



Modifiable Risk Factors Linked to Late Stages of Chronic Kidney Disease in Saudi Arabia

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Abstract: The present study aims to identify modifiable risk variables associated with late-stage chronic renal disease (CKD) in Saudi Arabia. During a cross-sectional survey in the Hail region, 256 Saudi participants were recruited for this study. Participants were chosen based on their estimated GFR. Only CKD patients in stages III, IV or V were eligible. Females had a higher prevalence of CKD, but male patients had a higher risk of end-stage disease, with an RR (95% CI) of 3.2893 (1.4416 to 7.5055), P = 0.0047. Hypertension was found in 62% of the participants (43% in Stage IV and 45.5% in Stage V). T2DM was found in 54% of the patients, with 60% having Stage IV and 27% having Stage V. Nonsteroidal anti-inflammatory medicines (NSAIDs) were used by 23% of the individuals (including 27% in Stage IV and 27% in Stage V). Herbal treatment was used by 21% of the patients (including 27% Stage IV and 36% Stage V). Late-stage CKD is prevalent in Saudi Arabia and is more common among women, rural residents, and people over 55. The findings of this study indicate that hypertension, diabetes, herbal medication use, nonsteroidal anti-inflammatory drugs (NSAIDs), and obesity are responsible for the increased prevalence of CKD in Saudi Arabia. Awareness and education programs focusing on modifiable risk factors for CKD are suggested for lowering the CKD prevalence rate.

Keywords: Chronic Kidney disease, hypertension, Diabetes, herbal, obesity, Saudi Arabia

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I. INTRODUCTION

Chronic kidney disease (CKD) is a gradual deterioration of kidney structure and function that can lead to renal failure.¹ Globally, the prevalence of CKD is increasing, leading to many comorbidities such as hypertension, diabetes, and cardiovascular disease.^{2,3} CKD is linked to an increased neurovascular disease burden, stroke severity, and cognitive vascular damage⁴. Protection of renal function can improve outcomes and can be achieved through dietary, lifestyle, and CKD-targeted pharmaceutical therapies.¹ In Saudi Arabia, CKD is a major public health issue. The prevalence of late-stage CKD was estimated to be approximately 10% higher than that of Western countries.⁵ According to a previous study, the overall prevalence rate of CKD (all stages) was 9.4%.⁶ Type 2 diabetes mellitus (T2DM), hypertension, and overweight obesity have all been linked to an increase in the prevalence of CKD in Saudi Arabia. As a result of these conditions, the prevalence of cardiovascular diseases in the country has increased.⁷ In Saudi Arabia, rising prevalence rates of hypertension, diabetes, and overweight/obesity have increased CKD incidence in recent years.⁸ CKD is one of the most common chronic consequences of T2DM in adults with uncontrolled hyperglycemia. Because CKD is a silent disease, the diagnosis is frequently obtained late in the disease's progression when there are few opportunities to avert the poor outcome. The level of awareness among diabetic patients in Saudi Arabia was lacking. Single patients with a higher level of education and who were well informed by their doctors on CKD seem to be more aware of the disease than other DM patients. Knowledge of renal function varied significantly between patient groups with different work Status. The patient's monthly income is crucial in determining their attitude toward healthcare in preventing renal disease. On the other hand, an educational level considerably impacts patients' attitudes toward renal disease prevention.^{10,11} Knowledge and awareness of CKD among the general public are crucial in successfully implementing CKD prevention and screening programs. Insufficient research has been undertaken among the Saudi population using a standardized questionnaire to assess public awareness of CKD. However, a study studied the awareness of chronic kidney disease (CKD) among the people of the Kingdom of Saudi Arabia using a validated questionnaire to identify the level of CKD knowledge and the determinants of CKD knowledge. The research uncovered a dearth of information on CKD among the Saudi populace. In contrast, respondents from more affluent and educated backgrounds possessed substantially greater knowledge. Those with CKD risk factors were also more knowledgeable about the disease.^{12,13} Patients with CKD are hospitalized for lengthier durations to treat the condition. Hospitalization significantly impacts the patient's quality of life (QOL). In the later stages of CKD, patients saw a decline in quality of life. In Saudi Arabia, a strong correlation was found between gender, occupation,

smoking, and the stages of CKD and hospitalized patients' quality of life. All quality of life (QoL) improvement levels for these people must be pursued.^{14,15} As a result, this study aimed to identify modifiable risk variables associated with late-stage chronic renal disease in adult Saudis.

2. MATERIALS AND METHODS

During a cross-sectional survey conducted in the Hai'l region, about 256 Saudi subjects were enrolled. Based on the participants' estimated GFR, they were included. We only included people with Stage III, Stage IV, or Stage V CKD. Creatinine level, age, and sex were used to estimate GFR and determine the CKD stage. Stage III CKD was determined based on GFR (GFR = 60 - 30 mL/min). (GFR = 30-15 mL/min) Stage IV Stage V (15 mL/min or less GFR).¹⁶ Hypertension and type 2 diabetes mellitus (T2DM) disorders were determined based on evidence provided by the contributor that he is now receiving treatment for a previously proven diagnosis of hypertension or diabetes. Body mass index (BMI) was calculated by measuring weight and height and was classified as follows: Underweight (BMI 18.5 Kg/m²) weight is normal (BMI 18.5- 25 kg/m²). Obesity (BMI 25-30 kg/m²) Obese morbidly (BMI 25- 30 kg/m²).¹⁷

2.1. Ethical consent

The ethical committee Research board of the College of Medicine, University of Hail, Saudi Arabia, authorized the study's proposal, including informed ethical consent. Each participant was informed and asked to sign an ethical consent form. The Human Research Ethics Committee (HREC) has examined and approved our application to study chronic renal disease. HREC 00090/CM-UOH.02/20 is the approval number.

2.2. Statistical analysis

Data were entered into SPSS software and evaluated for frequencies, cross-tabulations, relative risk (RR), and statistical significance using the Pearson Chi-square test (P-value). A P-value of 0.05 with a 95% confidence interval was considered statistically significant (CI).

3. RESULTS

In the current study, 119/256 (46.5%) of the 256 CKD patients were males, while 137/256 (53.5%) were females. The study participants ranged in age from 20 to 98 years. The age categories 56-70 years were the most common, followed by 70 years and 41-55 years, with 98/256 (38.3%), 62/256 (24.2%), and 59/256 (23%), respectively. As indicated in Table 1, Fig 1, approximately 217/256 (84.8%) of the patients live in rural areas, whereas the remainder, 39/256 (15.2%), live in urban areas.

Table 1. Distribution of the study subjects by CKD and demographical characteristics

Variable	Stage III	Stage IV	Stage V	Total
Gender				
Males	99	11	9	119
Females	130	5	2	137
Total	229	16	11	256
Age				
< 25 years	8	0	2	10
26-40	20	3	4	27

41-55	54	3	2	59
56-70	90	7	1	98
71+	57	3	2	62
Total	229	16	11	256
Residence				
Urban	33	5	1	39
Rural	196	11	10	217
Total	229	16	11	256

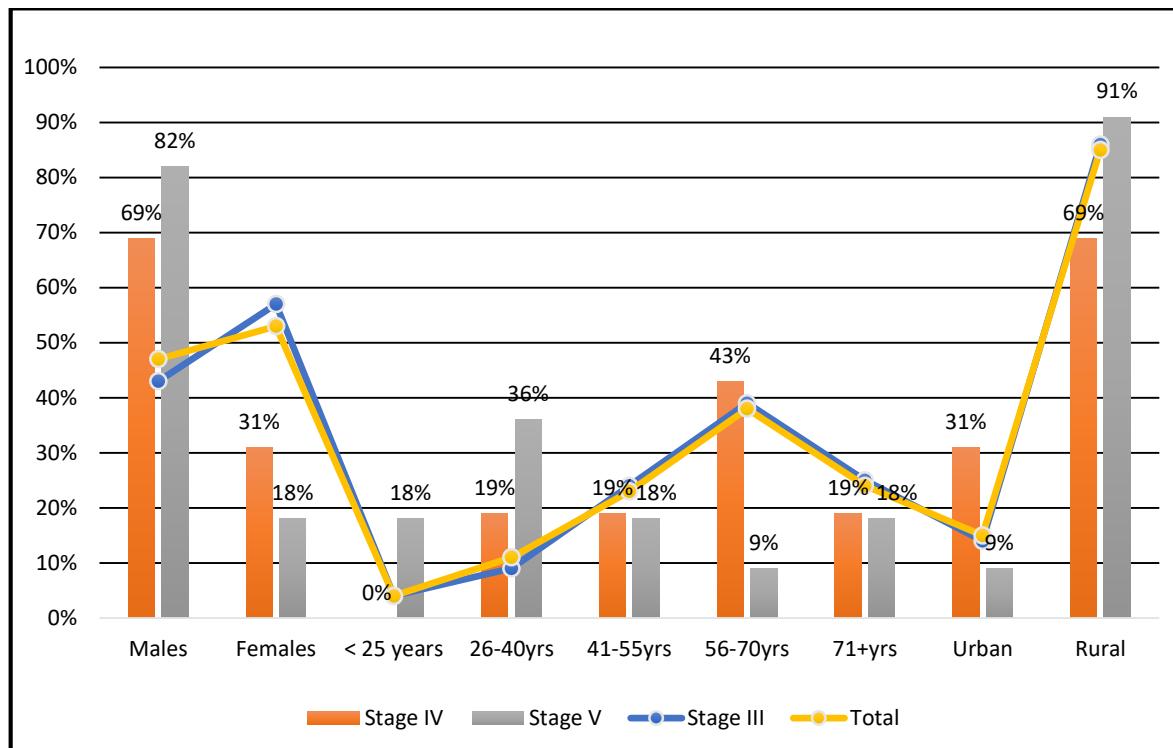


Fig 1. Description of the CKD by the proportion of demographical features

About 9/119(7.6%) males had stage V, 11/119(9.2%) had stage IV, and 99/119(83.2%) had stage III. About 2/137 (1.5%) females had stage V, 5/137 (3.5%) had stage IV, and 130/137 (95%) had stage III. The RR (95% CI) for end-stage renal disease in male patients was 3.2893 (1.4416 to 7.5055), $P = 0.0047$, as shown in Table 1 and Fig 1. 4/11 (36.4%) of patients with end-stage renal illness (stage V) were between the ages of 26 and 40. 7/16 (43.8%) of patients with stage IV were between the ages of 56 and 70. There were around

10/11 (91%) patients with end-stage renal illness (stage V) in the rural population, compared to only one (9%) in the urban group. Approximately 11/16 (68.8%) and 5/16 (31.2%) of patients with stage IV were in rural and urban areas, respectively. As shown in Table 1 and Figure 1, the risk of end-stage renal disease was RR (95% CI) = 0.8174(0.3537 to 1.8889), $P = 0.6370$, and z statistic = 0.472 in the rural population.

Table 2. Distribution of the study subjects by modifiable risk factors

Variable	Stage III	Stage IV	Stage V	Total
Hypertension				
Yes	141	6	5	152
No	80	8	6	94
Total	221	14	11	246
T2DM				
Yes	122	9	3	134
No	101	6	8	115
Total	223	15	11	249
NSAIDs				
Yes	43	4	3	50
No	147	11	8	166
Total	190	15	11	216
Herbal medication				
Yes	37	4	4	45
No	153	11	7	171

Total	190	15	11	216
Bodyweight				
Underweight	1	0	0	1
Normal weight	43	1	4	48
Overweight	80	7	5	92
Obese	32	3	0	35
Morbid obese	22	1	2	25
Total	178	12	11	201

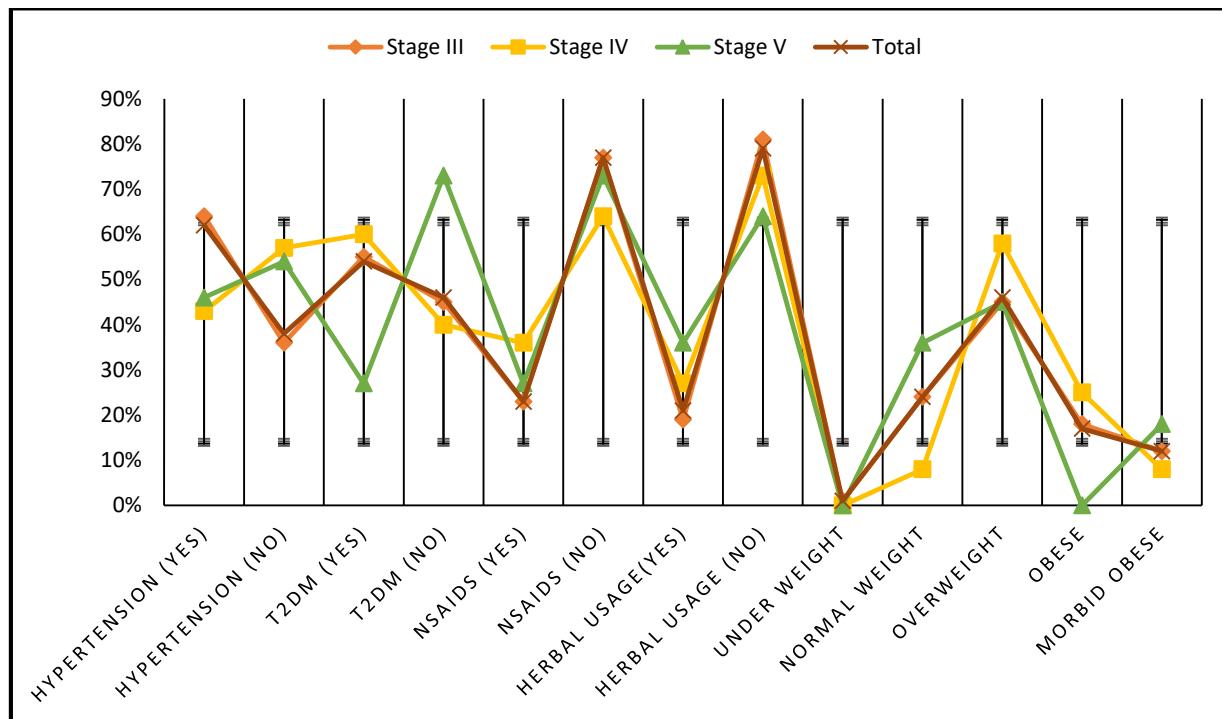


Fig 2. Study subjects by modifiable risk factors proportions with entire groups

Table 2 and Figure 2 summarize the study subjects' distribution by modifiable risk variables. Hypertension was discovered in 152/246 (62%) of the patients (including 6/14 (43%) Stage IV and 5/11 (45.5%) Stage V). T2DM was found in 134/249 (54%) of the individuals (including 9/15 (60%) Stage IV and 3/11 (27%). Nonsteroidal anti-inflammatory medicines (NSAIDs) were used by 50/216 (23%) of the individuals (including 4/15 (27%) in Stage IV and 3/11 (27%) in Stage V). Herbal medication was used by 45/216 (21%) of the individuals (including 4/15 (27%) Stage IV and 4/11 (36%). Stages IV and V were more common in overweight people, accounting for 7/12 (58.3%) and 5/11 (45.5%), respectively. Increased BMI was related to an increased risk of CKD (RR (95% CI) = 1.1368 (0.4458 to 2.8992), P = 0.7883.

4. DISCUSSION

The rising prevalence of CKD in Saudi Arabia needs research on the most common modifiable risk factors. The current study's findings revealed that females have a larger incidence of CKD than males, whereas men have a higher frequency of late-stage CKD. Previously, it was reported that the risk of CKD is somewhat higher in women than in men, even though males are more likely to reach end stages and acquire the cardiovascular disease.¹⁸ The current study's findings revealed an increased prevalence of CKD in people aged 56 to 70. Previously, it was observed that CKD worsens with age, leading to irreversible progression.¹⁹ The current study found that rural inhabitants had a higher relative risk of CKD than urban populations. Previously, similar findings were

reported from other parts of the world.²⁰ The rural population, on the other hand, maybe more vulnerable to uncontrolled modifiable risk factors than the urban population. The current study revealed many hypertensive and diabetic patients with late-stage CKD. Diabetic renal disease accounts for approximately 40% of all CKD worldwide. Furthermore, hypertension is a substantial modifiable risk factor for advancing diabetic kidney disease and raises the incidence of cardiovascular disease and death in these individuals. Exact hypertension management can lessen the development of CKD and the risk of cardiovascular disease.²¹ Patients with advanced CKD had a slightly higher relative risk of using herbal medications. Alternative medicine (herbal components) is widely used in many parts of the world. The origin and substance of these herbal remedies vary widely around the globe.²² It has been stated that approximately one-third of individuals in the industrialized world and more than 80% of people in underdeveloped nations utilize herbal medicine to cure common disorders.²³ The administration of a herbal medication may result in nephrotoxicity, which can lead to CKD and, eventually, renal failure.^{24,25} NSAIDs were used by 23% of the donors, including 27% of Stage IV and 27% of Stage V. Regular NSAID use has been linked to decreasing renal function and progressive CKD.²⁶ However, several studies found that taking standard-dose NSAIDs did not significantly increase the risk of accelerated CKD progression.²⁷ The current study's findings indicate a slightly higher relative risk of CKD development with high BMI. The most major modifiable risk factor for CKD development is

increasing BMI. Obese people experience compensatory hyperfiltration to meet the increased metabolic demands of their body weight. It raises intraglomerular pressure, causing kidney injury and increasing the chance of developing CKD.^{28,29} Late-stage CKD is frequent in Saudi Arabia and is more common in women, rural residents, and people over 55. Hypertension, diabetes, herbal drug use, NSAIDs, and obesity are the most frequent modifiable risk factors for CKD. Identifying and controlling these risk factors is essential to prevent CKD progression and reduce mortality. Early detection and management of these risk factors can help reduce CKD morbidity and mortality. Therefore, screening and early treatment are essential.

5. ACKNOWLEDGMENT

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6. AUTHORS CONTRIBUTION STATEMENT

Hessa Abdullah Alshammari and Fahad Khalid ALQuwaiay conceived the presented idea. Hussain Gadelkarim Ahmed developed the theory and performed the computations. Abdulkarim Ali Alqufayi, Ahmed A. Alrashidi, and Faisal Saud Mohammed Alzayed verified the analytical methods. Omar Ali Alshammari encouraged Saleh Ahmed Alogla to investigate [a specific aspect] and supervised the findings of this work. All authors discussed the results and contributed to the final manuscript.

7. CONFLICT OF INTEREST

Conflict of interest declared none.

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