Contents lists available at Science-Gate

International Journal of Advanced and Applied Sciences

Journal homepage: http://www.science-gate.com/IJAAS.html

Nurses' knowledge, attitude, and practice toward chronic kidney disease in hemodialysis centers at Hail City, Saudi Arabia

Awatif M. Alrasheeday [1], Meshael H. Alshammari [2], Sameer A. Alkubati [3, 4, *], Jordan H. Llego [3, 5], Dhahyah M. Alshammari [6], Hessah H. Alshammari [2], Mohammad A. AlShammari [2]

[1]*Nursing Administration Department, College of Nursing, University of Ha'il, Ha'il, Saudi Arabia*
[2]*Ha'il Health Cluster, Ha'il, Saudi Arabia*
[3]*Medical Surgical Nursing Department, College of Nursing, University of Ha'il, Ha'il, Saudi Arabia*
[4]*Department of Nursing, Faculty of Medicine and Health Sciences, Hodeida University, Hodeida, Yemen*
[5]*College of Nursing, University of Luzon, Dagupan City, Philippines*
[6]*Ha'il General Hospital, Ha'il, Saudi Arabia*

ARTICLE INFO

Article history:
Received 14 February 2024
Received in revised form
3 June 2024
Accepted 15 June 2024

Keywords:
Chronic kidney disease
Nurse knowledge
Attitudes
Hemodialysis centers
Experience and information

ABSTRACT

Chronic kidney disease (CKD) is a significant global issue with clinical, social, and economic impacts. It negatively affects quality of life and is linked to higher rates of illness and death. Nurses are crucial in the early detection and management of CKD. This study aimed to evaluate the knowledge, attitudes, and practices of nurses regarding CKD, and the factors influencing these aspects in hemodialysis centers in Hail City, Saudi Arabia. A cross-sectional study was conducted from July to October 2022 using a self-administered questionnaire. This questionnaire assessed nurses' knowledge of CKD, their attitudes toward it, and their CKD care practices. A significance level of $p<0.05$ was used for all tests. Approximately 63.06% of the nurses provided correct answers related to CKD knowledge. Most nurses (84.52%) had positive attitudes towards caring for CKD patients, and more than half (53.06%) had positive CKD care practices. There was a significant relationship between nurses' knowledge scores and both "years of experience" and "received information regarding CKD care" ($p=0.033$ and $p<0.001$, respectively). Nurses with more experience and previous information had higher knowledge scores than those with less experience and no prior information. Additionally, nurses with more experience and previous information also had more positive attitudes toward CKD patients than those with less experience and no prior information ($p=0.004$ and $p=0.008$, respectively). Therefore, nurses with more experience and prior information about CKD care were more knowledgeable and had more positive attitudes towards CKD patients compared to those with less experience and no prior information.

1. Introduction

Chronic kidney disease (CKD) is a global health issue with significant social and economic impacts (Kovesdy, 2022). It negatively affects the quality of life (Bello and Johnson, 2022) and increases morbidity and mortality rates (Lv and Zhang, 2019). CKD affects 850 million people worldwide (Bello and Johnson, 2022). The prevalence of end-stage renal disease (ESRD) has increased over the past thirty years in the Arabic world, including Saudi Arabia, highlighting the need for specialized care and effective action. There are currently over 20,000 dialysis patients in Saudi Arabia, with 9,810 receiving post-transplant care (Mousa et al., 2021). CKD patients face severe health challenges that disrupt their daily lives and affect their physical, mental, and emotional well-being (Alshammari et al., 2024; 2023; Hejazi et al., 2021). Additionally, individuals, families, and healthcare systems are financially impacted by CKD (Ranabhat et al., 2020). Early detection and management of CKD is necessary as it can lead to effective curative actions (Alkubati et al., 2024; George et al., 2017). In order to slow the progression of CKD, healthcare professionals, especially nurses, need to have the necessary

* Corresponding Author.
Email Address: alkubatisa@yahoo.com (S. A. Alkubati)
https://doi.org/10.21833/ijaas.2024.07.004
Corresponding author's ORCID profile:
https://orcid.org/0000-0001-8538-5250

knowledge about its early detection, prevention, and management. In a study that was conducted in Australia, the authors found that nurses' knowledge regarding CKD risk factors and screening practices was poor, 3.77 out of 10 (Sinclair et al., 2019). Almutary et al. 2013 recommended that due to the rapidly increasing number of patients with CKD in Saudi Arabia, Saudi nursing education must raise the proportion of nurses having postgraduate training in the areas of chronic illness prevention and care and renal trained specialist nurses are required for CKD stages 4 and 5 (Almutary et al., 2013).

Recent studies across various geographical regions highlight a consistent pattern in the knowledge, attitude, and practice among nurses in hemodialysis centers towards CKD. While there is generally a good level of understanding about CKD, its risk factors, and management, including the significance of monitoring glomerular filtration rates, challenges persist in the practical application of this knowledge, especially in pre- and post-dialysis care and adherence to infection control measures. These gaps underscore the necessity for continuous professional development and practical training programs tailored to bridge the divide between theoretical knowledge and its clinical application. This need is accentuated by the global nature of these challenges, pointing toward a universal requirement for enhanced training and resources to improve patient outcomes in hemodialysis settings (Jui-Chin et al., 2024; Wolide et al., 2020).

A study was conducted to assess the knowledge, attitudes, and practices of 326 healthcare workers in Jimma, Ethiopia. The study found that these healthcare workers had sufficient knowledge and positive attitudes and practices regarding CKD. They were also aware of the primary functions of the kidneys, the risk factors for CKD, and how to diagnose the disease (Wolide et al., 2020). Sargent et al. (2012) identified a ton of evidence supporting the significant role nurses play in primary healthcare settings in delivering health promotion interventions to avoid chronic disease. The nursing role aims to regulate the modifiable factors and monitor renal functions for persons who are at a high risk of developing CKD. The Kidney Health Check offers a roadmap for early CKD detection, and it is crucial to evaluate persons at risk for CKD annually (Almutary et al., 2013). Based on our knowledge, there are few studies on nurses' knowledge, attitudes, and practices regarding CKD, and none have been published in Saudi Arabia. Therefore, this study aimed to assess the knowledge, attitudes, and practices of nurses concerning CKD, as well as the sociodemographic factors affecting them, in hemodialysis centers in Hail City, Saudi Arabia.

2. Methods

A cross-sectional study was utilized in this study during the period from July to October 2022 in Hail city, Saudi Arabia. The study involved nurses from three dialysis centers in Hail City, Saudi Arabia: the King Abdullah Dialysis Center, the Dialysis Center at King Salman Specialist Hospital, and the Dialysis Center at King Khaled Hospital. All nurses who had been providing direct care to hemodialysis patients for a year or more were included. This comprised 35 nurses from the King Abdullah Dialysis Center, 30 nurses from the Dialysis Center at King Salman Specialist Hospital, and 40 nurses from the Dialysis Center at King Khaled Hospital. All nurses participated, resulting in a 100% response rate. The researchers collected the completed questionnaires to ensure no data was missing.

A self-administered questionnaire, developed by Wolide et al. (2020), was used, consisting of four main parts. The first part covered the socio-demographic characteristics of participants, such as age, sex, years of experience, and training in CKD patient care. The second part included fourteen questions about the nurses' knowledge of kidney disease causes, diagnosis, treatment, and normal kidney function. These questions had multiple-choice answers: "yes," "no," and "I don't know," with overall scores ranging from 0 to 14. The third part addressed nurses' attitudes towards kidney patients with four questions, offering choices of "strongly agree," "agree," "not sure," "disagree," and "strongly disagree." The fourth part contained seven questions about nurses' practices in caring for kidney patients, with answers on a four-point scale: "very unlikely," "not likely," "likely," and "very likely." The questionnaire's validity and reliability were confirmed by a previous study (Wolide et al., 2020), and in this study, reliability was confirmed with a Cronbach's alpha of 0.750.

The researchers approached nurses and asked them to take part in this study. A researcher provided the surveys and informed permission forms to the nurses during their break time after describing the study's objectives and waiting until they completed the forms. In this study, the English version of the questionnaire was utilized.

Before embarking on the study, ethical approvals from the Ministry of Health's scientific research (Ethical Approval No: 2022-16) were obtained. In addition, approvals from intended dialysis centers were obtained. Participants were assured that their participation in the study was voluntary, and they had the right to withdraw at any time without any consequences. Confidentiality and anonymity were assured.

The collected data was organized in Microsoft Excel. The researchers ensured that there was no missing data in the questionnaires. The Statistical Package for Social Sciences (SPSS), version 27.0, was used to analyze the data. The nurses' characteristics and their responses were described using frequencies, percentages, and means. The Kolmogorov-Smirnov test was used to check the normality of the data distribution. The results showed a p-value of less than 0.05, indicating that the data were not normally distributed. Therefore, nonparametric statistics (Mann-Whitney test or

Kruskal-Wallis test) were used to examine the association between sociodemographic characteristics and the overall knowledge, attitudes, and practice scores. The significance level for all tests was set at $p<0.05$.

3. Results

Table 1 presents the sociodemographic characteristics of the participants, including sex, age, years of experience, and whether they received information about CKD patient care. The results show that most participants were female (68.6%). More than half of the participants (53.3%) were between 30 and 39 years old. About two-thirds (64.8%) had more than five years of experience. Additionally, less than two-thirds (62.9%) had received information about caring for CKD patients.

Table 2 shows the knowledge of CKD among nurses in the three dialysis centers in Hail. The highest percentage of correct answers was for the statement "Early detection of CKD saves health care costs" (82.9%). This was followed by the statements "Diabetes mellitus (DM) and high blood pressure can cause CKD," "Long-term alcohol consumption can cause CKD?," "Do you know about dialysis and organ transplantation?," and "Late referral to a nephrologist is a risk factor for CKD?" (77.1%, 77.1%, and 74.3%, respectively). The lowest percentage of correct answers was for the statement "Is the estimated glomerular filtration rate (eGFR) a better indicator of CKD severity than creatinine alone?" (37.1%). This was followed by "Has the eGFR helped in referral when significantly elevated?" (47.6%) and "Do you know any standard treatment guidelines for CKD?" (48.6%). As shown in Table 3, most of the nurses agreed or strongly agreed with all the items on attitudes toward CKD. The highest score was obtained for the item "Do you need more education on CKD and eGFR?" (84.8%), followed by the item "I often worry about the treatment costs of CKD for patients?" (80.9%).

Table 4 provides information on nurses' practices related to CKD care. Most nurses scored highly on the item "How likely are you to test urine proteins routinely in the diagnosis of CKD?" (61.9%). The percentage scores for the items "How likely are you to use information from textbooks or social media?," "Does your health facility provide adequate information about kidney disease?," and "How likely is your health facility to support CKD care?" were 59.0%, 58.1%, and 57.1%, respectively. The lowest percentage scores were for the items "How likely are you to treat CKD patients at home?" and "How likely are you to recommend a traditional healer for CKD?"

Table 1: Socio-demographic characteristics of nurses (N=105)

Characteristic		n	%
Gender	Male	33	31.4
	Female	72	68.6
Age	20-29	31	29.5
	30-39	56	53.3
	40-49	18	17.1
Years of experience	1-2	17	16.2
	3-5	20	19.0
	>5	68	64.8
Do you receive information regarding care of CKD patients	Yes	66	62.9
	No	39	37.1

Table 2: Knowledge toward CKD among nurses at Hail Hospitals, KSA (N=105)

No.	Question	Correct scores (%)	Incorrect scores (%)
1	Is eGFR a better indicator of CKD severity than creatinine alone?	39 (37.1%)	66 (62.9%)
2	Has eGFR helped in referrals when significantly elevated?	50 (47.6%)	55 (52.4%)
3	Can age-related reduction be detected through urine analysis?	65 (61.9%)	40 (38.1%)
4	Are you aware of the Modification of Diet in Renal Disease formula?	73 (69.5%)	32 (30.5%)
5	Can kidney problems be detected by changes in urine color or smell?	64 (61.0%)	41 (39.0%)
6	Are you aware of the five stages of CKD?	56 (53.3%)	49 (46.7%)
7	Can diabetes mellitus (DM) and high blood pressure (HBP) cause CKD?	81 (77.1%)	24 (22.9%)
8	Can long-term alcohol consumption cause CKD?	81 (77.1%)	24 (22.9%)
9	Are anemia and cardiovascular disorders risks for CKD?	71 (67.6%)	34 (32.4%)
10	Does early detection of CKD save health care costs?	87 (82.9%)	18 (17.1%)
11	Does late referral to a nephrologist cause CKD?	75 (71.4%)	30 (28.6%)
12	Do you know any standard treatment guidelines for CKD?	51 (48.6%)	54 (51.4%)
13	Do you know about β-blockers and ACE inhibitors (ACEIs)?	56 (53.3%)	49 (46.7%)
14	Do you know about dialysis and organ transplantation?	78 (74.3%)	27 (25.7%)

Table 3: Attitude toward CKD among nurses (N=105)

No.	Attitude	Strongly agree	Agree	Not sure	Disagree
1	I often worry about treatment costs for CKD patients?	41 (39.0%)	44 (41.9%)	16 (15.2%)	4 (3.8%)
2	Kidney disease is a major public health problem in Saudi Arabia?	34 (32.4%)	48 (45.7%)	19 (18.1%)	4 (3.8%)
3	Ministry of Health gives adequate attention?	41 (39.0%)	43 (41.1%)	18 (17.1%)	3 (2.9%)
4	Do you need more education on CKD and eGFR?	42 (40.0%)	47 (44.8%)	12 (11.4%)	4 (3.8%)

Table 4: Practice toward CKD among nurses (N=105)

No.	Practice items	Likely	Unlikely
1	How likely would you refer patients to Nephrologists?	59 (56.2%)	46 (43.8%)
2	How likely would you recommend a traditional healer for CKD?	45 (42.9%)	60 (57.1%)
3	How likely are you to suggest CKD patients treat themselves at home?	38 (36.2%)	67 (63.8%)
4	How likely are you to use information from textbooks or social media?	62 (59.0%)	43 (41.0%)
5	Have you ever advised your patients on preventing kidney disease?	60 (57.1%)	45 (42.9%)
6	Does your health facility provide adequate information about kidney disease?	61 (58.1%)	44 (41.9%)
7	How likely are you to use routine urine protein tests to diagnose CKD?	65 (61.9%)	40 (38.1%)

Table 5 shows that around two-thirds of the nurses (63.06%) rated correct answers related to knowledge. The majority of the nurses (84.52%) had positive attitudes toward the care of CKD patients. More than half of the nurses (53.06%) adopted positive practices in terms of the care of CKD patients.

Table 5: Total nurses' knowledge, attitude, and practice scores (N=105)

Variable	Mean	Std. deviation	%
Knowledge	8.82	4.07	63.06
Attitude	3.38	1.11	84.52
Practice	3.71	2.48	53.06

As shown in Table 6, there was a significant difference between the knowledge scores and the items of years of experience and received information regarding care of CKD (p=0.033 and p<0.001, respectively), with nurses who had more experience and those who had previous information scored higher than those with less experience and who had not received previous information. In addition, nurses with more experience and previous information scored higher positive attitudes toward patients with CKD than those with less years of experience and who had not received previous information (p=0.004 and p=0.008, respectively. There was no significant relationship between age or sex and nurses' knowledge, attitudes, and practices (p>0.05).

4. Discussion

Acquiring knowledge improves cognitive abilities like logical thinking and problem-solving. A solid foundation of information enhances cognitive functioning by making brain processes smoother and more efficient. Therefore, gaining information enhances cognitive abilities and aids in problem-solving. In terms of CKD knowledge, the nurses are relatively well-informed. This finding aligns with other studies that showed nurses have sufficient knowledge to care for CKD patients (Gapira et al., 2020; Wolide et al., 2020). Regarding specific items, "early detection of CKD saves health care costs" received the highest correct responses. This indicates that nurses have a good understanding of the importance of early CKD detection. Timely identification of kidney disease is crucial for slowing disease progression, preventing complications, implementing tailored treatments, encouraging lifestyle changes, protecting kidney function, reducing healthcare costs, and monitoring high-risk individuals. Routine examinations, careful monitoring of kidney function, and recognizing risk factors are essential for early detection and improving outcomes for those with kidney disorders. Screening programs for early detection are commonly used in high-income countries (HICs) to assess disease extent and implement strategies to improve kidney health. This proactive approach helps prevent kidney disease from progressing to advanced stages, which require expensive treatments and also improves cardiovascular outcomes. However, these strategies have shown limited effectiveness due to a lack of overall benefits and insufficient economic viability (Skolnik and Style, 2021). The top two, three, and five factors all relate to understanding what can lead to CKD. To better understand diseases on a deeper level, it is essential to improve our ability to predict the onset and progression of these conditions. This approach allows for personalized treatments for specific disease subtypes instead of a one-size-fits-all approach. It also helps nurses predict how patients will respond to treatments. Knowledge enables nurses to take effective actions, while a lack of information hinders their ability to provide safe and effective care. Alcohol consumption negatively impacts kidney health and is a risk factor for CKD (Erfanpoor et al., 2021; Fan et al., 2019). Hypertension is a significant risk factor for CKD in both men and women, regardless of diabetes. The study also shows that diabetes is a major risk factor for CKD in men but not in women. Additionally, there is no significant interaction between diabetes and hypertension in causing CKD. Delayed referral to nephrologists can lead to the sudden need for dialysis through temporary vascular access, increasing the risk of death. Early referral to a nephrologist during the predialysis stage is associated with better survival rates and lower mortality (Dhanorkar et al., 2022).

Table 6: The difference between nurses' sociodemographic and knowledge, attitudes, and practice scores (N=105)

Variable		*n*	Knowledge		Attitudes		Practice	
			Mean rank	p-value	Mean rank	p-value	Mean rank	p-value
Gender	Male	33	51.11	0.664	51.36	0.665	50.79	0.610
	Female	72	53.87		53.75		54.01	
Age	20-29	31	51.50	0.911	53.03	0.390	50.71	0.440
	30-39	56	53.07		55.29		56.29	
	40-49	18	55.36		45.83		46.69	
Years of experience	1-2	17	35.47	0.033	34.26	0.004	47.74	0.163
	3-5	20	57.30		57.10		43.75	
	>5	68	56.12		56.48		57.04	
Previous training	Yes	66	69.83	<0.001	58.09	0.008	53.11	0.963
	No	39	24.53		44.38		52.82	

Regarding the fourth factor, dialysis nurses play a crucial role in preparing and supporting individuals with kidney conditions for transplantation. Therefore, nurses working in CKD care need to be knowledgeable about dialysis and kidney transplants. The primary responsibility of nephrology nurses is to help maintain the best possible health for potential transplant recipients by

providing skilled and effective dialysis care (Pedreira-Robles et al., 2023).

Regarding the lowest-scored item, nearly half of the respondents did not know the standard treatment guidelines for CKD. It is essential for nurses to know these guidelines to guide and optimize care for CKD patients. The two items with the lowest correct answers are related to early detection and diagnosis. For the item "Has eGFR helped in referral when significantly elevated," the lack of prompt diagnostic evaluation and specialized therapy is an issue. Referral criteria to nephrology should simplify clinicians' decision-making. Integrating smartphone applications into the referral process could enhance criteria and simplify decisions for non-nephrologist physicians, reducing delays in nephrology referrals and improving accuracy (Oliva-Damaso et al., 2019).

Moreover, eGFR is more accurate in assessing kidney function than relying solely on blood creatinine levels. Serum creatinine levels are influenced by factors like muscle mass, age, sex, and race. However, eGFR may not be reliable for individuals with rapid changes in creatinine levels, significant variations in muscle mass and body size, or altered dietary patterns (Levey et al., 2020).

Regarding the attitude toward CKD among healthcare providers, they have a positive attitude, which aligns with findings from other studies showing that nurses have a positive attitude toward caring for CKD patients (Wolide et al., 2020). A positive attitude is essential for effective task completion and overall professional growth. Adopting a positive perspective at work helps create a cooperative and supportive environment, promoting both efficiency and personal development (Tenney et al., 2016).

Regarding their knowledge gaps in eGFR, nurses express a need for further education on CKD. This desire for increased knowledge and proficiency in eGFR shows a commitment to lifelong learning, which is crucial in the nursing profession (Qalehsari et al., 2017). The statement "I often worry about the treatment cost for CKD patients" indicates that nurses show empathy towards patients. Research shows that empathy positively impacts various aspects of healthcare, including patient satisfaction, treatment compliance, and clinical outcomes. Patients are more likely to follow their treatment plans and engage in self-care when they feel their concerns are understood and acknowledged (Fernandez-Lazaro et al., 2019; Moudatsou et al., 2020).

Regarding their practices, nurses demonstrated positive practices in caring for CKD patients, similar to findings from other studies (Wolide et al., 2020). Specifically, nurses routinely use urine protein tests to diagnose CKD, as urine protein levels are commonly acknowledged as indicators of CKD severity. These levels also serve as prognostic factors for future declines in glomerular filtration rate and associated risks (Wu et al., 2023). Using information from textbooks or social media is helpful for nurses to access information easily and quickly. Textbooks are considered reliable reference points due to their rigorous study methodologies, unlike much of the material found on the internet, which often lacks a systematic approach.

Although home treatment for CKD had the lowest percentage, it is still a positive indicator since CKD has no cure, and patients' conditions are better managed at treatment facilities (Chen et al., 2019).

On the difference between nurses' sociodemographic and knowledge, attitudes, and practice scores. The findings of the latest study indicate that there is no statistically significant difference between the sex of nurses and their scores in knowledge and attitude toward patients with CKD, on the difference between nurses' sociodemographic and knowledge, attitudes, and practice scores. The findings of the latest study indicate that there is no statistically significant difference between the sex and age of nurses and their scores in knowledge and attitude toward patients with CKD. This is congruent with the findings of Sahu et al. (2022), which indicated that there is no difference between caretakers of patients with CKD's sex, age, and their scores in knowledge and attitude.

Regarding years of experience, the current study shows that there is a significant difference between nurses' years of experience and their knowledge and attitude scores. This is congruent with the findings of different studies that claimed that as years of experience increase, knowledge also increases (Diongole et al., 2022; Gapira et al., 2020). Through the combination of practical experience and introspection, preconceived beliefs and expectations can be validated, improved, or invalidated in real-life situations. The acquisition of experience for nurses extends beyond mere exposure to patient conditions and scenarios. Instead, experience encompasses the process of nurses engaging in reflection over encountered circumstances, thus enhancing their ability to make informed decisions in a spontaneous and intuitive manner (Raghubir, 2018).

With respect to prior training, the present investigation reveals a notable disparity between the number of years nurses have been practicing and their corresponding scores in knowledge and attitude. The findings of the study indicate that nurses who had received prior training achieved higher scores compared to their counterparts who did not undergo such training. According to nurses, Continuous Professional Development (CPD) enhances professional standards through acquiring capabilities, leading to improved professional performance and resulting in favorable outcomes for patients, organizations, and individual nurses. The aforementioned results were particularly evident in the thematic areas of Attitudes and Motivation as Reflectors of Nurses' Professional Values and Perceived Impact on Practice as a Fundamental Value. The nurses' clinical efficacy and competency are closely associated with CPD. In order to uphold these aspects, nurses must ensure that their practice remains current, hence underscoring the need for

CPD for nurses. The acquisition of information and skills by nurses via CPD contributes to the enhancement of the professional standing of nursing, a concept that was found to be prominent in several research examined in this review (Mlambo et al., 2021).

Finally, the current study also found that there is no significant difference between the demographics and practices of nurses toward patients with CKD. This finding could be associated with the fact that, as per the researcher's observation, the nationality of the nursing staff force in the units is diverse, which could lead to ignoring diversity, which may lead to unequal nursing care and negative patient outcomes (Togioka et al., 2023).

However, this study highlights the level of nurses' knowledge, attitudes, and practices (KAP) about the management of CKD to explore their competence and provide a deeper understanding of the factors influencing the care of patients with chronic renal disease in hemodialysis centers. This emphasizes the necessity of targeted educational programs and seminars to raise the standard of care given by nurses in hemodialysis facilities to patients with CKD.

This study has a few limitations. It was conducted in only one city in Saudi Arabia, which reduces the generalizability of the results. Additional studies with larger samples and wider geographic areas are needed. Additionally, the convenience sample used in this study may not represent the population accurately. Some factors, such as education level, were not included in this study and should be considered in future research.

5. Conclusion and recommendations

Most of the nurses in this study had adequate knowledge and positive attitudes toward caring for patients with CKD. About half of the nurses engaged in positive CKD-related practices. Nurses with more experience and prior training were more knowledgeable and had more positive attitudes than those with less experience and no training.

Nurses are essential members of the healthcare team and spend a lot of time with patients. Improving their knowledge, attitudes, and practices related to CKD is critical for patient safety. Healthcare administrators in dialysis centers should organize workshops and educational sessions to enhance nurses' competencies in CKD care.

This study evaluated nurses' professional competencies by examining their knowledge, attitudes, and practices (KAP) related to CKD treatment. This comprehensive approach provides a better understanding of the factors affecting CKD management in hemodialysis units. The study recommends enhancing nurses' understanding, beliefs, and actions regarding CKD to ensure patient safety. It emphasizes the need for targeted educational initiatives and seminars to improve the quality of CKD care provided by nurses in hemodialysis centers.

Acknowledgment

The authors thank all nurses for their participation in this study.

Compliance with ethical standards

Ethical considerations

All procedures were carried out in accordance with the relevant standards and laws, including the Helsinki Declaration. The Ministry of Health's scientific research gave the study approval (ethical approval no: 2022-16). Informed written consent was obtained from all participants who were involved in the study.

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

References

Alkubati SA, Al-Sayaghi KM, Salameh B, Halboup AM, Ahmed WAJ, Alkuwaisi M, and Zoromba MA (2024). Prevalence of depression and its associated factors among hemodialysis patients in Hodeida City, Yemen. Journal of Multidisciplinary Healthcare, 17: 689-699. https://doi.org/10.2147/JMDH.S452935 **PMid:38370607 PMCid:PMC10874630**

Almutary HH, Bonner A, and Douglas C (2013). Chronic kidney disease in Saudi Arabia: A nursing perspective. Middle East Journal of Nursing, 7(6): 17-25. https://doi.org/10.5742/MEJN.2013.76337

Alshammari B, Alkubati SA, Alrasheeday A, Pasay-An E, Edison JS, Madkhali N, Al-Sadi AK, Altamimi MS, Alshammari SO, Alshammari AA, and Alshammari F (2024). Factors influencing fatigue among patients undergoing hemodialysis: A multi-center cross-sectional study. Libyan Journal of Medicine, 19(1): 2301142. https://doi.org/10.1080/19932820.2023.2301142 **PMid:38194427 PMCid:PMC10786431**

Alshammari B, Alkubati SA, Pasay-An E, Alrasheeday A, Alshammari HB, Asiri SM, Alshammari SB, Sayed F, Madkhali N, Laput V, and Alshammari F (2023). Sleep quality and its affecting factors among Hemodialysis patients: A multicenter cross-sectional study. Healthcare, 11(18): 2536. https://doi.org/10.3390/healthcare11182536 **PMid:37761733 PMCid:PMC10531149**

Bello AK and Johnson DW (2022). Educating primary healthcare providers about kidney disease. Nature Reviews Nephrology, 18(3): 133-134. https://doi.org/10.1038/s41581-021-00527-y **PMid:34921298 PMCid:PMC8679563**

Chen TK, Knicely DH, and Grams ME (2019). Chronic kidney disease diagnosis and management: A review. JAMA, 322(13): 1294-1304. https://doi.org/10.1001/jama.2019.14745 **PMid:31573641 PMCid:PMC7015670**

Dhanorkar M, Prasad N, Kushwaha R, Behera M, Bhaduaria D, Yaccha M, Patel M, and Kaul A (2022). Impact of early versus late referral to nephrologists on outcomes of chronic kidney disease patients in Northern India. International Journal of Nephrology, 2022: 4768540. https://doi.org/10.1155/2022/4768540 **PMid:35692284 PMCid:PMC9177347**

Diongole HM, Tondi ZMM, Garba A, Aboubacar I, Ibrahim O, Djibril B, and Rostaing L (2022). Knowledge, attitudes and practices of health personnel caring for kidney disease in Zinder. Health Sciences and Disease, 23(5): 147-150. https://doi.org/10.5281/hsd.v23i5.3644

Erfanpoor S, Etemad K, Kazempour S, Hadaegh F, Hasani J, Azizi F, Parizadeh D, and Khalili D (2021). Diabetes, hypertension, and incidence of chronic kidney disease: Is there any multiplicative or additive interaction? International Journal of Endocrinology and Metabolism, 19(1): e101061. https://doi.org/10.5812/ijem.101061 **PMid:33815514 PMCid:PMC8010431**

Fan Z, Yun J, Yu S, Yang Q, and Song L (2019). Alcohol consumption can be a "double-edged sword" for chronic kidney disease patients. Medical Science Monitor: International Medical Journal of Experimental and Clinical Research, 25: 7059–7072. https://doi.org/10.12659/MSM.916121 **PMid:31538630 PMCid:PMC6767945**

Fernandez-Lazaro CI, García-González JM, Adams DP, Fernandez-Lazaro D, Mielgo-Ayuso J, Caballero-Garcia A, Moreno Racionero F, Córdova A, and Miron-Canelo JA (2019). Adherence to treatment and related factors among patients with chronic conditions in primary care: A cross-sectional study. BMC Family Practice, 20: 132. https://doi.org/10.1186/s12875-019-1019-3 **PMid:31521114 PMCid:PMC6744672**

Gapira BE, Chironda G, Ndahayo D, Theos MPM, Tuyisenge MJ, and Rajeswaran L (2020). Knowledge related to chronic kidney disease (CKD) and perceptions on inpatient management practices among nurses at selected referral hospitals in Rwanda: A non-experimental descriptive correlational study. International Journal of Africa Nursing Sciences, 13: 100203. https://doi.org/10.1016/j.ijans.2020.100203

George C, Mogueo A, Okpechi I, Echouffo-Tcheugui JB, and Kengne AP (2017). Chronic kidney disease in low-income to middle-income countries: The case for increased screening. BMJ Global Health, 2(2): e000256. https://doi.org/10.1136/bmjgh-2016-000256 **PMid:29081996 PMCid:PMC5584488**

Hejazi SS, Hosseini M, Ebadi A, and Alavi Majd H (2021). Components of quality of life in hemodialysis patients from family caregivers' perspective: A qualitative study. BMC Nephrology, 22: 379. https://doi.org/10.1186/s12882-021-02584-8 **PMid:34774021 PMCid:PMC8590210**

Jui-Chin H, Fen-Fang C, Tso-Ying L, Pao-Yu W, and Mei-Hsiang L (2024). Exploring the care experiences of hemodialysis nurses: From the cultural sensitivity approach. BMC Nursing, 23: 17. https://doi.org/10.1186/s12912-023-01678-y **PMid:38166820 PMCid:PMC10763141**

Kovesdy CP (2022). Epidemiology of chronic kidney disease: An update 2022. Kidney International Supplements, 12(1): 7-11. https://doi.org/10.1016/j.kisu.2021.11.003 **PMid:35529086 PMCid:PMC9073222**

Levey AS, Titan SM, Powe NR, Coresh J, and Inker LA (2020). Kidney disease, race, and GFR estimation. Clinical Journal of the American Society of Nephrology, 15(8): 1203-1212. https://doi.org/10.2215/CJN.12791019 **PMid:32393465 PMCid:PMC7409747**

Lv JC and Zhang LX (2019). Prevalence and disease burden of chronic kidney disease. In: Liu BC, Lan HY, and Lv LL (Eds.), Renal fibrosis: Mechanisms and therapies: 3-15. Springer, Singapore, Singapore. https://doi.org/10.1007/978-981-13-8871-2_1 **PMid:31399958**

Mlambo M, Silén C, and McGrath C (2021). Lifelong learning and nurses' continuing professional development, a metasynthesis of the literature. BMC Nursing, 20: 62. https://doi.org/10.1186/s12912-021-00579-2 **PMid:33853599 PMCid:PMC8045269**

Moudatsou M, Stavropoulou A, Philalithis A, and Koukouli S (2020). The role of empathy in health and social care professionals. Healthcare, 8(1): 26. https://doi.org/10.3390/healthcare8010026 **PMid:32019104 PMCid:PMC7151200**

Mousa D, Alharbi A, Helal I, Al-Homrany M, Alhujaili F, Alhweish A, Marie MA, and Al Sayyari A (2021). Prevalence and associated factors of chronic kidney disease among relatives of hemodialysis patients in Saudi Arabia. Kidney International Reports, 6(3): 817-820. https://doi.org/10.1016/j.ekir.2020.12.029 **PMid:33732996 PMCid:PMC7938070**

Oliva-Damaso N, Oliva-Damaso E, Rodriguez-Perez JC, and Payan J (2019). Improved nephrology referral of chronic kidney disease patients: Potential role of smartphone apps. Clinical Kidney Journal, 12(6): 767-770. https://doi.org/10.1093/ckj/sfz115 **PMid:31807289 PMCid:PMC6885667**

Pedreira-Robles G, Garcimartín P, Bach-Pascual A, Giró-Formatger D, Redondo-Pachón D, and Morín-Fraile V (2023). Creating the nursing care map in the evaluation of kidney transplant candidates: A scoping review and narrative synthesis. Nursing Open, 10(10): 6668-6689. https://doi.org/10.1002/nop2.1937 **PMid:37480193 PMCid:PMC10495730**

Qalehsari MQ, Khaghanizadeh M, and Ebadi A (2017). Lifelong learning strategies in nursing: A systematic review. Electronic Physician, 9(10): 5541–5550. https://doi.org/10.19082/5541 **PMid:29238496 PMCid:PMC5718860**

Raghubir AE (2018). Emotional intelligence in professional nursing practice: A concept review using Rodgers's evolutionary analysis approach. International Journal of Nursing Sciences, 5(2): 126-130. https://doi.org/10.1016/j.ijnss.2018.03.004 **PMid:31497624 PMCid:PMC6718873**

Ranabhat K, Khanal P, Mishra SR, Khanal A, Tripathi S, and Sigdel MR (2020). Health related quality of life among haemodialysis and kidney transplant recipients from Nepal: A cross sectional study using WHOQOL-BREF. BMC Nephrology, 21: 433. https://doi.org/10.1186/s12882-020-02085-0 **PMid:33046010 PMCid:PMC7552453**

Sahu G, Kumar S, Acharya S, Talwar D, Annadatha A, Patel M, Pawar T, Shah D, Phate N, and Verma P (2022). The act of prevention: Knowledge, attitudes, and perception among caretakers of kidney disease patients in rural Wardha District of Central India. Cureus, 14(3): e23058. https://doi.org/10.7759/cureus.23058

Sargent GM, Forrest LE, and Parker RM (2012). Nurse delivered lifestyle interventions in primary health care to treat chronic disease risk factors associated with obesity: A systematic review. Obesity Reviews, 13(12): 1148-1171. https://doi.org/10.1111/j.1467-789X.2012.01029.x **PMid:22973970 PMCid:PMC3533768**

Sinclair PM, Kable A, Levett-Jones T, Holder C, and Oldmeadow CJ (2019). An evaluation of general practice nurses' knowledge of chronic kidney disease risk factors and screening practices following completion of a case study-based asynchronous e-learning module. Australian Journal of Primary Health, 25(4): 346-352. https://doi.org/10.1071/PY18173 **PMid:31288905**

Skolnik NS and Style AJ (2021). Importance of early screening and diagnosis of chronic kidney disease in patients with type 2 diabetes. Diabetes Therapy, 12(6): 1613-1630. https://doi.org/10.1007/s13300-021-01050-w **PMid:33914300 PMCid:PMC8179861**

Tenney ER, Poole JM, and Diener E (2016). Does positivity enhance work performance?: Why, when, and what we don't

know. Research in Organizational Behavior, 36: 27-46. https://doi.org/10.1016/j.riob.2016.11.002

Togioka BM, Duvivier D, and Young E (2023). Diversity and discrimination in healthcare. StatPearls Publishing, Treasure Island, USA.

Wolide AD, Kumela K, Kerga F, Debalke S, Seboka M, Edilu B, Gashe F, and Bobassa EM (2020). Knowledge, attitude, and practices toward chronic kidney disease among care providers in Jimma town: Cross-sectional study. BMC Public Health, 20: 1079. https://doi.org/10.1186/s12889-020-09192-5 **PMid:32646400 PMCid:PMC7346627**

Wu MF, Lee CH, Pai PH, and Wang JM (2023). Screening cases of suspected early stage chronic kidney disease from clinical laboratory data: The comparison between urine conductivity and urine protein. Biomedicines, 11(2): 379. https://doi.org/10.3390/biomedicines11020379 **PMid:36830916 PMCid:PMC9953103**