Improving Knowledge, Dietary Behavior, and Clinical Outcomes Through a Protein and Energy Intake Self-Care Support Program among Monks Undergoing Hemodialysis: A Quasi-Experimental Study

Surasak Thakhat, Noppawan Phinitkhajorndech, Suchira Chaiviboontham*

Abstract: The Buddhist monastic discipline includes regulations regarding monks' consumption of food and drinks. Even in cases of health problems and with exceptions allowed, most monks still adhere to the practice of eating one to two meals per day. This limits their ability to obtain sufficient nutrients, increasing the risk of malnutrition. Malnutrition and protein-energy wasting commonly occur in people undergoing hemodialysis and may be of intense concern for Buddhist monks. This quasi-experimental study, a one-group pre-posttest with repeated measures, aimed to examine the effects of the Protein and Energy Intake Self-Care Support Program on knowledge, self-care behaviors, and clinical outcomes among 30 monks undergoing hemodialysis at the Priest Hospital in Bangkok, Thailand. The participants received an intervention for twelve weeks. The instruments used were a Personal and Health Information Form, the Knowledge of Protein and Energy Intake Questionnaire, and a 24-Hour Dietary Recall Record Form to evaluate dietary behaviors as self-care behaviors. Descriptive statistics and one-way repeated-measures ANOVA were used to analyze data.

The program led to a significant increase in mean scores for knowledge, dietary behaviors, and clinical outcomes (serum albumin and protein catabolic rate). Repeated measures analysis showed that knowledge significantly improved across three evaluation time points. Dietary behaviors and clinical outcomes significantly improved across all four evaluation time points. These findings suggest that the intervention effectively promotes long-term enhancements in both nutritional status and clinical outcomes in monks undergoing hemodialysis. Nurses can apply this intervention in nursing practice. However, further testing of this intervention is needed through a randomized controlled trial in a multi-site study.

Keywords: Dietary behavior, Energy intake, Health, Hemodialysis, Malnutrition, Monks, Protein intake, Self-care support program

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Introduction

Chronic kidney disease (CKD) and end-stage renal disease (ESRD) are common and significant health problems globally, with 37 million people with CKD, and the rate of new ESRD cases was 394 per million population.[1] Data from Thailand Renal Replacement Therapy (TRT) shows a consistent

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increase in the prevalence of ESRD people requiring RRT, with 152,827 cases (2,540 per million population). People undergoing HD made up the majority.[2]

HD treatment helps people live longer and have a better quality of life, as close to normal as possible.[3-4] At the same time, long-term complications, such as malnutrition and protein-energy wasting (PEW), are a serious concern, often caused by insufficient protein and energy intake, infection, cardiovascular events, and protein and energy loss from dialysis.[4-8] Monks' lifestyle differs significantly from that of the general population, since Buddhist monastic discipline includes regulations on monks' consumption of food and drink.[9] The data show that monks with ERSD have 1-2 meals/day, which often limits their nutrient intake, resulting in an increased risk of malnutrition compared to the general population with ESRD.[9-10] The data on monks undergoing HD at the Priest Hospital in Bangkok during 2021-2024,[10] found that around 60% of monks had 1-2 meals per day, and most (80%) had received knowledge about protein and energy intake from nurses. Monks' dietary behavior, as well as their average dietary protein intake (DPI) at 0.85 g/kg/day and average dietary energy intake (DEI) at 31.50 kcal/kg/day,[10] fell below the recommended standards set by the International Society of Renal Nutrition and Metabolism (ISRNM).[7,11]

Monks undergoing HD need comprehensive information on their health conditions, treatments, and self-care, especially regarding nutritional status, with an emphasis on enhancing self-care abilities through tailored educational and supportive interventions, leading to sustained, appropriate knowledge, dietary behaviors, and improved clinical outcomes.[12-14] If monks who adhere to the practice of consuming only 1-2 meals per day receive adequate protein and energy, they will be healthier.[9] However, studies on monks and long-term studies remain limited. To address these needs, the effects of a Self-care Promoting Program grounded in Orem's theory, which equips individuals with the knowledge and skills needed to ensure sufficient protein and energy intake, in monks undergoing HD, needed to be examined.

Literature Review and Conceptual Framework

This intervention study was guided by Orem's self-care theory,[15] and a literature review. According to Orem,[15] self-care is defined as a deliberate action that an individual initiates and performs on their own behalf to maintain life, health, and well-being, emphasizing the importance of personal autonomy and competence in self-care activities. People experience inadequate self-care when self-care demands exceed their capacity to provide it. In this case, nurses use their expertise to design a nursing system that increases people's self-care abilities and/or meets their self-care needs through various forms of support.[15] These methods are doing for, teaching, guiding, supporting, and providing an environment to support self-care.[15]

Monks undergoing HD have high and complex self-care demands due to both their medical condition and religious dietary restrictions, which limit food intake to no more than two meals per day. Malnutrition and PEW are often caused by insufficient protein and energy intake and by losses of protein and energy from RRT.[4,7,11] It is a critical concern in people undergoing HD due to its significant impact on health outcomes. PEW is characterized by a loss of body protein and energy stores, leading to reduced functional capacity, muscle wasting, and impaired quality of life.[7,11,14] It is highly prevalent, affecting approximately 30% to 70% of individuals with HD.[7] The significance of malnutrition and PEW lies in its strong association with increased morbidity and mortality.[7,11]

Thus, people or monks undergoing HD need an educational and supportive system to enhance their

ability to meet these complex demands and maintain adequate protein and energy intake, as well as other needs arising from the disease, treatments, and religious dietary restrictions. Orem's theory emphasizes the knowledge and skills necessary for self-care, asserting that individuals need to be prepared to meet their self-care demands to sustain health and well-being.[15] It highlights that effective self-care involves understanding and awareness of one's health status, valuing self-care, and having the practical abilities to carry out required skills. Enhancing these aspects enables individuals to take an active role in their care and achieve better health outcomes.

Utilizing Orem's Self-Care Theory, this framework provides a supportive-educative system to empower people undergoing hemodialysis to manage their own nutritional needs, enabling them to take a more active role in their care.[4-5] By addressing the self-care deficit inherent in protein and energy regulation, specialized nursing support can alleviate the risks of PEW.[12-15] Cultivating individuals' self-care abilities through the development of specialized knowledge and clinical skills is a fundamental prerequisite for optimizing health outcomes.[15] This strategic focus on dietary behaviors is hypothesized to yield significant improvements in knowledge, dietary behavior, and biochemical outcomes.

The literature strongly supports the efficacy of protein and energy self-care support interventions, which are essential for empowering this specific population to improve self-care ability, dietary behavior, and biochemical outcomes.[16-18] By enhancing nutritional knowledge and self-care agency, such interventions directly improve dietary behavior, which is fundamentally linked to superior clinical outcomes, including stabilized serum albumin (sAlb) and protein catabolic rate (nPCR).[12-13,16-18] This study addresses a critical gap in the literature by integrating self-care theory with the unique monastic life of Thai monks. The Protein and Energy Intake Self-Care Support (PEI-SCS) program, developed by the authors, is essential for monks undergoing HD, and nurses are vital in providing information and support to enhance self-care ability.[15] By integrating knowledge enhancement with practical skill-training and continuous reinforcement, this program fosters the self-care proficiency essential for superior health outcomes.

Study Aim and Hypothesis

This study aimed to evaluate the effects of the PEI-SCS on knowledge, dietary behavior, and clinical outcomes among Buddhist monks undergoing hemodialysis (HD). The following hypothesis was tested: the mean score of knowledge (3 time periods), dietary behavior including dietary protein intake (DPI) and dietary energy intake (DEI), and clinical outcomes including serum albumin (sAlb) and protein catabolic rate (nPCR) (4 time periods) would improve following program participation across the designated time points.

Methods

Design: This study used a one-group pre-post repeated-measures design. This report adhered to the TREND (Transparent Reporting of Evaluations with Nonrandomized Designs) guideline for this paper.

Sample and Setting: Initially, 30 ESRD monks undergoing HD who met the inclusion criteria were recruited from the Hemodialysis Unit of the Priest Hospital, Ministry of Public Health, Bangkok, Thailand. The sample size was determined using a power analysis in G*Power 3.1,19 with repeated measures ANOVA statistics to estimate an effect size of 0.25. The confidence value (α) was set at 0.05, and the test power ($1-\beta$) was set at 0.80. This determination was based on a literature review of dietary promotion programs focusing on protein and energy consumption behavior in people undergoing HD.[13,18] Data from the statistical analyses were used to calculate the sample

size, resulting in 28 cases. Given the possibility of dropouts, a minimum sample size of 30 participants was used.[20]

The monks' medical records were reviewed to determine if they met the inclusion criteria, which were: 1) at least 18 years old (with additional cognitive and daily living ability assessment for those more than 60 years),[21] 2) able to communicate in Thai and be able to read and write in Thai, 3) able to communicate via phone, 4) undergoing HD at least three months, 5) meeting the hemodialysis adequacy (Kt/V) standard criteria of more than 1.2, 6) exhibiting either a sAlb of less than 3.8 g/dL or a body mass index (BMI) less than 23 kg/m^2, and 7) willing to participate and provided their consent. For termination criteria, the participants were excluded if they 1) had limited ability to consume food orally, 2) experienced an acute illness such as bloodstream infection, or underwent changes in the treatment plan, such as receiving intradialytic parenteral nutrition (IDPN) during the study.

Ethical Considerations: Approval to conduct the study was obtained from the Institutional Review Board, Faculty of Medicine Ramathibodi Hospital, Mahidol University (COA. MURA2022/453, ref. 3668), and the Ethics Committee on Human Research of the Priest Hospital (ref. No. 18/2565). The study adhered to the principles of protecting participants' rights. Comprehensive information on the study's purposes, procedures, and potential benefits was provided to the participants. Written informed consent was obtained voluntarily, and participants had the right to withdraw at any time. Participants' information was kept confidential, and the data were presented anonymously and used solely for research purposes.

Instruments: Data collection instruments

The Personal and Health Record Form: This form includes demographic data: age, weight, height, glomerular filtration rate (eGFR), creatinine level (sCr), serum albumin level (sAlb), body mass index (BMI), dry weight (DW), ideal body weight (IBW), comorbidities, the number of ordination years, the highest level of education, moral position or rank during hemodialysis period, number of hemodialysis treatments per week, nutritional status (NAF score), hemodialysis adequacy (Kt/V), protein catabolic rate (nPCR), number of meals and snacks per day, the number of carers or caregivers, and the history of receiving education on protein and energy intake. Health information was retrieved from the participant's medical records.

The Knowledge of Protein and Energy Intake Questionnaire: This questionnaire was originally developed by On-Saengngam[22] and is based on the concept of self-perception behavior; it was used with permission. In the original study, the content validity was 0.89. It comprises 22 items, e.g., "People undergoing hemodialysis should maintain an adequate daily energy intake of 30-35 kcal per kilogram of body weight per day." Each question is in true-false format, with a scoring system: a correct answer receives 1 point, and an incorrect response 0 points. The test's total score ranged from 0 to 22 points. The higher the score, the higher the knowledge of protein and energy intake. For this study, the reliability (KR-20) was 0.79.

A 24-hour Dietary Recall Record Form: This form was used to collect dietary information, including DPI and DEI. This is self-recorded by participants using a standardized 24-hour Dietary Recall Record Form to capture the actual consumption.[23] The clinical nutritionist provided initial instructions and used visual aids, such as food models and photographic atlases, to ensure that participants accurately quantified portion sizes and preparation methods. To ensure the accuracy and consistency of the nutritional data, the recording process followed a structured protocol: all dietary recalls were conducted via face-to-face interviews by trained research assistants proficient in nutritional assessment for people undergoing hemodialysis. This minimized recall bias and ensured that specific cooking methods (e.g., sodium or potassium considerations) were documented. In the

recording process, the "Triple-Pass Method"[24] was employed. First, a quick list of all foods consumed was obtained. Second, detailed descriptions were recorded, including brand names, portion sizes, and preparation techniques. Finally, a review was conducted to account for often-forgotten items such as snacks, sauces, and beverages. To enhance the precision of volume and weight estimates, visual aids such as standardized food models, measuring cups and spoons, and a photographic food atlas were used during the interview to help participants quantify their intake accurately.

Nutritional intake was assessed using participant self-reports, with DPI (g/kg/day) and DEI (kcal/kg/day) calculated relative to ideal body weight (IBW) per EDA guidelines.[23,25] Clinical parameters, including sAlb and nPCR, were longitudinally extracted from medical records at baseline and weeks 4, 8, and 12. These time points were synchronized with routine monthly follow-ups. Nutritional sufficiency was defined as a serum albumin level >3.8 g/dL.[23,26]

The nPCR was calculated using the following formula:

nPCR = (0.0136 x F) + 0.251

where "F" is defined as Kt/V x [(pre-BUN) + (post-BUN)]/2. In this equation, "K" represents the dialyzer urea clearance (mL/min), "t" denotes the dialysis session duration (minutes), and "V" signifies the urea distribution volume.[25-26] Based on the Nephrology Society of Thailand guidelines, the optimal target range for nPCR was defined as 1.0-1.2 g/kg/day.[26]

The Protein and Energy Intake Self-Care Support (PEI-SCS) Program

The PEI-SCS was developed based on the framework of Orem's Self-Care Theory,[15] and the literature review. The program is of 12 weeks duration and consists of three phases. The first phase, enhancing self-awareness and knowledge, is of 40-50 minutes of nutrition assessment and education by the primary investigator (PI), including guidance for enhancing self-awareness of self-care ability in adequate protein and energy intake behavior, by providing knowledge through teaching and a booklet, and assessing knowledge of protein and energy intake. The second phase, supporting skill development for 45-60 minutes involving a set of activities, including developing self-care skills, recording and calculating the amount of food in a 24-hour recall, especially on non-HD days (3 days a week), practicing food exchange skills, setting goals, and encouraging continuous care and self-monitoring. A nutritionist demonstrated food exchanges and encouraged participants to replicate the demonstration themselves. The PI demonstrated how to record a 24-hour dietary intake and calculate daily protein and energy intake and facilitated participants in goal setting. Phase 3 (weeks 2-12) involved encouraging continuous self-care skills through 5-10 minutes on-site (HD unit) and online (mobile phone), involving a set of activities such as revising common goals with the PI, self-monitoring through a 24-hour food recall form, and the PI providing positive reinforcement and encouragement for sustained behavioral change. The detail is demonstrated in **Appendix, Table A1.**

The PEI-SCS was assessed for content validity in content, activities, duration, and arrangement by three specialists, including a nephrologist, a hemodialysis advanced practice nurse, and a nurse instructor specializing in Self-Care Theory and nutrition. The content validity index (CVI) was 0.90. The program was adjusted following the experts' suggestions and reviewed for appropriateness of language by a monk experienced in developing research instruments. This PEI-SCS was outlined and initially piloted with five monks.

Data Collection: This study was conducted between October and December 2022, following IRB approval. The PI delivered the PEI-SCS, while a trained assistant collected data to minimize bias. Assessments were performed at baseline and at 1-, 4-, 8-, and 12-week post-program participation.

The HD nurse selected an eligible sample that met the specified criteria and introduced the PI to the participants. After that, the PI introduced the program to the participants and explained the research objectives, program participation, and participants' rights. The participants were then asked to participate in the research, and an informed consent form was signed. The data were collected as follows:

Before starting the program, participants were assessed for their preparedness. The participants answered a set of questionnaires, including those of Personal Data and Health Information, Knowledge of Protein and Energy Intake Questionnaires, and a 24-Hour Dietary Recall Record Form, specifically regarding protein and energy intake, within three days before the evaluation, and a clinical data record, sAlb level, and nPCR over the past month. It took approximately 20-30 minutes to complete the assessment.

Intervention day and follow-up (during the program) at the HD unit: the PI provided education on self-care for protein and energy intake to groups of 5-10 participants in a closed area while they waited for dialysis. The PI used various tools, including a projector, a handbook, and an easy dietary assessment (EDA) booklet.[23] Participants were encouraged to practice recording their diet and calculate the amount of food they consumed in a 24-hour food recall. They also learned to determine how much protein and energy they should consume daily. In addition, the goal was set to help participants practice achieving daily protein and energy intake targets. After that, participants were also trained in food-exchange skills by the hospital's nutritionist and given repeated demonstrations to assess the accuracy of food selection. The session took approximately 45-60 minutes to complete.

Follow-up: In weeks 1 and 4 at the HD unit, the PI conducted a 5-10-minute session on protein and energy intake assessment. Weeks 4, 8, and 12 involved the following activities: participants were evaluated for protein and energy intake, sAlb, and nPCR.

Data Analysis: The sample characteristics and general information were analyzed with descriptive statistics. The mean scores for knowledge of protein and energy intake, dietary behavior, and clinical outcomes across time periods were compared using a one-way repeated-measures ANOVA. Most variables met the method's assumptions. However, the DPI and nPCR data did not meet the assumption of sphericity.[27] Thus, Greenhouse-Geisser correction was applied for the F-statistics. The Bonferroni method was used for pairwise comparisons.[27]

Results

Demographic characteristics and health data

The participants in this study were 30 monks, with a mean age of 53.47 years. Half of them had completed high school or higher education (53.3%), and most had been ordained monks for over 10 years and completed the advanced Dharma Scholar level. There were 18 monks (60%) who strictly adhered to the principles of discipline and had only two meals per day. All participants received HD 3 times per week for 5 months to 27 years. The eGFR ranged from 5.32 to 10.52 ml/minute/1.73 m^2. Most participants had a hemodialysis sufficiency level (Kt/V) ranging from 1.32 to 3.49 and a urea reduction rate (URR) ranging from 66.70 to 91.90.

Comparison of the changes in knowledge among the three time periods

Baseline assessments revealed that participants possessed a moderate level of knowledge regarding protein and energy intake. Following the intervention, mean knowledge scores showed a significant upward trend, increasing from 15.77 at baseline to 18.40 at week 1 and to 18.47 by week 4. Notably, the proportion of participants achieving a high knowledge proficiency rose to 93.33% after one week, with 100% mastery observed by the end of the four weeks, as shown in **Table 1 and Figure 1.**

Table 1. Frequency and percent of participants in the levels of knowledge score (n = 30)

Times	Knowledge level			
	Moderate level (score 13-16)		High level (score 17-22)	
	n	%	n	%
Pre-test (Before starting the program)	20	66.67	10	33.33
week 1	2	6.67	28	93.33
week 4	-	-	30	100.00

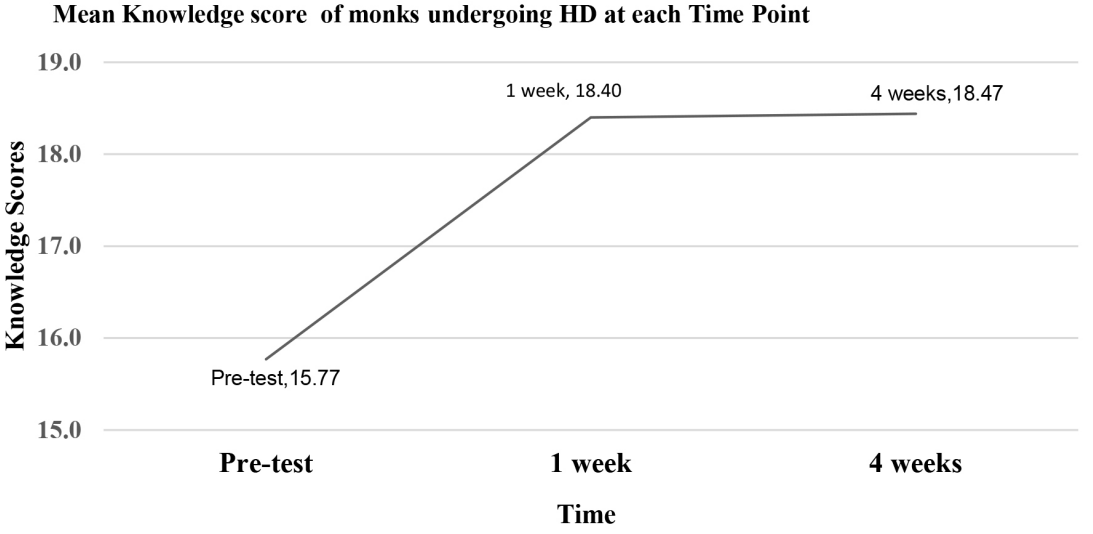


Figure 1. Mean knowledge score of monks undergoing hemodialysis

Repeated-measures ANOVA demonstrated a statistically significant effect of time on participants' knowledge of protein and energy intake ($F = 69.88$, $p < 0.05$). Post hoc analysis using Bonferroni adjustment revealed that mean knowledge scores at both weeks 1 and 4 were significantly higher than at baseline. However, no significant difference was observed between the scores at weeks 1 and 4, indicating that the knowledge gains were sustained but plateaued after the first week, as shown in **Table 2 and Figure 1.**

Table 2. One-way repeated measures ANOVA and pairwise comparisons of outcomes (n = 30)

Variance source	Min-Max	Mean	SD	Mean difference (95% CI) of pairwise comparisons				ANOVA	
				1 week	4 weeks	8 weeks	12 weeks	F	p- value
Knowledge score (0-22)								$\eta^2_p = 0.71$	
Pre-test	13.00-18.00	15.77	1.40	2.63* (2.01-3.26)	2.70* (1.96-3.44)	NA	NA	69.88	< 0.05
1 week	16.00-20.00	18.40	1.10	-	0.07 (0.05-0.57)	NA	NA		
4 weeks	17.00-21.00	18.47	1.00	-	-	NA	NA		

Table 2. One-way repeated measures ANOVA and pairwise comparisons of outcomes (n = 30) (Cont.)

Variance source	Min-Max	Mean	SD	Mean difference (95% CI) of pairwise comparisons				ANOVA	
				1 week	4 weeks	8 weeks	12 weeks	F	p- value
DPI (g/kg/day)								η^2_p = 0.85	
Pre-test	0.79-1.17	0.99	0.09	NA	0.12* (0.09-0.16)	0.22* (0.19-0.26)	0.29* (0.25-0.32)	168.60	< 0.05[GH]
4 weeks	0.87-1.30	1.11	0.09	NA	-	0.09* (0.08-0.12)	0.16* (0.13-0.19)		
8 weeks	1.09-1.39	1.21	0.08	NA	-	-	0.07* (0.05-0.08)		
12 weeks	1.13-1.45	1.28	0.09	NA	-	-	-		
DEI (kcal/kg/day)								η^2_p = 0.91	
Pre-test	22.35-33.04	28.48	2.37	NA	2.93* (2.00-3.84)	5.23* (4.17-6.26)	6.34* (5.23-7.43)	144.43	< 0.05
4 weeks	25.17-35.82	31.41	2.83	NA	-	2.30* (2.00-3.84)	3.41* (2,43-4.38)		
8 weeks	29.46-38.39	33.71	2.87	NA	-	-	1.11* (0.29-1.94)		
12weeks	29.95-38.75	34.82	2.05	NA	-	-	-		
Protein catabolic rate (nPCR: g/kg/day)								η^2_p = 0.58	
Pre-test	0.90-1.90	1.33	0.32	NA	0.03 (0.01-0.17)	0.11 (0.01-0.22)	0.21* (0.09-0.32)	12.06	<0.05[GH]
4 weeks	0.90-2.20	1.36	0.34	NA	-	0.08 (0.01-0.15)	0.18* (0.07-0.28)		
8 weeks	1.10-2.10	1.44	0.26	NA	-	-	0.10* (0.04-0.16)		
12 weeks	1.20-2.10	1.54	0.24	NA	-	-	-		
Serum albumin levels (sAlb: g/dL)								η^2_p = 0.71	
Pre-test	2.80-4.00	3.65	0.23	NA	0.21* (0.13-0.28)	0.35* (0.24-0.45)	0.51* (0.38-0.64)	69.36	< 0.05
4 weeks	3.10-4.30	3.86	0.25	NA	-	0.14* (0.05-0.23)	0.30* (0.19-0.42)		
8 weeks	3.10-4.60	4.00	0.30	NA	-	-	0.16* (0.07-0.27)		
12 weeks	3.40-4.90	4.16	0.29	NA	-	-	-		

Note. *p < 0.05, DPI = Dietary protein intake, DEI = Dietary energy intake, nPCR = Normalized protein catabolic rate, sAlb = Serum albumin, GH = Greenhouse-Geisser correction, NA = No assessment, η^2_p = Partial eta square

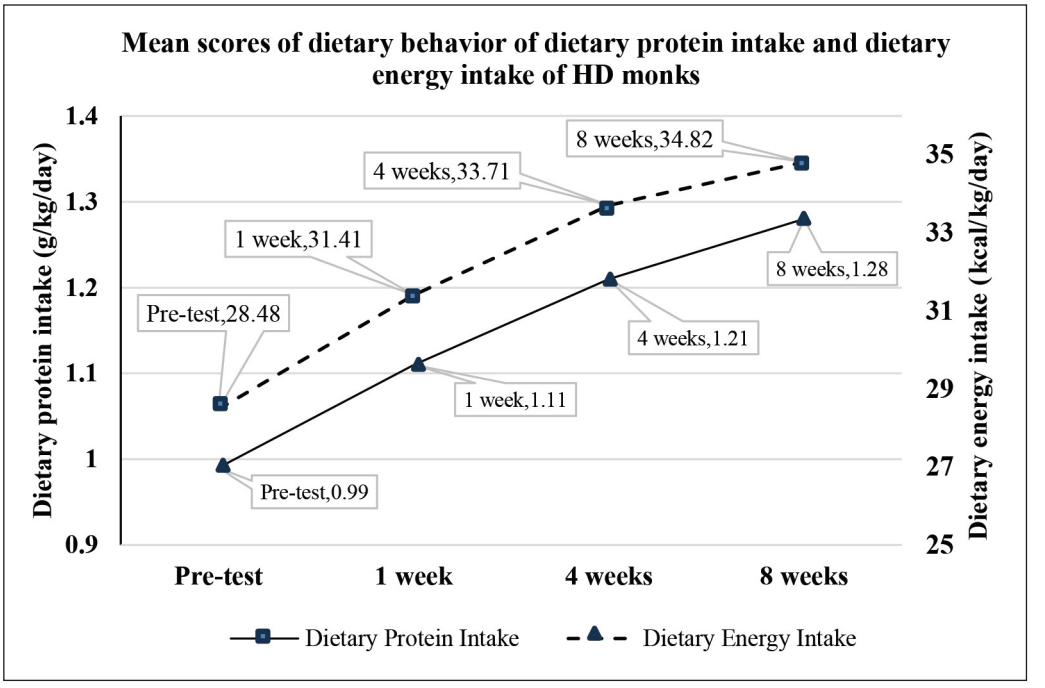


Figure 2. Mean dietary behaviors on dietary protein intake and dietary energy intake of monks undergoing hemodialysis

Comparison of the changes in dietary behaviors among four time periods

At baseline, the mean DPI was 0.99 g/kg/day (SD = 0.09), with 100% of participants failing to meet the ISRNM-recommended minimum of 1.2 g/kg/day.[16] Following the intervention, at week 4, 80% of participants remained below the target, and improved to 43.34% by week 8. By week 12, 76.66% of the cohort achieved a DPI exceeding 1.2 g/kg/day, meeting the clinical practice guidelines for standard care.

Regarding DEI, the proportion of participants achieving the target (> 30 kcal/kg/day) increased progressively at weeks 4, 8, and 12, reaching 76.66%, 90%, and 96.66%, respectively. Repeated-measures ANOVA revealed significant differences in mean DPI and DEI scores across the four time points ($F = 168.60$, $p < 0.05$; $F = 144.43$, $p < 0.05$). Post-hoc pairwise comparisons using the Bonferroni correction indicated that both DPI and DEI at week 12 were significantly higher than all preceding intervals. Furthermore, values at week 8 significantly exceeded those at week 4 and baseline, while week 4 values were significantly higher than baseline. Overall, a steady upward trend in mean DPI and DEI was observed following the intervention (**Table 2 and Figure 2**).

The comparison of the clinical outcomes, at the times before receiving the program, the participants had an average nPCR of 1.33 g/kg/day (SD = 0.32), and 73.33% of the participants had an nPCR of >1.2 g/kg/day, indicating that most of the participants had a normal nPCR and met the criteria of ISRNM guidelines. Additionally, the participants had an overall average sAlb of 3.65 g/dL (SD = 0.23) before receiving the program. This result signifies that most of the participants had sAlb level lower than the criteria of the ISRNM guidelines (malnutrition) before receiving the program.

After participating in the intervention for four, eight, and twelve weeks, the results showed that the participants had mean nPCR values of 1.36, 1.44, and 1.54 g/kg/day, respectively. When comparing most participants, it was observed that in weeks 4, 8, and 12, the participants had an nPCR of > 1.2 g/kg/day, suggesting that most participants had a high level of nPCR as a recommendation criterion. It was found that in weeks 4, 8, and 12, the participants had gradually increasing sAlb levels > 3.8 g/dL, indicating that, at the end of the program, most participants had sAlb levels meeting the ISRNM guidelines criteria.

One-way repeated-measures ANOVA showed significant improvements in nPCR ($F = 12.06$, $p < 0.05$) and sAlb ($F = 69.36$, $p < 0.05$) over time. Bonferroni post hoc analysis revealed that nPCR at week 12 was significantly higher than at all prior time points. Similarly, sAlb demonstrated a significant, progressive increase at each follow-up visit compared with baseline ($p < 0.05$; **Table 2 and Figure 3**). Both nutritional markers (nPCR and sAlb) gradually improved, indicating better nutritional status over time.

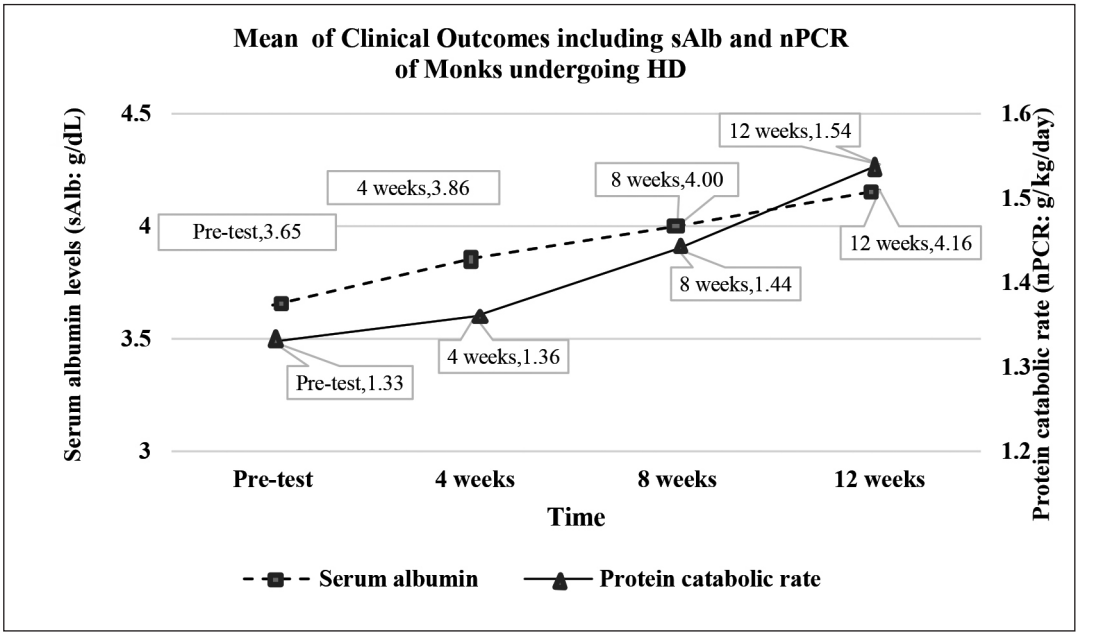


Figure 3. Mean of clinical outcomes including serum albumin and normalized protein catabolic rate of monks undergoing hemodialysis

Discussion

This study investigated the effects of the PEI-SCS program among monks undergoing HD. The PEI-SCS demonstrated improvements in knowledge, dietary behavior, and clinical outcomes of sAlb and nPCR at 12 weeks of receiving this intervention.

Malnutrition and PEW are highly prevalent among ESRD patients undergoing HD,[28-29] which is associated with increased mortality risk.[17,30] One of the most important causes of malnutrition is the inflammatory complex syndrome, characterized by loss of appetite and low dietary protein and energy intake.[31] Clinical studies from retrospective and

cohort studies have indicated that nutritional interventions were associated with improved mortality and morbidity among people undergoing HD. Additionally, several epidemiological studies have shown that improved nutritional status parameters are associated with better survival and quality of life among people undergoing HD.[32-35] This study was consistent with other studies demonstrating the effectiveness of dietary intervention on nutritional biomarkers among ESRD patients undergoing HD.[16,36]

Hypoalbuminemia is another marker reflecting nutritional status and is a strong predictor of poor outcomes and mortality among patients with HD.[37] In addition, protein catabolic rate (nPCR), a parameter of nutritional status monitoring among people undergoing HD, had the most significant impact in indicating good nutritional status.[11, 16] Although the International Society Renal Nutrition and Metabolism (ISRNM) guidelines recommend that HD patients should consume protein optimized at 1.2 g/kg/day and 30-35 kcal/kg/day of energy,[16] other studies have shown that minimum protein and energy intake requirements are often not met in ESRD patients, despite extensive nutritional counseling[28]. In addition, monks undergoing HD have 1-2 meals a day, which limits nutrient intake and increases the risk of malnutrition compared with general patients undergoing HD. Thus, additional interventions are needed to help monks achieve therapeutic goals for nutritional protein and energy intake. It should be noted that evidence for the effectiveness of nutritional support in the general HD population is limited. Evidence suggests that the PEI-SCS program effectively improves knowledge, dietary behaviors, and clinical outcomes, such as sAlb and nPCR, through targeted education and self-care support. Central to this approach is the pivotal role of the nurse in providing information and support to enhance self-care ability and to reinforce it continuously, which translates increased patient knowledge into superior health outcomes.[13-15]

Our findings align with existing literature supporting the efficacy of personalized dietary education and collaborative goal-setting.[13-14,31] Improvements in sAlb, DPI, and DEI suggest that comprehensive monitoring and reinforcement are key to better outcomes. Although knowledge levels remained high through 4 weeks, future research should investigate the rate of knowledge decline to inform long-term education strategies. Furthermore, consistent with previous evidence, the increase in nPCR observed here reflects a strong association with higher DPI.[17,38-39]

Limitations

Several limitations warrant consideration. First, the generalizability of the findings is constrained as the study was conducted at a single specialized center (Priest Hospital, Bangkok), which may not fully represent the diverse monk population undergoing hemodialysis at risk of protein-energy wasting. Second, the small sample size and the lack of a control group may affect statistical power and internal validity. Future research should employ multi-center randomized controlled trials (RCTs) with larger cohorts to rigorously validate the efficacy of self-care interventions. Furthermore, the use of a true/false questionnaire to assess knowledge may have introduced guessing bias. Future studies should consider utilizing more robust assessment tools.

Conclusions and Implications for Nursing Practice

The PEI-SCS based on Orem's Self-Care Theory[15] demonstrated improvements in knowledge, dietary behavior, and clinical outcomes (sAlb and nPCR) at 12 weeks after receiving this intervention.

This intervention can be integrated into the regular nursing system as a part of HD care service for monks, and it should adhere to proper dietary principles.

Future studies should use an RCT with a double-blind design and long-term follow-up to explore additional changes, patterns, and relationships among research variables.

Author Contributions:

Conceptualization, Method, and design: S.T., N.P., S.C.
Data collection, Drafting the manuscript: S.T., N.P.
Data analysis and interpretation: S.T, N.P.
Editing the manuscript: N.P., S.T.
Revising the manuscript: N.P., S.C.
Final approval of the manuscript: S.T., N.P., S.C.

Conflict of Interest

The authors state that there is no conflict of interest.

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Appendix

Table A. Summary of the self-care promoting program focusing on protein and energy intake

Time schedule	Objectives of the content	Method of helping/Activities

Before starting the program (20-30 minutes)	- To preparate, assess personal health condition, and plan the program
	- To measure outcomes:
	  - Knowledge
	  - Behavior: DPI and DEI
	  - nPCR and sAlb
		Methods of helping: assessing and identifying personal health conditions; teaching; guiding; providing information
		• Introduce and overview program (teaching, guiding, and supporting)
		• Assess the preparation of the participant
		• Collect personal and health information
		• Assess knowledge of protein and energy intake by the questionnaire
		• Assess dietary behavior
		• Collect clinical outcomes, including nPCR and sAlb

Phase 1: Enhancing self-awareness and knowledge (45-60 minutes)	- To teach, demonstrate, practice, and set goals on protein and energy intake - To measure outcomes: knowledge	• Guide for enhancing self-awareness of self-care ability in adequate protein and energy intake • Promote knowledge about protein and energy intake and provide booklet (teaching, guiding, and promoting) Guiding, teaching, coaching, and supporting
Phase 2: Supporting skill development 1 week after participating in the program (at HD unit follow-up 5-10 minutes)	- To develop self-care skills, provide continuing care and positive encouragement	• Reviewing food and assessing protein and energy intake behavior in a 24-hour food recall • Encouraging participant and develop skills of self-care • Developing self-care skills, calculating the amount of food in a 24-hour recall, especially on non HD day (3 days a week) • Practicing food exchange skills • Setting goal • Encouraging continuous self-care and self-monitoring
	- To assess knowledge of protein and energy	• Assessing knowledge of protein and energy intake
Phase 3: providing ongoing care and support 2-12 weeks after participating in the program (by phone or LINE application follow-up 5-10 minutes)	- To provide continuing care and positive encouragement - To assess the behavior of protein and energy intake and clinical outcomes	Teaching, guiding, and supporting • Assessing knowledge of protein and energy intake • Assessing the 24-hour recall of regular protein and energy intake • Collecting clinical outcome data, including sAlb and nPCR • Reviewing food in a 24-hour recall • Giving advice, encourage, and develop skills of self-care

Table A. Summary of the self-care promoting program focusing on protein and energy intake (Cont.)

Time schedule	Objectives of the content	Method of helping/Activities
4 weeks after participating in the program (by phone or LINE application follow-up 5-10 minutes)	- Follow-up and positive encouragement. - To assess knowledge, behavior of protein and energy intake, and clinical outcomes:	Teaching, guiding, supporting and assessing outcomes • Assess the 24-hour recall of regular protein and energy intake • Collect clinical outcome data, including sAlb and nPCR
5-7 weeks after participating in the program (by phone or LINE application, follow-up 5-10 minutes)	- Knowledge - Behavior: DPI and DEI - nPCR and sAlb	• Review food in a 24-hour recall • Give advice and encouragement
8 and 12 weeks after participating in the program. (at HD unit follow-up 10-15 minutes)	- To assess the behavior of protein and energy intake and clinical outcomes: - Behavior: DPI and DEI - nPCR and sAlb	Assessing outcomes • Visit participants • Assess the 24-hour recall of regular protein and energy intake • Collect clinical outcome data, including sAlb and nPCR

Note. HD = Hemodialysis, DPI = Dietary protein intake, DEI = Dietary energy intake, nPCR = Normalized protein catabolic rate, sAlb = Serum albumin

การพัฒนาความรู้ พฤติกรรมการบริโภค และผลลัพธ์ทางคลินิกโดยใช้โปรแกรมส่งเสริมการดูแลตนเอง ด้านการบริโภคโปรตีนและพลังงานในพระสงฆ์ที่ได้รับการฟอกเลือดด้วยเครื่องไตเทียม : การศึกษากึ่งทดลอง

สุรศักดิ์ ทะขัด นพวรรณ พินิจขจรเดช สุชิรา ชัยวิบูลย์ธรรม*

บทคัดย่อ: พระธรรมวินัยของพระสงฆ์ในพระพุทธศาสนามีข้อกำหนดเกี่ยวกับการฉันภัตตาหารและเครื่องดื่มอย่างเคร่งครัด แม้จะได้รับการยกเว้นตามพระธรรมวินัยในกรณีอาพาธ แต่พบว่าพระสงฆ์ส่วนใหญ่ยังคงเคร่งครัดยึดถือปฏิบัติในการฉันภัตตาหารเพียงวันละ 1 ถึง 2 มื้อ ข้อจำกัดดังกล่าวนำไปสู่การได้รับสารอาหารไม่เพียงพอและเพิ่มความเสี่ยงต่อการเกิดภาวะทุพโภชนาการ ภาวะทุพโภชนาการและการสลายกล้ามเนื้อและพลังงาน (protein-energy wasting) เป็นปัญหาที่พบบ่อยในผู้ที่ได้รับการฟอกเลือดด้วยเครื่องไตเทียม ประเด็นดังกล่าวถือเป็นประเด็นสำคัญทางคลินิกที่ต้องเฝ้าระวังอย่างใกล้ชิดในกลุ่มพระสงฆ์ที่ได้รับการฟอกเลือดด้วยเครื่องไตเทียม การศึกษาแบบกลุ่มเดียววัดซ้ำนี้ มีวัตถุประสงค์เพื่อศึกษาผลของโปรแกรมสนับสนุนการดูแลตนเองด้านการบริโภคโปรตีนและพลังงานต่อความรู้ พฤติกรรมการฉันภัตตาหาร และผลลัพธ์ทางคลินิกในพระสงฆ์ที่ได้รับการฟอกเลือดด้วยเครื่องไตเทียม ณ โรงพยาบาลสงฆ์ ประเทศไทย จำนวน 30 รูป ซึ่งได้รับโปรแกรมเป็นระยะเวลา 12 สัปดาห์ เครื่องมือที่ใช้ในการวิจัย ได้แก่ 1) แบบสอบถามข้อมูลส่วนบุคคลและข้อมูลสุขภาพ 2) แบบสอบถามความรู้เกี่ยวกับการบริโภคโปรตีนและพลังงาน 3) แบบบันทึกการฉันภัตตาหารย้อนหลัง 24 ชั่วโมงเพื่อประเมินพฤติกรรมการดูแลตนเองด้านการฉันภัตตาหาร วิเคราะห์ข้อมูลโดยใช้สถิติบรรยาย และการวิเคราะห์ความแปรปรวนแบบวัดซ้ำหนึ่งทาง (one-way repeated measures ANOVA)

ผลการศึกษาพบว่า คะแนนเฉลี่ยด้านความรู้ พฤติกรรมการบริโภคอาหาร และผลลัพธ์ทางคลินิกเพิ่มขึ้นอย่างมีนัยสำคัญทางสถิติ โดยผลการวิเคราะห์ความแปรปรวนแบบวัดซ้ำพบว่า คะแนนด้านความรู้พัฒนาขึ้นอย่างมีนัยสำคัญตลอด 3 ช่วงเวลาของการประเมิน ในขณะที่พฤติกรรมการบริโภคอาหารและผลลัพธ์ทางคลินิกดีขึ้นอย่างมีนัยสำคัญตลอดทั้ง 4 ช่วงเวลา ผลการวิจัยชี้ให้เห็นว่าโปรแกรมสนับสนุนการดูแลตนเองดังกล่าวมีประสิทธิภาพในการส่งเสริมภาวะโภชนาการ และผลลัพธ์ทางคลินิกในระยะยาวสำหรับพระสงฆ์ที่ได้รับการฟอกเลือดด้วยเครื่องไตเทียม พยาบาลสามารถนำไปประยุกต์ใช้ในการปฏิบัติการพยาบาลได้ อย่างไรก็ตาม ควรมีการศึกษาผลของโปรแกรมเพิ่มเติมโดยใช้การทดลองแบบสุ่มและมีกลุ่มควบคุมในหน่วยไตเทียมหลายแห่งเพื่อยืนยันผลลัพธ์ของโปรแกรมต่อไป

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คำสำคัญ : พฤติกรรมการบริโภคอาหาร ปริมาณพลังงานที่ได้รับ สุขภาพ การฟอกเลือดด้วยเครื่องไตเทียม ทุพโภชนาการ พระสงฆ์ ปริมาณโปรตีนที่ได้รับ โปรแกรมสนับสนุนการดูแลตนเอง

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