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Chronic Kidney Disease Awareness and Related Factors: Literature Review

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ABSTRACT: Kidney disease has recently become a major global health concern. Awareness of the disease can lead to early diagnosis and management, thereby preventing its progression to end-stage renal disease**. Aim:** This study aimed to systematically review existing literature on disease awareness and the related factors among patients with chronic kidney disease. **Methods**: The literature review was conducted through various electronic databases to identify studies published in the past decade, examining CKD awareness and its associates. **Results:** A total of 20 studies on awareness about chronic kidney disease and associated factors were systematically reviewed. Of the identified studies, the majority were descriptive and cross-sectional, showing that sociodemographic factors of age, education, and income strongly influenced CKD awareness. Awareness was consistently higher in older subjects and those with better education and income. Besides, CKD awareness was better when access to health was more available, especially among those who had a check for renal function in the recent period. However, a marked regional variation is noted: a developed nation enjoys a better awareness level as compared to developing ones. These results emphasize the need for targeted educational programs, especially among low-income and rural communities, to enhance the early detection and management of CKD.

Keywords: Kidney Disease, Kidney Disease Awareness, Renal Disease, Renal Failure.

INTRODUCTION

Chronic kidney disease (CKD) is defined as impaired kidney function lasting for a minimum of three months. It is staged based on albuminuria, glomerular filtration rate (GFR), and the underlying causes.

The most accurate indicator of total renal function is typically thought to be the glomerular filtration rate., which clearly shows a marker of progressive renal disease. In cases where the kidneys get compromised due to not having the ability to filter blood or function adequately, it causes a decline in GFR and proteinuria. If not adequately treated, end-stage renal disease can develop from chronic kidney disease. ESRD is a deadly and irreversible disease that is only controlled by dialysis or kidney transplantation [1]. Epidemiology scientists have estimated that by 2050, out of 1345, the figure will rise to 4.902 million and 7.083 million patients in dire situations and have to undergo renal replacement therapy [2,3].

Consequently, it is a significant global health issue impacting over 10% of the world's population, one of the top ten causes of death in the US alone and the 12th worldwide. It is a major cause of death, and according to a systemic review of the global burden of disease. By 2040, it is predicted to be the primary cause of death globally [4,5].

The frequency of CKD increased to 974.86 per million in Jordan in recent times. In addition, the incidence of co-morbidity recorded in CKD patients revealed that hypertension was a comorbid condition for 71% of the patients, diabetes in 59%, and cardiovascular illnesses, in 12%. Furthermore, 8.6% of CKD patients were smokers, and 4% had a family history of CKD [6].

CKD is no doubt a very complex condition influenced by several factors, such as social status, sex, age, education, and socioeconomic levels of which it happens to be. Over the past few decades, there has been a great deal of debate over the treatment and prevention of chronic kidney disease. In this regard, several studies reported generally low awareness of CKD in various populations. It was determined that, for example, in Malaysia, only 31.3% of patients with stages 3-5 CKD had been informed about the diagnosis by a doctor or other health professional in one study. In Oman, it was found in a survey that only 36% of the patients who had stage 3-5 CKD disease were aware of the presence of kidney problems. In Nigeria, Okoro et al., 2020, claimed that just 29% of people with reduced kidney function based on estimated GFR were cognizant that they had chronic kidney disease.

A recently reported global CKD awareness study of 40,000 adults in 14 countries reported an overall awareness of 42%, which was less than 50% in every country except Japan, which was 82%. A meta-analysis published in 2013 comprising 31 studies from 20 countries showed a mean awareness for CKD of 43%, ranging from 14 to 71% based on the country and study. There is a general belief that increased awareness of the disease will motivate early initiation of preventive treatment to halt the advancement of kidney disease by limiting the use of nephrotoxic medications and other measures [5].

Research Problem

A rising worldwide health concern, chronic kidney disease is extremely debilitating to the afflicted person, health systems, and global economies. It has strong associations with many other diseases due to its complex interactions with various medical

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conditions, its far-reaching implications extend beyond the kidneys themselves. Its intricate associations with diabetes, hypertension, cardiovascular diseases, bone and mineral disorders, anemia, immune dysfunction, and mental health underscore the complexity of managing this condition [7]. A holistic approach that considers the interplay between CKD and its related diseases is essential for providing effective care and improving patient outcomes. However, CKD might progress to ESRD if it is not managed appropriately, where life cannot be sustained without dialysis therapy or kidney transplantation [8].

Consequently, CKD significantly contributes to critical healthcare costs [7]. Less than 0.03% of the overall population of high-income countries receives dialysis or has undergone kidney transplantation, which together account for 2–3% of the yearly healthcare spending [9]. CKD prevention is less expensive than its treatment and co-morbidities [8].

In Jordan, there were 7290 Jordanian patients receiving dialysis treatments, although there were 898 new cases by the end of 2020. Most patients (97.8%) had health insurance. Kidney Patients Fund; a division of the Ministry of Health's insurance department; provides insurance to the majority of the patients [10]. Thus, it burdens the country and patients and increases the load on the health sector.

Although the prevalence of CKD in Jordan is increasing, the disease is still not managed well. The disease awareness and the risk factors linked to it among patients who have CKD remain limited. The lack of disease awareness among patients with CKD is believed to affect the progression of the disease [11]. Furthermore, exploring factors contributing to the inadequate awareness of CKD in Jordan is crucial to identifying disease management barriers and developing appropriate strategies to increase awareness, improve early detection, and enhance the overall management of CKD among patients. By addressing this problem, the healthcare system can potentially reduce disease progression, complications, and associated healthcare costs.

According to our search and knowledge, prior studies have not evaluated disease awareness among Jordanian CKD patients. Consequently, a well-thought-out study is required to evaluate disease awareness among CKD patients in Jordan.

Significance of the Study

CKD is a major global threat to the health of the countries and communities. It is projected that around seven million people globally will require renal replacement therapy by 2050 due to end-stage kidney disease.

Since patient practices with the disease are based on their awareness, patient awareness is crucial. Because awareness can be used to plan therapies and inform treatment modifications, it is a necessity to measure the awareness of the patients directly. Patients with chronic kidney disease may not be fully aware of their disease, which could have a substantial impact on public health and economic costs as well as the progression of CKD and the prevention of primary and secondary illnesses.

This study is the first of its kind to examine disease awareness among CKD patients and the factors that are associated with the disease in Jordan. The findings of this study will help policymakers understand how critical it is to raise disease awareness and the factors associated with it among CKD patients in order to put into practice practical solutions to mitigate the disease's negative effects. The study's findings may also encourage practitioners and educators to use a novel interventional model that raises CKD patients' awareness of the condition. Lastly, it encourages researchers to think about various factors and illnesses in their brain centers.

Purpose of the Study

This study aimed to systematically review existing literature on disease awareness and the related factors among patients with chronic kidney disease.

Research Questions

1. What are the key factors influencing chronic kidney disease awareness based on existing global and Jordanian literature?
2. How do sociodemographic and clinical variables impact awareness in different populations?

Materials and Methods

A methodical approach was used in this literature review to identify and analyze studies related to awareness of chronic kidney disease. Several electronic databases, such as PubMed, Scopus, and Google Scholar, were thoroughly searched. The inclusion criteria focused on studies published within the last ten years, examining CKD awareness and its associated factors globally and locally. Studies involving cross-sectional, descriptive, and mixed-method designs were included. Key variables such as sociodemographic factors, comorbid conditions, and healthcare access were extracted and synthesized to provide a cohesive analysis of the current state of CKD awareness.

Search Strategy

The following electronic databases were searched (i.e., EMBASE, Web of Science, PsycINFO, Sociological Extract, PubMed, Scopus, EBESCO, and Google Scholar) to find studies that could provide data on the current evidence about CKD and awareness of the disease among patients. The search utilized the following keywords "chronic kidney disease", “renal disease”, “renal failure”, “renal dysfunction”, "awareness, “end-stage renal disease”, “dialysis”, and “kidney transplantation” in different combinations. The inclusion criteria encompassed original or primary research, secondary analysis of aggregate data (systematic review, integrative review, concept analysis, and meta-analysis), and studies employing quantitative, qualitative, or mixed-method designs. The author specifically considered studies published within the last ten years, on both males and females and living in ruler or urban areas. Conversely, pediatric case studies and those exclusively addressing individuals with end-stage kidney disease were excluded from the analysis. This selective approach aimed to maintain research relevance and specificity by concentrating on adult populations as well as the initial phases of chronic kidney disease. Figure 1 illustrates the initial search across various databases yielded a total of 1,003 documents.

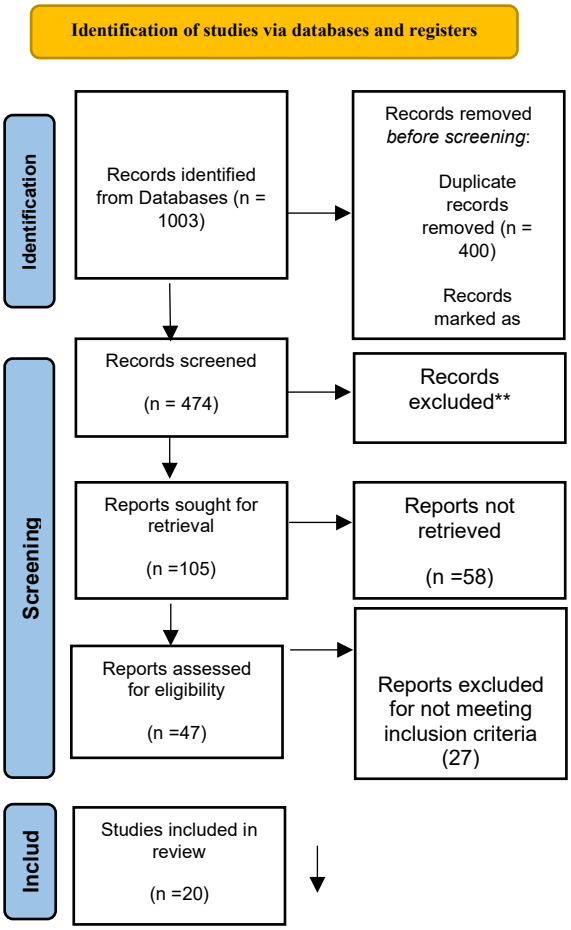

Figure (1): PRISMA flow diagram of Chronic Kidney Disease Awareness.

Subsequently, several exclusion criteria and automated tools were employed to further refine the selection process. Specifically, 400 duplicate records were eliminated, these duplicates are often excluded to ensure that each unique study is counted only once in the review. An additional 82 records were deemed ineligible through the use of automated tools, they involve criteria related to publication type, relevance to the research question, and the exclusion of studies that don't meet the defined criteria. Additionally, 44 records were excluded for various other reasons during the initial screening including publication type, language, and publication date. After these exclusions, 474 records were remained. Following a thorough screening process, 369 records that did not meet the inclusion criteria which include originality, relevance, data availability, and publication status, were subsequently excluded. This left 105 reports for retrieval. Unfortunately, 58 of these reports could not be retrieved, leaving 47 reports that were assessed for eligibility. Finally, after rigorous assessment, 27 reports were excluded for not including significant information that helped the research topic, resulting in a total of 20 papers being included in the review. The results of reviewed studies are presented in Table. 1.

RESULTS

The Burden of Chronic Kidney Disease

CKD stands as a formidable global challenge, it imposes a substantial burden on individuals, healthcare systems, and society as a whole [12]. CKD refers to the progressive and irreversible deterioration of kidney function, leading to waste accumulation in the body, usually diagnosed by albuminuria (protein in the urine) and decreased eGR [13]. Clinically and recently, laboratory testing is commonly used to estimate GFR using indicators such as creatinine in the diagnosis of CKD. As an alternative, it may involve analyzing urine for albumin or protein, singly or in combination. Professional associations have created classification systems over the past 20 years that make it easier to identify and monitor CKD globally. These efforts have improved the knowledge of the prevalence of CKD and how it affects various outcomes, including mortality [14].

The majority of studies focused on CKD stages 3-5 and used estimated GFR (eGFR) to identify CKD. Additional research looks at CKD stages 1-4 that have both decreased eGFR and albuminuria, which is typically defined as a ratio of albumin to creatinine that is higher than 30 mg/g. This calls for multiple evaluations throughout time and the detection of elevated urine albumin or low eGFR for a minimum of ninety days [12].

Importantly, the CKD disease progresses silently, often without symptoms until its advanced stages, when it can lead to ESRD requiring dialysis or kidney transplantation [15]. (Functionally, CKD is characterized by a GFR reduction, typically to 60 ml/min/1.73 m² while, typical GFR in young individual's ranges from 120 to 130 ml/min/1.73 m² [13].

It is estimated that about one in every ten adults has CKD. Most of the affected people experience a lot of negative health outcomes with large associated costs. Notably, CKD is normally underdiagnosed if the identification is based on diagnostic codes only. In a study, yhe analysis study showed that the pooled prevalence of potential cases of CKD is 10.0% in 11 countries. The age average of the group was 75 years old, with 53% being female, 38% having diabetes, and 60% utilizing medications to control their blood pressure. Interestingly, two-thirds of CKD patients found using laboratory criteria lacked the appropriate diagnostic codes for their condition [13].

The burden of CKD goes further than a single patient; it affects families, caregivers, and health systems. This is because patients with CKD need continuous monitoring and management, led by frequent medical visits, medications, and dietary restrictions, among other things. Economically, the management of CKD presents a significant burden to the health systems and society [16]. The economic costs of CKD management, including those of diagnostics, treatments, hospitalizations, and supportive care, are immensely high. The financial strain of CKD is an enormous burden, and projections are that the overall cost of care will be over 1 trillion dollars globally by 2025 [17]. More importantly, CKD is one of the primary causes of low productivity associated with disability and premature mortality: hence, the economic burden is magnified.

In a study published in 2023, addressed the growing global significance of chronic kidney disease, specifically CKD caused by glomerulonephritis [5]. By arguing in favor of a strict quantitative assessment of the burden of CKD and significant updates to its epidemiological profile, this was meant to close a knowledge gap that already existed. The 2019 GBD study introduced the data for this study. This study estimated the incidence, prevalence, death, and disability-adjusted life years (DALYs) associated with glomerulonephritis in order to calculate the portion of the burden that could be directly attributable to the illness. Remarkably, a high prevalence of 17,300,000 CKD patients was observed in 2019, with 606,300 new cases of CKD being diagnosed. 183,700 CKD-related deaths and 6,900,000 DALYs were linked to CKD caused by glomerulonephritis.

Critically, these numbers represented a very wide increase, with incident cases, prevalent cases, deaths, and DALYs increasing by 77, 81, 100, and 66 percent, respectively, compared to the data extracted in 1990. Concomitantly with this fact, CKD turned out to be more prevalent than expected in most areas indicated by lower sociodemographic indices, thus outlining the overt and emerging need for targeted interventions

and healthcare regulations against such a growing public health problem. Perhaps the most shocking thing about this study's findings, however, was the fact that the highest incidence rate was found in children aged from 1 to 4 years. The majority of this load was borne by middle-aged and elderly people. This simply goes on to prove the complexity of CKD epidemiology and the need for comprehensive healthcare strategies in order to minimize its impact globally [12].

The emotional burden of CKD should not be underestimated; CKD significantly impairs the life quality of patients. Disease progression and the need for complex treatments such as dialysis or transplantation can lead to physical and emotional distress patients often experience anxiety, depression, diminished functional capacity, and reduced social participation [18]. However, patients with CKD face challenges related to employment, relationships, and overall well-being. Family members and caregivers also experience emotional distress, while providing support and care to their loved ones [19]. The prevalence of CKD in Jordan is estimated to be 6.8% in the general population [20]. The latest reports indicate a critical threat of CKD among its citizens; in the Annual Report 2020, the number of Jordanian patients treated in dialysis centers was 7,290. In 2020, there were 975 new cases admitted. Among them, 77 were foreigners, making up about 7.9%, while Jordanians formed 898, accounting for 92.1% of the total number of new cases.

The main causative factors in these cases were different, yet hypertension topped with 28%. It was closely followed by diabetes mellitus at 26%, with a combination of DM and hypertension accounting for 25% of the cases. Other identifiable causes were as follows: glomerulonephritis 6%, polycystic kidney disease 3%, infections 3%, congenital factors 3%, vesicoureteral reflux 1%, drug-related 1%, systemic lupus erythematosus 1%, and finally, miscellaneous, seen in 3% of the patients. Such statistics give an idea about the pattern of chronic kidney disease etiologies among patients in Jordan for the year 2020 [21].

Unfortunately, Jordan faces a critical shortage: the lack of appropriate databases or registries that would facilitate early identification and effective management of CKD. Actually, it is shown that at-risk populations for CKD in Jordan do not value early diagnosis of the disease [22, 23].

Chronic Kidney Disease Awareness

A Global Perspective: CKD is an international health concern linked to the increasing decline in kidney function. While early intervention and management of CKD risk factors, such as hypertension, are very important in slowing its progression, CKD has received scant public attention comparable to diseases such as coronary heart disease or diabetes [17].

In most cases, there is a generally low degree of awareness about CKD worldwide, even in large proportions at advanced stages of the disease. Among the possible factors influencing this lack of awareness are delayed diagnosis, poor patient communication by health providers, and limited understanding by patients of the disease [17, 24].

The poor awareness among patients with chronic kidney disease is a prerequisite step in effective management and control of diseases [25]. The study revealed that while patients with CKD generally had low awareness levels, there were differences in the methods used to measure awareness. This study used differently worded awareness questions to compare the estimated prevalence of CKD in the study setting. The study was conducted by reviewing relevant literature and conducting a meta-analysis among adults with CKD who were not on dialysis. The inclusion criteria required studies that estimated CKD awareness based on laboratory criteria for CKD status and provided the exact wording of the questions in assessing awareness. All data extraction was done by two independent reviewers; in case of inconsistency between the two, they were settled by a third independent reviewer.

The research comprised thirty-two carefully chosen studies that were carried out between 2004 and 2017 with populations that varied from 107 to 28,923 people. In individual studies, the range of CKD awareness was 0.9% to 94.0%. A higher awareness rate of 26.5% (95% CI, 11.9%-48.9%) was noted among individuals with an estimated glomerular filtration rate < 60 mL/min/1.73 m². The overall pooled CKD awareness was found to be 19.2% (95% CI, 10.0%-33.6%). Additionally, there were differences in the general population's awareness of CKD (7.3%; 95% CI, 5.0%-10.5%) and patients from nephrology practices (86.2%), who had the lowest awareness of the condition.

However, the analysis found that there was a lot of variation between studies overall and between subgroups depending on the language and study design. In conclusion, the study highlighted the substantial impact of question wording on CKD awareness estimates and emphasized the importance of consistent terminology to effectively monitor and leverage CKD awareness for improved disease management and control. Therefore, the author of this thesis used tools that have adequate psychometric properties.

A study involved an extensive examination of public awareness about CKD, with the goals of determining the level of awareness, identifying factors that contribute to better awareness, and developing a validated CKD knowledge and awareness scale for use in research and public health assessments. Through an electronic self-administered questionnaire and a community-based cross-sectional strategy, they recruited individuals in Lebanon who were 18 years of age and older. The study's tool consists of a 37-item CKD awareness measure that was meticulously created using the principal component approach, and validation later confirmed its validity [11].

Results indicated that while there were some particular gaps in awareness among certain population segments, overall awareness about CKD remained quite good. In particular, scores were higher with older age and recent renal function assessment and lower with lower education level. Tools developed in this study may assist public health stakeholders by facilitating targeted educational interventions to reduce the burden of CKD.

People with chronic kidney disease generally don't know much about their health status. It highlights that people who high risk of developing kidney failure should be the target audience for raising awareness of CKD. The study used data that covered 3,713 participants from 1999 to 2016 and excluded any pregnant adults. It also employed serial cross-sectional surveys. Using the Kidney Failure Risk Equation, they assessed the 5-year risk of kidney failure and classified the predicted risk as minimal, low, intermediate, or high. An affirmative response to the query about CKD awareness was considered regarding being informed by a medical expert that your kidneys are weak or failing [26].

In each risk group, the authors estimated the prevalence of CKD awareness using complex sample survey methods. Then, they applied multivariate logistic regression methods to examine the key relation between Kidney Failure Risk Equation risk and CKD awareness. They found that CKD awareness remained low even in the riskiest groups and was behind that for hypertension and diabetes, which showed a rising trend over time. The study

acknowledged the limitations of using this question: "weak or failing kidneys" for ascertaining CKD awareness.

Chronic Kidney Disease Awareness in Jordan: CKD is an important health issue in Jordan and, in fact, many other countries too. In Jordan, some reasons that increase the prevalence of CKD are very high prevalence of CKD risk factors such as diabetes and hypertension, besides genetic predispositions. This, therefore, demands multi-dimensional approaches that include public awareness, improvements in health infrastructure, and easily accessible therapeutic facilities. Due to the aging population, there is a very high risk for CKD. The major concern, however, is that this comes bearing a significantly heavy burden of risk factors. These include diabetes, hypertension, cardiovascular disease, smoking, and obesity. CDC, 2022, points out, however, that Jordan lacks databases and disease registries that would facilitate the identification and early management of CKD.

The burden of CKD was studied using a representative sample of high-risk Jordanian patients because there was no database in Jordan that identified CKD patients. Data for this cross-sectional, correlational study was gathered in an outpatient setting from September 2013 to March 2014, involving 540 high-risk patients with chronic kidney disease. With an average age of 55.0 ± 12.5 years and a mean estimated glomerular filtration rate of 116.0 ± 47.5, women made up 64% of the sample. Consequently, a third of the patients had varying degrees of eGFR reduction. Age, gender (male), joblessness, past smoking history, and comorbidities such as low high-density lipoprotein, diabetes mellitus, cardiovascular disease, and hypertension were associated positively with CKD. The findings give an explanation for Jordan's high CKD under-diagnosis rate. In this context, evidence-based processes and recommendations for CKD prevention and screening become crucial [27].

It is noteworthy to mention that a small number of studies related to CKD patients have been found in Jordan. Unfortunately, rather than focusing on awareness, research conducted in Jordan has shown how little patients and healthcare professionals know about CKD. In this regard, in 2014 a study was carried out with the goal of developing and receiving approval for the CKD Screening Index, a tool intended to evaluate patients' awareness but not knowledge of CKD. Convenience sampling was used to select 740 Jordanian patients from outpatient departments who had been considered to be at risk for the development of CKD for this cross-sectional study [23].

To characterize the knowledge level, attitude, and practices of patients with chronic illnesses on the issue of CKD prevention and early detection. Two authors emphasized that patients with diseases like hypertension and diabetes should obtain knowledge and foster good practices to decrease the potential prevalence of complications and costs for dialysis. The study found that while the majority of participants had some knowledge of kidney disease, about half of them were misinformed about its symptoms and indicators. Furthermore, the majority of participants were unaware of the advantages of problem identification at an early stage. It was deduced that there was a need to improve the population's understanding of CKD with a view to increasing awareness and practices that would create an enabling environment for better health decisions and improved quality of life. The identified implications include roles for nurses in developing screening and intervention protocols, taking into consideration cultural factors and financial status, plus calling for government support in terms of public health policies for CKD prevention and awareness [22]. The current study is, therefore, the first concerning awareness of the disease and its related factors among patients diagnosed with chronic kidney disease in Jordan. However, awareness is preferred in measurement among patients rather than knowledge because knowledge is a result of education and practice that require essential skills.

A study aimed to exploring the low-income population of patients with CKD against their practices of self-care. With a total of 137 patients with CKD. The participants ranged in age from 6% White, 36% Hispanic, 43% Black, and 15% Asian, with an average age of 55. Additionally, 26% lacked basic health literacy. Of these individuals, 67% had stage 3 or stage 4 CKD, 51% had diabetes, and 38% had high blood pressure. These results suggest that there is a complex association between health literacy and self-care behaviors that are crucial to managing chronic kidney disease. A deeper understanding of this relationship might be essential to encourage participation in practices that have been shown to slow the progression of CKD [28].

It simply underscores from the literature how important CKD awareness projects are to be implemented within any global and local health setting. This concept is not specific to Jordan but is global concerning the role awareness plays in very early detection, prevention, and effective management of CKD. Indeed, these campaigns are powered, in no small part, through collaborative efforts among health professionals, state actors, and civil society. On the other hand, literature directly associates, among other things, socio-demographic variables such as gender, socioeconomic status, and educational level with CKD, thereby making these factors relevant for addressing this serious global health concern. Those studies conducted earlier on the prevalence of awareness about CKD have shown that there is variation in the percentage of CKD awareness among various countries. Hence, there is a requirement for country-specific studies with a view to assessing and understanding the variation in CKD awareness among Jordanian patients. This study fortunately forms the first ever attempt in Jordan for the assessment of CKD awareness and its associated factors among patients.

Literature Gap: Existing research into the awareness of CKD points, however, to a significant lack of awareness in most patients worldwide, associated with late diagnosis and worse outcome. There are regional and income disparities in CKD awareness, but further research is required to understand their underlying factors. At the national level in Jordan, little research has targeted CKD patients, most being studies among healthcare professionals, thus leaving a gap in the research for patient awareness. This is the first assessment of CKD awareness in patients from Jordan. On the other hand, some common factors that increase the risk for low CKD awareness have been identified, such as older age, lower education, and presence of comorbid conditions; further studies need to be conducted. In addition, although tools have been developed for their diagnosis, like the CKD Screening Index, it needs further validation to ensure its generalizability across different populations.

Author/ country	Study title	Objectives of study	Tools/design	Sample Size	Main results
In Lebanon / Younes et;al. 2020	Chronic kidney disease awareness among the general population: tool validation and knowledge assessment in a developing country	To evaluate public awareness of CKD, detect factors associated with increased knowledge, and develop and validate a CKD knowledge scale for use in research and public health evaluation.	In a cross-sectional study conducted in Lebanon, individuals 18 years of age and older's knowledge of chronic kidney disease (CKD) was assessed using electronic self-administered questionnaires. Clinical and sociodemographic variables were analyzed as predictors.	1308 participants	The study involved 1308 participants and used a scale with nine factors, explaining 53.26% of variance. The scale showed high internal consistency and correlation with the full scale. The median CKD knowledge score was 51.00, with higher scores associated with older age, occupation, and recent renal function assessments.
In San Francisco/ Wong et; al. 2018	Association between health literacy and self-care behaviors among patients with chronic kidney disease	To investigate the association between self-care behaviors and health literacy in low-income individuals with chronic kidney disease (CKD).	cross-sectional analysis of the baseline data using a validated questionnaire from the Kidney Awareness Registry and Education study (n = 137 CKD patients).	137 participants	Low health literacy leads to higher smoking rates, lower sugary beverage consumption, and decreased fast food intake. However, there's no significant relationship between health literacy and physical activity or medication adherence. The complex relationship between health literacy and self-care practices for chronic kidney disease management is crucial.
In Malaysia / Sowtali et; al. 2018	Knowledge and Awareness About Chronic Kidney Disease among Undergraduate Students in International Islamic University Malaysia Kuantan Campus	To investigate the correlation between International Islamic University Malaysia's knowledge and awareness of CKD	A straightforward random sampling technique was used to conduct a cross-sectional study involving 108 students. Class representatives were given a questionnaire, and responses correctly answered items were scored with one.	108 participants	A study found that despite 70.4% of participants being women, 43.5% had inadequate knowledge about CKD. 99.1% being aware of CKD, 48.1% learned about it online.
In Germany; Stolpe et; al. 2021.	High Unawareness of Chronic Kidney Disease in Germany	Estimating CKD unawareness by concentrating on patients who have risk factors associated with CKD	In a 2010 study, utilizing age, sex, BMI, hypertension, diabetes, and comorbidities, a log-binomial regression model was used to estimate the prevalence and ratios of CKD unawareness on 3,305 German patients with CKD stages 1-4.	3305 participants	The study found high rates of CKD unawareness in various stages of CKD, with female patients being more likely to be unaware. CKD awareness persisted, even among those with comorbidities. The study emphasizes the importance of improved communication and guideline-based treatment for high CKD risk individuals.
Chu et; al.2021	Patient Awareness of CKD: A Systematic Review and Meta-analysis of Patient-Oriented Questions and Study Setting	to discover the differences in the estimated prevalence of CKD awareness depending on the features of the study settings and the language used in the assessment.	32 studies from 2004 to 2017 that included populations ranging from 107 to 28,923 people were the subject of a systematic review and meta-analysis. Independent data extraction was done, and mixed-effects models were employed in the analysis.	Ranged from 107 to 28,923 participants	The study revealed significant variation in kidney disease awareness across different populations, with awareness ranging from 0.9% to 94.0%. The overall pooled awareness was 19.2%, with higher awareness among individuals with a glomerular filtration rate. The wording used to assess awareness significantly impacted results, with "kidney problem" yielding the highest sensitivity. The study also found that awareness varied significantly depending on the study setting, emphasizing the importance of consistent terminology for effective disease management and control.

Author/ country	Study title	Objectives of study	Tools/design	Sample Size	Main results
In Jimma/ Wolide A et; al. 2020 .	Knowledge, attitude, and practices toward chronic kidney disease among care providers in Jimma town: cross-sectional study	to evaluate the care provider's understanding, perspective, and methods regarding CKD	326 healthcare professionals from Jimma University Specialized Hospital and three medium-to-higher clinics in Jimma Town participated in a cross-sectional study. The data were analyzed using generalized linear modalities and descriptive statistics.	326 participants	The study found that over half of care providers were aware of using eGFR to assess kidney function and referring patients to nephrologists. They were aware of the five stages of CKD and risk factors, but were concerned about treatment costs and the Ethiopian ministry of health's lack of attention. Most likely, they would refer patients to senior physicians.
In USA/ Chu et;al. 2020	CKD Awareness Among US Adults by Future Risk of Kidney Failure.	To improving knowledge of CKD, especially among those who are more likely to develop kidney failure	The Kidney Failure Risk Equation was used in a series of cross-sectional surveys of nonpregnant adults with CKD to assess the 5-year risk of kidney failure. The predicted risk was classified as minimal, low, intermediate, or high.	Ranged from 107 to 28,923 participants	The study reveals low CKD awareness among high-risk individuals, behind hypertension and diabetes. It emphasizes the need for targeted interventions to address this longstanding gap and improve kidney health.
In (USA) Murphy et;al.2020 .	Awareness and Discussions About Chronic Kidney Disease Among African-Americans with Chronic Kidney Disease and Hypertension.	To assess patient-physician discussions regarding chronic kidney disease (CKD) during routine primary care visits, determine associated factors, and comprehend the awareness of CKD among African-American patients with uncontrolled hypertension.	In order to find independent predictors of CKD awareness and discussions, the study used audio recordings of patient-physician discussions, questionnaires to measure CKD awareness, and multivariate regression analysis.	48 participants.	The study found that only 29% of African-American patients with uncontrolled hypertension and CKD were aware of their condition. CKD awareness was associated with moderate-severe CKD and diabetes. CKD discussions were common in 63% of visits, focusing on laboratory assessment and risk factor management. However, follow-up CKD awareness did not significantly change.
In Jordan /Khalil et; al. 2014.	Development and psychometric evaluation of the Chronic Kidney Disease Screening Index	to develop and assess the psychometric profile of the CKD Screening Index, a tool used to measure patients' awareness of CKD prevention and early detection through their knowledge, attitudes, and behaviors.	In order to create and validate the CKD Screening Index, a cross-sectional study enrolled 740 Jordanian patients who were at risk for CKD. The study was conducted in four stages: item generation, pilot study, preliminary validation, and final validation.	740 participants	The CKD Screening Index significantly associated with depressed and anxious patients, with a Guttman Split-Half Coefficient of 0.80, and negatively correlated with attitude and practice factors.
	Knowledge, attitudes, and practices towards prevention and early detection of chronic kidney disease	to provide an overview of Jordanian patients' knowledge, attitudes, and practices regarding the early detection and prevention of chronic kidney disease.	740 Jordanian outpatient clinic patients were enrolled in the study in order to assess their knowledge, attitudes, and practices regarding kidney disease prevention and early detection through the use of the Chronic Kidney Disease Screening Index.		The study found that while most participants are aware of kidney disease, half have incorrect information about chronic kidney disease symptoms and are unaware of the importance of early detection.
In Jordan /Khalil et; al. 2018.	Under-diagnosed chronic kidney disease in Jordanian adults: prevalence and correlates	To determine the prevalence of chronic kidney disease (CKD) in a national sample of high-risk Jordanian patients and investigate	Using bivariate analysis, the study examined the prevalence of kidney disease (CKD) and its relationship to clinical and demographic factors in 540 high-risk outpatients from 2013 to 2014.	540 outpatients	The study found that 64% of patients had CKD, with a mean age of 55.0 years and a mean eGFR of 116.0. Factors such as age, maleity, unemployment, smoking, co-morbidities,

Author/ country	Study title	Objectives of study	Tools/design	Sample Size	Main results
		the relationship between CKD and clinical and demographic factors			and low HDL were positively correlated.
In Southeastern United States / Tummalapalli S et; al.2020.	Chronic Kidney Disease Awareness and Longitudinal Health Outcomes: Results from the Reasons for Geographic and Racial Differences in Stroke Study	to determine whether knowledge of chronic kidney disease (CKD) among those who have the condition is related to long-term health practices, illness control, and health consequences.	Just 4.4% of participants in a study looking at CKD awareness were aware of their condition. Baseline awareness did not significantly affect health behaviors, CKD management indicators, or changes in eGFR and UACR among the 6,529 participants. But not CHD or stroke, it was associated with a higher risk of ESKD and death.	6529 participants	A study found that only 4.4% of 6,529 participants with baseline CKD were aware of their condition. However, baseline awareness was linked to an increased risk of Early Stage Kidney Disease (ESKD) and death, but not to subsequent coronary heart disease (CHD) or stroke. The study also found no significant association between baseline awareness and subsequent health behaviors, CKD management indicators, or changes in eGFR and UACR.
In Ethiopia/ Kumela Goro et; al. 2019.	Patient Awareness, Prevalence, and Risk Factors of Chronic Kidney Disease among Diabetes Mellitus and Hypertensive Patients at Jimma University Medical Center, Ethiopia	to evaluate the prevalence, risk factors, and patient awareness of chronic kidney disease in patients with diabetes mellitus and hypertension.	In Jimma University Medical Center, a cross-sectional study revealed that just 4.4% of 6,529 participants with baseline chronic kidney disease (CKD) knew they had the disease. Baseline awareness, however, was associated with a higher risk of ESKD and death, but not with a higher risk of heart disease, stroke, or cardiovascular disease (CHD) later on. Multivariate logistic regression was employed in the study to find independent CKD predictors.	110 participants	The study involved 110 male participants aged 54.81 ± 12.45 years, with 26% having chronic kidney disease (CKD). Factors associated with CKD included uncontrolled blood pressure, fasting blood sugar, nonusers of ACEIs, poor knowledge of CKD, and long hypertension duration.
In Ethiopia/ Fiseha et; al. 2020.	Prevalence and awareness of chronic kidney disease among adult diabetic outpatients in Northeast Ethiopia	To determine out the prevalence of CKD is and how much knowledge there is about it among diabetic outpatients who visit a hospital in Northeast Ethiopia	In a diabetes clinic in Northeast Ethiopia, a cross-sectional study was carried out between February 1 and July 30, 2016. 323 adult diabetics participated in the study and gave urine samples for albuminuria and blood samples for serum creatinine. Using the Modification of Diet in Renal Disease (MDRD) equation, the estimated glomerular filtration rate (eGFR) was determined.	323 participants	A study of 323 patients found that 26.3% had Stage 1-5 CKD, 13.0% had eGFR < 60 ml/min/1.73m2, and 18.0% had albuminuria. Only 10.6% were aware of their condition, increasing with worsening stages. Factors such as albuminuria, high serum creatinine, kidney disease family history, and obesity significantly influenced CKD awareness.
In Saudi Arabia Nahlah Fahad, et; al. 2022	Measuring the Awareness of Chronic Kidney Disease (CKD) with Environmental Evaluation among Adult Diabetic Patients in Hail Region, Saudi Arabia	to determine in the Hail region of Saudi Arabia in 2022 how well-informed adult diabetic patients are about the possibility of developing chronic kidney disease.	a cross-sectional study carried out among Saudi Arabia's Hail region's diabetic patients. Arabic-language versions of a self-administered questionnaire were given to DM patients. A 7-item questionnaire to gauge the DM population's level of knowledge about chronic kidney disease is included in the questionnaire along with social and demographic questions about age, gender,	400 participants	400 DM patients responded to our survey (51% females vs 49% males). 23.8% had type 2 diabetes, and 40.5% had 5-15 years of diabetes. Nearly half (46.8%) were considered as a poor level of awareness, 29.3% had a moderate, and 24% had a good awareness level. Factors associated with an increased level of awareness were having a bachelor's degree, being unmarried, being a student,

Author/ country	Study title	Objectives of study	Tools/design	Sample Size	Main results
			relationship status, and other topics.		and having a doctor as a source of CKD information.
In Malaysia / Loo et; al. 2022.	Knowledge of chronic kidney disease among undergraduate and postgraduate students in a public university in Klang Valley, Malaysia: A cross-sectional study	to evaluate university students' understanding of chronic kidney disease (CKD) and the factors that are related to it.	Between July 2020 and August 2020, University Kebangsaan Malaysia students participated in a convenience sample-based cross-sectional study.	3074 participants.	A study found that 32.6% of university students had below-average knowledge of chronic kidney disease (CKD), with factors like maleness, undergraduate programs, and non-health-related faculties contributing to this issue.QOC, staff satisfaction, and staff retention.
In Palestine, Nablus / Badran et; al. 2023.	The relationship between diabetes-related knowledge and kidney disease knowledge, attitudes, and practices: a cross-sectional study	To evaluate the early detection and prevention of CKD knowledge, attitudes, and practices (KAP) of DM patients, ascertain its correlation with other variables, and investigate the relationship between KAP scores concerning the prevention and early detection of CKD and the Michigan Diabetic Knowledge Test.	Data from two Nablus primary healthcare centers were used in a cross-sectional study. The questionnaire was divided into three sections: questions about diabetes mellitus, sociodemographic information, and a CKD screening index consisting of three scales. The Michigan Diabetic Knowledge Test (MDKT) was utilized to evaluate the patients' knowledge regarding diabetes.	386 participants	A study involving 386 diabetic patients found that those under 55 years old, with normal BMI, high education, and a single oral diabetic drug were associated with higher knowledge scores. Patients over or equal to 55, with high income, less frequent tobacco use, and a higher MDKT score were associated with higher attitude scores. Patients with normal BMI, city residency, high education, less frequent tobacco use, and better knowledge, attitude, and MDKT scores were associated with better practices toward CKD prevention and early detection.
In Saudi Arabia/ Alghamdi et; al. 2023.	Knowledge, Attitudes, and Practices of High-Risk Patients towards Prevention and Early Detection of Chronic Kidney Disease (CKD) in Saudi Arabia	To evaluate high-risk patients' knowledge, attitudes, and behaviors regarding early detection and prevention of chronic kidney disease in Saudi Arabia	A cross-sectional descriptive study was conducted in Saudi Arabia with the use of the CKD Screening Index, a recently created tool. It was carried out using a self-administered questionnaire from December 2021 to May 2022. The CKD screening index tool, clinical factors, and sociodemographic data comprise the three sections of the questionnaire.	385 participants.	Knowledge of kidney function had a significant difference across patient groups with varying employment status. Monthly income is a significant factor in the patient attitude on healthcare towards preventing kidney disease. On the other hand, educational level significantly affects the overall attitude of patients towards preventing kidney disease.
Quetta, Pakistan / Ahmed, et; al. 2022.	Awareness of Chronic Kidney Disease, Medication, and Laboratory Investigation among Nephrology and Urology Patients of Quetta, Pakistan	To investigate Quetta's nephrology and urology patients' knowledge of chronic kidney disease (CKD), its treatments, and laboratory tests	A questionnaire was adopted and culturally modified in order to conduct a cross-sectional study. 500 questionnaires were self-administered to inpatients, outpatients, and dialysis patients using a convenient sampling technique. 468 responses (response rate: 93.6%) were examined.	468 participants	The study found that 50.3% of nephrology and urology patients in Quetta are unaware of symptoms of CKD worsening, and 56.2% are unaware of kidney function aggravates. 47.4% have no understanding of long-term prognosis, and 51.5% are unaware of medication names and usage. Low awareness requires immediate educational intervention.
In Saudi Arabia, Jazan / Assiry et; al 2022.	Public Awareness of Chronic Kidney Disease in Jazan Province, Saudi Arabia-A Cross-Sectional Survey	To evaluate the general public's knowledge of chronic kidney disease (CKD), including their awareness of risk factors and	Over seven months, from November 2020 to July 2021, 440 citizens of the Province of Jazan took part in an online cross-sectional survey. A 73-item validated self-report survey was used to gather data.	440 participants	A study of 286 male respondents aged 18-59 showed that 65% were male. However, only 27.3% had good knowledge, and a high awareness of risk factors, and complications associated with CKD.

Author/ country	Study title	Objectives of study	Tools/design	Sample Size	Main results
		complications related to the disease, in the province of Jazan, Saudi Arabia.			Knowledge was significantly associated with being a student, employed, having completed graduate studies, residing in urban areas, aged 18-39, and having no co-morbidities. Positive correlations were found between knowledge and awareness of risk factors and complications.
In Jordan/ Khalil et;al.2014	Knowledge, attitudes, and practices toward prevention and early detection of chronic kidney disease	To describe the knowledge, attitudes, and practices of Jordanian patients with chronic illnesses towards prevention and early detection of chronic kidney disease.	Using the Chronic Kidney Disease Screening Index, a study recruited 740 Jordanian outpatient clinic patients to measure knowledge, attitudes, and practices about kidney disease prevention and early detection.	470 participants.	The study found that while most participants are aware of kidney disease, half have incorrect information about chronic kidney disease symptoms and are unaware of the importance of early detection.

DISCUSSION

Key Factors Influencing CKD Awareness

There was wide variation across different populations for CKD awareness, with an overall pooled awareness of 19.2%. The authors found higher awareness in those with a lower glomerular filtration rate, underlining the importance of targeted interventions for those at higher risk [25].

Sociodemographic Variables

CKD awareness was higher in older subjects and those with greater occupational status. education and socioeconomic status do play a role in the issue of CKD awareness, therefore evidencing that those subjects with higher education and income are more likely to be aware of CKD [5, 11, 29].

At the regional level, low awareness about CKD, isolation of individuals less educated people and those who reside in rural areas further showed the lowest awareness [30-32].

Impact of Sociodemographic and Clinical Variables

Age and Education: Evidence was given in all studies to indicate that CKD awareness is related to older age and higher education. Significant factors that contributed to awareness and thus showed a need for subgroup populations that are younger and less educated to be targeted through information campaigns. Another study supported the previous results in Saudi Arabia by Nahlah found that of the individuals with CKD, 46.8% had insufficient knowledge, 29.2% had intermediate awareness, and 24% had good awareness of chronic kidney disease. The most probable explanation for these findings is that education is crucial to health since it serves as the foundation for a patient's health awareness. Furthermore, people with a higher degree of education frequently exhibit stronger critical thinking abilities and a desire to learn more about illnesses. Hence, compared to people with lower education levels, those with higher health awareness are often more knowledgeable about CKD [11,33,34].

Comorbid Conditions: patients with comorbidities like diabetes and hypertension stand at a higher level of awareness, although the general awareness remains suboptimal even in these high-risk groups [35,36].

Address: living in a rural area substantially hinders getting the proper care for chronic kidney disease (CKD) and may, therefore, also be a barrier to learning about CKD. People living in rural areas could be less concerned with their health and medical issues., which might explain these results. Moreover, rural regions are characterized by lower levels of education and skill development, which leads to lower income and a poorer quality of life. This will have a direct influence on health knowledge, which is defined as the capacity to receive, analyze, and comprehend fundamental health information needed to make knowledgeable healthcare decisions [37-40].

Smoker and diet: two characteristics are heavily impacted by the cultural and social variables that are believed to be determinants of better lives, physical exercise, healthy eating habits, and smoking. Furthermore, cultural and religious aspects might potentially have significant effects on smoking and diet [40-44].

Disclosure Statement

- **Ethics approval and consent to participate:** As this study is a literature review, it does not involve direct interaction with participants. Therefore, consent form is not applicable.
- **Consent for publication:** If your manuscript contains any individual person's data in any form (including individual details, images or videos), consent to publish must be obtained from that person, or in the case of children, their parent or legal guardian. All presentations of case reports must have consent to publish.
- Otherwise, add Not applicable
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