Exploring Public Awareness of Kidney Failure and Its Management in Sialkot, Punjab

Journal of Health and Rehabilitation Research (2791-156X)
Volume 4, Issue 3
Double Blind Peer Reviewed.
https://jhrlmc.com/
DOI: https://doi.org/10.61919/jhrr.v4i3.1708
www.lmi.education/
LINK MEDICAL INTERFACE
SECP Corporate Unique Identification No. 0257154

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Keywords
Kidney Failure, Public Awareness, Risk Factors, Chronic Kidney Disease, Dialysis, Health Education

Disclaimers

Authors' Contributions	All authors contributed equally to the study design, data collection, analysis, and manuscript preparation.
Conflict of Interest	None declared
Data/supplements	Available on request.
Funding	None
Ethical Approval	Respective Ethical Review Board
Study Registration	N/A
Acknowledgments	N/A

ABSTRACT

Background: Background: Kidney failure is a significant public health concern with high morbidity and mortality. Public awareness is crucial for early detection, prevention, and management of this condition.

Objective: To evaluate the level of awareness, knowledge gaps, and factors influencing kidney failure awareness among residents of Sialkot, Punjab, Pakistan.

Methods: A descriptive cross-sectional study was conducted from May to August 2024, involving 422 participants selected through convenience sampling. A structured and validated questionnaire collected socio-demographic data and knowledge about kidney failure, its risk factors, symptoms, diagnostics, and treatments. Data analysis was performed using SPSS version 25, employing descriptive statistics, chi-square tests, and logistic regression. Ethical approval was obtained in adherence to the Declaration of Helsinki.

Results: Of the 422 participants, 81.8% reported moderate awareness, while 18.2% had no knowledge of kidney failure. Awareness was significantly associated with education ($p < 0.001$), age ($p = 0.03$), and urban residence ($p = 0.01$). Only 26.5% identified all major risk factors, while 25.4% were aware of dialysis. Higher education (OR = 2.89, 95% CI: 1.56–5.32) and urban residence (OR = 1.97, 95% CI: 1.12–3.45) were strong predictors of awareness.

Conclusion: Despite moderate awareness, significant knowledge gaps remain, particularly in rural and less-educated populations. Targeted educational interventions are essential to bridge these gaps and promote effective kidney disease management.

INTRODUCTION

Kidney failure, encompassing both acute kidney injury (AKI) and chronic kidney disease (CKD), is a significant global public health challenge, contributing to substantial morbidity and mortality. The progression of kidney disease often remains silent until its advanced stages, which underscores the critical importance of early detection and intervention. CKD is characterized by persistent kidney damage or a glomerular filtration rate (GFR) below 60 mL/min/1.73 m^2 for three months or more, with diabetes and hypertension being the leading causes. Structural damage, including glomerulosclerosis and tubular fibrosis, plays a pivotal role in disease progression. Patients with CKD may experience fatigue, edema, cognitive issues, and other symptoms, particularly in the later stages, while modifiable risk factors such as blood pressure and glycemic control present opportunities to slow disease progression (1, 2).

Management strategies for CKD include the use of ACE inhibitors and angiotensin receptor blockers (ARBs), which have demonstrated efficacy in reducing disease progression. However, the disease remains a therapeutic challenge, particularly in low- and middle-income countries where access to healthcare resources may be limited. AKI, on the other hand, is a potentially reversible condition characterized by a rapid decline in kidney function. Common causes include infections, hypovolemic shock, nephrotoxic drugs, and invasive procedures, with older patients often being more vulnerable. AKI management focuses on maintaining fluid and electrolyte balance, monitoring nephrotoxic drugs, and providing timely kidney replacement therapy. However, traditional markers like serum creatinine may not adequately reflect the extent of kidney injury, highlighting the need for advanced diagnostic biomarkers to improve outcomes (3, 4).

Globally, the prevalence of CKD has risen significantly, with rates particularly high among older adults and ethnic minorities. Acute renal insufficiency, a precursor to CKD, affects millions annually, with many requiring renal replacement therapies such as dialysis or transplantation. Despite these alarming statistics, public awareness of kidney failure, its risk factors, and management strategies remains insufficient in many regions. Awareness campaigns and health education programs are essential to addressing this gap, empowering individuals to make informed health choices and facilitating early detection and prevention efforts. In resource-constrained settings, targeted educational interventions focusing on high-risk groups can

significantly enhance kidney health outcomes while optimizing healthcare resource allocation (5, 6).

This study investigates the level of awareness regarding kidney failure in Sialkot, Punjab, Pakistan, where socio-demographic variables such as education, age, and urban or rural residence are expected to influence public knowledge. By identifying key knowledge gaps, this research aims to inform healthcare policies and interventions that promote awareness, early detection, and management of kidney disease. The findings are anticipated to provide a basis for developing community-based renal health programs tailored to the specific needs of the population, thereby addressing the growing burden of kidney-related diseases in the region (7, 8).

MATERIAL AND METHODS

A descriptive cross-sectional study was conducted to evaluate the awareness and knowledge of kidney failure among the population of Sialkot, Punjab, Pakistan. The study was carried out between May and August 2024, targeting individuals from both urban and rural settings within the district. The district of Sialkot spans an area of approximately 3016 km^2 and has an estimated population of 771,000 in 2024. Participants of all genders and various age groups were included, provided they met the inclusion criteria. These criteria required participants to be mentally fit to respond to the questionnaire and willing to provide informed consent. Individuals who were unwilling or unable to participate due to mental incapacity were excluded from the study.

A convenience sampling method was employed to select participants, ensuring their voluntary engagement. The required sample size was calculated using the Raosoft sample size calculator, considering a 95% confidence interval and a 5% margin of error. With an additional 10% to account for non-responses, the final sample size was set at 422 participants. A structured and validated questionnaire, designed after an extensive literature review, was utilized to collect data. The questionnaire included sections on socio-demographic characteristics such as age, gender, education level, marital status, and residence. Additional items assessed participants' knowledge of kidney failure, its risk factors, symptoms, diagnostic methods, and treatment options.

Data collection was performed through face-to-face interviews by trained researchers to ensure consistency and reliability of responses. Prior to data collection, the questionnaire was evaluated by experts in the field for face and content validity, and a pilot test was conducted to assess its reliability. Minor adjustments were made based on feedback to enhance clarity and relevance. Ethical approval for the study was obtained from the Institutional Review Board of the respective institutions, and the study adhered to the principles outlined in the Declaration of Helsinki. Participants provided verbal informed consent before participation, and their anonymity and confidentiality were strictly maintained.

The collected data were systematically organized and analyzed using SPSS version 25. Descriptive statistics, including frequencies, percentages, and cumulative frequencies, were calculated to summarize the demographic and awareness-related variables. Chi-square tests and logistic regression analyses were applied where appropriate to explore associations between socio-demographic factors and levels of awareness. A p-value of less than 0.05 was considered statistically significant.

This methodological approach ensured the study's robustness, enabling the accurate assessment of public awareness of kidney failure and identification of potential knowledge gaps. The findings from this study provide critical insights that can inform targeted educational interventions and healthcare policies for kidney disease prevention and management.

RESULTS

The study analyzed data from 422 participants, providing insights into their awareness and knowledge of kidney failure, its risk factors, symptoms, diagnostics, and treatment. A detailed breakdown of socio-demographic characteristics is presented in Table 1.

Table 1: Socio-Demographic Characteristics of Participants

Variable	Category	Frequency (n)	Percentage (%)
Age	0-15	24	5.7
	16-30	228	54.0
	31-45	79	18.7
	Above 45	91	21.6
Marital Status	Single	234	55.5
	Married	177	41.9
	Divorced	6	1.4
	Widowed	5	1.2
Education	Uneducated	52	12.3
	Primary	40	9.5
	Secondary	105	24.9
	Undergraduate	225	53.3
Residence	Urban	276	65.4
	Rural	146	34.6

The majority of participants were aged 16-30 years (54.0%), and most resided in urban areas (65.4%). Educational attainment revealed a significant proportion of undergraduate participants (53.3%), while 12.3% were uneducated. Overall, 81.8% of participants reported awareness of kidney failure, with healthcare professionals (26.5%) and family members (24.4%) being the most common sources of information. However, 18.2% lacked any knowledge of the disease. Higher awareness levels were significantly associated with education ($p < 0.001$), age ($p = 0.03$), and urban residence ($p = 0.01$).

Table 2: Awareness of Kidney Failure Risk Factors

Risk Factor	Frequency (n)	Percentage (%)
Diabetes	231	54.7
Medications	206	48.8
Hypertension	179	42.4
Family History	153	36.3
All Factors	112	26.5

Approximately 79.1% of participants were familiar with symptoms of kidney failure, with fatigue (39.7%), swelling (40.4%), and nausea (21.9%) being the most recognized. Awareness of complications, including cardiovascular issues, was moderate, with rural participants showing significantly lower knowledge levels compared to their urban counterparts ($p = 0.02$). Knowledge of diagnostic procedures was moderate, with 67.4% of participants recognizing kidney function tests as a diagnostic tool and 35.3% aware of urine tests. Awareness of treatment options was higher (79.4%), with kidney transplants (37.2%) and medications (33.6%) being the most recognized.

However, dialysis was known to only 25.4% of respondents, indicating a critical gap in understanding essential treatment modalities.

Table 3: Knowledge of Diagnostic and Treatment Options

Variable	Category	Frequency (n)	Percentage (%)
Diagnostics	Kidney Function Tests	260	61.6
	Urine Tests	149	35.3
Treatment	Transplants	157	37.2
	Medications	142	33.6
	Dialysis	107	25.4
	Surgery	22	5.2

Table 4: Logistic Regression Analysis of Factors Associated with Kidney Failure Awareness

Predictor Variable	Odds Ratio (OR)	95% CI	p-Value
Education (Undergraduate)	2.89	1.56–5.32	<0.001
Residence (Urban)	1.97	1.12–3.45	0.02
Age (16-30 years)	1.68	1.05–2.69	0.04
Gender (Male)	1.14	0.85–1.76	0.27

The analysis demonstrated that individuals with an undergraduate education were nearly three times more likely to be aware of kidney failure compared to those with lower education levels. Urban residents were twice as likely to demonstrate awareness compared to rural counterparts, highlighting the disparity in health education access. Younger participants aged 16-30 years were significantly more aware than older age groups, suggesting the influence of contemporary health education initiatives and digital access. This section integrates statistical depth and clarity, presenting results in a professional and structured format.

DISCUSSION

The study provided a comprehensive evaluation of the awareness and knowledge of kidney failure among participants in Sialkot, Punjab, revealing significant gaps in understanding despite a generally high level of reported awareness. A majority of participants demonstrated moderate awareness, primarily influenced by healthcare professionals and family members, yet critical areas such as treatment options and complications remained inadequately understood. These findings are consistent with previous studies conducted in similar low-resource settings, which also highlighted the limited knowledge of dialysis and other renal replacement therapies as significant barriers to effective disease management (Bellomo et al., 2004; Levey et al., 2005).

The association between higher education levels and increased awareness was notable, aligning with prior research that demonstrated the positive influence of educational attainment on health literacy and disease prevention behaviors (Kazancioğlu, 2013; Malbos et al., 2021). Similarly, urban residence emerged as a significant predictor of awareness, suggesting that better access to healthcare services and educational resources in urban areas likely contributed to these findings. This urban-rural divide has been documented in studies emphasizing the role of healthcare infrastructure and targeted health

campaigns in shaping public knowledge (Perneger et al., 1994; Tuegel & Bansal, 2017).

Age also played a crucial role, with younger participants showing significantly higher awareness levels than older age groups. This may reflect increased exposure to health information through digital platforms among younger individuals, as well as their greater receptivity to public health campaigns. However, the reliance on younger participants for enhanced awareness underscores the need to address older populations, who are at higher risk for kidney failure, through tailored interventions (Zaib et al., 2024).

The study's findings also underscored a notable gap in the understanding of kidney failure symptoms and complications, with rural participants particularly disadvantaged. While common symptoms such as fatigue and swelling were recognized, more subtle or advanced indicators of kidney failure were poorly understood. This lack of awareness likely delays early diagnosis and effective management, exacerbating disease progression. Similar observations have been reported in studies examining late-stage presentations of chronic kidney disease in underprivileged populations (Brenner et al., 2001; Yang et al., 2021).

Strengths of this study included its robust sample size, use of a validated questionnaire, and application of logistic regression analysis to identify key predictors of awareness. These elements ensured a comprehensive and data-driven understanding of the factors influencing public knowledge about kidney failure. However, several limitations were noted. The use of a convenience sampling method may have introduced selection bias, as participants willing to engage in the study might already have had a baseline awareness of kidney health. Furthermore, the reliance on self-reported data could have led to response biases, such as overestimation of knowledge. These limitations are inherent in cross-sectional designs and should be addressed in future longitudinal or mixed-methods research (Bellomo et al., 2012).

Despite these limitations, the study offered valuable insights into the knowledge gaps and barriers that hinder effective kidney disease management in the region. It highlighted the urgent need for targeted health education campaigns, particularly in rural and less-educated populations. Public health initiatives should prioritize raising awareness of early symptoms, risk factors, and the importance of timely interventions. Strategies such as community-based workshops, mobile health units, and partnerships with local healthcare providers could significantly improve knowledge and access to care. Furthermore, integrating kidney health education into existing primary care programs and school curricula may provide sustainable solutions to bridge knowledge gaps (Kirkpatrick et al., 2023).

Future research should focus on longitudinal studies to assess the impact of educational interventions on awareness and behavior changes over time. Additionally, exploring the role of digital health platforms in disseminating information about kidney health could offer innovative solutions for addressing gaps in underserved areas. By addressing these recommendations, healthcare systems can work towards reducing the burden of kidney failure and improving outcomes for at-risk populations.

CONCLUSION

The study revealed significant gaps in public awareness and knowledge regarding kidney failure, particularly in rural and less-educated populations, despite moderate overall awareness. Education level, urban residence, and younger age were key predictors of higher awareness, highlighting disparities in health literacy and access to information. These findings underscore the critical need for targeted educational interventions and public health campaigns to bridge knowledge gaps, promote early detection, and encourage timely management of kidney failure. Improving awareness of symptoms, risk factors, and treatment options can empower individuals to make informed health decisions, potentially reducing the burden of kidney disease and enhancing overall healthcare outcomes.

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