RESEARCH ARTICLE

EFFECTIVENESS OF A COMPREHENSIVE NURSING PACKAGE ON SELF-EFFICACY, TREATMENT ADHERENCE AND CLINICAL OUTCOMES AMONG HEMODIALYSIS PATIENTS AT BILLROTH HOSPITAL, CHENNAI: A PILOT STUDY

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Short title: Nursing Package for Hemodialysis Patients

ABSTRACT

Background: Hemodialysis patients face multiple challenges that require comprehensive nursing interventions to enhance self-efficacy, treatment adherence and clinical outcomes. A Comprehensive Nursing Package (CNP) was developed to address these needs through structured educational and motivational strategies.

Methods: A pilot quasi-experimental study was conducted at Billroth Hospital, Chennai, among 60 hemodialysis patients (control group n=30; experimental group n=30) selected by consecutive sampling. The experimental group received the CNP, comprising a health education pamphlet, video demonstrations on vascular access care and intradialytic exercises, motivational counselling and telephone reminders over four weeks. Outcomes were self-efficacy (Self-Efficacy for Managing Chronic Disease 6-item scale, SEMCD-6), treatment adherence (End-Stage Renal Disease Adherence Questionnaire, ESRD-AQ) and clinical parameters (serum urea, creatinine and hemoglobin), measured at baseline (A1), immediately post-intervention (A2) and four weeks post-intervention (A3). Repeated measures ANOVA and independent t-tests were used for analysis.

Results: Both groups showed significant improvements in self-efficacy from baseline to follow-up (control: 10.70 ± 2.56 to 42.73 ± 3.54, $F=834.33$, $p<0.001$; experimental: 11.30 ± 3.67 to 50.87 ± 1.83, $F=803.63$, $p<0.001$), but self-efficacy was significantly higher in the experimental group at A2 ($t=-14.502$, $p<0.001$) and A3 ($t=-18.341$, $p<0.001$). Treatment adherence improved significantly in the experimental group (A1: 591.66 ± 98.98; A3: 1016.66 ± 83.13; $F=204.466$, $p<0.001$), with significant between-group differences at A2 ($t=-5.072$, $p<0.001$) and A3 ($t=-5.783$, $p<0.001$). Serum creatinine was significantly lower in the experimental group than in the control group at A2 ($p=0.008$) and A3 ($p=0.002$). No significant changes were observed in serum urea or hemoglobin levels.

Conclusion: The Comprehensive Nursing Package enhanced self-efficacy and treatment adherence among hemodialysis patients, with modest effects on clinical outcomes. This pilot study provides preliminary evidence supporting structured nursing interventions in hemodialysis settings.

Keywords: Hemodialysis, Nursing intervention, Self-efficacy, Treatment adherence, Clinical outcomes, Chronic kidney disease.

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INTRODUCTION

Chronic kidney disease (CKD) is a significant global health burden, and hemodialysis is the primary renal replacement therapy for patients with end-stage renal disease (ESRD). Hemodialysis patients face numerous physical, psychological and social challenges that profoundly affect their quality of life and treatment outcomes. The complexity of hemodialysis treatment demands strict adherence to multiple therapeutic regimens, including dialysis sessions, dietary restrictions, fluid limitations and medication protocols, and non-adherence can lead to serious complications, increased hospitalisation and elevated mortality.

Self-efficacy, defined as an individual's belief in his or her capacity to execute the behaviours necessary to produce specific performance attainments, plays a crucial role in chronic disease management. In hemodialysis patients, higher self-efficacy has been associated with better treatment adherence, improved clinical outcomes and enhanced quality of life.[1,2] Recent systematic reviews have emphasised the importance of health education interventions in improving self-efficacy among hemodialysis patients, showing that structured educational programmes can significantly enhance patients' confidence in managing their condition.[1]

Treatment adherence remains a persistent challenge in hemodialysis care, with non-adherence rates ranging from 30% to 60% across various aspects of the treatment regimen. Poor adherence to dialysis schedules, dietary restrictions and fluid limitations contributes to increased morbidity and mortality. Evidence suggests that comprehensive nursing interventions incorporating educational, behavioural and psychological components can effectively improve adherence behaviours,[3-5] and the application of theoretical frameworks such as Orem's Self-Care Model has had positive effects on treatment adherence and self-care behaviours in hemodialysis populations.[4]

Clinical outcomes in hemodialysis patients are typically monitored through biochemical parameters, including serum urea, creatinine and hemoglobin levels, which reflect the adequacy of dialysis and overall disease management. Recent studies have shown that nursing interventions can positively influence these parameters, particularly when combined with patient education and self-management strategies.[6] Technology-based interventions, such as mobile applications and tele-nursing, have emerged as a promising approach to enhance patient engagement and improve clinical outcomes.[6,7]

The role of nursing in hemodialysis care extends beyond technical procedures to comprehensive patient education, psychological support and continuous monitoring. Nurse-led interventions have improved patient outcomes including self-efficacy, treatment adherence, quality of life and clinical parameters,[8-10] and recent evidence supports structured nursing programmes that integrate health education, motivational counselling and follow-up support.[9,11]

Despite this growing evidence, context-specific intervention packages that address the needs of Indian hemodialysis patients are still lacking. Cultural factors, healthcare system characteristics and resource availability influence the feasibility and effectiveness of nursing interventions. The Comprehensive Nursing Package (CNP) was therefore developed as a culturally appropriate intervention combining health education, video demonstrations, motivational counselling and telephone reminders. This pilot study evaluated the effectiveness of the CNP on self-efficacy, treatment adherence and clinical outcomes among hemodialysis patients at Billroth Hospital, Chennai, to inform larger-scale implementation studies.

Need for the Study

Hemodialysis patients in India face particular challenges related to healthcare access, financial constraints and limited awareness of disease management. The burden of CKD in India is substantial, with increasing prevalence and limited availability of renal replacement therapy in many regions, and patients undergoing hemodialysis require extensive support to manage complex treatment regimens, dietary modifications and lifestyle adjustments.

Observations from clinical practice at Billroth Hospital revealed that many hemodialysis patients had low self-efficacy, poor treatment adherence and suboptimal clinical outcomes. Patients frequently missed dialysis sessions, failed to adhere to dietary and fluid restrictions and had inadequate knowledge of vascular access care and self-management, contributing to complications, emergency hospitalisations and deteriorating health. Existing nursing care in many Indian hemodialysis units focuses primarily on the technical aspects of dialysis, with limited emphasis on patient education, psychological support and self-management training.

Recent literature has highlighted the effectiveness of various nursing interventions in improving outcomes among hemodialysis patients globally;[12-14] however, most studies have been conducted in Western or East Asian contexts, with limited evidence from Indian settings, and cultural adaptation is essential to ensure relevance and acceptability. The COVID-19 pandemic further underscored the importance of self-efficacy and self-management skills, as healthcare access became more difficult and patients had to take greater responsibility for their care.[15] This pilot study is a first step in establishing the feasibility and preliminary effectiveness of the CNP.

Aim and Objectives

The aim of this pilot study was to evaluate the effectiveness of the CNP on self-efficacy, treatment adherence and clinical outcomes among hemodialysis patients at Billroth Hospital, Chennai. The specific objectives were (1) to assess the baseline demographic and clinical characteristics of patients in the control and experimental groups; (2) to evaluate the effect of the CNP on self-efficacy at baseline, immediately post-intervention and four weeks post-intervention; (3) to determine its effect on treatment adherence across the three time points; (4) to examine its effect on clinical outcomes (serum urea, creatinine and

hemoglobin); (5) to compare self-efficacy, treatment adherence and clinical outcomes between the groups; and (6) to explore associations between demographic and clinical variables and the study outcomes.

Hypotheses: There will be significant differences between the control and experimental groups after the CNP in self-efficacy scores (H1), treatment adherence scores (H2) and clinical outcomes (serum urea, creatinine and hemoglobin) (H3).

MATERIALS AND METHODS

Research Design

A pilot quasi-experimental study with a two-group pre-test/post-test design was used. This design allowed comparison between an experimental group receiving the intervention and a control group receiving standard care, while acknowledging the practical constraints of randomisation in a clinical setting. There were three measurement points: baseline (A1), immediately post-intervention at four weeks (A2) and follow-up at eight weeks from baseline (A3).

Setting and Sample

The study was conducted in the hemodialysis unit of Billroth Hospital, a tertiary care hospital in Chennai, Tamil Nadu, India, which provides regular dialysis to approximately 150 patients with CKD. The sample comprised 60 hemodialysis patients, 30 in each group. Patients were included if they were aged 18 years or above, had ESRD and were undergoing maintenance hemodialysis for at least three months, were able to communicate in Tamil or English and were willing to participate. Patients with severe cognitive impairment or psychiatric disorders, critically ill patients requiring intensive care, patients planning kidney transplantation within the study period and those who declined to participate were excluded.

Sampling Technique

Consecutive sampling was used. All eligible patients attending the hemodialysis unit during the study period were approached; the first 30 eligible patients who consented were assigned to the control group and the next 30 to the experimental group, to minimise contamination between groups while maintaining feasibility.

Instruments

Demographic and clinical data sheet: A structured form recorded age, gender, residence, dietary pattern, marital status and monthly income, together with weight, blood pressure, estimated glomerular filtration rate (eGFR) stage, comorbidities and duration of ESRD.

Self-Efficacy for Managing Chronic Disease 6-item Scale (SEMCD-6): This validated instrument assesses patients' confidence in managing aspects of chronic disease. Its six items are rated on a 10-point scale (1 = not at all confident to 10 = totally confident), with higher scores indicating greater self-efficacy. The scale has shown good reliability and validity in chronic disease populations.

End-Stage Renal Disease Adherence Questionnaire (ESRD-AQ): This instrument, designed specifically for hemodialysis patients, evaluates adherence to dialysis attendance, dietary restrictions, fluid limitations and medication. Scores range from 0 to 1200, with higher scores indicating better adherence.

Clinical parameters: Serum urea (mg/dL; normal range 15–40 mg/dL), serum creatinine (mg/dL) and hemoglobin (g/dL; normal range 12–16 g/dL in females and 13–17 g/dL in males) were obtained from hospital records at each assessment point.

Intervention Protocol

The CNP was developed on the basis of evidence-based practice and theoretical frameworks, including Bandura's Self-Efficacy Theory and Orem's Self-Care Deficit Theory, and was delivered over four weeks. It comprised four components.

Health education pamphlet: A culturally appropriate, illustrated pamphlet in Tamil and English covered CKD and hemodialysis, the importance of treatment adherence, dietary and fluid management, medication management, recognition and management of complications, vascular access care and lifestyle modification. It was given to all experimental group participants in the first session, and key concepts were reviewed in later interactions.

Video demonstrations: Two videos were shown during dialysis sessions: Video 1, vascular access care (15 minutes), covering types of vascular access (arteriovenous fistula, graft and catheter), daily inspection and care of the access site, recognition of complications (infection and thrombosis) and when to seek medical attention; and Video 2, intradialytic exercises (20 minutes), covering the benefits of exercise during dialysis, safe techniques, upper- and lower-limb and breathing exercises, and precautions and contraindications.

Motivational counselling: Individual sessions of 20–30 minutes were held weekly for four weeks. Based on motivational interviewing, they explored patients' concerns and barriers to adherence, set realistic goals, enhanced intrinsic motivation, built confidence in self-management, addressed problem-solving for common challenges and celebrated progress.

Telephone reminders: Weekly calls of about 10–15 minutes by trained nursing staff, between counselling sessions, reinforced key messages, reminded patients of dialysis appointments, provided encouragement, addressed questions and monitored progress toward goals.

Data Collection Procedure

After ethical approval and informed consent, baseline data (A1) were collected from all participants, including demographic and clinical variables, self-efficacy and treatment adherence scores and laboratory values. The control group received standard nursing care in the hemodialysis unit, comprising routine monitoring, basic patient education and technical dialysis care. The experimental group received the CNP in addition to standard care: week 1, the pamphlet, the vascular access video and the first counselling session; week 2, the intradialytic exercise video, the second counselling session and the first telephone reminder; week 3, the third counselling session and second reminder; and week 4, the fourth counselling session and third reminder. Post-intervention assessment (A2) was performed at the end of

week 4 in both groups, and follow-up assessment (A3) four weeks after the intervention ended (week 8).

Ethical Considerations

Ethical approval was obtained from the Institutional Ethics Committee of Billroth Hospital before the study began. Written informed consent was obtained from all participants after explanation of the study purpose, procedures, risks and benefits and the right to withdraw without affecting their care. Confidentiality was maintained through unique identification codes and secure data storage, and control group participants were offered the intervention package after the study.

Data Analysis

Data were analysed using SPSS version 26.0. Descriptive statistics (frequencies, percentages, means and standard deviations) were calculated. Chi-square tests assessed baseline equivalence of categorical variables. Repeated measures ANOVA examined within-group changes across A1, A2 and A3, with Bonferroni-corrected post-hoc pairwise comparisons. Independent t-tests compared the groups at each time point, and Pearson correlation coefficients explored relationships between variables. Statistical significance was set at $p<0.05$.

RESULTS

Demographic and Clinical Characteristics

The socio-demographic profiles of the two groups were comparable (Table 1; Figure 1). Most participants were aged 41–60 years, with a slight male predominance in both groups; most were married, lived in urban areas and followed a mixed diet, and monthly income was predominantly low to middle. There were no significant differences between groups in any demographic variable (all $p>0.05$).

Table 1: Distribution of demographic variables in the control and experimental groups (N=60)

Demographic variable	Category	Control group n (%)	Experimental group n (%)	χ^2	p-value
Age (years)	20–40	8 (26.7)	7 (23.3)	0.612	0.736
	41–60	14 (46.7)	16 (53.3)		
	>60	8 (26.7)	7 (23.3)		
Gender	Male	18 (60.0)	19 (63.3)	0.072	0.788
	Female	12 (40.0)	11 (36.7)		
Residence	Urban	20 (66.7)	21 (70.0)	0.082	0.775
	Rural	10 (33.3)	9 (30.0)		
Marital status	Married	24 (80.0)	23 (76.7)	0.113	0.737
	Others	6 (20.0)	7 (23.3)		
Dietary pattern	Vegetarian	10 (33.3)	9 (30.0)	0.082	0.775
	Non-vegetarian	20 (66.7)	21 (70.0)		
Monthly income (INR)	<10,000	12 (40.0)	13 (43.3)	0.408	0.815
	10,000–20,000	11 (36.7)	10 (33.3)		
	>20,000	7 (23.3)	7 (23.3)		

Values are n (%). Chi-square test.

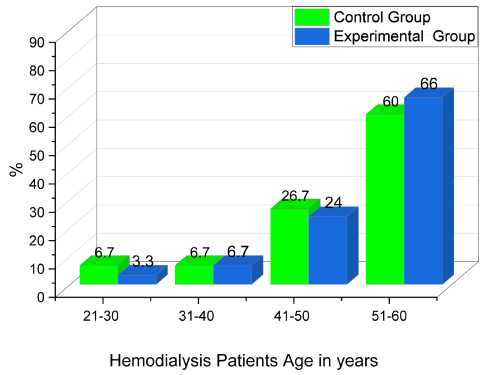


Figure 1: Age distribution of hemodialysis patients in the control and experimental groups

Most participants had been on hemodialysis for 1–3 years and had hypertension and diabetes mellitus as comorbidities. Clinical characteristics did not differ significantly between groups (all $p>0.05$), supporting their homogeneity at baseline (Table 2; Figure 2).

Table 2: Distribution of clinical variables in the control and experimental groups (N=60)

Clinical variable	Category	Control group n (%)	Experimental group n (%)	χ^2	p-value
Duration of ESRD	<1 year	8 (26.7)	7 (23.3)	0.503	0.777
	1–3 years	14 (46.7)	15 (50.0)		
	>3 years	8 (26.7)	8 (26.7)		
eGFR stage	Stage 4	5 (16.7)	6 (20.0)	0.533	0.766
	Stage 5	25 (83.3)	24 (80.0)		
Comorbidities	Hypertension	18 (60.0)	17 (56.7)	0.067	0.795
	Diabetes mellitus	15 (50.0)	16 (53.3)	0.060	0.806
	Both	12 (40.0)	13 (43.3)	0.060	0.806
Blood pressure	Controlled	14 (46.7)	15 (50.0)	0.060	0.806
	Uncontrolled	16 (53.3)	15 (50.0)		
Weight (kg)	40–60	9 (30.0)	10 (33.3)	0.346	0.841
	61–80	15 (50.0)	14 (46.7)		
	>80	6 (20.0)	6 (20.0)		

Values are n (%). Chi-square test. eGFR: estimated glomerular filtration rate; ESRD: end-stage renal disease.

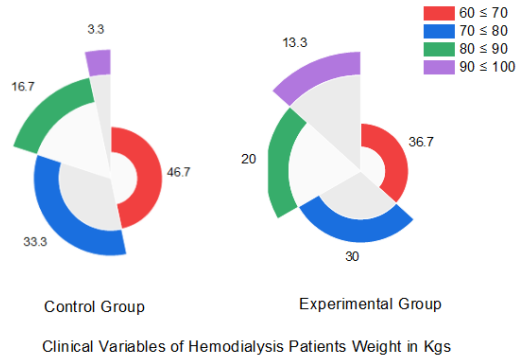


Figure 2: Weight distribution (kg) of hemodialysis patients in the control and experimental groups

Effect of the CNP on Self-Efficacy

Both groups showed statistically significant improvements in self-efficacy from baseline through post-intervention to

follow-up (Table 3). In the control group, self-efficacy increased from 10.70 ± 2.56 at baseline to 42.73 ± 3.54 at follow-up (F=834.33, p<0.001), and in the experimental group from 11.30 ± 3.67 to 50.87 ± 1.83 (F=803.63, p<0.001). The experimental group had substantially higher scores at A2 (41.47 ± 2.83 vs 27.50 ± 4.45) and A3.

Table 3: Repeated measures ANOVA for self-efficacy (SEMCD-6) scores

Group	Time point	Mean ± SD	F (within-subjects)	p-value
Control	A1 (baseline)	10.70 ± 2.56	834.33	<0.001
	A2 (post-intervention)	27.50 ± 4.45		
	A3 (follow-up)	42.73 ± 3.54		
Experimental	A1 (baseline)	11.30 ± 3.67	803.63	<0.001
	A2 (post-intervention)	41.47 ± 2.83		
	A3 (follow-up)	50.87 ± 1.83		

A1: baseline; A2: immediately post-intervention (week 4); A3: follow-up (week 8).

In the control group, all pairwise comparisons were significant, indicating progressive improvement, with the largest change between A1 and A2 (mean difference −16.800, p<0.001) (Table 4); this may reflect routine hemodialysis care, patient–staff interaction and repeated measurement. In the experimental group, all comparisons were also highly significant, with the largest change between A1 and A2 (−30.167, p<0.001) and continued improvement from A2 to A3 (−9.400, p<0.001) (Table 5).

Table 4: Post-hoc pairwise comparisons for self-efficacy in the control group (n=30)

Comparison	Mean difference	Standard error	p-value
A1 vs A2	−16.800	0.672	<0.001
A1 vs A3	−32.033	0.848	<0.001
A2 vs A3	−15.233	0.534	<0.001

Bonferroni-corrected comparisons.

Table 5: Post-hoc pairwise comparisons for self-efficacy in the experimental group (n=30)

Comparison	Mean difference	Standard error	p-value
A1 vs A2	−30.167	0.815	<0.001
A1 vs A3	−39.567	1.032	<0.001
A2 vs A3	−9.400	0.468	<0.001

Bonferroni-corrected comparisons.

Effect of the CNP on Treatment Adherence

Treatment adherence in the experimental group improved from 591.66 ± 98.98 at baseline to 1016.66 ± 83.13 at follow-up, a 71.8% increase (F=204.466, p<0.001), with a narrowing standard deviation suggesting increasingly consistent adherence. The control group improved more modestly, from 603.33 ± 109.21 to 761.66 ± 226.73 (26.2%; F=27.334, p<0.001) (Table 6).

Table 6: Repeated measures ANOVA for treatment adherence (ESRD-AQ) scores

Group	Time point	Mean ± SD	F (within-subjects)	p-value
Control	A1 (baseline)	603.33 ± 109.21	27.334	<0.001
	A2 (post-intervention)	679.16 ± 259.39		
	A3 (follow-up)	761.66 ± 226.73		
Experimental	A1 (baseline)	591.66 ± 98.98	204.466	<0.001
	A2 (post-intervention)	960.83 ± 126.91		
	A3 (follow-up)	1016.66 ± 83.13		

A1: baseline; A2: immediately post-intervention (week 4); A3: follow-up (week 8).

In the control group, only the comparison between baseline and follow-up was significant (A1 vs A3: −158.333, p=0.015), whereas the changes between A1 and A2 (p=0.312) and between A2 and A3 (p=0.108) were not (Table 7; Figure 3). In the experimental group, all pairwise comparisons were significant (A1 vs A2: −369.167, p<0.001; A1 vs A3: −425.000, p<0.001; A2 vs A3: −55.833, p=0.002), indicating progressive and sustained improvement that continued after the intervention ended (Table 8).

Table 7: Post-hoc pairwise comparisons for treatment adherence in the control group (n=30)

Comparison	Mean difference	Standard error	p-value
A1 vs A2	−75.833	45.678	0.312
A1 vs A3	−158.333	52.345	0.015
A2 vs A3	−82.500	38.234	0.108

Bonferroni-corrected comparisons.

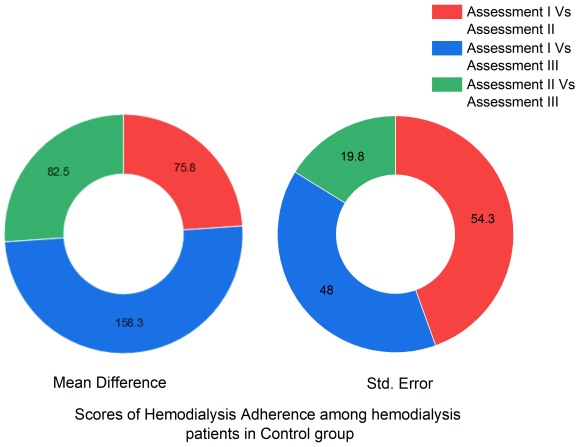


Figure 3: Post-hoc comparisons of treatment adherence scores in the control group

Table 8: Post-hoc pairwise comparisons for treatment adherence in the experimental group (n=30)

Comparison	Mean difference	Standard error	p-value
A1 vs A2	−369.167	28.456	<0.001
A1 vs A3	−425.000	31.234	<0.001
A2 vs A3	−55.833	15.678	0.002

Bonferroni-corrected comparisons.

Effect of the CNP on Clinical Outcomes

Serum urea: Serum urea remained stable in the control group (F=1.084, p=0.345). In the experimental group it fell from 40.99 ± 21.62 to 35.60 ± 16.73 mg/dL, but the change was not significant (F=0.886, p=0.418), possibly because of the short intervention period and the multifactorial determinants of urea levels (Table 9).

Table 9: Repeated measures ANOVA for serum urea levels

Group	Time point	Mean ± SD (mg/dL)	F (within-subjects)	p-value
Control	A1 (baseline)	38.76 ± 25.73	1.084	0.345
	A2 (post-intervention)	39.01 ± 26.80		
	A3 (follow-up)	39.11 ± 26.84		

Group	Time point	Mean ± SD (mg/dL)	F (within-subjects)	p-value
Experimental	A1 (baseline)	40.99 ± 21.62	0.886	0.418
	A2 (post-intervention)	40.59 ± 19.93		
	A3 (follow-up)	35.60 ± 16.73		

A1: baseline; A2: immediately post-intervention (week 4); A3: follow-up (week 8).

Serum creatinine: Creatinine remained stable in the control group (6.92 ± 3.04 to 7.03 ± 3.10 mg/dL) and showed a decreasing trend in the experimental group (5.05 ± 3.51 to 4.59 ± 2.76 mg/dL); the between-subjects effects were significant in both groups (Table 10; Figures 4 and 5). Between-group differences were significant at A2 (t=2.768, p=0.008) and A3 (p=0.002) (Table 12).

Table 10: Repeated measures ANOVA for serum creatinine levels

Group	Time point	Mean ± SD (mg/dL)	F (between-subjects)	p-value
Control	A1 (baseline)	6.92 ± 3.04	154.192	<0.001
	A2 (post-intervention)	6.90 ± 3.08		
	A3 (follow-up)	7.03 ± 3.10		
Experimental	A1 (baseline)	5.05 ± 3.51	79.112	<0.001
	A2 (post-intervention)	4.70 ± 3.07		
	A3 (follow-up)	4.59 ± 2.76		

A1: baseline; A2: immediately post-intervention (week 4); A3: follow-up (week 8).

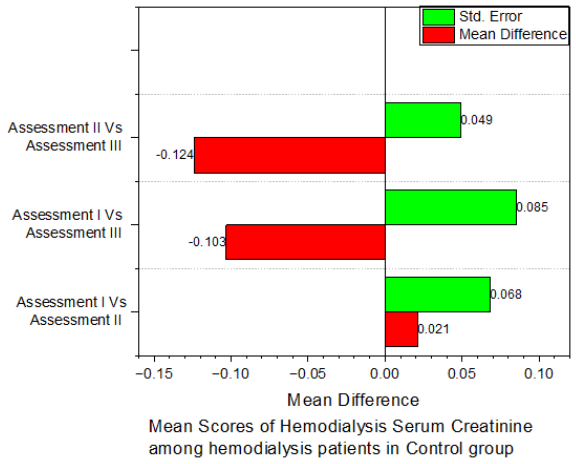


Figure 4: Post-hoc comparisons of serum creatinine in the control group

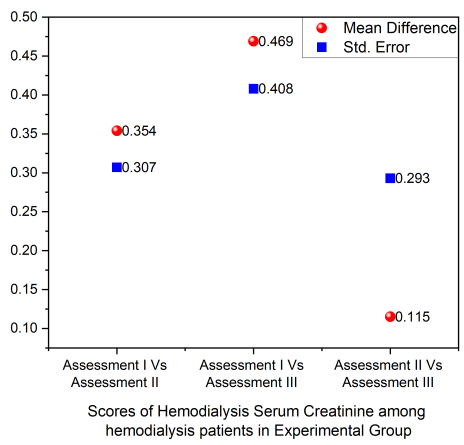


Figure 5: Post-hoc comparisons of serum creatinine in the experimental group

Hemoglobin: Hemoglobin remained stable at about 9.1–9.3 g/dL in both groups, with no significant within-group changes (control: F=0.234, p=0.792; experimental: F=0.089, p=0.915) (Table 11), consistent with its dependence on erythropoiesis-stimulating agents and iron supplementation rather than on the behavioural factors addressed by the CNP.

Table 11: Repeated measures ANOVA for hemoglobin levels

Group	Time point	Mean ± SD (g/dL)	F (within-subjects)	p-value
Control	A1 (baseline)	9.10 ± 1.88	0.234	0.792
	A2 (post-intervention)	9.24 ± 2.02		
	A3 (follow-up)	9.30 ± 2.04		
Experimental	A1 (baseline)	9.25 ± 2.27	0.089	0.915
	A2 (post-intervention)	9.17 ± 2.35		
	A3 (follow-up)	9.30 ± 2.13		

A1: baseline; A2: immediately post-intervention (week 4); A3: follow-up (week 8).

Between-Group Comparisons

At baseline, self-efficacy (t=−0.734, p=0.466) and treatment adherence (t=0.456, p=0.650) did not differ between the groups. At post-intervention and follow-up, the experimental group had significantly higher self-efficacy (A2: t=−14.502; A3: t=−18.341; both p<0.001) and treatment adherence (A2: t=−5.072; A3: t=−5.783; both p<0.001) and significantly lower serum creatinine (A2: p=0.008; A3: p=0.002) than the control group (Table 12).

Table 12: Between-group comparisons of outcomes at the three time points (N=60)

Outcome variable	Time point	Control group mean ± SD	Experimental group mean ± SD	t-value	p-value
Self-efficacy	A1	10.70 ± 2.56	11.30 ± 3.67	−0.734	0.466
	A2	27.50 ± 4.45	41.47 ± 2.83	−14.502	<0.001*
	A3	30.77 ± 5.72	50.87 ± 1.83	−18.341	<0.001*
Treatment adherence	A1	603.33 ± 109.21	591.66 ± 98.98	0.456	0.650
	A2	679.16 ± 259.39	960.83 ± 126.91	−5.072	<0.001*
	A3	761.66 ± 226.73	1016.66 ± 83.13	−5.783	<0.001*
Serum creatinine	A1	6.92 ± 3.04	5.05 ± 3.51	2.234	0.029*
	A2	6.90 ± 3.08	4.70 ± 3.07	2.768	0.008*
	A3	7.03 ± 3.10	4.59 ± 2.76	0.877	0.002*

*Independent samples t-test. *p<0.05.*

Correlation Analysis

No statistically significant correlations between self-efficacy, treatment adherence and clinical outcomes were observed in either group at follow-up (all p>0.05) (Tables 13 and 14). In the experimental group, a moderate but non-significant positive correlation was observed between self-efficacy and hemoglobin (r=0.306, p=0.101), which may become evident in larger samples.

Table 13: Correlation between variables in the control group at follow-up (n=30)

Variable	SE	TA	Urea	Cr	Hb
SE	1.000	0.111 (p=0.561)	−0.089 (p=0.642)	−0.145 (p=0.446)	0.178 (p=0.348)
TA	0.111 (p=0.561)	1.000	−0.056 (p=0.771)	−0.123 (p=0.518)	0.094 (p=0.623)
Urea	−0.089 (p=0.642)	−0.056 (p=0.771)	1.000	0.312 (p=0.093)	−0.201 (p=0.288)
Cr	−0.145 (p=0.446)	−0.123 (p=0.518)	0.312 (p=0.093)	1.000	−0.167 (p=0.379)
Hb	0.178 (p=0.348)	0.094 (p=0.623)	−0.201 (p=0.288)	−0.167 (p=0.379)	1.000

Pearson correlation coefficients (r) with p-values. SE: self-efficacy; TA: treatment adherence; Cr: serum creatinine; Hb: hemoglobin.

Table 14: Correlation between variables in the experimental group at follow-up (n=30)

Variable	SE	TA	Urea	Cr	Hb
SE	1.000	0.234 (p=0.213)	−0.156 (p=0.410)	−0.198 (p=0.295)	0.306 (p=0.101)
TA	0.234 (p=0.213)	1.000	−0.112 (p=0.556)	−0.189 (p=0.318)	0.145 (p=0.445)
Urea	−0.156 (p=0.410)	−0.112 (p=0.556)	1.000	0.287 (p=0.124)	−0.223 (p=0.236)
Cr	−0.198 (p=0.295)	−0.189 (p=0.318)	0.287 (p=0.124)	1.000	−0.178 (p=0.347)
Hb	0.306 (p=0.101)	0.145 (p=0.445)	−0.223 (p=0.236)	−0.178 (p=0.347)	1.000

Pearson correlation coefficients (r) with p-values. SE: self-efficacy; TA: treatment adherence; Cr: serum creatinine; Hb: hemoglobin.

Association of Demographic and Clinical Variables with Outcomes

No statistically significant associations were found between demographic or clinical variables (including age, gender, duration of ESRD and comorbidities) and self-efficacy, treatment adherence or clinical parameters at follow-up in either group (all $p>0.05$), suggesting that the effectiveness of the CNP was not influenced by the characteristics measured in this study.

DISCUSSION

This pilot study evaluated the effectiveness of the CNP on self-efficacy, treatment adherence and clinical outcomes among hemodialysis patients at Billroth Hospital, Chennai, and provides preliminary evidence supporting structured nursing interventions in this population.

Self-Efficacy

Self-efficacy improved significantly in both groups, with superior outcomes in the experimental group, whose scores rose from 11.30 ± 3.67 at baseline to 50.87 ± 1.83 at follow-up. These findings align with systematic reviews highlighting the effectiveness of health education interventions in enhancing self-efficacy among hemodialysis patients.[1] The significant between-group differences at post-intervention ($t=-14.502$, $p<0.001$) and follow-up ($t=-18.341$, $p<0.001$) suggest that the CNP provided benefits beyond standard care. Both groups continued to improve between post-intervention and follow-up, but the experimental group remained significantly higher, indicating that the CNP equipped patients with skills and confidence that continued to develop after the formal intervention ended.

These findings are consistent with other studies of structured nursing interventions. A psychoeducational nursing programme in Egypt produced significant and sustained improvements in self-efficacy among hemodialysis patients,[9] a self-management programme based on the 5A nursing model improved self-efficacy and quality of life,[13] and a supportive educative nursing intervention (SENI) also enhanced self-efficacy.[16] The CNP was grounded in Bandura's Self-Efficacy Theory, which identifies four sources of self-efficacy: mastery experiences, vicarious experiences, verbal persuasion and physiological states. The CNP addressed these through practice of self-care skills, video demonstrations, motivational counselling and attention to physical symptoms and concerns, which probably contributed to the improvements observed.

Treatment Adherence

Treatment adherence in the experimental group increased by 71.8%, from 591.66 ± 98.98 to 1016.66 ± 83.13, compared with a 26.2% increase in the control group (603.33 ± 109.21 to 761.66 ± 226.73), which probably reflects routine care and repeated assessment. The significant between-group differences at post-intervention ($t=-5.072$, $p<0.001$) and follow-up ($t=-5.783$, $p<0.001$) demonstrate the effectiveness of the CNP in promoting adherence. These findings are consistent with meta-analyses showing that adherence improvement programmes enhance adherence in hemodialysis patients,[17,18] and with a network meta-analysis identifying educational, behavioural and combined strategies as effective in CKD.[19] An educational programme based on Orem's Self-Care Model improved treatment adherence in hemodialysis patients,[4] periodic nursing interventions improved compliance behaviour and health status in long-term hemodialysis patients,[3] and stages-of-change-based nursing interventions improved compliance among patients with CKD undergoing hemodialysis. The progressive improvement in the experimental group, with significant differences between all time points, suggests that the CNP initiated a positive trajectory of behaviour change, and the telephone reminders may have been particularly valuable in maintaining adherence after the intensive phase ended.

Clinical Outcomes

Serum creatinine showed the most promising results among the clinical parameters, with a decreasing trend in the experimental group (5.05 ± 3.51 to 4.59 ± 2.76 mg/dL) and significant between-group differences at post-intervention and follow-up. This suggests that enhanced self-efficacy and adherence may translate into better clinical outcomes through improved adherence to dialysis schedules, dietary restrictions and fluid management. An m-nursing application improved compliance with hemodialysis therapy and reduced urea and creatinine levels in patients with CKD,[6] and evidence-based nursing supervision has had positive effects on clinical parameters, although the size of these effects varies and the relationship between nursing interventions and biochemical outcomes is complex. Serum urea decreased non-significantly in the experimental group, and hemoglobin remained stable in both groups, consistent with its dependence on erythropoiesis-stimulating agents and iron supplementation. The modest clinical changes compared with the marked psychological and behavioural

improvements suggest that behavioural change may precede measurable biochemical change.

Intervention Components and Mechanisms

The effectiveness of the CNP can be attributed to its multicomponent, theory-based design. The pamphlet provided accessible, culturally appropriate information, and educational interventions have consistently improved outcomes in hemodialysis populations.[10,20] Video demonstrations offered visual and vicarious learning for vascular access care and intradialytic exercises,[21,22] motivational counselling addressed individual barriers and built confidence,[23,24] and telephone reminders maintained engagement between face-to-face sessions.[7,25] Together, these components addressed the cognitive, behavioural and emotional aspects of disease management, in line with evidence supporting comprehensive nursing interventions in hemodialysis care.[11,14]

Comparison with Existing Literature

These findings are consistent with the broader literature. Structured health education programmes significantly enhance outcomes in hemodialysis patients,[1] the 5A nursing model improved quality of life,[13] and comprehensive nursing has had positive effects on quality of life and clinical outcomes in chronic renal failure.[14] A systematic review and meta-analysis found that nurse-led care improved self-management, quality of life and clinical parameters in CKD,[10] nurse-led structured home visiting improved quality of life and treatment adherence,[8] and technology-based interventions, including educational and mobile applications, have improved self-efficacy and self-care.[6,21,22]

Strengths

This study provides evidence from an Indian context, addressing the gap in culturally specific interventions for hemodialysis patients in South Asia. The CNP integrates multiple evidence-based components into a replicable model, the study assessed psychological, behavioural and clinical outcomes together, and the improvements were sustained at follow-up.

Limitations

This study has several limitations. The small sample (n=60) limits statistical power and generalisability, and the results are preliminary. Consecutive sampling without randomisation may have introduced selection bias, and unmeasured confounders may have influenced outcomes. The single-centre design limits generalisability to other settings, particularly rural hospitals, and the eight-week duration was too short to assess long-term effects. Blinding was not possible, self-efficacy and adherence were self-reported and subject to social desirability and recall bias, and only three biochemical parameters were measured; blood pressure control, interdialytic weight gain, hospitalisation and quality of life would provide a more complete assessment. Intervention fidelity was not formally assessed, control participants may have been exposed to intervention components through informal contact with the experimental group, and literacy and health literacy may have affected engagement with the educational materials.

CONCLUSION

This pilot study shows that the CNP improved self-efficacy and treatment adherence among hemodialysis patients, with significantly greater improvements in the experimental group than in the control group receiving standard care and with benefits sustained at the four-week follow-up. Serum creatinine was also lower in the experimental group. The multicomponent, theory-based CNP, integrating health education, video demonstrations, motivational counselling and telephone reminders, appeared feasible to implement in a real-world clinical setting and offers a culturally appropriate model for Indian hemodialysis patients. Larger multicentre randomised controlled trials with longer follow-up and cost-effectiveness analysis are needed to confirm these preliminary findings.

IMPLICATIONS FOR NURSING PRACTICE

Hemodialysis units should consider structured nursing intervention packages that go beyond technical dialysis care to address patients' educational, psychological and self-management needs, explicitly targeting self-efficacy through mastery experiences, vicarious learning, verbal persuasion and attention to physiological states. Multicomponent interventions combining education, skill development, motivational support and follow-up are more likely than single strategies to meet patients' complex needs. Educational materials should be adapted to language, literacy and cultural beliefs, and technology such as telephone follow-up, mobile applications and tele-nursing can maintain engagement and continuity of care. Nurses should be trained in motivational interviewing, patient education and standardised assessment, patient education should be treated as a core nursing responsibility with adequate time and resources, and nursing interventions should be integrated into interdisciplinary team care with systematic monitoring of self-efficacy, adherence and clinical outcomes.

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None

CONFLICT OF INTEREST

The authors declare no conflicts of interest related to this study.

DATA AVAILABILITY

The datasets generated and analysed during the current study are available from the corresponding author on reasonable request.

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REFERENCES

1. Herawati L, et al. Improving self-efficacy and quality of life in hemodialysis patients through health education: a systematic review. JIIKI. 2025;15(02). DOI: 10.33221/jiiki.v15i02.3792

2. Hsu SH, et al. Health literacy, self-efficacy and health outcomes of patients undergoing haemodialysis: mediating role of self-management. Journal of Renal Care. 2024. DOI: 10.1111/jorc.12493
3. Wang Y, et al. Effect of periodic nursing interventions on improving compliance behavior and health status in long-term hemodialysis patients. Pakistan Journal of Medical Sciences. 2024;40(9). DOI: 10.12669/pjms.40.9.9076
4. Rezaei S, et al. The effect of an educational program based on Orem's self-care model on treatment adherence, self-care behaviors, and quality of life in hemodialysis patients. Journal of Preventive Medicine and Public Health. 2025. DOI: 10.3961/jpmph.25.727
5. Ekholm M, et al. Behavioral interventions targeting treatment adherence in chronic kidney disease: a systematic review and meta-analysis. OSF Preprints. 2024. DOI: 10.31219/osf.io/v9pj7
6. Andriati R. Innovation of the M-Nursing application to improve compliance with haemodialysis therapy and urea-creatinine levels in patients with CKD. Malaysian Journal of Nursing. 2025;17(1). DOI: 10.31674/mjn.2025.v17i01.011
7. Selima E, Safaan N, El-Nagar S. Effect of tele-nursing education intervention on knowledge and adherence to therapeutic regimen of hemodialysis patients. Menoufia Nursing Journal. 2023;8(4):321-335. DOI: 10.21608/menj.2023.345827
8. Pooresmaeil F, et al. Nurse-led home visiting program on quality of life and treatment adherence of hemodialysis patients. Frontiers in Public Health. 2023;11. DOI: 10.3389/fpubh.2023.1013019
9. Helali A, et al. Psychoeducational nursing program on self-efficacy and quality of life in hemodialysis patients. Scientific Reports. 2025. DOI: 10.1038/s41598-025-04052-x
10. Arooj H, et al. The impact of nurse-led care in chronic kidney disease management: a systematic review and meta-analysis. BMC Nursing. 2025;24. DOI: 10.1186/s12912-025-02829-z
11. Chen Z, et al. Impact of nursing interventions on hemodialysis patients using the integrated theory of health behavior change. Medicine (Baltimore). 2025;104(2):e41050. DOI: 10.1097/MD.0000000000041050
12. Zheng X, et al. Effect of nursing team management model on quality of care in hemodialysis. Journal of Healthcare Engineering. 2022;2022. DOI: 10.1155/2022/2071893
13. Keivan N, et al. Role of self-management program based on 5A nursing model in quality of life among patients undergoing hemodialysis. BMC Nephrology. 2023;24(1). DOI: 10.1186/s12882-023-03108-2
14. Wen Q, Yao SC, Yao B. Effectiveness of comprehensive nursing in hemodialysis of patients with chronic renal failure. Evidence-Based Complementary and Alternative Medicine. 2022;2022. DOI: 10.1155/2022/1399650
15. Qalawa SA, Eltahry SI, Aly AA. Self-efficacy among patients with hemodialysis during the COVID-19 pandemic. Journal of Medicine and Life. 2022;15(6):797-804. DOI: 10.25122/jml-2021-0405
16. Wasalamah S, et al. Supportive educative nursing intervention (SENI) in improving self-efficacy of hemodialysis patients. HES Medicine. 2022;1(1). DOI: 10.56741/hesmed.v1i01.30
17. Kim HS, Jeong I, Cho MK. Effect of treatment adherence improvement program in hemodialysis patients: a systematic review and meta-analysis. International Journal of Environmental Research and Public Health. 2022;19(18):11657. DOI: 10.3390/ijerph191811657
18. Yangoz ST, Ozer Z, Boz I. Comparison of the effect of educational and self-management interventions on adherence to treatment in hemodialysis patients. International Journal of Clinical Practice. 2021;75(5). DOI: 10.1111/ijcp.13842
19. Ma B, et al. Systematic review and network meta-analysis of adherence enhancement strategies in chronic kidney disease. Journal of Evidence-Based Medicine. 2025. DOI: 10.1111/jebm.70078
20. Monem RA, et al. Effect of designed educational nursing intervention on knowledge and compliance to therapeutic regimen among hemodialysis patients. Menoufia Nursing Journal. 2022;7(2):367-384. DOI: 10.21608/menj.2022.272901
21. Hosseini A, et al. The effect of an educational app on hemodialysis patients' self-efficacy and self-care: a quasi-experimental longitudinal study. Chronic Illness. 2023;19(2):383-394. DOI: 10.1177/17423953211073365
22. Sarmadi, et al. Comparing the effects of interactive and conventional video education on activation, treatment adherence, and weight changes in dialysis patients. PLOS ONE. 2025. DOI: 10.1371/journal.pone.0334498
23. Turan GB, et al. Effect of self-efficacy on dietary adherence in hemodialysis patients. Hemodialysis International. 2025. DOI: 10.1111/hdi.70004
24. Wu R, et al. Effect of self-determination theory on knowledge, treatment adherence, and self-management of patients with maintenance hemodialysis. Contrast Media & Molecular Imaging. 2022;2022. DOI: 10.1155/2022/1416404
25. Arad M, et al. Do the patient education program and nurse-led telephone follow-up improve outcomes in hemodialysis patients? BMC Nephrology. 2021. DOI: 10.1186/s12882-021-02319-9