Effect of Comprehensive Nursing Intervention on self-care practices of patients undergoing hemodialysis

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Abstract

Background: Chronic kidney disease is a prolonged medical condition that impacts the self-care routines of patients receiving hemodialysis. Self-care practices significantly influence the treatment outcomes of patients, and it is essential for nurses to provide appropriate guidance to address the challenges that may arise during hemodialysis sessions.

Objectives: This study aimed to invent comprehensive nursing intervention and evaluate its efficacy on self-care practices.

Design: This study was experimental with a time series design.

Participants: Total enumerative sampling method was used to recruit 106 patients newly recruited for hemodialysis. The participants were randomly assigned to one of two groups: the intervention group given comprehensive nursing intervention, while the control group received routine care.

Measurements: This study was experimental with a time series design. The measurement instrument included structured self-care practice checklist which involves questions related to fistula care, physical activity, dietary modification and fluid restriction. The analysis involves use of chi square and independent t test.

Results: The participants mean age was 47.5 years. Application of comprehensive nursing intervention significantly ($p < 0.05$) improved self-care practice of patients in experimental group as compared to control group.

Conclusion: Comprehensive Nursing Intervention can improve self-care practice of patients undergoing hemodialysis.

KEYWORDS

Comprehensive Nursing Intervention, hemodialysis, self-care practice, fistula care, physical activity, dietary modification, fluid restriction

INTRODUCTION

Chronic Kidney Disease (CKD) is characterized by a gradual decline in kidney function, which may eventually necessitate renal replacement therapies, including dialysis or transplantation. (Vaidya SR, Aeddula NR. 2024). Rapid urbanization, which leads to increased obesity and reduced physical activity, is contributing to shifts in the incidence of risk factors associated with chronic kidney disease (CKD) on a global scale. (Neuen LB 2017). Hemodialysis is the predominant treatment option, with renal transplantation following closely behind, while peritoneal dialysis ranks significantly lower. Similar to other developing nations, India faces distinct circumstances and challenges that affect the management of chronic kidney disease. An overview of preventive strategies for chronic kidney disease (CKD) presented by Li PKT et al. (2020) highlights the importance of prevention at three distinct levels. Primary prevention targets the identification of individuals at high risk, the management of obesity, the enhancement of glycaemic control, and the regulation of blood pressure. It also advocates for the reduction of salt intake and the promotion of healthy dietary and lifestyle choices. Secondary prevention focuses on the early detection of CKD, the management of blood pressure, and the reduction of protein consumption. Tertiary prevention encompasses fluid management, nutritional therapy, and the use of pharmacological treatments. The availability of facilities and expertise varies considerably across different regions of the country. (Varughese S, Abraham G. 2018). An integrative review concerning patients undergoing hemodialysis has highlighted the importance of self-care management factors, emphasizing that the patients themselves play a crucial role in formulating effective strategies aimed at improving both physical and psychological outcomes.

A concept paper highlighted the importance of self-care practices among hemodialysis patients, focusing on the critical aspects of vascular access maintenance, fluid management, dietary compliance, and adherence to treatment during the hemodialysis process. (Pargaien M, Prakash DK. 2025).

A pilot study indicated that a dietary intake monitoring application assisted patients in adhering to their prescribed diets and enabled them to review their previous meals through a reflective mechanism. (Connelly K et.al 2012).

Patients undergoing hemodialysis often lack sufficient self-care, which negatively impacts their self-care efficacy and, consequently, their overall quality of life. (Rayyani M, et.al. 2014). Therefore, this study aimed to develop a comprehensive nursing intervention for

patients receiving hemodialysis and evaluate its effectiveness in improving self-care practices.

METHODS

A quantitative methodology employing a Randomized Controlled Trial with a Time Series design was utilized to evaluate the efficacy of a comprehensive nursing intervention and the participants were chosen through the total enumerative sampling technique.

PARTICIPANTS AND SETTING

The study recruited adult patients receiving hemodialysis from dialysis centre Uttarakhand, India. New patients planned for hemodialysis during fistula formation were enrolled in the study. Exclusion criteria included: patients having serious cognitive impairment, unstable medical conditions and patients not able to perform activities of daily living.

Based on the literature previously published (Mansouri et al., 2020), a calculation for sample size was performed. The mean ± standard deviation was extracted from the before mentioned article to attain an 80% power (B) at a significance level of 5% (α). The formula utilized for the sample size calculation is expressed as follows: $n = 2SD^2 \times (Z\alpha/2 + Z\beta)^2 / d^2$. The determined sample size amounted to 90. Taking into account a 10% dropout rate, the researcher subsequently enrolled 106 patients across both the experimental and control groups.

INTERVENTION

Comprehensive Nursing Intervention

The intervention for this study was formulated by the researcher following an evaluation of patients' needs through the implementation of focused group discussions. The component of Comprehensive nursing intervention encompassed educating patients about the anatomy and function of the kidneys, as well as the operation and significance of hemodialysis. Instruction was provided on the hygiene practices related to the fistula, care for the fistula arm, and the essential Do’s and Don’ts associated with it. Additionally, a demonstration was conducted on how to assess the functionality of the fistula. The importance of dietary management was emphasized, including guidance on food items that should be consumed or avoided by patients undergoing hemodialysis, along with a demonstration on potassium leaching. Strategies for managing thirst were also taught, alongside the significance of exercise and

sleep hygiene. Furthermore, demonstrations were provided on appropriate exercises, including asanas and breathing techniques, tailored for patients receiving hemodialysis.

OUTCOME MEASURE INSTRUMENT

Self-Care Practice Checklist: To assess the self-care practices of patients undergoing haemodialysis, a self-care practice checklist was created, comprising twenty questions based on a six-point Likert scale. This checklist focused on two primary areas: fistula care and physical activity. The Likert scale included the following response options: Six to seven days a week (5), Four to five days a week (4), Two days a week (3), Three days a week (2), Once a week (1), and Never (0). The tool contained a total of twenty questions, with fourteen items framed positively and six items framed negatively, necessitating reverse scoring for the latter. Additionally, a dichotomous checklist with twenty-eight questions was utilized to evaluate dietary modifications and fluid restrictions. This dichotomous response format offered options of yes (1) and no (0), with nine items framed positively and nineteen items requiring reverse scoring. A higher score indicated better self-care practices, with the scoring range spanning from a minimum of 0 to a maximum of 148.

STUDY PROCEDURE

Participant recruitment

New patients enrolled for hemodialysis having new fistula formation within three weeks of fistula formation and meeting inclusion criteria were enrolled in the study. Total 116 patients were eligible for the study eight patient did not meet inclusion criteria and two patients denied to participate in study.

Random assignment and homogeneity analysis

This study was a Randomised Controlled Trial with time series design. The participants were assigned to control and experimental groups at random through the Sequentially Numbered Opaque Sealed (SNOOSE) method. To evaluate the homogeneity of demographic and clinical characteristics between the intervention and control groups, an independent t-test and a chi-square test were employed (refer to Table 1). This approach was taken to confirm that any outcomes observed could be directly linked to the implementation of the comprehensive nursing intervention, rather than to any pre-existing disparities between the two groups.

Participant instruction

Once baseline data for the study were obtained, the intervention group received six session of comprehensive nursing intervention. Participants were encouraged to practice fistula care, use of reuseable ice cubes, potassium leaching of food items and practice of coordination/ strengthening exercise and yoga daily. Follow up of all participants were made for a period of six months.

Data collection

A researcher gathered in-person data from 106 participants at a hemodialysis centre within an Indian hospital while the patients were waiting for their hemodialysis treatment. The investigator provided a questionnaire focused on self-care practices, which the participants could complete on their own or have read to them by the researcher.

Table 1 Baseline participant profiles between the intervention and control group

Sociodemographic Characteristics	**Experimental group (52) n (%)**	**Control group (54) n (%)**	**χ2/ t value**	**p value**
Age **Mean±SD**	47.5 ± 12.86	48.5 ± 14.60	0.67	0.50
Gender Male Female	 28 (54) 24 (46)	 32(60) 22 (40)	 0.31	 0.57
Martial status Married Unmarried Divorced/ Widow/Widower	 41 (79) 07 (13) 04 (8)	 44(81) 11(10) 10(09)	 1.28	 0.52
Education qualification No formal Education Primary Education Middle School High School Intermediate Graduate Post Graduate	 12 (23) 06 (11) 09 (17) 11 (21) 08 (15) 02 (04) 04 (08)	 07 (13) 07 (13) 07 (13) 12 (22) 15 (28) 02 (04) 04 (07)	 3.78	 0.70
Residency Rural Urban Semi urban	 35 (67) 15 (29) 02 (04)	 38 (70) 15 (28) 01 (02)	 0.41	 0.81

Family Income per month in Rupees. Less than 10,000 10,001- 20,000 20,001 – 30,000 30,001 – 40,000 40,001-50,000 More than 50,000	 36 (69) 03 (06) 09 (17) 0 02 (04) 02 (04)	 33 (61) 10 (19) 04 (07) 03 (06) 02 (03) 02 (04)	8.78	0.10
Employment/ job status Private job Government job Self employed Homemaker Unemployed Retired	 05 (10) 00 (00) 06 (12) 15 (29) 24 (46) 02 (04)	 08 (15) 01 (02) 06 (11) 14 (26) 23 (43) 02 (04)	1.70	0.88
Receiving health benefits from Ayushman Card Health insurance Personal money	 50 (96.15) 01 (1.92) 01 (1.92)	 49 (90.74) 04 (7.41) 01 (1.85)	3.77	0.28
Years since diagnosed with CKD **Mean±SD**	0.73 ± 1.32	0.70 ±1.07	0.68	0.49
Hemodialysis Session per week 1 times 2 times 3 times	 04 (7.69) 35 (67.31) 13(25.00)	 04 (7.41) 36(66.67) 14 (25.92)	3.86	0.42
Diabetes mellitus Yes No	 18(34.62) 34(65.38)	 17(31.48) 37(68.52)	0.11	0.73
Hypertension Yes No	 30 (57.69) 22 (42.31)	 36 (66.67) 18 (33.33)	0.90	0.34
BMI Underweight Normal Weight Overweight	 15 (28.85) 34 (65.38) 03 (5.77)	 18 (33.33) 30 (55.56) 06 (11.11)	0.50	0.61

Data analysis

Demographic and clinical characteristics were evaluated through descriptive statistics. The homogeneity of the groups at the baseline of the study was examined utilizing the chi-square test, Fisher's exact test, and two-tailed independent t-tests. The impact of the intervention was subsequently assessed at 12 and 24 weeks.

Table 2 Comparison of Self-care practice scores between experimental and control group at

Domains of self-care practice	**Experimental group (52) Mean± SD**	**Control group (54) Mean± SD**	**t- test**	**p-value**
Fistula Care	24.15 ± 4.4	22.48 ± 3.4	2.23	**0.025**
Physical Activity	18.71 ± 4.5	17.85 ± 4.8	1.35	0.175
Dietary Modification	14.73 ± 2.2	13.57 ± 2.7	1.99	**0.046**
Fluid restriction	3.73 ± 1.1	3.75 ± 1.3	0.08	0.930
Total Self-care Practice	61.32 ± 08.13	57.60 ± 07.47	2.41	0.017

baseline

***Independent t test, p < 0.05**

Table no 3 Changes in self-care practice of patients undergoing haemodialysis from Baseline to 12 weeks and Baseline to 24 weeks

Variable		Experimental group (52) Mean ± SD Median (min, max)	Control group (54) Mean ±S D Median (min, max)	p-value (between group)
Fistula Care	Baseline to 12 weeks	9.96 ± 4.07 0 (-3 ,10)	-0.43 ± 3.60 0 (-8, 15)	**< 0.001**
	Baseline to 24 weeks	9.11 ± 5.24 10 (-3, 20)	-1.34 ± 9.11 -0.5 (-16, 20)	**< 0.001**
Activity	Baseline to 12 weeks	29.64 ± 9.46 31 (-5, 42)	-1.18 ± 6.99 -2 (-11, 44)	**< 0.001**
	Baseline to 24 weeks	32.07 ± 9.49 34 (-6, 46)	2.21 ± 6.67 -2.5 (-12, 38)	**< 0.001**
Dietary Modification	Baseline to 12 weeks	5.19 ± 3.31 5 (-2 ,16)	-2.69 ± 3.30 -3 (-10, 8)	**< 0.001**
	Baseline to 24 weeks	5.41 ± 2.69 5 (-1, 10)	-3.46 ±3.93 -3.5(-14,11)	**< 0.001**
Fluid restriction	Baseline to 12 weeks	2.96 ± 1.21 3 (0 ,5)	-0.20 ± 1.26 0(-3 , 5)	**< 0.001**
	Baseline to 24 weeks	3.09 ± 1.23 3(-1, 5)	-0.48 ± 1.30 0 (- 4, 3)	**< 0.001**

Ethical considerations

To maintain confidentiality, participant records, which were designated by numerical identifiers, were securely stored apart from the measurement data in a locked file drawer.

Electronic files were safeguarded on an encrypted computer. Access to the research information was restricted solely to the study researcher.

RESULTS

Baseline personal profiles

As shown in Table 1, 106 patients receiving haemodialysis were enroled in the study. Participants' mean age was 47.5 (SD = 12.86). They had received haemodialysis for a mean of 0.73 (SD = 1.32) months. Most participants were married, lived with family members, reported no formal education, residing in rural area, having monthly family income of less than 10,000 rupees per month and were unemployed. No significant differences in demographic and clinical characteristics were found between intervention and control groups at baseline (all $p > 0.05$)

Changes in self- care practice

The mean baseline fistula care score was 24.15 (SD = 04.40), physical activity score was 18.71 (SD = 4.50), dietary modification score was 14.73 (SD = 2.20), fluid restriction score was 3.73 (SD =1.10) indicating moderate self-care practice. For all the variables (Fistula Care, Activity, Dietary Modification, and Fluid Restriction), the experimental group showed significant improvements compared to the control group at both 12 and 24 weeks. The p-values indicate that these differences are statistically significant (**$p < 0.001$**) for all measures.

DISCUSSION

Study's findings align with existing literature demonstrating the positive impact of educational interventions on self-care practices among hemodialysis patients. Several studies have reported significant improvements in patients' adherence to treatment regimens, including fluid and dietary restrictions, following structured educational programs.

For instance, a study published in the *International Journal of Health Sciences* evaluated the effect of an educational intervention on hemodialysis patients' knowledge and adherence levels. The results indicated that the intervention group experienced a significant increase in knowledge regarding disease management, fluid adherence, and dietary adherence compared to the control group. Notably, adherence improved across all domains, with statistically significant enhancements in fluid and dietary restrictions (Dsouza B et al. 2023)

Similarly, research featured in the *Journal of Education and Health Promotion* assessed the impact of education based on the PRECEDE model on self-care behaviours in hemodialysis patients. The findings revealed that the educational intervention effectively elevated the level of self-care behaviours among participants, emphasizing the importance of tailored educational programs in promoting better health practices. (Mohammed AW .et.al. 2023)

Furthermore, a study in the *Journal of Renal Care* examined the effects of a hemodialysis patient education program on adherence to fluid and dietary restrictions. The study concluded that the training provided to hemodialysis patients positively influenced their compliance with diet and fluid restrictions, leading to improved adherence (Başer E, Mollaoğlu M. 2019)

These studies, among others, corroborate findings that structured educational interventions can significantly enhance self-care practices in hemodialysis patients, particularly concerning fluid restriction and dietary modifications. Implementing such programs can empower patients to manage their condition more effectively, potentially leading to improved health outcomes.

Limitations

The results of the study were influenced by the participants' adherence to the comprehensive care intervention, which encompassed multiple domains. This complexity contributed to lower adherence rates and inconsistent application of the intervention. Additionally, the participants were aware of their group assignments, which may have introduced bias into the self-reported outcomes.

Implications for clinical practice and future research

Enhancing the value of future investigations involves exploring the adherence to self-care practice. Particular emphasis should be placed on qualitative responses to contribute to the development and refinement of the intervention. Face-to-face interviews instead of written self-reports can further enrich the qualitative data. This expanded approach aims to foster a comprehensive understanding of the intervention's potential benefits.

CONCLUSIONS

In summary, this study provides compelling evidence to support the efficacy of comprehensive nursing intervention on self- care practice among patients receiving haemodialysis. User-friendly and cost-effective supplementary modalities

AUTHOR CONTRIBUTIONS

Minu Pargaien: Principal project leader who conceived the study, invented comprehensive nursing intervention, recruited the participants and drafted and revised the manuscript.

Dr. Kamli Prakash: Helped to select the study, helped in formulating the intervention and guided during the study period.

Dr. Sanchita Pugazhendi: Guided during the study period. and approved the final manuscript.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created in this study.

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