

Public Awareness of Chronic Kidney Disease Among Adults in Palestine: Knowledge Gaps and Determinants of Higher Awareness in a Resource Constrained Setting

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Abstract

Background

Chronic kidney disease (CKD) is a major public health challenge associated with kidney failure, cardiovascular complications, and premature mortality. In Palestine, delayed recognition is especially concerning because screening and follow up take place within a resource constrained health system. This study assessed public awareness of CKD and identified factors associated with higher knowledge among adults in Palestine.

Methods

We conducted a cross sectional, community based online survey between November 2025 and January 2026. Adults aged 18 years or older living in Palestine were recruited using snowball sampling. CKD knowledge was measured using a questionnaire adapted from the previously published and validated CKD knowledge scale by Younes et al. The instrument was translated into Arabic using forward and backward translation, reviewed by subject experts and an Arabic language specialist, and showed good internal consistency in the present sample. Descriptive analyses and multivariable linear and logistic regression models were used to evaluate knowledge patterns and independent predictors.

Results

A total of 977 participants were analyzed; mean age was 28.97 ± 12.55 years, and 58.2% were women. The mean CKD knowledge score was 55.88 ± 6.67 , corresponding to 64.4% correct responses overall. Using the validated threshold, 88.7% met the criterion for better knowledge. Important gaps remained in awareness of CKD stages (24.7%), fever as a symptom of advanced CKD (25.9%), and the kidney's role in bone health (32.5%). Female sex, older age, health field occupation, attendance at awareness sessions, and recent kidney function testing were independently associated with higher knowledge, whereas smoking was associated with lower knowledge.

Conclusion

CKD awareness in this Palestinian sample was generally acceptable but uneven. Targeted education, stronger prevention messaging, and wider early screening initiatives are needed through culturally tailored community programs.

Introduction

Chronic kidney disease is a chronic and often irreversible disorder defined by structural or functional kidney abnormalities that persist for at least three months and may be manifested by a reduced glomerular filtration rate, albuminuria, or other markers of kidney damage. It is now recognized as a major noncommunicable disease and a growing cause of disability and premature death worldwide. Beyond progression to kidney failure, CKD is strongly linked to cardiovascular morbidity, recurrent hospitalization, and reduced quality of life, which makes early recognition a core public health priority rather than a purely nephrology concern [1, 2].

The clinical and economic consequences of late CKD detection are substantial. As kidney function declines, many patients eventually require dialysis or transplantation, both of which impose long term physical, financial, and system level burdens. This challenge is particularly relevant in Palestine, where the Ministry of Health reported 1,778 patients receiving dialysis in the West Bank and 236,131 dialysis sessions during 2024 [1, 3]. In a setting where health services already operate under resource constraints and where continuity of care may be affected by fragmented access and movement restrictions, missed opportunities for prevention or early detection can carry especially serious consequences.

Public awareness is therefore an essential part of CKD prevention. The disease may remain clinically silent for years, while major drivers such as diabetes, hypertension, obesity, smoking, cardiovascular disease, and family history continue to accelerate renal injury. When the public lacks accurate knowledge about kidney function, risk factors, symptoms, or screening methods, diagnosis is often delayed and patients are less likely to seek testing or engage in kidney protective behaviors. Evidence from community and primary care settings suggests that awareness initiatives can support earlier identification, improve risk perception, and strengthen preventive action [4, 5].

Despite growing attention to kidney health, previous studies from the region show that public understanding of CKD remains incomplete. A recent study in Türkiye demonstrated poor recognition of CKD stages and limited awareness of the kidney's role in bone health, while research from Saudi Arabia documented persistent misconceptions regarding CKD causes, symptoms, and treatment [6, 7]. These findings suggest that familiarity with the term CKD does not necessarily translate into accurate clinical understanding.

Comparable concerns have been reported in Arab populations more broadly. Recent studies from Palestine and Makkah found that respondents often recognized some common risk factors, yet important deficits remained in knowledge about complications, early detection, and protective behaviors [8, 9]. However, there remains a need for a more detailed Palestinian assessment that does not only estimate overall awareness, but also identifies item level knowledge gaps and the participant characteristics associated with better knowledge. Such evidence is especially important in Palestine, where educational campaigns must be feasible, targeted, and responsive to a resource constrained context. Accordingly, the present study aimed to assess public awareness of CKD among adults in Palestine and to identify the major gaps and determinants that may guide future awareness and early detection strategies.

Methodology

Study design and setting

We conducted a cross sectional, community based survey in Palestine between November 2025 and January 2026 to assess public awareness and knowledge of CKD. Data were collected using an electronic self administered questionnaire distributed through social media platforms and interpersonal networks, consistent with a snowball sampling strategy. This approach facilitated broad community reach across different Palestinian areas, although it may have preferentially recruited younger and more digitally connected adults.

Participants

Eligible participants were adults aged 18 years or older residing in Palestine who were able to provide electronic informed consent and complete the questionnaire in Arabic or English. The survey was open to the general public, and occupation was recorded for analytic purposes, including work in health related fields. A minimum sample size was estimated using CDC Epi Info with a 95% confidence level and 5% margin of error. Of 981 submitted questionnaires, 977 complete responses were retained in the final analytic sample after data cleaning.

Questionnaire source, translation, and validation

The questionnaire used in this study was adapted from the previously published and validated CKD knowledge scale developed by Younes et al. [2]. It was therefore not developed de novo for the present study. The instrument included two sections: sociodemographic and health related characteristics, and a 34 item CKD knowledge assessment covering kidney function, tests used to evaluate kidney health, CKD staging, organs affected by CKD, risk factors, symptoms of advanced disease, prevention, and treatment options. For use in the present study, the questionnaire was translated into Arabic using forward and backward translation by bilingual researchers. The translated version was then reviewed by subject experts and an Arabic language specialist to assess clarity, linguistic accuracy, and cultural appropriateness. After reconciliation of the comments, the final questionnaire was administered in Arabic and English.

Scoring and reliability

Scoring was performed according to the original published instrument [2]. Knowledge items were scored according to the original instrument, with correct responses assigned higher values than incorrect or "do not know" answers, yielding a theoretical total score range of 34 to 68. Higher scores indicated better CKD knowledge. The adapted questionnaire showed good internal consistency in the present sample, with a Cronbach's alpha of 0.879. For descriptive subgroup analyses, better knowledge was defined as a total score of 48 or higher, based on the ROC derived threshold reported in the validation study [2]. For the adjusted logistic model, a stricter dichotomization of score greater than 51 was used to enhance discrimination, while linear regression on the continuous score was retained as the primary adjusted analysis.

Data management and statistical analysis

Data were exported from the electronic platform for cleaning and analysis using SPSS version 25. Continuous variables are presented as means with standard deviations or medians with interquartile ranges, and categorical variables as frequencies and percentages. Group differences in mean knowledge scores were assessed using independent samples t tests or one way analysis of variance as appropriate, while associations with categorical knowledge classifications were evaluated using chi square tests. Multivariable linear regression was used to examine predictors of the continuous knowledge score, and multivariable logistic regression was used to identify factors associated with knowledge score greater than 51. Adjusted effect estimates are reported with 95% confidence intervals, and statistical significance was defined as $p < 0.05$.

Ethical approval

The study protocol, questionnaire, and electronic consent procedure were reviewed and approved by the Al-Quds University Research Ethics Committee. Participation was voluntary and anonymous, and electronic informed consent was obtained before access to the questionnaire. All data were used for research purposes only and handled confidentially

Results

Participant characteristics

A total of 981 questionnaires were received. After exclusion of four incomplete responses, 977 participants were included in the final analysis. Mean age was 28.97 ± 12.55 years, median age was 23 years (IQR 19–36), and the observed age range was 18 to 100 years. Women constituted 58.2% of the sample. More than half of respondents were aged 18 to 24 years, 86.4% had university level education, and 42.5% were students. Only 12.0% had ever attended a CKD awareness session, while 28.6% reported never having undergone kidney function testing and 25.6% could not recall the timing of their last test (Table 1).

CKD knowledge distribution and item level gaps

The mean total CKD knowledge score was 55.88 ± 6.67 out of a theoretical range of 34 to 68, corresponding to 64.36% correct responses across all scored items. Using the ROC derived threshold, 867 participants (88.7%) met the criterion for better knowledge. Internal consistency of the 34 item scale was high (Cronbach alpha = 0.879). Item level correctness ranged from 24.7% to 99.4%, demonstrating broad familiarity with some basic concepts but substantial deficits in other domains (Figure 1; Table 3).

The highest performing items were recognition that a healthy human has two kidneys (99.4%), that urine testing can evaluate kidney disease (92.0%), and that kidneys filter the blood and remove waste (91.5%). By contrast, only 24.7% correctly identified that CKD has five stages, 25.9% correctly rejected fever as a typical symptom of advanced CKD, and 32.5% recognized the kidney's role in bone health. Knowledge was also limited for brain involvement (40.1%), blood pressure monitoring as part of assessment (45.8%), and nausea or vomiting as a symptom of advanced disease (Figure 1; Table 3).

Subgroup differences in CKD knowledge

Women had significantly higher mean knowledge scores than men (56.77 ± 6.22 versus 54.64 ± 7.06 , $p < 0.001$), and a greater proportion met the better knowledge threshold (92.3% versus 83.8%, $p < 0.001$). Occupation showed the largest unadjusted difference in knowledge score, with respondents working in the health field achieving the highest mean score (59.75 ± 5.73) and the highest prevalence of better knowledge (96.2%) (Table 2; Figure 2).

Attendance at CKD awareness sessions was also associated with higher knowledge. Participants who had attended an awareness session had a mean score of 59.54 ± 6.09 compared with 55.39 ± 6.61 among those who had not, and 97.4% versus 87.6% met the threshold for better knowledge (both $p \leq 0.003$). Knowledge likewise varied significantly according to the recency of kidney function testing, with the highest mean scores observed among those reporting testing within 6 to 12 months or 1 to 2 years, whereas the lowest scores were seen among participants who did not know when they were last tested (Table 2; Figure 3). Current smokers also had lower knowledge than nonsmokers (54.31 ± 6.85 versus 56.32 ± 6.58 , $p < 0.001$).

Multivariable predictors of CKD knowledge

In the adjusted linear model, female sex, older age, residence in Hebron compared with Jerusalem, work in the health field, attendance at CKD awareness sessions, and more recent kidney function testing were independently associated with higher CKD knowledge scores. Current smoking, alcohol consumption, and the presence of self reported comorbidity were associated with lower scores in the linear model. In the adjusted logistic model for knowledge score greater than 51, female sex (adjusted OR 1.79, 95% CI 1.21–2.63), older age (adjusted OR 1.04 per year, 95% CI 1.01–1.07), residence in Hebron (adjusted OR 1.82, 95% CI 1.16–2.85), health field occupation (adjusted OR 5.63, 95% CI 2.51–12.62), awareness session attendance (adjusted OR 2.15, 95% CI 1.08–4.28), and kidney function testing within 6 to 12 months (adjusted OR 2.11, 95% CI 1.04–4.28) remained significant, whereas current smoking was negatively associated with higher knowledge (adjusted OR 0.51, 95% CI 0.33–0.80) (Table 4; Figure 4).

Although alcohol use was also inversely associated with higher knowledge in the logistic model, this estimate should be interpreted cautiously because the exposed subgroup was very small. Education, marital status, nationality, insurance type, and family history were not independently associated with higher knowledge after adjustment.

Discussion

This cross sectional study provides a detailed assessment of CKD awareness among adults in Palestine and highlights a mixed pattern of findings. Overall knowledge was reasonably good at the aggregate level, yet this seemingly reassuring pattern masked several clinically important misconceptions. The most prominent gaps concerned CKD staging, advanced symptom recognition, and the kidney's role in bone health. Knowledge was also socially patterned: women, health field workers, participants who had attended awareness sessions, and those who had undergone more recent kidney function testing demonstrated better performance, whereas smoking was associated with lower knowledge. Taken together, these results suggest that CKD awareness in Palestine is not uniformly poor, but it remains uneven and selectively incomplete in ways that may affect prevention and early detection.

The overall level of awareness observed in our sample is broadly consistent with recent regional studies showing moderate to relatively good public familiarity with CKD, while also confirming that total scores can obscure specific conceptual deficits. A recent online study from the West Bank similarly reported that some core CKD concepts were recognized by many respondents, yet important misunderstandings persisted regarding risk factors, complications, and protective behaviors [8]. Comparable patterns have been reported in Saudi samples, where broad awareness coexisted with substantial misconceptions about CKD treatment and disease progression [10]. This distinction matters because accurate public understanding is needed not only for general familiarity, but also for timely testing, risk recognition, and informed help seeking.

The weakest items in the present study are clinically meaningful. Fewer than one third of participants knew that CKD has five stages, recognized fever as an atypical manifestation of advanced CKD, or identified the kidney's role in bone health. Similar deficiencies have been described in Türkiye, where knowledge of CKD staging and skeletal complications was also notably poor, and in Saudi Arabia, where misconceptions about symptoms and management remained common [6,7]. These domains are less intuitive than basic anatomical knowledge and are often underemphasized in public messaging, yet they are central to understanding disease severity, monitoring, and long term complications.

Occupational exposure to health information emerged as one of the strongest correlates of higher knowledge. Participants working in the health field had substantially higher mean scores and markedly higher odds of being above the median in adjusted analysis. Attendance at CKD awareness sessions and more recent kidney function testing showed similar positive associations. These findings are plausible because repeated contact with healthcare environments can improve exposure to preventive counseling, laboratory interpretation, and risk communication. They also align with evidence suggesting

that stronger integration of CKD recognition into routine primary care and screening pathways can improve disease identification and public understanding [4,11].

Women in our sample performed better than men, and age showed a small but statistically significant positive association with knowledge. Similar sex differences have been reported in some regional studies, although the magnitude and direction are not always uniform across populations [6,10]. The higher scores among women in the present study may reflect greater engagement with health information, greater participation in family health decision making, or higher responsiveness to prevention messages. The age effect was modest, but it may indicate that cumulative exposure to healthcare encounters and chronic disease information gradually improves CKD knowledge over time.

Current smoking was consistently associated with lower CKD knowledge in both unadjusted and adjusted analyses. This finding should not be interpreted causally, yet it may reflect clustering of lower health engagement with other risk behaviors. Evidence from population studies suggests that limited health literacy is associated with smoking and with reduced adoption of preventive health behaviors [12]. In addition, when health communication is not sufficiently clear or patient centered, complex clinical concepts such as kidney function decline, systemic complications, and screening indications may be poorly understood by the public [13]. Together, these observations support the value of integrating CKD education into broader risk reduction and health literacy initiatives.

The Palestinian context is particularly important when interpreting these findings. CKD awareness does not develop in isolation from the structure of the health system in which people seek care. In Palestine, preventive efforts are delivered within a resource constrained environment, and continuity of screening or follow up may be affected by fragmented service delivery and movement restrictions associated with the occupation. Under such conditions, seemingly modest knowledge gaps may translate into delayed testing, interrupted follow up, and later presentation with advanced disease. The large dialysis burden documented by the Ministry of Health underscores why low cost public education and earlier risk identification should remain public health priorities [3].

Our findings are also compatible with evidence from other low and middle income settings in which CKD awareness has been limited by uneven access to health information and preventive services. Studies from Ethiopia and Nigeria reported incomplete public understanding of CKD and emphasized the importance of community level education for early detection [5,14]. Although social and health system contexts differ across settings, these comparisons reinforce the view that CKD awareness should be addressed as a population health issue rather than as a problem confined to specialist clinics.

This study has several strengths. It used a previously validated knowledge instrument, evaluated both overall and item level awareness, and included a relatively large community sample with multivariable analysis of associated factors. At the same time, important limitations should be acknowledged. The cross sectional design precludes causal inference, and the online snowball sampling strategy likely favored younger, more educated, and more digitally connected participants. The inclusion of respondents from health related occupations may have modestly increased average knowledge estimates, while self reported data remain vulnerable to recall and social desirability bias. In the Palestinian context, digital exclusion, uneven regional participation, and barriers related to mobility or access may also have limited representation of some groups. These factors should be considered when interpreting the findings and generalizing them to the wider population.

Despite these limitations, the study offers actionable implications. Future awareness programs should move beyond general messaging and focus specifically on the concepts that participants found most difficult, particularly CKD staging, advanced manifestations, multisystem consequences, and the rationale for screening. Educational materials should be delivered through channels that the public already uses, including universities, primary care clinics, community campaigns, and digital platforms, but they should be framed in clear language and linked to concrete preventive actions. Expanding low cost kidney function testing for high risk groups, embedding CKD content into smoking cessation and chronic disease counseling, and evaluating awareness interventions prospectively would all be valuable next steps.

Conclusion

In this Palestinian sample, public awareness of CKD was generally acceptable but far from complete. Important deficits persisted in knowledge of CKD stages, advanced symptoms, and the kidney's systemic effects. Higher knowledge was associated with female sex, older age, health field occupation, prior awareness session attendance, and recent kidney function testing, whereas smoking was associated with lower knowledge. These findings support targeted, context sensitive education and stronger early detection strategies within the Palestinian health system, particularly in a resource constrained environment where late recognition carries major clinical and system level consequences.

Declarations

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N/A

Data availability

The datasets used and or analyzed during the current study are available from the corresponding author on reasonable request.

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Ethics approval and consent to participate

All procedures performed in this study involving human participants were conducted in accordance with the ethical standards of the relevant institutional research committee and with the Declaration of Helsinki. Ethical approval was obtained from the Al-Quds University Research Ethics Committee. Participation was voluntary and anonymous, and electronic informed consent was obtained from all participants before they accessed the questionnaire.

Clinical trial number

Not applicable.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Author contribution

All authors contributed substantially to study conception and design, survey dissemination, data acquisition, data interpretation, manuscript drafting, critical revision of the manuscript, and approval of the final version. Salahaldeen Deeb served as the corresponding author and coordinated the final manuscript preparation.

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Tables

Table 1. Participant characteristics of the study sample, Palestine (N = 977).

Characteristic	Category	n (%)
Sex	Female	569 (58.2%)
	Male	408 (41.8%)
Age group	18–24	529 (54.1%)
	25–34	166 (17.0%)
	35–44	139 (14.2%)
	45–54	92 (9.4%)
	55–64	45 (4.6%)
	≥65	6 (0.6%)
Marital status	Single	583 (59.7%)
	married	375 (38.4%)
	widow	12 (1.2%)
	divorced	7 (0.7%)
Education	University	844 (86.4%)
	Secondary	114 (11.7%)
	Basic	15 (1.5%)
	Uneducated	4 (0.4%)
Occupation	Student	415 (42.5%)
	Non-health employed	271 (27.7%)
	Health field	156 (16.0%)
	Not working/retired	135 (13.8%)
Monthly income	Average	639 (65.4%)
	High	203 (20.8%)
	Low	135 (13.8%)
Smoking	no	761 (77.9%)
	Yes	180 (18.4%)
	Former smoker	36 (3.7%)
Health insurance	Governmental	591 (60.5%)
	None	175 (17.9%)
	Private	158 (16.2%)
	Other	53 (5.4%)
Self-reported comorbidities (any)	No	874 (89.5%)
	Yes	103 (10.5%)
Family history (any)	No	513 (52.5%)
	Yes	464 (47.5%)
CKD awareness session attendance	No	860 (88.0%)
	Yes	117 (12.0%)
Kidney function test recency	No exam	279 (28.6%)
	Don't know	250 (25.6%)
	<6 months	209 (21.4%)
	1–2 years	89 (9.1%)
	6–12 months	87 (8.9%)
	>2 years	63 (6.4%)

Table 2. CKD knowledge outcomes by key participant characteristics.

Better knowledge defined as total score ≥ 48 , based on the ROC derived threshold from the validation study [2].

Variable	Category	n	Knowledge mean $\pm$ SD	Better knowledge n (%)	Test (score)	p (score)	χ^2	p (better)
Sex	Male	408	54.64 $\pm$ 7.06	342 (83.8%)	t=4.88	<0.001	$\chi^2(1)=16.12$	<0.001
	Female	569	56.77 $\pm$ 6.22	525 (92.3%)				
Age group (years)	18–24	529	55.40 $\pm$ 7.24	454 (85.8%)	F=1.92	0.088	$\chi^2(5)=11.22$	0.047
	25–34	166	56.45 $\pm$ 6.25	151 (91.0%)				
	35–44	139	56.73 $\pm$ 5.95	128 (92.1%)				
	45–54	92	56.38 $\pm$ 5.11	86 (93.5%)				
	55–64	45	56.38 $\pm$ 4.97	43 (95.6%)				
	≥ 65	6	51.50 $\pm$ 9.67	5 (83.3%)				
Marital status	bachelor	583	55.63 $\pm$ 7.18	504 (86.4%)	F=0.86	0.462	$\chi^2(3)=7.90$	0.048
	married	375	56.30 $\pm$ 5.82	346 (92.3%)				
	divorced	7	54.71 $\pm$ 5.94	6 (85.7%)				
	widow	12	55.92 $\pm$ 5.95	11 (91.7%)				
Education	University	844	56.14 $\pm$ 6.56	756 (89.6%)	F=3.73	0.011	$\chi^2(3)=13.00$	0.005
	Secondary	114	54.18 $\pm$ 7.18	94 (82.5%)				
	Basic	15	55.53 $\pm$ 4.72	15 (100.0%)				
	Uneducated	4	50.75 $\pm$ 11.70	2 (50.0%)				
Occupation	Student	415	55.37 $\pm$ 7.24	358 (86.3%)	F=22.67	<0.001	$\chi^2(3)=11.93$	0.008
	Non-health employed	271	54.78 $\pm$ 6.06	237 (87.5%)				
	Health field	156	59.75 $\pm$ 5.73	150 (96.2%)				
	Not working/retired	135	55.22 $\pm$ 5.36	122 (90.4%)				
Smoking status	no	761	56.32 $\pm$ 6.58	689 (90.5%)	F=7.40	<0.001	$\chi^2(2)=14.84$	<0.001
	Former smoker	36	54.61 $\pm$ 6.29	33 (91.7%)				
	Yes	180	54.31 $\pm$ 6.85	145 (80.6%)				
Self-reported comorbidity (any)	No	874	55.98 $\pm$ 6.65	775 (88.7%)	t=1.32	0.189	$\chi^2(1)=0.00$	0.989
	Yes	103	55.10 $\pm$ 6.80	92 (89.3%)				
Kidney function test recency	No exam	279	55.40 $\pm$ 7.09	238 (85.3%)	F=5.28	<0.001	$\chi^2(5)=21.33$	<0.001
	Don't know	250	54.49 $\pm$ 6.91	212 (84.8%)				
	<6 months	209	56.71 $\pm$ 6.03	193 (92.3%)				
	1–2 years	89	57.27 $\pm$ 5.93	86 (96.6%)				
	6–12 months	87	57.63 $\pm$ 5.56	84 (96.6%)				
	>2 years	63	56.43 $\pm$ 7.02	54 (85.7%)				
CKD awareness session attendance	No	860	55.39 $\pm$ 6.61	753 (87.6%)	t=7.27	<0.001	$\chi^2(1)=9.09$	0.003
	Yes	117	59.54 $\pm$ 6.09	114 (97.4%)				
Nationality	Palestinian	952	55.89 $\pm$ 6.67	845 (88.8%)	t=0.05	0.957	$\chi^2(1)=0.02$	0.898
	Non-Palestinian	25	55.80 $\pm$ 6.56	22 (88.0%)				

Table 3. CKD knowledge item correctness overall and by key subgroups (N = 977).

Item (short)	Overall correct (%)	Female correct (%)	Male correct (%)	χ^2 (sex)	p (sex)	V (sex)	Health-field correct (%)	Non-health correct (%)
B1	99.4	99.3	99.5	0.00	0.996	0.013	99.4	99.4
B2-1 Urine	71.0	73.3	67.9	3.10	0.078	0.059	85.9	68.2
B2-2 Protein breakdown	54.0	54.0	54.2	0.00	1.000	0.002	59.6	53.0
B2-3 Filter blood	91.5	93.1	89.2	4.23	0.040	0.070	95.5	90.7
B2-4 Bone health	32.5	35.5	28.4	5.09	0.024	0.074	48.1	29.6
B2-5 BP regulation	65.5	67.3	63.0	1.87	0.171	0.044	79.5	62.8
B2-6 Break down fats	43.8	42.7	45.3	0.57	0.451	0.026	58.3	41.0
B3-1 Urine test	92.0	92.3	91.7	0.07	0.796	0.009	94.2	91.6
B3-2 Blood test	82.2	81.9	82.6	0.07	0.789	0.008	89.7	80.7
B3-3 Stool test	52.3	54.0	50.0	1.53	0.216	0.040	66.7	49.5
B3-4 BP monitoring	45.8	47.1	44.1	0.83	0.361	0.029	59.0	43.3
B4 CKD stages	24.7	30.1	17.2	20.58	<0.001	0.148	32.7	23.1
B5-1 Heart	73.2	73.1	73.3	0.00	0.931	0.003	85.9	70.7
B5-2 Lungs	52.2	52.0	52.5	0.02	0.891	0.006	76.3	47.6
B5-3 Skin	49.9	50.4	49.3	0.12	0.727	0.011	67.3	46.5
B5-4 Brain	40.1	40.4	39.7	0.03	0.874	0.007	59.0	36.5
B6 HTN	72.5	74.3	70.1	2.01	0.156	0.045	83.3	70.5
B6 Diabetes	61.1	60.1	62.5	0.54	0.461	0.024	76.9	58.0
B6 Family history	75.1	75.6	74.5	0.16	0.687	0.013	88.5	72.6
B6 Heart disease	57.6	56.2	59.6	1.12	0.289	0.034	76.3	54.0
B6 NSAIDs	68.0	68.0	68.1	0.00	0.987	0.000	83.3	65.1
B6 Obesity	60.1	60.5	59.6	0.04	0.849	0.006	73.7	57.5
B6 Stress	45.3	45.5	45.1	0.02	0.884	0.006	62.2	42.1
B7 Nausea/vomiting	49.9	50.8	48.8	0.36	0.548	0.019	69.9	46.1
B7 Fatigue	83.8	84.9	82.4	1.04	0.307	0.033	92.3	82.0
B7 Loss appetite	57.4	57.5	57.4	0.00	0.981	0.001	76.3	53.9
B7 Fever	25.9	26.2	25.5	0.03	0.864	0.008	37.2	23.8
B7 Fluid retention	87.1	88.8	84.8	3.36	0.067	0.059	91.7	86.2
B8 Limit soft drinks	84.6	85.9	82.8	1.69	0.193	0.042	92.3	83.2
B8 Control sugar	81.8	82.6	80.6	0.63	0.429	0.025	92.3	79.8
B8 Control BP	80.1	80.8	79.2	0.33	0.567	0.018	89.7	78.3
B8 Control weight	76.9	78.0	75.5	0.83	0.362	0.029	87.8	74.7
B9 Drugs	57.3	57.3	57.4	0.00	0.985	0.001	73.1	54.3
B9 Dialysis	86.8	88.0	85.0	1.73	0.188	0.042	92.9	85.6

Table 4. Adjusted associations with CKD knowledge in multivariable linear and logistic models.

Scale scoring was aligned with the original instrument's coding. For the logistic model, higher knowledge was defined as score greater than 51.

Predictor	Adj. B (95% CI)	p (B)	Adj. OR (95% CI)	p (OR)
Sex: Female vs Male	2.09 (1.16, 3.02)	<0.001	1.79 (1.21, 2.63)	0.003
Age (years), per 1-year increase	0.07 (0.01, 0.12)	0.015	1.04 (1.01, 1.07)	0.003
Residential area: Hebron vs Jerusalem	1.09 (0.03, 2.16)	0.045	1.82 (1.16, 2.85)	0.009
Occupation: Health field vs Non-health employed	4.49 (3.13, 5.86)	<0.001	5.63 (2.51, 12.62)	<0.001
Occupation: Student vs Non-health employed	1.91 (0.55, 3.27)	0.006	1.37 (0.79, 2.40)	0.264
CKD awareness session attendance: Yes vs No	2.79 (1.51, 4.07)	<0.001	2.15 (1.08, 4.28)	0.029
Kidney function test recency: 1-2 years vs No exam	1.71 (0.20, 3.22)	0.027	1.94 (0.99, 3.80)	0.055
Kidney function test recency: 6-12 months vs No exam	2.16 (0.60, 3.71)	0.007	2.11 (1.04, 4.28)	0.039
Smoking status: Yes vs no	-1.31 (-2.42, -0.20)	0.021	0.51 (0.33, 0.80)	0.003
Alcohol consumption: any (Yes/previous) vs No	-5.34 (-8.80, -1.87)	0.003	0.25 (0.07, 0.87)	0.03
Self-reported comorbidity: any vs none	-1.50 (-2.92, -0.08)	0.038	0.74 (0.39, 1.39)	0.345

Figures

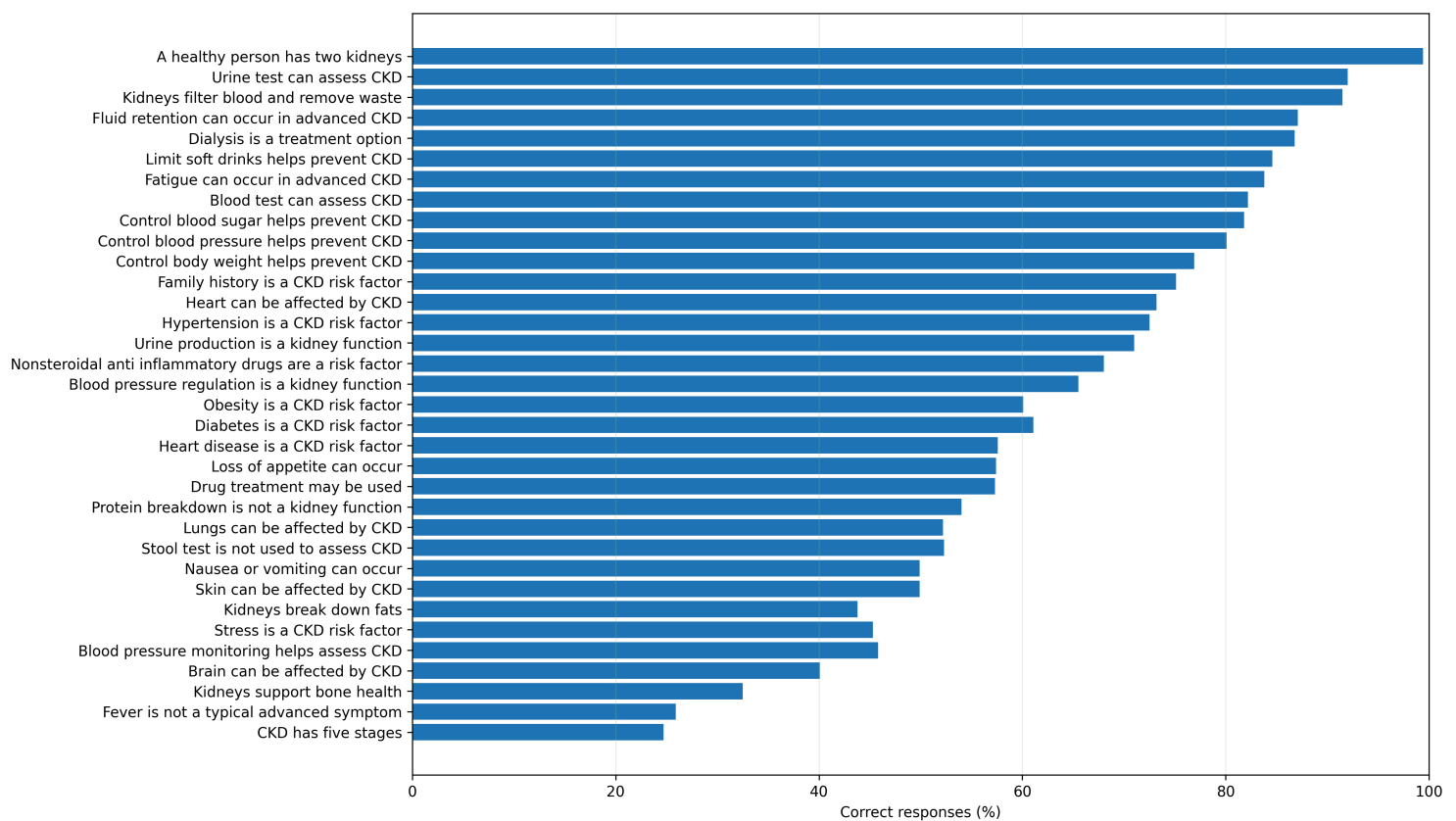


Figure 1

Overall percentage of correct responses across CKD knowledge items.

Horizontal bars show the percentage of respondents who answered each item correctly. Lower values indicate areas of weaker public awareness.

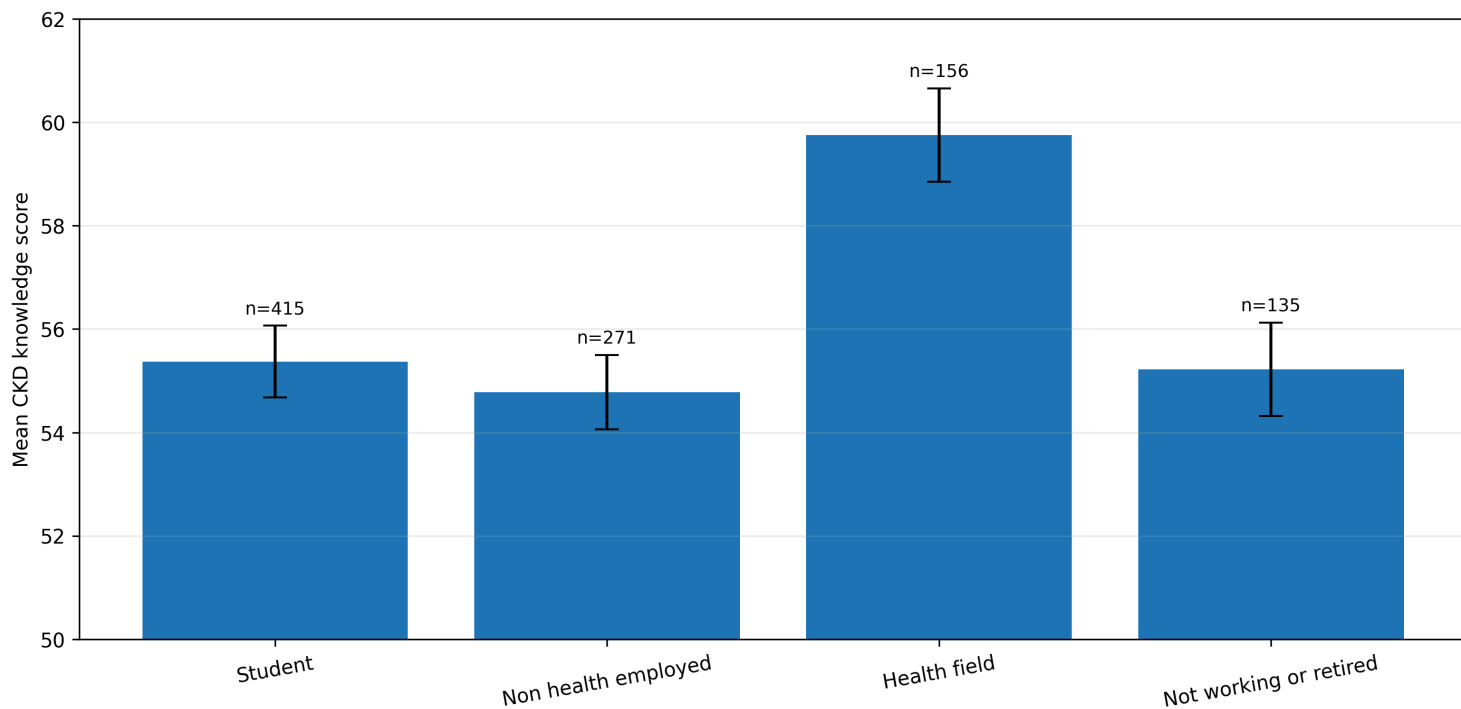


Figure 2

Mean CKD knowledge score by occupation category.

Bars represent mean knowledge scores and error bars indicate 95% confidence intervals.

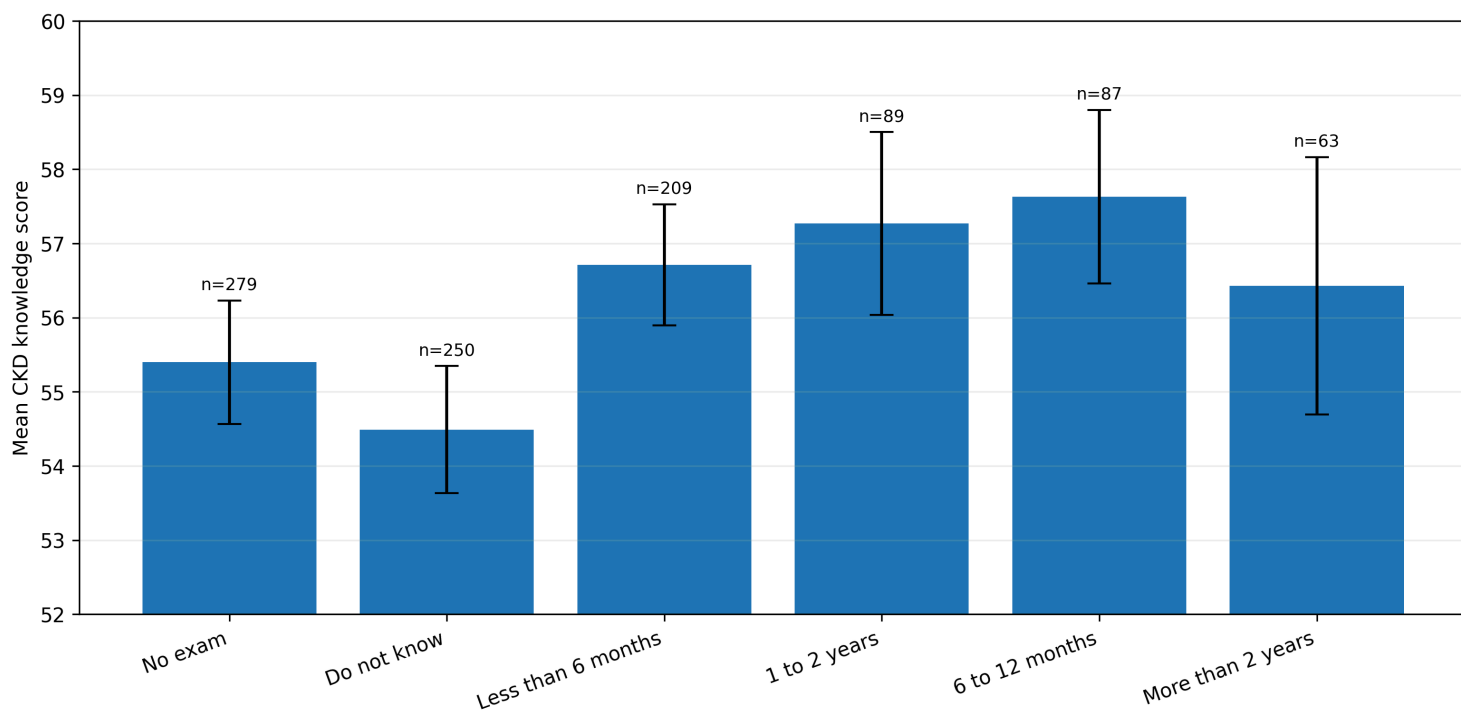


Figure 3

Mean CKD knowledge score by kidney function test recency.

Bars represent mean knowledge scores and error bars indicate 95% confidence intervals. The lowest scores were observed among respondents who did not know when they were last tested.

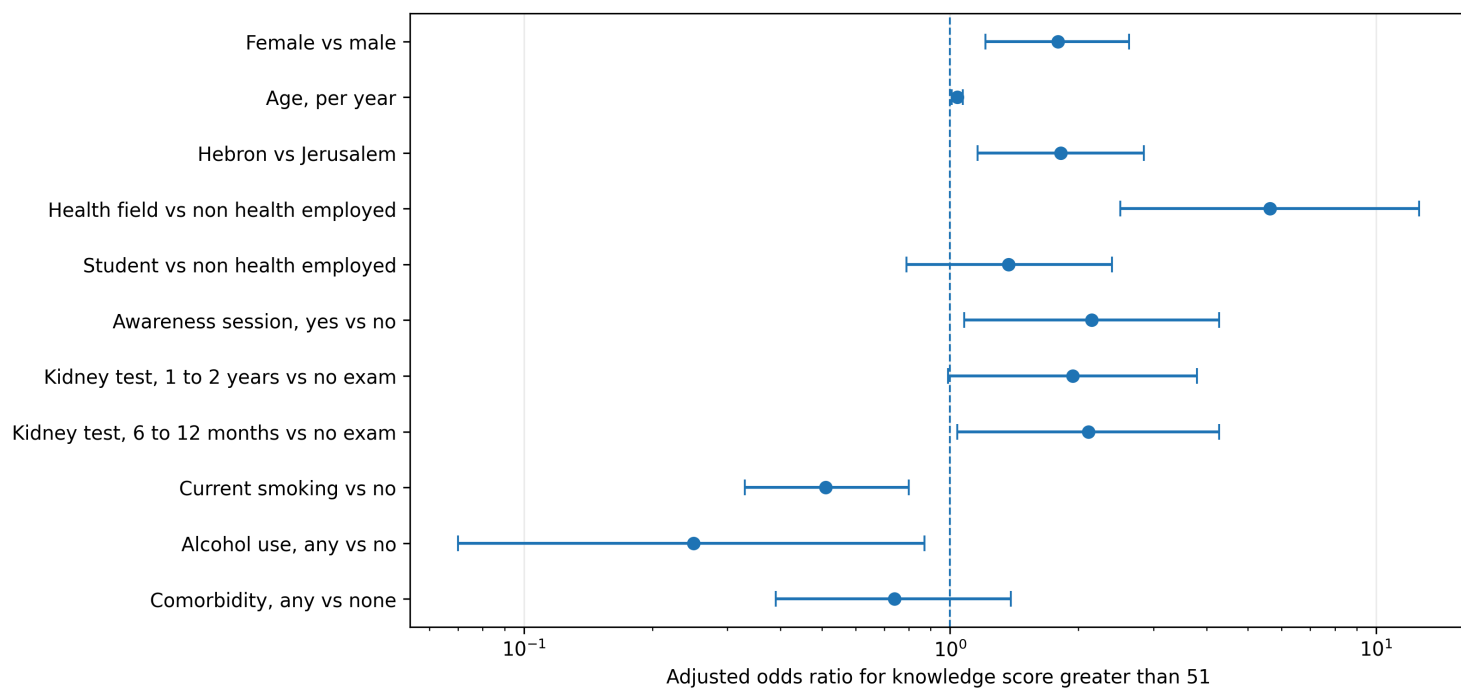


Figure 4

Adjusted predictors of higher CKD knowledge in the multivariable logistic model.

Forest plot showing adjusted odds ratios and 95% confidence intervals for knowledge score greater than 51. The vertical reference line indicates an odds ratio of 1.00.