD subjects is higher [8]. Patients with a family history of hypertension were found in 41.2% of the test and 8.1% of the control group. In our study, the mean values of the systolic BP in the test and control were 140.10 ± 19.38 and 123.70 ± 7.12mmHg and that of the diastolic BP of the test and control were 86.23 ± 5.11 and 75.12 ± 4.91mmHg respectively. Result indicates that the test subjects have a higher chance of developing CKD compared to the control. Participants presented a prevalence of family history of CKD, DM, and hypertension in the KEEP-Japan study conducted by Susumu Takahashi *et al.* who reported that generally, individuals with both hypertension and family history are at increased risk of developing CKD [9]. In a different study by Seyed Bahman Ghaderian *et al.* demonstrating the connection between diabetes mellitus and hypertension in chronic kidney disease, diabetic nephropathy, and hypertensive nephrosclerosis were the leading causes of end-stage renal disease (ESRD) in a sizable portion of patients [10]. Another risk factor that was prevalent in both the study population's test (26.1%) and control (6.1%) groups was diabetes mellitus. The mean value of DM was found to be 129.96 ± 30.74mg/dl and that for control subjects were 114.08 ± 45.82mg/dl. This indicates that test subjects are more diabetic and have an increased risk of developing CKD compared to the control subjects. This was greater than the results of earlier research by Raji *et al*. [11]. A similar study conducted in the Department of Endocrinology and Diabetes by Richard J. MacIsaac PhD, MBBS, *et al.* the study result showed that diabetic kidney disease occurs in 25%-40% of patients with diabetes [12]. The mean value of the serum creatinine in the test (2.10 ±6.66) and control (0.944 ± 0.347mg/ dl). These results indicate that the test subjects had increased serum creatinine values than the control, and depict that FDR is at higher risk of developing CKD. According to related research by Laura C. Plantinga *et al*. 40% of US family doctors were unable to identify progressing chronic kidney disease (CKD) in a patient whose serum creatinine level was 2.0 mg/dl [13]. Low serum albumin profile is another factor attributed to the development of CKD. The serum albumin mean value of the test (3.34 ± 0.64g/dl) and control (3.96 ± 0.47 g/dl) were compared, and the results showed that the serum albumin value was lower in test subjects than that of the control. Among the FDRs of CKD patients, cigarette smoking was another significant risk factor for CKD; 21.3% of the test and 11.8% of the control were chain smokers, which was comparable to the research by Zaghloul *et al.* (40%). Smoking is unquestionably the most avoidable cause of mortality in the majority of nations, but it has also been found to be a risk factor for kidney illness on its own [14]. Hence the study showed that the risk of developing CKD in FDR's of the dialysis patient is higher compared to that of control. Furthermore, other risk factors including urine albumin, albumin creatinine ratio, serum creatinine, hypertension, and diabetes multiplied the prevalence of the disease in FDR's of CKD patients, which implies these test subjects to be screened regularly to prevent and avoid the burden of the disease in the society [15-17].

Conclusion

In this study, a community-based cross-sectional analysis was done on family members of dialysis patients with CKD. We successfully carried out the study by active screening of the study participants using their laboratory test values. We concluded that family history is a major contributing factor in developing CKD by analyzing family members of dialysis patients (test population), who account for 50% (n=357) within the study population. Their spouses (control population) without positive family history account for 50% (n=357) of the study population. While lifestyle, serum creatinine levels, hypertension, diabetes mellitus, albuminuria, and proteinuria were independent risk factors, the study's risk variables for chronic kidney disease (CKD) included cigarette smoking, obesity, dyslipidemia, hypertension, and diabetes mellitus. In our study, 26.1% and 6.1% of the test and control population respectively had a family history of DM. According to the study, the family of patients with CKD had little information or understanding of the disease's prevalence, risk factors, and other clinical features. The significance of raising awareness and promoting early CKD identification is supported by this evidence. The public should be made aware that kidney disease progression may be slowed down by early intervention. Awareness of the risks associated with obesity and education on implementing a healthy lifestyle, including exercise and balanced nutrition, can help prevent the risk factors. The benefits of a targeted health screening program are particularly noteworthy, as they can identify previously undiagnosed individuals with hypertension, diabetes mellitus, and chronic kidney disease (CKD) at different stages, as well as those with poorly controlled risk factors within the population under study who were appropriately counseled and referred for implementation. Delaying the onset of end-stage renal disease requires improved treatment, high-risk screening for people with diabetes and hypertension, and access to specialized care. Early diagnosis of risk factors and management of CKD helps in prevention.

In conclusion to our study, People with a family history of failure have a higher probability of getting kidney diseases as compared to people who have no family history of ESRD.

The study's conclusion is supported by precise laboratory results, and in order to prevent socially induced bias, a questionnaire was used. The study also highlighted the value of clinical pharmacist services through clinical interventions such as one-on-one oral counseling and patient information booklets. The study design was cross-sectional, and the sample size was limited. A six-month duration for the research was insufficient. 3. A comparison by age and gender was not feasible. 4. There were few family representatives, and many half-siblings, half-parents, and second-and third-degree relatives were not included.

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CONFLICT OF INTEREST: None

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ETHICS STATEMENT: The study was approved by the Ethical Committee of KIMS Al Shifa Hospital and certified as per letter no. KAS/IEC/Pharm D/2019-04. The study has not received funding from any sources.

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