



Knowledge of Chronic Kidney Disease in Northern Saudi Arabia

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Abstract Objectives: Chronic kidney disease (CKD) is a serious health issue in Saudi Arabia. In Saudi Arabia, there is limited research on CKD and related risk factors among the general population. The primary objective of this study was to explore the knowledge of kidney function, risk factors, signs and preventive measures of CKD among the general population. **Methods:** A population-based, descriptive, cross-sectional study design using a pre-designed, structured questionnaire was undertaken among the adult general population in Arar City, Northern Saudi Arabia, during the period from March 1 to September 30, 2024. **Results:** A total of 400 participants were included, with a mean age of 28.5 ± 10.4 , 68.3% males, 64.5% single, the majority being university educated or above (79.8%), 17.8% hypertensive and 15% diabetic. The most often reported kidney function was blood cleansing (84.4%) and urinalysis was the most often indicated renal function test (76%). High blood pressure and excessive salt consumption were mentioned as the most common (71%) risk factors for CKD, while urine retention was the most often reported symptom of CKD (72.3%). The most frequently cited preventive factors for the development of CKD were staying fit and active (72.8%), maintaining proper blood pressure (70.3%), eating healthy food and maintaining a healthy body weight (69.8%). **Conclusion:** This study offered preliminary insights into CKD-related knowledge among the general population in northern Saudi Arabia.

Key Words CKD, Knowledge, Risk Factors, Symptoms, Preventive Factors, Saudi Arabia

INTRODUCTION

CKD is a non-communicable illness that causes enduring abnormalities in kidney structure or function for at least 3 months [1].

CKD is a global public health concern that affects around 10% of the worldwide population [2]. This significant burden is only now being known and it remains incomplete. Unfortunately, the complex burden of CKD and expenses is constantly expanding, especially in low-income countries [2]. It will continue to increase as the prevalence of diabetes mellitus (DM), hypertension (HT) and an aging population increases [3].

In 2019, CKD was classified as the 7th leading cause of death worldwide, emphasizing the need for prevention efforts [4]. CKD is a significant issue worldwide in both developing and developed countries [5].

The Middle East area has a significant rate of CKD; the prevalence of CKD in the general population is 4.7% in Saudi Arabia [6], 6.8% in Jordan [7] and 14.9% in Iran [8].

In Europe, the overall prevalence of potential CKD in adult populations was estimated to be 10%, with two out of every three CKD patients going. This cohort had a high mortality rate, with CKD being the major cause of hospital visits and expenses [9].

HT, DM and obesity are major risk factors in the development of CKD and they are especially prevalent in Saudi Arabia [6,10]. Therefore, patient education regarding the importance of controlling high blood pressure and diabetes, the leading causes of CKD, can greatly improve kidney function and quality of life [11].

The considerable increase in the development of CKD to end-stage renal disease (ESKD) is expected to remain due to a lack of proactive measures to raise patients' understanding and awareness of CKD [12].

Prevention, early identification and effective treatment of the main risk factors of CKD, such as DM and HT, form an essential public health approach and are crucial in the Arab

world, since these risk factors are widely prevalent [10]. Additionally, Lack of information on CKD, as well as unfavourable attitudes and behaviours, has contributed to a delayed identification of the disease [13].

One of the key goals of CKD management is to slow its progression to ESKD, thereby increasing lifespan and minimizing the need for dialysis or transplantation [1].

Research in developed and developing nations indicates a lack of public awareness of CKD and its risk factors [14]. In Saudi Arabia, many studies reported a lack of knowledge among the Saudi people about CKD [15-19]. Additionally, in Jordan, the public knowledge of CKD was intermediate [7].

Enhancing public awareness of CKD is necessary for implementing effective preventive programs. Individuals with early CKD or those at risk of developing CKD may be identified more quickly among communities with high levels of education and awareness regarding CKD [20,21].

The study aimed to explore the knowledge of kidney functions, risk factors, signs and preventive measures of CKD among the adult general population in Arar city, Northern Saudi Arabia.

METHODS

Study Setting and Design

A cross-sectional study design was conducted among an adult general population who are 18 years and older, both males and females, in Arar city, the capital of Northern Saudi Arabia, over the period from March 1 to September 30, 2024.

Sampling Tool

A well-designed self-administered questionnaire, Arabic version prepared by reviewing the relevant literature [15,17,22,23]. The questionnaire was divided into six sections.

- The first section included sociodemographic data
- The second section featured questions about renal function
- In the third portion, there were questions concerning risk factors for CKD
- The fourth domain asked about the signs and symptoms of CKD
- The fifth component includes questions regarding awareness of the conditions that necessitate screening
- The final part asked about preventative methods for CKD

The questionnaire was originally developed in English, then translated into Arabic and subsequently back into English by a multilingual expert. Two nephrology experts evaluated the content validity of the questionnaire.

A pilot study on 20 people was conducted to eliminate bias and technical concerns or any ambiguity in the questions or replies, before adoption.

Sampling Method

Following ethical permission, a survey was conducted to recruit participants via an online questionnaire approach using several social media platforms (WhatsApp,

Facebook). After describing the research objectives, participants provided informed consent, which was clearly stated at the top of the questionnaire.

Sample Size

The minimum sample size was calculated according to the following formula:

$$N = (Z_{1-\alpha/2})^2 P(1-P)/d^2 \\ = (1.96)^2 \times 0.50 \times (0.5)/(0.05)^2 = 383.4 \sim 384$$

Where $(Z_{1-\alpha/2})$ is the standard normal variate at 5% type 1 error (1.96); (P) is the expected proportion of awareness in Saudi Arabia (50%) and (d) is the absolute error (0.05). The sample was completed at 400.

Statistical Analysis

The data was collected and then analysed using SPSS version 22. Categorical data were described as frequency and percentage, while numerical data were presented as mean and standard deviation.

Inclusion and Exclusion Criteria

Adults who were at least 18 years old and willing to participate were included in the study, whereas those who were under 18 or refused to participate were excluded.

RESULTS

Table 1 depicts the sociodemographic features of the study sample. The study included 400 participants, with a mean age of 28.5 ± 10.4 . More than two-thirds were male (68.2%), more than sixty percent were single (64.5%), the majority were university-educated (70.3%), more than half were students (54.2%) and slightly less than half had a household income of more than 10,000 SAR. The prevalence of diabetes and hypertension was 15% and 17.8%, respectively.

Table 2 shows how the investigated population perceives kidney function. The most often reported kidney function was blood cleansing (84.4%), followed by blood waste filtering (76.3%), electrolyte balancing (73.3%), urine production (69%), hormone release (61%), protein breakdown (50.8%) and fat disintegration (47.5%). Urinalysis was the most often indicated renal function test (76%), followed by blood testing (67.8%) and blood pressure monitoring (62%).

Table 3 shows the respondents' knowledge of renal risk factors. HT and excessive salt consumption were mentioned the most (71%), followed by DM (69.3%), obesity (65.8%), hereditary (64.3%), stress (60.8%), hyperlipidaemia (59%), heart disease (58%), insufficient sleep (53.8%), anaemia (53.3%), dye injection (51.5%) and female gender (48.3%).

Table 4 displays the participants' perspectives on CKD symptoms. Water retention was the most often reported symptom of CKD (72.3%), followed by chronic fatigue (59.8%), nausea and vomiting (56.5%), thirst (55%), back pain (53.8%), fever (52.3%), frothy urine (51.5%) and symptomless (48.5%).

Table 1: Demographic characteristics of the study participants

Parameter	No	Percentage
Age	Mean \pm SD= 28.5 \pm 10.4	
Sex		
Male	273	68.2
Female	127	31.8
Marital status		
Single	258	64.5
Married	132	33
Divorced/Widowed	10	2.5
Educational level		
Primary school	19	4.8
Intermediate school	8	2
Secondary	54	13.5
University	281	70.3
Post-graduation study	38	9.4
Occupation		
Student	217	54.2
Employee	124	31
Retired	20	5
Others	39	9.8
Family income		
Less than 5000 SR	81	20.2
5000-10000 SR	131	32.8
More than 10000 SR	188	47
Suffered from diabetes mellitus		
Yes	60	15
No	340	85
Suffered from Hypertension		
Yes	71	17.8
No	329	82.2

Table 5 shows the participants' knowledge of chronic renal disease. CKD is defined by slightly less than 60% (58%) of participants as a reduced kidney's capacity to eliminate waste from the blood. More than half (54.5%) reported renal inflammation, while kidney stones and infection were reported by 45.5% and 43.5%, respectively.

More than 60% of participants reported that hypertensive and diabetic patients require renal function testing, while roughly 60% mentioned that individuals had a family history of kidney illness. More than two-thirds agreed that a person can survive with only one kidney, while slightly more than forty percent said that a person can live with less than one.

Table 6 illustrates the participants' knowledge of CKD preventive factors. The most frequently cited preventive factor for the development of CKD was Staying fit and active (72.8%), followed by maintaining proper blood pressure (70.3%), eating healthy food and maintaining body weight (69.8%), having enough fluid intake (69.8%), maintaining blood glucose levels (64.3%) and reduced protein consumption (54%),

Unfortunately, fewer than half of the participants (43.8%) agreed that CKD is irreversible, almost 60 percent felt that kidney functions are diminished by old age and the majority claimed that CKD is serious.

DISCUSSION

CKD is a growing global health crisis affecting millions of individuals worldwide. This progressive condition is characterized by a gradual loss of kidney function, which can

Table 2: Perception of kidney function among the studied population

Parameter	No	Percentage
Clean blood		
Yes	339	84.8
No	34	8.4
I do not know	27	6.8
Help filter waste from the blood		
Yes	305	76.3
No	42	10.5
I do not know	53	13.2
Regulate body water and minerals in the blood, such as sodium, potassium, phosphorus and calcium		
Yes	293	73.3
No	38	9.5
I do not know	69	17.2
The kidney's function is to make urine		
Yes	276	69
No	78	19.5
I do not know	46	11.5
Releases hormones into the blood to regulate blood pressure, produce red blood cells and promote strong bones		
Yes	244	61
No	56	14
I do not know	100	25
Break down protein inside the body		
Yes	203	50.8
No	96	24
I do not know	101	25.2
Break down food to produce substances that dissolve fats		
Yes	190	47.5
No	95	23.8
I do not know	115	28.7
The most common kidney function test is		
Urinalysis		
Yes	304	76
No	33	8.3
I do not know	63	15.7
Blood test		
Yes	271	67.8
No	49	12.2
I do not know	80	20
Blood pressure monitoring		
Yes	248	62
No	58	14.5
I do not know	94	23.5

lead to severe complications, including kidney failure and an increased risk of cardiovascular disease. Factors such as diabetes, hypertension and an ageing population contribute significantly to the rising prevalence of CKD. Awareness and understanding of various aspects of this disease would help address its root causes and implement effective management strategies with interventions and lifestyle changes to work towards alleviating the burden of CKD on communities around the globe.

The mean age of participants in the study is 28.5 \pm 10.4, very similar to the study of Alhowsaihi *et al.* in Riyadh [24], while it was 37.15 \pm 16.24 in the survey by Younes *et al.* from Lebanon [23].

Regarding the participants' knowledge of kidney functions, the study revealed that the majority correctly answered blood cleaning, blood waste filtering, electrolyte balancing and urine production. In line with comparable research in Saudi Arabia, 93.8% [16], (87.9%), [26] 79.8% [15],

Table 3: Knowledge of the common risk factors for CKD

Parameter	No	Percentage
High blood pressure		
Yes	284	71
No	28	7
I do not know	88	22
Excessive salt intake		
Yes	286	71.5
No	29	7.3
I do not know	85	21.2
Diabetes mellitus		
Yes	277	69.3
No	43	10.7
I do not know	80	20
Obesity		
Yes	263	65.8
No	52	13
I do not know	85	21.2
Hereditary factors		
Yes	257	64.3
No	50	12.5
I do not know	93	23.2
Excessive stress		
Yes	243	60.8
No	45	11.2
I do not know	112	28
Hyperlipidemia		
Yes	236	59
No	54	13.5
I do not know	110	27.5
Heart diseases		
Yes	232	58
No	47	11.8
I do not know	121	30.2
Insufficient sleep		
Yes	215	53.8
No	63	15.8
I do not know	122	30.4
Anemia		
Yes	213	53.3
No	55	13.7
I do not know	132	33
Dye injection		
Yes	206	51.5
No	65	16.3
I do not know	129	32.3
Being female		
Yes	193	48.3
No	72	18
I do not know	135	33.7

76.4%, [22] and (73.6%) [19] of participants believed that the kidney's primary role is to purify blood. In a Jordanian study [7], 92.8% confirmed that the kidneys purify the blood of poisons and transform waste products into urine. The awareness of the kidneys' filtering waste from blood was 79.4% in a study by Chow *et al.* in Singapore [27].

Regarding the knowledge of kidney function tests, more than 60% percent correctly stated urine analysis, blood testing and blood pressure measurement. Screening for CKD and frequent monitoring of renal function are critical public health strategies for preventing CKD from progressing into more serious stages. The patients' awareness of the regularly used tests to measure their kidney condition is vital in developing and executing health programs

Table 4: Perceptions of symptoms of CKD

Parameter	No	Percentage
Water retention		
Yes	289	72.3
No	39	9.7
I do not know	72	18
Chronic fatigue		
Yes	239	59.8
No	47	11.8
I do not know	114	28.4
Nausea and vomiting		
Yes	226	56.5
No	47	11.8
I do not know	127	31.7
Frequent Thirst		
Yes	220	55
No	52	13
I do not know	128	32
Back pain		
Yes	215	53.8
No	59	14.8
I do not know	126	31.4
Fever		
Yes	209	52.3
No	62	15.5
I do not know	129	32.2
Frothy urine		
Yes	206	51.5
No	55	13.8
I do not know	139	34.7
Loss of appetite		
Yes	203	50.8
No	57	14.2
I do not know	140	35
Symptomless		
Yes	194	48.5
No	68	17.0
I do not know	138	34.5

to meet the rising public health problem of the increased prevalence of CKD with advanced stages.

In comparable research in Saudi Arabia, more than 80% of participants correctly stated blood and urine tests as screening methods for renal function and 56.6% stated blood pressure measurement [15]. Moreover, in Abha, Saudi Arabia, urine test, blood test and blood pressure monitoring were listed by 89.7%, 90.3% and 53.5% respectively [28]. Research [14] among the Australian population found that around 65% of respondents recognized that blood and urine tests can be used to detect kidney function and just 20.3% knew that blood pressure assessment.

In terms of CKD risk factors knowledge, most respondents highlighted hypertension, excessive salt consumption, diabetes, obesity and inherited factors. The main causes of CKD are diabetes and hypertension. Investigating whether this misinformation is linked to the causes of CKD warrants further research. There is good evidence to support the efficacy of such a strategy in managing blood pressure and improving disease outcomes. An accurate and prioritized understanding of CKD risk factors promotes disease awareness and facilitates timely screening.

In industrialized and many developing nations, substantial numbers of individuals are ignorant of the two

Table 5: Knowledge of CKD and situations that require screening.

Parameter	No	Percentage
Reduction in the kidneys' ability to remove waste from the blood		
Yes	232	58
No	66	16.5
I do not know	102	25.5
Inflammation of the kidney		
Yes	218	54.5
No	79	19.8
I do not know	103	25.7
A stone in the kidneys		
Yes	182	45.5
No	127	31.8
I do not know	91	22.7
An infection of the kidneys		
Yes	174	43.5
No	95	23.8
I do not know	131	32.7
In your opinion, which of the following conditions requires screening for CKD		
Hypertension		
Yes	260	65
No	34	8.5
I do not know	106	26.5
Diabetes mellitus		
Yes	259	64.8
No	49	12.2
I do not know	92	23
A person with a family history of renal disease		
Yes	238	59.5
No	53	13.3
I do not know	109	27.2
A person needs at least one healthy kidney to lead a healthy life.		
Yes	286	71.5
No	47	11.8
I do not know	67	16.7
A person can live with less than one healthy kidney.		
Yes	171	42.8
No	117	29.2
I do not know	112	28

primary causes of chronic kidney disease: hypertension and diabetes [29]. In a study [18] done in Riyadh, Saudi Arabia, more than half (56.6%) of the participants showed an appropriate awareness of CKD risk factors. According to Almutary's study [30] in Saudi Arabia, DM and HT are the primary causes of chronic kidney disease. Research in Madina, Saudi Arabia [16], indicated that 65.8%, 52.4%, 49.7%, 43.9% and of respondents identified genetic factors, DM, obesity and HT as risk factors for CKD, respectively. Research conducted by Alobaidi *et al.* [15] revealed that 69.2% reported hypertension and 54.3% diabetes as risk factors for CKD. A study carried out in western Saudi Arabia [31] showed that 52.7% of participants considered diabetes as a risk factor for CKD. Ahmed *et al.* [20] found that 90% of the Saudi population identified obesity as a risk factor for CKD, 56% excessive salt intake and 60% reported DM and hypertension. Al-Husayni *et al.* [17] in Jeddah, Saudi Arabia, discovered that around 50% and 35% of participants were aware that diabetes and hypertension are risk factors for CKD.

In a survey in Hong Kong [32], most respondents (79.5%) identified higher dietary salt as a risk factor for CKD, while

Table 6: Knowledge of preventive factors of CKD

Parameter	No	Percentage
Do you think that the following can prevent CKD?		
Keeping fit and active		
Yes	291	72.8
No	27	6.8
I do not know	82	20.4
Keeping blood pressure controlled		
Yes	281	70.3
No	27	6.7
I do not know	92	23
Eating healthy food and keeping body weight		
Yes	279	69.8
No	35	8.8
I do not know	86	21.4
Maintaining enough fluid intake		
Yes	279	69.8
No	34	8.5
I do not know	87	21.7
Keeping blood glucose controlled		
Yes	257	64.3
No	44	11
I do not know	99	24.7
Decreased protein intake		
Yes	216	54
No	56	14
I do not know	128	32
CKD is an irreversible illness.		
Yes	175	43.8
No	90	22.5
I do not know	135	33.7
Becoming old will decrease the function of the kidneys.		
Yes	241	60.3
No	56	14
I do not know	103	25.7
CKD is a serious disease.		
Yes	299	74.8
No	37	9.2
I do not know	64	16

fewer than half recognized hypertension (43.8%), diabetes (44%) and hereditary factors (42.8%). A survey of the Australian population [14] found that 60.6% of respondents listed diabetes as a risk factor for CKD.

In terms of CKD symptoms, urine retention was the most reported, followed by chronic fatigue and nausea/vomiting. Furthermore, slightly less than half believed that CKD may be asymptomatic. According to a comparable local survey [15], 79.8% 68.8% and 44.7% of participants identified water retention, chronic fatigue and nausea/vomiting as signs of CKD, respectively. Furthermore, 70.9% of respondents in South Saudi Arabia thought that water retention is a sign of CKD [22]. In southern Saudi Arabia, 61.6% and 43% of participants in a similar survey listed chronic fatigue and no symptoms [23]. Alobaidi *et al.* [28], in western Saudi Arabia, 85.9% and 61.6% of participants identified water retention and fatigue as signs of CKD, while only 30% correctly recognized nausea, vomiting and lack of appetite. In a study conducted by Almutary [30], 70% of the participants correctly identified fatigue and nausea/vomiting as signs of CKD, while 70% did not know that the disease could be asymptomatic.

CONCLUSIONS

A substantial proportion of the participants were aware of the kidney functions, renal function tests and common risk/preventive factors for CKD. Less than sixty percent of respondents listed the most common symptoms of CKD. More research is needed to investigate the reasons for low symptom awareness and design a focused intervention to raise CKD awareness among the public.

Limitations

Several study limitations should be noted before interpreting the findings. We conducted an internet-based cross-sectional study using a questionnaire distributed through social media sites, which may have introduced selection bias. Furthermore, our study sample is not representative of the broader Saudi population, which limits the generalizability of the research findings.

Ethical Statement

The study was approved by the local bioethical committee of Northern Border University (HAP-09-A43) with decision no. (28/24/H) on March 18, 2024.

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