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Awareness of chronic kidney disease (CKD) among CKD patients

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ABSTRACT

Background: CKD is a public health issue that could burden the health care system of KSA. Patients' awareness about their condition proves better adherence and reduction of complication. *Aims:* to evaluate the awareness of CKD patient about their condition. *Methods:* a cross- sectional study using a validated questionnaire conducted in king Fahad medical city in Riyadh. CKD diagnosed patient from 18 years old and above were selected. *Result:* a total of 114 CKD patient participated in the study. Mostly were males (62.3%), age groups of 51-70 (38.6%) and 31-50 (31.6%) years old, married (60.2%), high school educational background (27.2%), unemployed (43.9%), <5000 SAR income, >12-month CKD duration (73.7%), DM (53.5%) HTN (83.3%) and no CVD (60.5%). CKD patients' awareness mean score is 28.94, awareness was highest on how to collect urine correctly (2.74) and lowest on what activities are organized regularly in clinics (0.29). C*onclusion:* poor awareness was observed among CKD patients regarding their medical condition, which warrants more efforts to enhance their knowledge.

Keywords: chronic kidney disease, awareness, cross-sectional study

1. INTRODUCTION

The Center for Disease Control and Prevention (CDC) defines chronic kidney disease (CKD) as a condition in which the kidney are damage and failed to filter blood (Centers for Disease Control and Prevention). But technically, CKD is defined as decreased in kidney function characterized with glomerular filtration rate [eGFR] of <60 mL/min per 1.73 m^2 or abnormalities in both function and structure and continue at least for three months or more (Lorig et al., 1999). In this condition, the excess fluid and wastes from the blood remained inside the body that eventually could cause harmful effects on one's

health, such as stroke and heart disease (Centers for Disease Control and Prevention).

CKD is a non-communicable type of disease; however, it can potentially affect tremendous individuals (Chen et al., 2019; Global Burden of Disease Study 2013 Collaborators, 2015). The incidence rate of CKD is estimated from 8% to 16% of the global population (Global Burden of Disease Study 2013 Collaborators, 2015; Ene-Iordache et al., 2016; Foreman et al., 2018; Global Chronic Kidney Disease Collaboration, 2020; Jha et al., 2013). At a global scale, the Global Burden of Disease (GBD) reported in 2015, CKD is an important cause of morbidity and mortality (Global Burden of Disease Study 2013 Collaborators, 2015; Global Chronic Kidney Disease Collaboration, 2020). According to the World Health Organization (WHO), there are around 850 million people who suffers from some form of CKD and furthermore reported that CKD is more prevalent in low to middle income countries rather than the high-income countries (Lorig et al., 1999; Global Burden of Disease Study 2013 Collaborators, 2015; Ene-Iordache et al., 2016; Foreman et al., 2018; Global Chronic Kidney Disease Collaboration, 2020; Jha et al., 2013).

In Kingdom of Saudi Arabia (KSA), CKD is considered as one major public health issue (Al Rahbi & Al Salmi, 2020; Almutary et al., 2013; Almutary, 2021; Alobaidi, 2021; Alsuwaida et al., 2010). In a recent study conducted to Saudi population, an increasing incidence and prevalence of end stage kidney disease (ESKD) has been reported (Almutary et al., 2013; Almutary, 2021; Alsuwaida et al., 2010). In 2010, the regional prevalence of CKD was estimated at 5.7% while the dialysis incidence rate was 136 new cases per million populations (Alsuwaida et al., 2010). Recently published article of the Global Chronic Kidney Disease Collaboration group (2020) reported that in Saudi Arabia there were 2.4 million patients suffering from CKD (Global Chronic Kidney Disease Collaboration, 2020).

Studies have shown that early detection is necessary to prevent CKD progression and reduce the risk of morbidity and mortality (Lorig et al., 1999; Chen et al., 2019; Ene-Iordache et al., 2016; Jha et al., 2013; Almutary et al., 2013). Common to any disease management, the patients' awareness to their condition plays a crucial role in medication adherence and handling complications (Chen et al., 2019; Almutary et al., 2013). There are several studies done globally to measure the awareness of chronic kidney disease among CKD patients such as those of Alobaidi et al., (2021), Dharmarajan et al., (2017) and Plantinga et al., (2010), to mention a few. However, to the best of authors' knowledge, only little information is addressing the awareness and knowledge of CKD among Saudi CKD patients. As a matter of fact, in 2021 a cross-sectional study done in Saudi Arabia found that the level of CKD knowledge among the Saudi population was generally poor (Almutary, 2021). Hence, the authors of this study tried to explore the awareness and knowledge of CKD among Saudi CKD patients using a validated questionnaire to assess the level of awareness and knowledge regarding CKD. Results from study will then be a good reinforcement of resource in the development of interventions in educating CKD patients regarding their condition and practitioners alike in reducing the public burden brought about by CKD issues.

In particular, this study aims to measure the level of awareness and knowledge regarding chronic kidney disease among CKD patients, which can help the nephrology departments to put more effort on patients' éducation. Specifically, the objectives of the study include: 1) to describe CKD patients' awareness about CKD, 2) to determine the association of awareness and socio-demographic factors and 3) to characterize predictors of CKD patients' awareness.

2. METHODOLOGY

A cross-sectional study conducted in King Fahad Medical City of Riyadh, Saudi Arabia for five months starting January-May 2022. Included participants were all patients diagnosed with CKD that are 18 years old or older and had provided consent, otherwise those CKD diagnosed patients were excluded from participating in the study. Qualified participants were then asked for contact information, creatinine level, estimated glomerular filtration rate (eGFR), albumin-to-creatinine ratio (ACR), protein creatinine ratio (PCR), urine and body measurements. After which a phone call interview was conducted by the data collector of this study.

An English questionnaire translated to Arabic language was used as a guide in collecting data from the participants (Peng et al., 2019). A total of 18 questions were asked to each of the participants to assess patients' knowledge about CKD. These questions were divided into four parts. Part 1 consists of seven questions intended to measure patients' perception about CKD, knowledge about symptoms developed when kidney function got degraded, medication that damages kidney, and medication mechanism of action used in CKD treatment. Part 2 includes five questions about diet and exercises that could harm or benefit CKD patients. Part 3 comprises of four questions formulated to understand patient apprehension about examination and laboratory results. Part 4 contain 2 questions to assess if patients are aware if the ways they can contact their nephrologist if they have question about their condition.

This study was analyzed using IBM SPSS version 23 (IBM Corp., Armonk, N.Y., USA) and visually presented by using GraphPad Prism version 8 (GraphPad Software, Inc., San Diego, CA, USA). A simple descriptive statistic was used to define the

characteristics of the study variables through a form of counts and percentages for the categorical and nominal variables while continuous variables are presented by mean and standard deviations. A domain was calculated by a simple additive method namely "Chronic Kidney Disease Patient Awareness". A likert scale of 0 to 4 was used to measure each question. The questions includes information pertaining to symptoms developed when they got worse, what aggravates their kidney function, long-term prognosis of their disease, how to control their blood pressure, the names and usage of their medicines, primary role of their medicines, which medicine may impair their kidney function, unhealthy diets, what contains high-quality proteins, food that should be avoided, amount of salt allowed for daily use, exercises, laboratory exams they should take regularly, how to collect urine correctly, meaning of test reports, evaluation of curative effect, educational activities organized in the clinic and how to contact medical staffs when they have questions. Also, a reliability analysis was used with a model of Alpha (Cronbach) to study the properties of measurement scales and the items that compose the scales and the average inter-item correlation.

To compare the domain to demographical data an independent *t*-test was used for two group means and for more than two groups, a One-way ANOVA, with Least Significant Difference (LSD) as a post hoc test was used. These tests were done with the assumption of normal distribution. In addition, General Linear Model (GLM) Univariate analyses were used to identify significant predictors using Main Effect as model. Lastly, a conventional p-value <0.05 was the criteria to reject the null hypothesis.

Ethical approval

This study was approved by the Institutional Review Board (IRB) of Institution (Approval No. 21-376E). Appropriate and informed consents (written and verbal) were obtained from the participant. Also, this research was carried out in accordance with the Code of Ethics of the World Medical Association (Declaration of Helsinki 2013) for experiments involving humans. The authors also ensured confidentiality of patients by concealing any identifiers.

3. RESULTS

Demographic characteristics and medical profile of the participants

This cross-sectional study was participated with a total of 114 patients. As shown on Table 1, more than a quarter of the participants belong to the age group of 31-50 (31.6%) and 51-70 (38.6%). Only a few belongs to the age group of 18-30 (13.2%) and more than 70 years old (16.7%). More than half were males (62.3%) and only 37.7% were females. Similarly, in terms of marital status of the participants, more than half (60.2%) were married while almost a quarter (23.9%) were singles, and a very few were divorced (8.8%) and widowed (7.1%). Regarding the education background, more than a quarter have reached high school (27.2%) while almost a quarter have reached Bachelors or Postgraduate degree (23.7%). About half of the participants belonged to secondary (14.9%), primary (13.2%) and nothing or no formal education at all (21.1%). Almost half of the participants were unemployed (43.9%) while more than a quarter were employed (29.8%), retired (24.6%) and very few (1.8%) were unable to work. Most participants monthly income is less than SAR 5000 (61.4%), followed by SAR 5,000-10,000 (20.2%) and lastly, higher than SAR10, 000 (18.4%).

Concerning medical condition of participants, this study also checked for diabetes (DM), hypertension (HTN) and cardiovascular disease (CVD). In this study, more than half has DM (53.5%), more than three quarters has HTN (83.3%) and more than a quarter has CVD (39.5%). In addition, majority of these participants had CKD >12 months (73.7%) while 16.7% and 9.6% had CKD <6 months and 6-12 months, respectively (Table 1). Additionally, the mean microalbumin level of the participants was 113.03 CRG/mmol (0.07 min, 760 max SD 157.1) while the mean creatinine level was 267.32 μm/L (99.0 min, 1,140.0 max SD 189.3) Contrastingly, the mean uric acid level was 36.2 (0.0 min, 550 max, SD 84.5) while the mean eGFR was 32.42 ckd-EPI (3.0 min, 81.0 max, SD 18.9) (Table 1).

Table 1 Characteristics of the study samples.

		Count	%
Total		114	100.0
Age	18-30	15	13.2
	31-50	36	31.6
	51-70	44	38.6
	>70	19	16.7

Gender	Male			71	62.3
	Female			43	37.7
Marital Status	Single			27	23.9
	Married			68	60.2
	Divorced			10	8.8
	Widowed			8	7.1
	Missing			1	
Education	Nothing			24	21.1
	Primary			15	13.2
	Secondary			17	14.9
	High School			31	27.2
	Bachelor Degree			24	21.1
	Postgraduate			3	2.6
Employment	Employed			34	29.8
	Unemployed			50	43.9
	Retired			28	24.6
	Unable to work			2	1.8
Income	<5000			70	61.4
	5000-10000			23	20.2
	10000-15000			16	14.0
	>15000			5	4.4
DM	Yes			61	53.5
	No			53	46.5
HTN	Yes			95	83.3
	No			19	16.7
CVD	Yes			45	39.5
	No			69	60.5
CKD	Yes			114	100.0
Duration of CKD	Less than 6 months			19	16.7
	6-12 months			11	9.6
	More than 12 months			84	73.7
	N	Min	Max	Mean	SD
MicroAlbumin (CRG/mmol)	95	0.07	760.0	113.03	157.1
UA blood	54	0.00	550.0	36.2	84.5

Creatinine (ummol)	114	99.0	1,140.0	267.32	187.3
eGFR (ckd-EPI)	113	3.00	81.0	32.42	18.9

Patients' awareness symptoms and CKD prognosis

As shown on Table 2, only 12.3% and 21.1% of the patients were clearly aware and knows most of it respectively, about the symptoms when CKD gets worsen and 34.2% knew nothing about it. Almost similar number of patients clearly knows (13.2%) and know most of (21.1%) what can aggravate CKD and there were 31.6% of patients who knew nothing about it. When patients were asked about the long-term prognosis of CKD, noteworthy that 51.8% of the patients knew nothing about and only few (14.9% and 9.6%) knew clearly and knew most of it, respectively.

Patients' awareness to management of CKD and medication effects

Table 2 shows that only 16.7% and 14.9% of the patients were clearly aware and knows most of it respectively, on how to control blood pressure and 35.1% knew nothing about it. A seemingly different number of patients clearly knows (34.2%) and know most of (18.4%) the names and usage of their medicines and there were only 14.9% of patients who knew nothing about it. However, when patients were asked about the primary role of their medicines, surprisingly, 40.4% of the patients knew nothing about and only few (18.4% and 9.6%) knew clearly and knew most of it, respectively. In addition to this, when patients were asked about which medicines may impair kidney function, astonishingly, 50.9% knew nothing about and only 14% and 11.4% clearly knew and knew most about it again, respectively.

Table 2 Chronic kidney disease patients' awareness

Variables	Know nothing about it n (%)	Know a bit n (%)	Know basically n (%)	Know most of it n (%)	Know clearly n (%)
Do you know what symptoms will develop when you get worse?	39(34.2)	13(11.4)	24(21.1)	24(21.1)	14(12.3)
Do you know what aggravates your kidney function?	36(31.6)	14(12.3)	25(21.9)	24(21.1)	15(13.2)
Do you know the long-term prognosis of your disease?	59(51.8)	14(12.3)	13(11.4)	11(9.6)	17(14.9)
Do you know how to control your blood pressure?	40(35.1)	15(13.2)	23(20.2)	17(14.9)	19(16.7)
Do you know the names and usage of your medicines?	17(14.9)	11(9.6)	26(22.8)	21(18.4)	39(34.2)
Do you know the primary role of your medicines?	46(40.4)	15(13.2)	21(18.4)	11(9.6)	21(18.4)
Do you know which medicine may impair the kidney function?	58(50.9)	13(11.4)	14(12.3)	13(11.4)	16(14.0)
Do you know what unhealthy diets are?	37(32.5)	22(19.3)	24(21.1)	13(11.4)	18(15.8)
Do you know what contains high-quality protein?	30(26.3)	17(14.9)	15(13.2)	20(17.5)	32(28.1)
Do you know food which should be avoided?	24(21.1)	9(7.9)	28(24.6)	21(18.4)	32(28.1)

Do you know how much salt to be used daily?	50(43.9)	21(18.4)	30(26.3)	2(1.8)	11(9.6)
Do you know what exercise fits you?	60(52.6)	18(15.8)	22(19.3)	9(7.9)	5(4.4)
Do you know what laboratory examinations you should regularly check?	35(30.7)	14(12.3)	21(18.4)	16(14.0)	28(24.6)
Do you know how to collect your urine correctly?	21(18.4)	11(9.6)	10(8.8)	7(6.1)	65(57.0)
Do you know the meaning of your test reports?	46(40.4)	17(14.9)	25(21.9)	9(7.9)	17(14.9)
Do you know how to evaluate your curative effect?	37(32.5)	18(15.8)	21(18.4)	18(15.8)	20(17.5)
Do you know what kind of educational activities are organized regularly in our clinic?	104(91.2)	0(0.0)	2(1.8)	3(2.6)	5(4.4)
Do you know how to contact our medical staffs when you have a question?	60(52.6)	7(6.1)	17(14.9)	5(4.4)	25(21.9)

Patients' awareness on diet and exercise

A person's diet can play a very important role in managing disease such as CKD. In this study, as shown on Table 2, only15.8% and 11.4% of the patients were clearly aware and knows most of it respectively, about what is considered unhealthy diets are and 32.5% knew nothing about it. A slightly different number of patients clearly knows (28.1%) and know most of (17.5%) what contains high-quality protein is and there were only 26.3% of patients who knew nothing about it. However, when patients were asked about which food should be avoided, there were still 21.1% of the patients knew nothing about and few individuals (28.1% and 18.4%) knew clearly and knew most of it, respectively. Moreover, when patients were asked about how much salt to be used, surprisingly, 43.9% knew nothing about and only 9.6% and 1.8% clearly knew and knew most about it again, respectively. Meanwhile, when patients were asked about what exercise fits their condition, noteworthy that 52.6% knew nothing about it while only 4.4% knew clearly and 7.9% knew most of it.

Patients' awareness on CKD detection process and support

The awareness of patients on the process it has to take prior detection and availability of support would affect their decision and level of cooperation in ensuring treatment. In this particular study, as shown in Table 2, patients were asked if they knew what laboratory examinations to check regularly and only 24.6% knew clearly and 14% knew most about it while there were 30.7% who knew nothing about. However, when asked if they know how to collect urine correctly, more than half of the patients knew clearly about it (57%) and only few (18.4%) knew nothing about it. Interestingly, when patients were asked about if they knew the meaning of their test reports, 40.4% knew nothing about it while very few (14.9%) knew clearly about it and 7.9% knew most of it. An almost similar number of patients have responded that they knew nothing about (32.5%) how to evaluate their curative effect while 17.5% and 15.8% knew clearly and knew most about it, respectively. Intriguingly, almost all of the patients (91.2) knew nothing about what kind of educational activities are organized in the clinic regularly while only very few knew clearly (2.6%) and knew most of it (4.4%). Furthermore, (52.6%) knew nothing about how to contact medical staff when they have a question while 21.9% knew clearly and 4.4% knew most about it.

Level of chronic kidney disease patients' awareness

The CKD awareness of patients mean score is 28.94 (min. 0 and max. 68 SD 14.8). Based on its Cronbach's alpha score of 0.872, it indicates that the test used to measure CKD patient awareness is good and reliable (Table 3). Furthermore, based on this test and as

shown on Figure 1, results revealed that patient's awareness on how to collect urine correctly (D14) was the highest with mean score of 2.74, followed by names and usage of medication (D5) with mean score of 2.47 and then what food to avoid (D10) with mean score of 2.25. On the contrary worth mentioning was the top 5 lowest awareness the patients had. Lowest patients' awareness was on what kind of activities are regularly organized in clinics (D17) with mean score of 0.29, followed by what exercise fits in their condition (D12) with mean score of 0.96 and then how much salt to be used daily (D11) with mean score of 1.15, next is the long-term prognosis of their disease (D3) with mean score of 1.24 and lastly, was which medicine may impair kidney function (D7) with mean score of 1.26.

Table 3 Level of chronic kidney disease patient awareness.

Variables	N	Min	Max	Mean	SD	Extraction[a]
Do you know what symptoms will develop when you get worse? (D1)	114	0	4	1.66	1.4	0.431
Do you know what aggravates your kidney function? (D2)	114	0	4	1.72	1.4	0.396
Do you know the long-term prognosis of your disease? (D3)	114	0	4	1.24	1.5	0.475
Do you know how to control your blood pressure? (D4)	114	0	4	1.65	1.5	0.551
Do you know the names and usage of your medicines? (D5)	114	0	4	2.47	1.4	0.633
Do you know the primary role of your medicines? (D6)	114	0	4	1.53	1.5	0.603
Do you know which medicine may impair the kidney function? (D7)	114	0	4	1.26	1.5	0.489
Do you know what are unhealthy diets? (D8)	114	0	4	1.59	1.4	0.545
Do you know what contains high-quality protein? (D9)	114	0	4	2.06	1.6	0.504
Do you know food which should be avoided? (D10)	114	0	4	2.25	1.5	0.532
Do you know how much salt to be used daily? (D11)	114	0	4	1.15	1.3	0.567
Do you know what exercise fits you? (D12)	114	0	4	0.96	1.2	0.651
Do you know what laboratory examinations you should regularly check? (D13)	114	0	4	1.89	1.6	0.517
Do you know how to collect your urine correctly? (D14)	114	0	4	2.74	1.6	0.698
Do you know the meaning of your test reports? (D15)	114	0	4	1.42	1.5	0.677
Do you know how to evaluate your curative effect? (D16)	114	0	4	1.70	1.5	0.626
Do you know what kind of educational activities are organized regularly in our clinic? (D17)	114	0	4	0.29	1.0	0.376
Do you know how to contact our medical staffs when you have a question? (D18)	114	0	4	1.37	1.6	0.377

Chronic Kidney Disease Patient Awareness	*114*	*0*	*68*	*28.94*	*14.8*	
Total Variance Explained						53.59%
Cronbach's Alpha						0.872

a- Extraction Method: Principal Component Analysis.

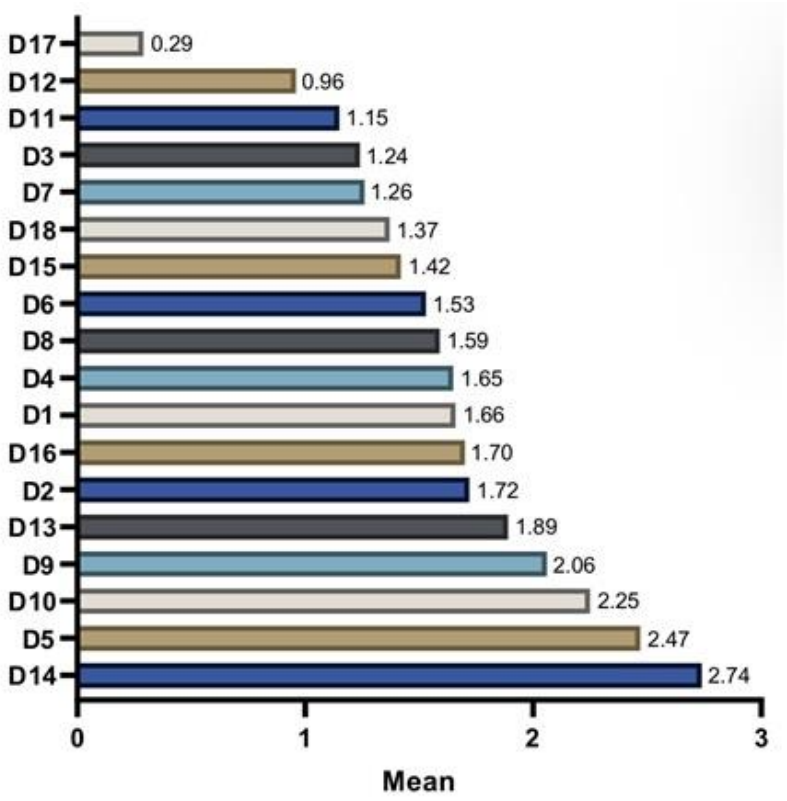

Figure 1 Chronic Kidney Disease Patients Awareness

Association of socio-demographics and medical profile to patients' awareness on CKD

In this particular study, analysis revealed (Table 4) that different age (*p-value* .007), educational background (*p-value* .008) and duration of CKD (*p-value* .013) would create a significantly different CKD patients' awareness at <0.05 confidence interval. Moreover, CKD patients' awareness were found more significantly different specifically between 31-50 years old and 51-70 years old age group over other age groups, and expectedly, those with primary and bachelor degree or postgraduate educational background and those with less than 6 months and more than 12 months duration of CKD experience among other educational background and CKD duration groups, respectively. However, no significant correlation was detected between any medical profile of the participants and CKD patient's awareness tested from this study.

Table 4 Association of socio-demographics and medical profile to CKD patients' awareness

Demographics		Total	CKD Patient Awareness	*p-value*
Age[b]	18-30	15	28.07 ± 12.6^{AB}	0.007[a]
	31-50	36	35.28 ± 14.5^{B}	
	51-70	44	27.18 ± 15.0^{A}	
	>70	19	21.68 ± 12.7^{A}	

Gender	Male	71	27.10 ± 15.1	0.088
	Female	43	31.98 ± 13.9	
Marital Status	Single	27	26.37 ± 13.1	0.321
	Married at least once	86	29.63 ± 15.3	
Education[b]	Nothing	24	25.54 ± 11.7[AB]	0.008[a]
	Primary	15	20.87 ± 17.1[A]	
	Secondary	17	25.18 ± 12.4[AB]	
	High School	31	31.77 ± 16.1[BC]	
	Bachelor Degree/Postgraduate	27	35.56 ± 12.8[C]	
Employment	Employed	34	32.12 ± 14.3	0.065
	Unemployed/Unable to work	52	29.75 ± 14.0	
	Retired	28	23.57 ± 15.8	
Income	<5000	70	27.30 ± 13.8	0.272
	5000-10000	23	30.22 ± 16.0	
	>10000	21	33.00 ± 16.2	
DM	Yes	61	27.00 ± 14.8	0.134
	No	53	31.17 ± 14.6	
HTN	Yes	95	29.20 ± 14.8	0.675
	No	19	27.63 ± 14.9	
CVS	Yes	45	29.16 ± 15.5	0.985
	No	68	29.10 ± 14.3	
Duration of CKD[b]	Less than 6 months	18	21.06 ± 9.4[A]	0.013[a]
	6-12 months	11	24.73 ± 12.1[AB]	
	More than 12 months	84	31.43 ± 15.3[B]	
		N	r	*p-value*
MicroAlbumin/Crg/mmol		95	0.010	0.924
UA blood		54	0.099	0.476
Creatinine ummol/l		114	-0.044	0.644
eGFR (ckd-EPI)		113	0.126	0.184

[a]-significant using One-Way ANOVA Test at <0.05 level.
[b]-Post-Hoc Test = LSD.
*CAPITAL letters indicates Post-Hoc multiple pairing summary indicator. Having the same letter means the same measure statistically.

Characteristics predictors on CKD patients' awareness

A GLM Univariate Analysis was conducted to characterize more the age, educational background and CKD duration as a factor affecting CKD patients' awareness. As shown on Table 5, patients at age 31-50 years old group have the highest positive factor score of 11.155 (S.E. 4.685, LB 1.863, UB 20.446). This was followed by age 51-70 years old group with positive factor score of 6.562 (S.E. 4.306, LB -1.978, UB 15.102) and lastly, the age 18-30 years old group with positive factor score of 2.487 (S.E. 5.619, LB -8.656, UB 13.630). Furthermore, among age groups of patients, only age 31-50 years old group were found to be a positive significant predictor of patient's awareness on CKD (*p-value* 0.019).

In terms of educational background as presented in Table 5, negative factor scores were obtained. Among the four (4) groups of educational background, patients that had primary education attained the highest negative factor score of -11.709 (S.E. 4.756, LB -21.141 UB -2.277). Next was patients that had secondary education having negative factor score of -6.284 (S.E. 4.346, LB -14.902 UB 2.335) and unexpectedly, patients that had no education had slightly lower negative factor score of -2.758 (S.E. 4.637, LB -11.955 UB 6.439) than patients with secondary educational background. Lastly, patients that had high school education have the lowest negative factor score of -1.107 (S.E. 3.608, LB -8.264 UB 6.049). Concerning to duration of CKD experience as also shown in Table 5, likewise attained a negative factor score. Patients with <6 months CKD duration had the highest negative factor score of -10.897 (S.E. 3.739, LB -18.313 UB -3.481) while those with >6 months had negative factor score of -7.754 (S.E. 4.515, LB -16.708 UB 1.200). Moreover, among CKD duration, only <6 months duration of CKD was found to be a significant negative predictor of patient's awareness on CKD (*p-value* 0.004).

Table 5 Characteristic of predictors on CKD patients' awareness

Dependent Variable: Chronic Kidney Disease Patient Awareness					
Parameter	B	S.E.	95% Confidence Interval		*p-value*
			Lower Bound	Upper Bound	
Intercept	28.461	4.967	18.611	38.312	<0.001[a]
Age=18-30	2.487	5.619	-8.656	13.630	0.659
Age=31-50	11.155	4.685	1.863	20.446	0.019[a]
Age=51-70	6.562	4.306	-1.978	15.102	0.131
Education=Nothing	-2.758	4.637	-11.955	6.439	0.553
Education=Primary	-11.709	4.756	-21.141	-2.277	0.015[a]
Education=Secondary	-6.284	4.346	-14.902	2.335	0.151
Education=High School	-1.107	3.608	-8.264	6.049	0.760
Duration of CKD=Less than 6 months	-10.897	3.739	-18.313	-3.481	0.004[a]
Duration of CKD=6-12 months	-7.754	4.515	-16.708	1.200	0.089

a- significant using General Linear Model (GLM) Univariate Analysis at <0.05 level.

4. DISCUSSION

Most often than not, an effective program utilizes data of information as a guide to develop appropriate strategies to be implemented. Despite those interventions to manage and reduce burden of CKD has been enhanced in other countries, the presence of uniqueness in every healthcare system is inevitable that needs to be considered. This study was based on the premise there is limited information regarding CKD in KSA as of the moment. Findings in this study becomes a new valuable resource for the nephrology department of the country in designing programs aside from those of Alobaidi (2021), Almutary (2021), Albujays et al., (2018), and lastly, that of Alsuwaida et al., (2010). In this case, the variation of people involved and location where the information was generated is a good way to have a robust representative of a certain population. In comparison with other similar studies, this study is unique because it measures the awareness of CKD particularly from CKD diagnosed patients in Riyadh in all stages of CKD and unlike that of Alobaidi (2021) wherein knowledge of the general public in Jeddah was measured. On the other hand,

Almutary et al., (2021) assessed the CKD knowledge of patients diagnosed with stage 3-5 CKD only while Abujays et al., (2018) studied on the level of awareness among Diabetes patients in Al-Ahsa Governorate.

In terms of awareness score, the mean score of 28.94 with Cronbach's alpha score of 0.872 from this study showed that the CKD patients' awareness is below average. Highest awareness identified were on how to collect urine correctly (mean score 2.74). On the other hand, lowest patients' awareness was on what kind of activities are regularly organized in clinics (mean score 0.29), followed by what exercise fits in their condition (mean score 0.96) and then how much salt to be used daily (mean score 1.15), next is the long-term prognosis of their disease (mean score 1.24) and lastly, was which medicine may impair kidney function (mean score 1.26). Intriguingly, almost all the patients (91.2) knew nothing about what kind of educational activities are organized in the clinic regularly while only very few knew clearly (2.6%) and knew most of it (4.4%).

Poor level of CKD awareness in Saudi population and other countries were also reported. Albujays et al., (2018) reported a poor attitude and lack of awareness on CKD among Saudi diabetic population in Al-Ahsa. In 2021, Almutary presented a mean score of 17.87±3.212 on knowledge relating to kidney disease measured using KiKs with lowest knowledge score identified were on effects of proteinuria, meanings of "glomerular filtration rate" and "targeted blood pressure". Also in the same year, Alobaidi (2021) reported a lack of awareness among the Saudi population regarding knowledge about CKD. In Iran, Roomizadeh et al., (2014) conducted a study measuring CKD knowledge and its risk factors and reported that knowledge about CKD and its risk factors among Iranian population is low. In India, Hussain et al., (2019) published a study measuring knowledge on CKD among T2DM diagnosed Indian patients and reported poor level of knowledge. In Hongkong, an almost similar way of gathering information about CKD awareness was conducted by Chow et al., (2014). In this study awareness of CKD through a telephone interview revealed that the general public of Hongkong was poorly informed about CKD. Common to all of these cited studies mentioned is the call for proper authorities to either develop or enhance or upgrade efforts in providing CKD education to more people particularly those with CKD risk factors.

Based on the results of this study, among socio-demographics only age, educational background and duration of CKD experience were significantly identified as determining factors for the CKD awareness of the population tested. These findings were almost similarly found in other studies like that of Alobaidi (2021) wherein the authors have reported that in Saudi population, significantly higher level of CKD knowledge prevailed among respondents with higher educational and higher economic backgrounds. In the study of Hussain et al., (2019) CKD knowledge was significantly correlated to educational status, socio-economic status, and income status.

Furthermore, the in-depth analysis revealed that only age among these demographics have positive factor score while both educational background and CKD duration has negative factor score. CKD patients' awareness at age 31-50 years old were 11.155 counts better comparing to other age group while patients. On the other hand, patients with only primary educational background are less 11.709 counts when compared to other educational background and patients with <6 months duration of CKD was 10.897 counts lesser than those with >6 months CKD duration experience. To the collective knowledge of the authors of this study, this is the first study that presented such information. Interestingly this study was able to provide new insights where to focus most the intervention efforts because based on the collective knowledge of the authors; this is the first study that presented such information.

5. CONCLUSION

A CKD patient in King Fahad Medical City of Riyadh, Saudi Arabia have poor awareness regarding their medical condition and warrants more educational efforts to enhance their knowledge. Age, educational background, and duration of CKD affect patients' awareness. CKD duration of <6 months and primary educational background predicts significant negative awareness while age group of 31-50 years old predicts significant positive awareness.

Authors' Contributions

AHA conceived and supervised the study and edited the manuscript; ASA, AZA & KSA conceived the study, did literature search, prepared the methodology, wrote and edited the manuscript; SKA designed and conceived the study, did literature search, prepared the methodology, wrote and edited the manuscript; AAA conceived the study, developed the data collection tool and participated in data collection; OAA, HHA, NSA, RQ, YA, KA, OAH and AB developed the data collection tool and participated in data collection.

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Conflicts of interest

The authors declare that there are no conflicts of interests.

Data and materials availability

All data associated with this study are present in the paper.

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