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ORIGINAL RESEARCH INTENSIVE CARE

Impact of evidence-based nursing interventions on the health status of hemodialysis patients: a quasi-experimental study

Hadeel Radhi Khairallah, MSc [1], Ibrahim A. Al-Ashour, Ph.D [2]

Authors affiliations:

1. Hadeel Radhi Khairallah, Department of Adult Nursing, Faculty of Nursing, University of Kufa, Kufa, Iraq; Email: hadeelr.alhamidawi@student.uokufa.edu.iq
2. Ibrahim A. Al-ashour, Department of Adult Nursing, Faculty of Nursing, University of Kufa, Kufa, Iraq; Email: brahima.alashour@uokufa.edu.iq

Correspondence: Hadeel Radhi Khairallah, **Email:** hadeelr.alhamidawi@student.uokufa.edu.iq; **Phone:** +9647717959482

ABSTRACT

Background: Chronic kidney disease is a worldwide public-health problem, as it can progress to end-stage renal disease, and the patient is treated with hemodialysis. The level of self-care practices and quality of life among patients on maintenance hemodialysis is a successful way to decrease the incidence of complications.

Objective: Hemodialysis is a vital therapy for patients with end-stage renal disease (ESRD), yet it is often associated with physical and psychological complications. Evidence-based nursing care can play a crucial role in minimizing these issues. This study aimed to assess the impact of an educational program based on evidence-based practices on nurses' knowledge and the health status of patients undergoing hemodialysis.

Methods: A quasi-experimental study was conducted using purposive sampling. The sample included 60 nurses (30 in intervention and 30 in control) and 104 patients (52 per group) from two hemodialysis centers in Al-Diwaniyah, Iraq, during 2024–2025. Nurses in the intervention group received structured training covering fluid and nutrition management, physical activity, psychosocial care, and vascular access. Nurses' knowledge was evaluated through a validated questionnaire, and patients' health status was assessed using the SF-36 instrument. Pre- and post-tests were analyzed using SPSS version 20. Findings: Post-intervention results showed a significant improvement in nurses' knowledge in all domains ($P < 0.0001$), especially in fluid and vascular access care. Patients under their care exhibited marked improvements in physical functioning, emotional well-being, and general health ($P < 0.0001$).

Conclusion: Evidence-based nursing education significantly enhances nurses' knowledge and improves patient health outcomes. Integrating such programs into routine nephrology nursing is recommended.

Abbreviations: CKD: Chronic kidney disease, ESRD: end-stage renal disease,

Keywords: Evidence-based nursing, hemodialysis, nursing education, health status.

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1. INTRODUCTION

Chronic kidney disease (CKD) represents a growing global health concern, imposing substantial clinical, psychological, and financial burdens on the healthcare system.[1] As CKD progresses to end-stage renal disease (ESRD), many patients become dependent on hemodialysis as a life-sustaining treatment.[2] However, this therapy is frequently associated with significant disruptions in patients' physical and mental well-being.

Patients undergoing dialysis often report fatigue, reduced physical capacity, limited self-care ability, and diminished social participation. Psychologically, they experience emotional distress and anxiety due to the chronic nature of their condition. A study using the SF-12 instrument found average scores of 40.69 for physical health and 50.20 for mental health—both below normative values—indicating functional impairment.[3] These findings highlight the urgent need for holistic, patient-centered interventions that address physical, psychological, and social dimensions of health.[4,5]

The global incidence of ESRD is projected to increase significantly, with an estimated 5.5 million people expected to require dialysis by 2030—nearly double the current number.[6] This trend, driven by aging populations and rising rates of diabetes and hypertension, poses a serious challenge to healthcare systems and demands sustainable, high-quality care solutions.[7]

In this context, professional nursing care plays a vital role in dialysis management. Nurses are responsible for patient education, clinical monitoring, fluid and dietary guidance, and emotional support. Their continuous interactions with patients enable them to influence both physical and psychological outcomes.[8,9]

However, the effectiveness of nursing care depends heavily on nurses' knowledge and their application of evidence-based practices. Knowledge gaps and the lack of systematic training can compromise care quality and patient outcomes. Educational interventions have demonstrated strong potential in enhancing nurses' competence and confidence, thereby improving holistic care delivery.[10] Evidence further indicates that when nurses implement evidence-based guidelines, patients show improvements in physical functioning, emotional well-being, and self-management.[11]

2. METHODOLOGY

A quasi-experimental pre-posttest design was used to evaluate the impact of evidence-based nursing interventions on the health status of hemodialysis patients. The study was conducted in two governmental dialysis centers in Al-Diwaniyah City, Iraq. The intervention was applied at Al-Hayat Dialysis Center (study group), while Fatima Al-Zahraa Dialysis Center served as the control group. Ethical approval was obtained from the College of Medicine, University of Kufa.

A purposive, non-probability sampling technique was adopted. The sample included 60 nurses (30 per group) and 104 patients diagnosed with end-stage renal disease (52 per group). Patient inclusion criteria were: age ≥19 years, medically stable, conscious, communicative, and undergoing regular hemodialysis. Nurses were eligible if they had experience in dialysis care for at least one year. The study purpose was explained clearly to all participants, who were assured of their right to withdraw at any time without consequences. Written informed consent was obtained. Confidentiality and anonymity were strictly maintained, and no financial incentives were offered. Those who refused participation or did not complete the study were excluded.

Two tools were used: Nurses' Knowledge Assessment Questionnaire – a structured tool with 20 multiple-choice items covering nutrition, physical activity, psychological support, social/spiritual care, and vascular access. Each correct answer scored 2, incorrect 1. The tool showed strong reliability (Cronbach's alpha = 0.83). SF-36 Health Survey was used to assess patients' health status across eight domains (e.g., physical functioning, pain, vitality), with a reliability score of 0.87.

Demographic and clinical data were collected to support analysis.

The educational intervention, based on evidence-based practice, was delivered to nurses in the study group over three weeks in three parts. Content included:

Part I: Introduction to evidence-based practice and health dimensions.

Part II: Clinical skills for managing nutrition, physical activity, and psychological needs.

Part III: Vascular access care and clinical safety.

Teaching methods included lectures, posters, group discussions, and printed materials. Nurses in the control group received no intervention and continued standard care.

Baseline data were collected between January 13 and June 10, 2025, using both tools. After the educational program, post-test data were collected one month later from both nurses and the patients to assess changes in knowledge and health outcomes.

2.1. Statistical analysis

Data analysis was conducted using SPSS version 20. Descriptive statistics (frequencies, means, and standard deviations) summarized participants' characteristics. Inferential tests, including paired and independent t-tests and chi-square tests, were used to assess the differences within and between groups. A significance level of $P \leq 0.05$ was adopted

3. RESULTS

A total of 60 nurses participated (30 in each group). Most were females, 70% in the study group vs. 66.7% in the control group and college graduates. No

Table 1: Demographic characteristics of nurses

Demographic Data	Rating and Intervals	Study Group N = 30	Control Group N = 30	Chi-square (d.f)	P-value
Sex	Males	9 (30.0)	10 (33.3)	0.077 (1)	0.781 (NS)
	Females	21 (70.0)	20 (66.7)		
Level of Education	Secondary School Nursing	3 (10.0)	2 (6.7)	4.127 (3)	0.248 (NS)
	Nursing Institute Graduate	8 (26.7)	14 (46.7)		
	Nursing College Graduate	17 (56.7)	14 (46.7)		
	Postgraduate	2 (6.7)	0 (0.0)		
Experience in hemodialysis unit (Years)	≤ 5.0	26 (86.7)	28 (93.3)	0.741 (1)	0.389 (NS)
	> 5	4 (13.3)	2 (6.7)		
Did you participate in a hemodialysis training course?	Yes	8 (26.7)	12 (40.0)	1.200 (1)	0.273 (NS)
	No	22 (73.3)	18 (60.0)		

Note: %= percentage, F. = frequency, df = degree of freedom, P = probability value. NS = Non-significant at (P > 0.05).

significant differences were observed between groups regarding sex, education level, years of experience in dialysis units, or previous hemodialysis training (P > 0.05), indicating baseline equivalence.

Among 104 patients (52 per group), the majority were aged 46 years or older. Gender distribution was nearly equal, and most participants were married and lived in rural areas. Educational backgrounds varied, with about half being able to read and write. Employment and income status differed, but statistical analysis showed no significant differences between groups across demographic variables (P > 0.05), confirming homogeneity.

Table 3 showed a significant improvement in all knowledge domains for the study group after the intervention. The highest gains were seen in vascular access care, followed by physical activity and fluid/nutrition management. No significant change was noted in the control group between pre- and post-test scores, indicating the effect was attributable to the educational intervention.

Patients in the study group showed significant improvement across all SF-36 domains after the intervention (p < 0.01), including physical functioning, emotional well-being, vitality, and general health. For example, emotional well-being increased from a mean of 28.92 to 47.69, and perceived health change improved from 21.63 to 57.69. The control group, by contrast, exhibited no significant change in any domain (P > 0.05), with pre- and post-test scores remaining nearly identical

4. DISCUSSION

The majority of nurses in both study and control groups were female and nursing college graduates, as per previous studies, who highlighted the importance of formal nursing education in developing clinical competence.[12] Additionally, many nurses had less than five years of experience in hemodialysis units, consistent with[13.] Notably, most participants had not attended specialized training in hemodialysis, echoing [14], who attributed this gap to limited professional development opportunities and high workload demands.

Most patients in the study group were aged 46 years and older, which aligns with [15], who confirmed age as a major risk factor for chronic kidney disease (CKD). Gender distribution showed a slight female predominance, consistent with findings by Al-Khafajy ZAAT, et al (2020), who observed better treatment adherence among female patients. Marital status analysis revealed that most were married, highlighting the role of family support, as noted by Jassem ZA, Al-Ashour IA (2021).[17] A notable portion of participants resided in rural areas, indicating disparities in healthcare access and delayed diagnosis.[18] Furthermore, higher employment rates in the study group and a predominance of housewives in the control group suggest socioeconomic differences. Over half of the participants reported insufficient income, supporting [19], who discussed the financial burden of dialysis.

Following the evidence-based educational intervention, nurses in the study group exhibited significant knowledge improvement across all domains, while the

Table 2: Demographic Characteristics of Patients

Demographic Data	Rating and Intervals	Study Group N (%)	Control Group N (%)	Chi-square (df)	P-value
Age groups (Years)	<= 25	2 (3.9)	0 (0.0)	3.679 (4)	0.451 (NS)
	26 – 35	5 (9.6)	8 (15.4)		
	36 – 45	13 (25.0)	10 (19.2)		
	46 – 55	17 (32.7)	15 (28.8)		
	56 and More	15 (28.8)	19 (36.5)		
Sex	Males	25 (48.1)	26 (50.0)	0.038 (1)	0.844 (NS)
	Females	27 (51.9)	26 (50.0)		
Marital Status	Single	10 (19.2)	13 (25.0)	0.711 (3)	0.871 (NS)
	Married	28 (53.8)	25 (48.1)		
	Divorce	8 (15.4)	9 (17.3)		
	Widowed	6 (11.5)	5 (9.6)		
Level of Education	Doesn't Read or Write	9 (17.3)	8 (15.4)	1.668 (6)	0.948 (NS)
	Read and Write	26 (50.0)	28 (53.8)		
	Primary School Graduate	8 (15.4)	9 (17.3)		
	Intermediate School Graduate	4 (7.7)	3 (5.8)		
	Secondary School Graduate	1 (1.9)	2 (3.8)		
	Institutes Graduate	3 (5.8)	1 (1.9)		
	College	1 (1.9)	1 (1.9)		
	Postgraduate	0 (0.0)	0 (0.0)		
Residence	Urban	22 (42.3)	23 (44.2)	0.039 (1)	0.843 (NS)
	Rural	30 (57.7)	29 (55.8)		
Socio-economic status	Sufficient	0 (0.0)	9 (17.3)	0.346 (2)	0.841 (NS)
	Sufficient to some extent	8 (15.4)	25 (48.1)		
	Insufficient	28 (53.8)	18 (34.6)		
Occupation	Retired	16 (30.8)	2 (3.8)	2.66 (4)	0.616 (NS)
	Housewife	3 (5.8)	25 (48.1)		
	Employee	26 (50.0)	2 (3.8)		
	Jobless	2 (3.8)	22 (42.3)		
	Worker	17 (32.7)	1 (1.9)		

Data presented as n (%);, df = degree of freedom, P = probability value. NS - Non-significant at (P > 0.05).

control group showed no notable changes. Nutrition and fluid management scores improved (mean from 1.46 to 1.77), reflecting the critical role nurses play in dietary education. Physical activity knowledge also increased (1.39 to 1.76) [20,] who emphasized nurse-led physical activity programs. Psychological support knowledge rose (1.38 to 1.57), supporting [21], who advocated for structured emotional care. Knowledge of social and spiritual care improved (1.33 to 1.62), aligning with [22], who emphasized the spiritual dimension of patient support. Vascular access management scores showed the most significant gain (1.42 to 1.90), echoing[23], who

Table 3: Nurses' knowledge scores by domain (study vs. control groups, pre- and post-test)

Domain	Number of items	Study Group		Control Group	
		Pre-test	Post-test	Pre-test	Post-test
Nutrition & Fluid Management	5	1.46 ± 0.18	1.77 ± 0.16	1.31 ± 0.21	1.33 ± 0.23
Physical Activity	3	1.39 ± 0.28	1.76 ± 26	1.38 ± 0.26	1.36 ± 0.26
Psychological Support	4	1.38 ± 0.19	1.57 ± 0.21	1.42 ± 0.31	1.41 ± 0.28
Spiritual/Social Health	5	1.33 ± 0.23	1.62 ± 0.24	1.51 ± 0.22	1.45 ± 0.23
Vascular Access Care	3	1.42 ± 0.28	± 1.90 ± 0.16	± 1.39 ± 0.28	1.42 ± 0.29

Data presented as mean ± SD; Poor (mean of scores 0-0.66), Moderate (mean of scores 0.67-1.33), Good (mean of scores 1.34 and more)

Table 4: Health status of patients with ESRD undergoing hemodialysis at pre-test and post-test

Domain	Group	Pre-test	Post-test	P-value
Physical Functioning	Study	23.08 ± 15.0	36.73 ± 19.78	0.0001** 0.32
	Control	**23.94 ± 14.05**	**23.85 ± 14.13**	**2**
Role-Physical	Study	2.88 ± 12.77	15.38 ± 26.27	0.0001**
	Control	**2.88 ± 12.77**	**2.88 ± 12.77**	**N/A**
Role-emotional	Study	12.82 ± 25.70	30.13 ± 35.71	0.0001**
	Control	**12.82 ± 25.70**	**12.82 ± 25.70**	**N/A**
Energy/Fatigue	Study	16.92 ± 15.91	29.62 ± 17.40	0.0001**
	Control	**17.69 ± 15.42**	**17.69 ± 15.42**	**N/A**
Emotional Well-being	Study	28.92 ± 14.03	47.69 ± 16.27	0.0001**
	Control	**29.38 ± 13.97**	**29.62 ± 13.91**	**0.322**
Social Functioning	Study	24.28 ± 18.92	40.63 ± 18.34	0.0001**
	Control	**25.72 ± 19.56**	**25.48 ± 19.49**	**0.322**
Pain	Study	20.10 ± 19.17	33.61 ± 18.84	0.0001**
	Control	**21.25 ± 17.72**	**21.06 ± 17.40**	**0.322**
General Health	Study	12.60 ± 11.86	25.58 ± 14.27	0.0001**
	Control	**12.60 ± 11.94**	**12.31 ± 11.98**	**0.083**
Health Change	Study	21.63 ± 23.24	57.69 ± 20.73	0.0001**
	Control	**23.56 ± 23.44**	**23.08 ± 23.66**	**0.322**

*M.S. = Mean of Score; SD = Standard deviation; d.f = degree of freedom, P = probability value; *P < 0.05 is significant; **Highly significant at (P < 0.01), N/A: not available.*

underscored the need for specialized vascular access training. Overall, the total knowledge score increased from 1.40 to 1.71, confirming the effectiveness of the program.[24]

Patients in the study group experienced statistically significant improvements in all eight domains of the SF-36 instrument after the intervention. Physical functioning improved notably, consistent with Agure S, et al (2024),[10] who linked nurse-led protocols to better mobility. Improvements in role limitations due to physical and emotional problems were supported by Tao WW, et al. (2020), who emphasized the effectiveness of psychological and educational support.[25] The energy/fatigue domain showed improvement, supporting a study by Shokrpour N, et al. (2021), who highlighted the benefits of integrated care.[26]

Enhanced emotional well-being aligned with the findings by Zuo M, et al. (2022), while improvements in social functioning and pain control reflected the findings by Hamdi Elzeiny H, et al. (2023).[27, 28] Finally, general health and overall health status improved significantly. These results confirm that structured, evidence-based nursing education can significantly enhance the physical, emotional, and social well-being of patients undergoing hemodialysis.

5. CONCLUSION

This study showed that implementing an evidence-based nursing education program significantly enhances nurses' knowledge and improves health outcomes for hemodialysis patients. The program increased nurses' skills in various care areas, leading to better patient-reported outcomes measured by the SF-36 survey. Patients cared for by trained nurses experienced improved physical functioning, less psychological distress, and a higher quality of life.

These results emphasize the importance of ongoing, structured education to help nurses provide comprehensive, patient-centered care in hemodialysis settings. Integrating evidence-based training into nephrology nursing practice is vital to improve care quality and reduce the burden of ESRD-related complications. Future studies should examine the long-term benefits and adaptability of such programs across different healthcare environments

6. Data availability

The numerical data generated during this research is available with the authors.

7. Conflict of interest

All authors declare that there was no conflict of interest.

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9. Authors' contribution

All authors equally contribute to this study

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