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Original Article

Enhancing Healthy Lifestyle in Hemodialysis Patients Through HPM-Based Education

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Abstract

Background: Hemodialysis patients often struggle with maintaining a healthy lifestyle, which negatively affects their quality of life. This study aimed to assess the effectiveness of an educational program, based on Pender's Health Promotion Model, in enhancing healthy lifestyle behaviors among adult hemodialysis patients. **Methods:** A randomized controlled trial was performed on 60 adult hemodialysis patients in Diwaniyah Governorate, Iraq. Participants were randomly divided into an intervention group (n=30), which received a four-session educational program, and a control group (n=30), which received no intervention. The primary outcome was measured using the Health Promoting Lifestyle Profile-I (HPLP-I) scale. **Results:** The intervention group showed significant improvements across all HPLP-I subscales compared to the control group. Specifically, the intervention group had significant increases in perceived benefits, self-efficacy, and engagement in healthy lifestyle activities, whereas the control group experienced minimal changes. **Conclusion:** This study confirms that interventions based on Pender's Health Promotion Model are effective in improving health outcomes for hemodialysis patients. The integration of such educational programs into routine hemodialysis care is recommended, with further research needed on long-term effects.

Keywords: *Educational Program; Health Promotion Model; Healthy Lifestyle; Hemodialysis; Self-Efficacy*

Introduction

Chronic kidney failure places a significant burden on patients, with an estimated 850 million people worldwide suffering from the condition, and 2.6 million requiring dialysis or a kidney transplant (Bello *et al.*, 2022; Taghavi *et al.*, 2024). The WHO (2022) projects that the global number of hemodialysis patients will rise to 2.2 million by 2040. Although hemodialysis is a crucial renal replacement therapy that improves quality of life by removing toxins and fluids, it is also associated with continuous care requirements and potential risks (Himmelfarb *et al.*, 2020; WHO,2022; American Heart Association. 2023; WHO, 2023).

Maintaining a healthy lifestyle is essential for this patient population (Alhajim, 2017; Theofilou *et al.* 2020). Pender's Health Promotion Model (HPM) provides a valuable framework for understanding and promoting healthy behaviors (Barbecho *et al.*, 2020; Masoudi *et al.*, 2020). Factors such as perceived self-efficacy, perceived barriers, and social support are known to influence health behaviors (Barbecho *et al.*, 2020; NEMO, 2023). Previous studies have highlighted the importance of educational interventions and lifestyle modifications in improving outcomes for hemodialysis patients (NEMO, 2023; NKF, 2024), as they often face challenges in adopting healthy lifestyles (Alhajim, 2017; Bello *et al.*,

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2019; Genc *et al*., 2024; Taghavi *et al*., 2024). Studies by Masoudi *et al*. (2020) and Goma *et al*. (2021) have documented a high prevalence of unhealthy behaviors, which are linked to a decline in quality of life.

Despite the established use of HPM in various patient groups (Assiri *et al*., 2023; Mohsenipouya *et al*., 2018), there is a limited body of research on its effectiveness specifically for hemodialysis patients (Himmelfarb *et al*., 2020; NKF, 2024). This study addresses a critical gap in the literature by evaluating the effectiveness of a structured, HPM-based educational program for adult hemodialysis patients in the Diwaniyah Governorate, Iraq. The primary objective is to assess the program's impact on healthy lifestyle behaviors and to measure changes in perceived benefits, perceived barriers, self-efficacy, social support, and activity-related effects.

Methodology

This study employed a randomized controlled trial design to investigate the effectiveness of a health promotion program. The research was conducted at the Dialysis Center in Diwaniyah Governorate, Iraq, From September 18, 2024, to March 21, 2025. The study population consisted of adult hemodialysis patients at this center.

A sample of 60 participants was selected using a probability sampling method with simple randomization. The sample was divided into an intervention group (n=30) and a control group (n=30). The sample size was determined using the formula for comparing means between two independent groups, which provides a power of 80% with a 95% confidence interval and an assumed effect size (Althubaiti, 2022) All participants met the following inclusion criteria: adult patients undergoing hemodialysis at the study center. Exclusion criteria included patients younger than 25 years, individuals with diagnosed mental illness, those unable to read or write, participants who missed a session of the educational program, those who withdrew consent, or those with incomplete questionnaires.

The study protocol was approved by the appropriate Institutional Review Board at Al-Diwaniyah Health Directorate, Training and Human Development Center, Research Unit. Prior to data collection, each participant was provided with a detailed informed consent form explaining the study's purpose, procedures, potential risks, and their right to withdraw at any time. All participants signed this form, indicating their voluntary agreement to participate.

Data was collected using two main tools. The first was a demographic questionnaire to gather information on age, gender, education, and marital status. The second was the Health Promoting Lifestyle Profile-I (HPLP-I), a validated 72-item instrument that assesses health-promoting behaviors based on Pender's model. The research tools underwent rigorous validation by a panel of five community health nursing experts, who confirmed their comprehensiveness and clarity, requiring no modifications. A pilot study conducted on 10% of the sample also found the questions to be unambiguous and the instruments applicable, with no changes needed. To ensure the accuracy and integrity of the tools, they underwent comprehensive evaluation by experts and a pilot study, which confirmed their validity and reliability without requiring any modifications. This reflects the robustness of the methodology used.

The HPLP-I measures six key dimensions: perceived benefits, perceived barriers, self-efficacy, social support, and activity-related effects. Items are rated on a 3-point Likert scale. Validity of the HPLP-I was supported by the study of Chen and Hsieh (2021). Reliability was established using Pearson's correlation coefficient via a test-retest method on 10 participants, who were not included in the main sample. The reliability scores were robust for all subscales: perceived benefits (r=0.84), perceived barriers (r=0.82), self-efficacy (r=0.83), social support (r=0.81), and activity-related effects (r=0.84).

The intervention group received a four-session educational program addressing a healthy lifestyle, including diet, exercise, stress management, and components of the HPM. The program utilized training materials from the Diwaniyah Health Directorate and was delivered in the dialysis center hall. Each session lasted 35 minutes, conducted over a period of four months between the pre-test and post-test measurements. Baseline data (pre-test) were collected from both groups, and post-tests were

administered at one week (Post-test I) and two months (Post-test II) after the program's completion to assess the short-term and long-term effects.

All data were analyzed using SPSS version 26. Descriptive statistics (frequency, percentage, mean, and standard deviation) were used to summarize the data. Inferential statistics, specifically the paired t-test, were employed to compare the mean scores within each group before and after the intervention. A p-value of less than 0.05 was considered statistically significant.

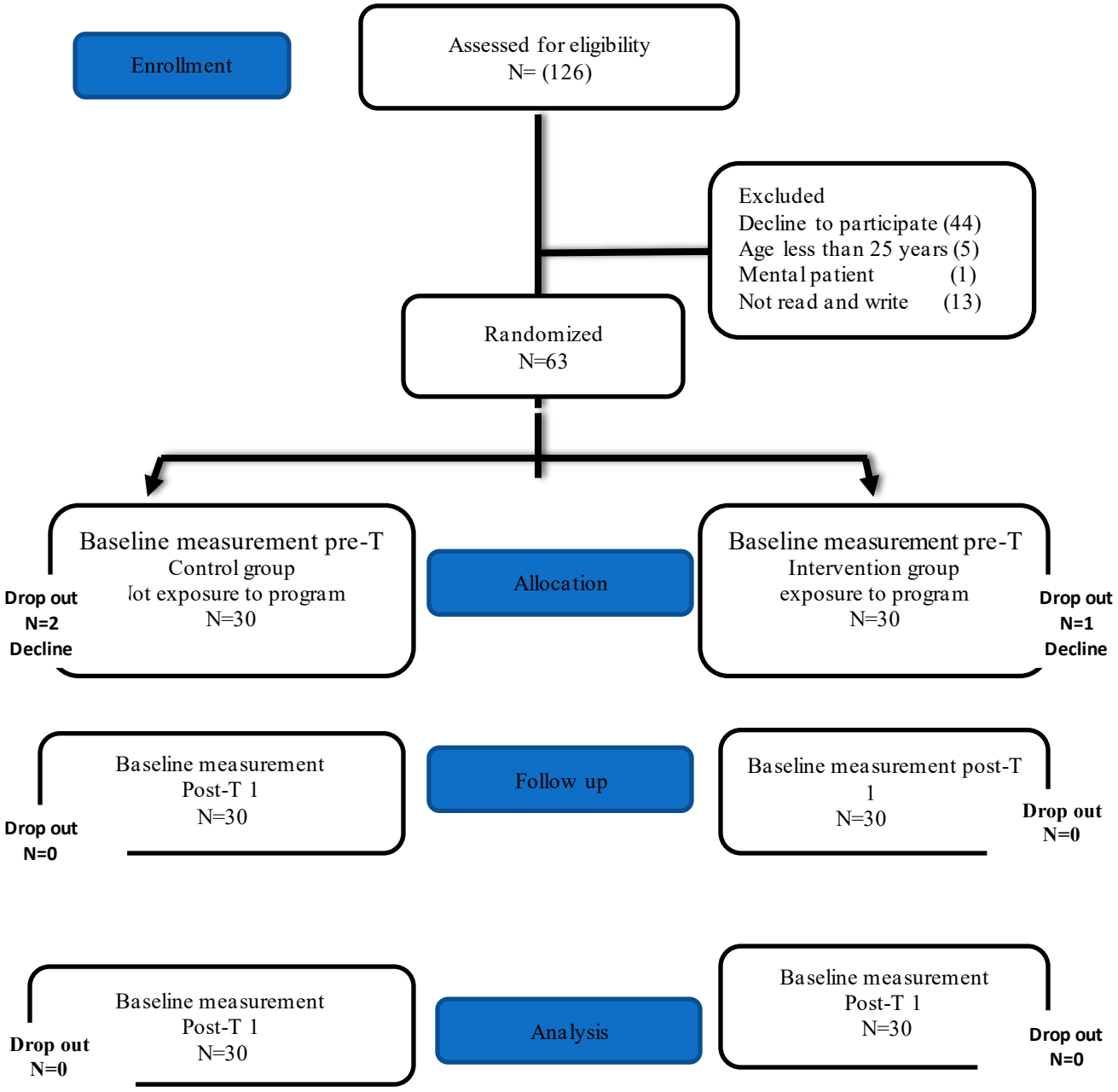

Figure 1: Study Protocol Algorithm

Ethical Consideration

This study received ethical approval from the Ethics Committee of Diwaniyah Health Directorate, Iraq with approval number 391, on 18th September 2024.

Results

Table 1: Demographic Characteristics of the Study Participants (n = 60)

Characteristics	Intervention Group (n=30)	Control Group (n=30)
Age (years)	**Frequency (f)**	**Percentage (%)**
25-34	2	6.7
35-44	2	6.7
45-54	4	13.3
55-65	7	23.3
Above 65	15	50.0
Total	**30**	**100.0**
Mean ± SD	**4.03 ± 1.25**	
Sex	**Frequency (f)**	**Percentage (%)**
Male	17	56.7
Female	13	43.3
Total	**30**	**100.0**
Marital Status	**Frequency (f)**	**Percentage (%)**
Married	22	73.3
Unmarried	2	6.7
Divorced	3	10.0
Widowed	3	10.0
Total	**30**	**100.0**
Educational Level	**Frequency (f)**	**Percentage (%)**
Primary	16	53.3
Intermediate (Secondary)	8	26.7
Preparatory (Secondary)	2	6.7
Institute	2	6.7
Bachelor's	2	6.7
Total	**30**	**100.0**
Socio-Economic Level	**Frequency (f)**	**Percentage (%)**
Low	16	53.3
Middle	12	40.0
High	2	6.7
Total	**30**	**100.0**
Mean ± SD	**1.53 ± 0.63**	
BMI	**Frequency (f)**	**Percentage (%)**
Underweight	1	3.3
Normal	2	6.7
Overweight	4	13.3
Obese	12	40.0
Severe Obesity	11	36.7
Total	**30**	**100.0**
Mean ± SD	**1.06 ± 0.25**	

*F: frequency; m: mean; SD: Standard deviation; %: Percentage; *BMI: Body mass Index; BMI Including: Underweight (50kg 167-52kg 170cm) Normal (55 kg154cm-73kg 171cm) Overweight (60kg 154cm -73kg 170cm) Obese (73kg 156kg-89kg 172cm) Severe Obesity (90kg 155cm-105kg170 cm).*

Table 1 presents a comprehensive comparison of the demographic characteristics between the two study groups (intervention and control), which consist of 60 participants. The results indicate that the two groups are highly similar across all studied characteristics. In terms of age, the vast majority of participants in both groups are over 65 years old, with a similar average age. Regarding sex, there is a balanced ratio in both groups, with a slight male predominance in the intervention group and a female predominance in the control group. Furthermore, the table shows that most participants are married, have a primary education, and belong to the low-income category. Additionally, the majority of participants in both groups are classified as "obese" and "severely obese" according to their Body Mass Index (BMI), which confirms the similarity between the two groups before the start of the study.

Table 2: Mean Comparisons Between Time Points for Each Group

Subscale	Group	Pre-test (Mean ± SD)	Post I (Mean ± SD)	Post II (Mean ± SD)
Perceived benefits	Intervention	1.14 ± 0.09	2.22 ± 0.22	2.33 ± 0.10
	Control	1.18 ± 0.13	1.23 ± 0.28	1.25 ± 0.35
Perceived barriers	Intervention	1.12 ± 0.12	2.36 ± 0.23	2.26 ± 0.12
	Control	1.12 ± 0.12	1.17 ± 0.36	1.18 ± 0.34
Self-efficacy	Intervention	1.12 ± 0.12	2.34 ± 0.31	2.26 ± 0.29
	Control	1.09 ± 0.10	1.15 ± 0.36	1.15 ± 0.36
Social support	Intervention	1.15 ± 0.07	2.20 ± 0.22	2.13 ± 0.07
	Control	1.14 ± 0.10	1.19 ± 0.35	1.20 ± 0.35
Activity-related affect	Intervention	1.14 ± 0.17	2.11 ± 0.36	2.25 ± 0.17
	Control	1.14 ± 0.17	1.20 ± 0.37	1.22 ± 0.37
Participate in healthy lifestyle	Intervention	1.10 ± 0.40	2.26 ± 0.86	2.36 ± 0.85
	Control	1.13 ± 0.50	1.20 ± 0.61	1.10 ± 0.40
Comparison Results		**(Pre-test vs. Post I)**	**(Pre-test vs. Post II)**	**(Post I vs. Post II)**
P-value (Intervention)		<0.001*	<0.001*	0.42
P-value (Control)		0.65	0.58	0.81

*SD: Standard Deviation, Mean: the arithmetic average of the data values in each group, P-value: a measure of statistical significance; a result is statistically significant when its P-value is less than 0.05, and not statistically significant when the P-value is greater than 0.05. An asterisk * indicates that a result is highly significant, typically when P < 0.001.*

Table 2 clearly demonstrates the effectiveness of the intervention program. The intervention group showed significant and sustained improvements across all healthy lifestyle subscales, with mean scores consistently increasing from the pre-test to both post-tests. The statistically significant P-values ($P < 0.001$) for the comparisons between the pre-test and both post-tests confirm that these gains were not due to chance. Furthermore, the non-significant *P*-value for the comparison between Post I and Post II indicate the improvements were durable, showing no significant decline over time. In stark contrast, the control group showed no such changes, as all of their P-values were non-significant. This highlights the program's specific and positive impact on the participants' healthy behaviors.

Discussion

This study evaluated the efficacy of an educational program for hemodialysis patients, with the central hypothesis being that such an intervention, based on Pender's Health Promotion Model (HPM), would significantly improve health behaviors. The results confirm this hypothesis, as the test groups demonstrated significant improvements in health behavior indicators. These findings are consistent with existing literature that highlights the effectiveness of HPM-based interventions in promoting healthy habits among patients with chronic conditions. Specifically, our results align with studies by Shahabi *et al*. (2023) and Assiri *et al*. (2023), which found that interventions based on this model positively impact physical activity and self-efficacy, respectively (Bahrami *et al*., 2025).

The study finds that the educational program improved participants' health behaviors by enhancing self-efficacy and perceived benefits, and by addressing barriers and leveraging social support, is well-supported by previous research. The emphasis on self-efficacy, in particular, is consistent with Assiri *et al*. (2023), who identified it as a strong predictor of health-promoting behavior. Similarly, the positive effect of behavioral intervention is supported by Mohsenipouya *et al*. (2018), who found that such programs can lead to more comprehensive healthy patterns. Furthermore, the inverse relationship between socio-demographic factors and healthy lifestyle behaviors observed in our study is reinforced by research from Khaw *et al*. (2022). This highlights the critical need for targeted health education programs, especially for vulnerable populations with lower educational and economic levels, who were found to have a high prevalence of chronic diseases like cardiovascular diseases and diabetes (Willis & Friedel, 2025).

Limitation

A major finding from this study was the unexpectedly high rate of overweight and obesity in both groups, highlighting the need for comprehensive lifestyle interventions. Despite some limitations, such as unmeasured confounding variables, the results can be used to develop similar educational programs and inform public health policies.

Conclusion

This study effectively demonstrated that an educational program based on Pender's Health Promotion Model (HPM) significantly improved health behaviours in haemodialysis patients.

The research showed that the HPM provides a strong theoretical framework for interventions that go beyond traditional disease management, promoting a holistic approach to patient health. The findings validate the program's success and offer a valuable model for healthcare providers to enhance treatment plans, manage chronic conditions, and improve long-term health outcomes.

Recommendations

Educational health programs should be integrated into patient care, with an emphasis on personalized content and delivery tailored to individual needs. Training healthcare providers to effectively deliver these programs will empower patients, fostering active participation and positive health outcomes.

Conflict of Interest

The authors declare that they have no conflicts of interest.

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