International Journal of Science and Research (IJSR)
ISSN: 2319-7064
Impact Factor 2025: 7.089

Effectiveness of Self-Instructional Module on Knowledge Regarding Dietary Regulations among Chronic Renal Failure Patients Undergoing Hemodialysis in Selected Hemodialysis Unit, Bangalore

Gigy Mole[1], Melba Elizabth K[2]

[1]Master of Science in Nursing, Medical Surgical Nursing, Rajiv Gandhi University of Health Sciences, Bangalore

[2]Associate Professor / HOD Department of Medical Surgical Nursing, Koshys College of Nursing, Bangalore

Abstract: ***Background and Objectives: The number of chronic renal failure (CRF) patients undergoing hemodialysis is increasing worldwide. Kidney failure occurs when the kidneys can no longer clean the blood or eliminate excess fluid, leading to the need for dialysis. Dietary regulations play a crucial role in maintaining a balance of electrolytes, minerals, and fluids in patients on dialysis. These regulations help reduce complications, promote well-being, and enhance the effectiveness of hemodialysis. Considering this, the investigator conducted a study to evaluate the effectiveness of a self- instructional module (SIM) in improving the knowledge of chronic renal failure patients regarding dietary regulations. The objectives of the study are to: 1) Assess the pre-test knowledge regarding dietary regulations for patients undergoing hemodialysis. 2) Assess the post-test knowledge regarding dietary regulations for patient undergoing hemodialysis. 3) Evaluate the effectiveness of self-instructional module on knowledge regarding dietary regulations among patients undergoing hemodialysis. 4) Associate the pre-test knowledge regarding dietary regulations among hemodialysis patients with the selected demographic variables. Methods: A pre-experimental one-group pre-test and post-test design was used to evaluate the effectiveness of self-instructional module on knowledge regarding dietary regulations among chronic renal failure patients undergoing hemodialysis in selected hemodialysis unit. The study was conducted among 60 chronic renal failure patients undergoing hemodialysis at Koshys Hospital, Bangalore. A structured knowledge questionnaire was administered before and after the intervention to assess the participants' knowledge regarding dietary regulations. Results: The pre-test results showed that 9 (15.0%) participants had inadequate knowledge, 32 (53.3%) had moderately adequate knowledge, and 19 (31.7%) had adequate knowledge. After the implementation of the self-instructional module, none of the participants had inadequate knowledge. The post-test results revealed that 36 (60.0%) had moderately adequate knowledge, while 24 (40.0%) had adequate knowledge. The paired t-test value for overall knowledge improvement was 20.390, which was significant at $p < 0.05$. There was a significant association between pre-test knowledge and selected demographic variables such as age, educational status, family income, and duration of dialysis ($p < 0.05$). Interpretation and Conclusion: The results showed that majority of the patient's has 36 (60.0%) had moderately adequate knowledge, while 24 (40.0%) had adequate knowledge adequate knowledge regarding dietary regulations during hemodialysis. The findings indicate that the self-instructional module was effective in improving the knowledge of chronic renal failure patients regarding dietary regulations. It can be used as an educational tool to enhance patient knowledge and promote better adherence to dietary guidelines, ultimately improving health outcomes.***

Keywords: Chronic renal failure; Hemodialysis; Structured interview schedule

1. Introduction

"Protect your Kidney, Save your heart"
- William G. Couser and Miguel C. Riella

The kidneys are vital organs whose main functions are regulation of the fluid and electrolyte composition of body fluids and removal of metabolic end products from the blood. Basically, kidneys must be able to excrete dietary and metabolic waste products that are not eliminated by other organs. This usual amounts about one to two liters of water, 6-8gm of salt and 6-8 potassium chloride and 70 mg of acid equivalents per day. In addition, protein is ingested and metabolized into urea and other waste products which is excreted as urine.[1]

Renal Failure is present when the excretion of water, electrolytes and metabolic waste products are insufficient. Acute renal failure has a sudden onset and is frequently reversible. Chronic kidney disease (CKD) represents the gradual, substantial and irreversible reduction in the excretory and homeostatic functions of the kidneys. Glomerular filtration rate, the volume of blood filtered through the kidney per minute, is the best overall measure of kidney function. Normal GFR in young healthy adult is about 120-130 ml/min/1.73 m^2.and declines with age to about 75 ml/min /1.73 m^2 at the age of 70.Chronic kidney disease is defined by GFR less than 60 ml/min/1.73 m^2 for more than 3 months.[1]

Renal replacement therapy (RRT) replaces non-endocrine kidney functions in patients with renal failure. Techniques include intermittent hemodialysis, continuous hemofiltration and hemodialysis and peritoneal dialysis. All modalities exchange solute and remove fluid from the blood using dialysis and filtration across permeable membranes. The choice of techniques depends on multiple factors including the primary need example, solute or water removal or both underlying indication (example acute or chronic renal failure, poisoning, vascular access, hemodynamic stability, availability, local expertise and patient preference.[1]

Chronic kidney disease (CKD) is amongst major health issues globally. Chronic kidney disease has been increasing, amounting more than 800million world-wide and 8 million in India. A proper evaluation and management of these patients is necessary to prevent further loss of kidney function, to prevent cardiovascular diseases and to manage the co-morbid conditions like peripheral arterial diseases, stroke, hypertension etc. associated with renal failure and the complications due to renal failure.[2]

Patients undergoing hemodialysis have a high prevalence of Protein Energy Malnutrition (PEM) and inflammation. PEM and wasting are strong predictors of death among hemodialysis patients. There is a paucity of data regarding the prevalence and clinical consequences of PEM in the chronic renal failure. However, in patients on maintenance dialysis and renal transplant patients in developing countries, malnutrition is reported to be present in 42%–77%. The etiology of malnutrition in ESRD is complex and poor food intake because of anorexia, nausea and vomiting due to uremia, hormonal derangements, acidosis and increased energy expenditure. PEM is strongly associated with morbidity and mortality.[3]

In the home care context, there is lack of continuity and follow up of attention that the patients receive in the hospitals. Coordinating care provided to the patients in the hospital and the home is essential for hemodialysis therapy to fulfil its purpose and to be perform smoothly and to maintain patient wellness and quality of life. Patient education efforts are common in dialysis centers; however, disease self-management education-the teaching problem- solving skills in an attempt to allow chronic disease patients the best quality of life- is lacking in the current delivery of ESRD patients. Enhancing skills in self-management is particularly important for patients living with severe and/or chronic health condition. ESRD is no exception. Education on self-management may provide an opportunity to favorably impact outcomes, including hospitalization and mortality.[4]

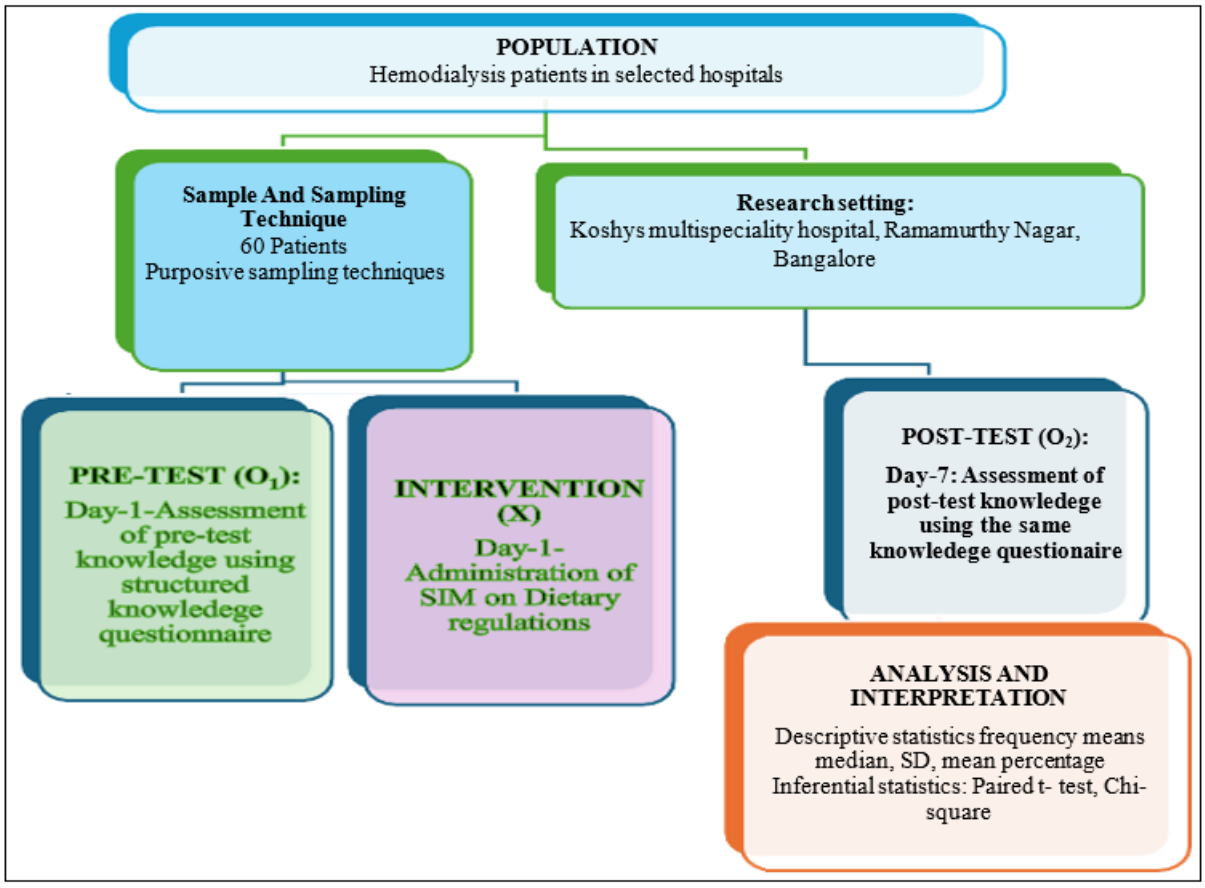
Steps in nutrition education have included a variety of approaches to convey the message: one-one counselling, group counselling, involvement in patient and family support groups, recipes with food samples, posters, videos, quizzes and competitions, newsletters and report cards. Nutrition tips are effective in practical nutrition education method in a simple format, where patients can make small change at a time in their diet.

The management of End Stage Renal Disease requires significant life style adjustments. Patients with End Stage Renal Disease are required to follow a complicated treatment protocol that includes frequent hemodialysis sessions, severe dietary restrictions, a complex medication regimen, and an exercise prescription. Failure to follow this regimen may result in short- & long- term consequences for health and survival. In short term, non-adherence to treatment regimens may increase the likelihood of emergency and hospital admissions. The development of additional co-morbidities, like cardio vascular disease, and mortality are potential long-term consequences. Adherence to dietary restrictions is an important determinant of health outcomes for patients with End Stage Renal Disease, an increase risk of complication and death is associated with dietary non adherence [5].

Increased protein catabolism, hypoalbuminemia and dialysis nutrient loss are the factors which causes malnutrition in patients undergoing hemodialysis. In dialysis patients, a healthy balanced diet is very important. The choice of diet and taking prescribed medications plays an important role in well-being of dialysis patient. The right amounts of energy, carbohydrate, protein, vitamins, minerals and fluids has to be taken. Some foods were better for our kidneys than others. Proper selection and preparation of food is essential. The knowledge on dietary regulations and fluid restrictions are important to maintain heath status in dialysis patients and this reduces the risk of mortality and morbidity. Hemodialysis patients has to give special attention to the nutrient content of foods which they consume to cope with excess fluid and metabolic waste. Patients on maintenance hemodialysis are receiving inadequate nutrition and several studies shows that toxins that accumulate with renal failure suppress appetite and contribute to nutritional decline.[6]

The global prevalence of chronic kidney disease (CKD) is increasing with the aging of populations worldwide. As kidney function declines, the accumulation of metabolic waste products and excessive electrolytes can significantly impair the health of patients with CKD. As nutritional management of patients with CKD is thought to control uremic symptoms and provide beneficial effects on the progression of kidney dysfunction, the diet of patients with CKD should be an important consideration in their care. Many guidelines recommend limiting protein intake in these patients, as high-protein diets aggravate kidney dysfunction. Excess sodium may be associated with CKD progression and all-cause mortality and, therefore, limiting salt intake is generally recommended. Low potassium is associated with muscle weakness and hypertension, whereas high potassium is associated with cardiac arrhythmia. Therefore, recent guidelines recommend adjusting dietary potassium intake on an individual basis to maintain serum potassium levels within the normal range. Appropriate dietary calcium intake is recommended to maintain calcium balance in patients with CKD G3, G4. Given the many dietary considerations for patients with CKD, effective nutritional management is challenging. Individualized strategies are needed to ensure the best outcome for patients with CKD [7].

2. Methods



3. Results

Table 2.2: Mean Standard Deviation and mean percentage of knowledge regarding dietary regulation among renal failure patients undergoing hemodialysis, **n =60**

S. No.	Aspects of knowledge regarding dietary regulation	Max score (30)	Pre test				Post test			
			Range	Mean	SD	Mean %	Range	Mean	SD	Mean %
1.	Anatomy and function of kidney	3	1-3	2.57	0.67	**85.7**	**1-3**	2.70	0.56	**90.0**
2.	Cause, signs, symptoms treatment	6	1-6	4.33	1.20	**72.2**	**2-6**	4.53	1.17	**75.5**
3	Dietary management on hemodialysis	21	5-19	12.48	3.50	**59.4**	**9-20**	14.80	2.85	**70.5**
Overall		30	9-28	19.28	4.82	**64.2**	**16-29**	22.03	3.96	**73.4**

The above table 2.2 shows the range, mean, SD and mean score percentage of knowledge regarding dietary regulation among renal failure patients undergoing hemodialysis. In pretest, the overall knowledge scores were ranging within the 9-28 with mean 19.28 and SD of 4.82 out of the maximum score of 30. The pretest mean percentage was 64.2%. But, after SIM it was increased to the range of 16-29 with mean 22.03 and SD of 3.96. The mean percentage was 73.4%. Similarly, the increase was found in aspects of knowledge regarding dietary regulation in between the pre and post- test. The above statistical outcomes evidenced that there was a increase in knowledge regarding dietary regulation among renal failure patients undergoing hemodialysis after the administration of SIM.

Section-3: Effectiveness of intervention of SIM on knowledge regarding dietary regulation among renal failure patients undergoing hemodialysis.

Table 3.1: Paired t-test analysis for statistical significance of pre and post-test knowledge regarding dietary regulation among renal failure patients undergoing hemodialysis, n =60

S. No.	Aspects of knowledge Related to disease	Max score	Paired t-difference (Enhancement)			t-test value	P-value
			Mean	SD	Mean %		
1.	Anatomy and function of kidney	3	0.13	0.43	4.3	2.399*	p<0.05
2	Cause, signs, symptoms treatment	6	0.20	0.51	3.3	3.013*	P<0.05
3	Dietary management on hemodialysis	21	2.31	1.63	11.0	11.001*	p<0.05
Overall		30	3.95	2.65	13.2	20.390*	P<0.05

Note. *-significant (p<0.05)

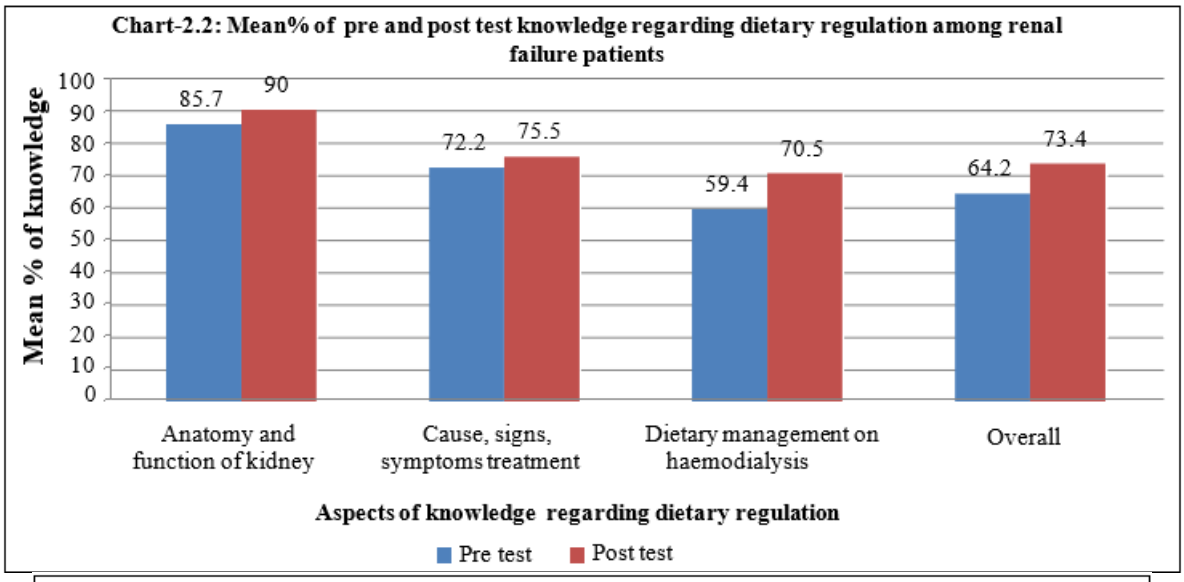
Hypothesis testing -1

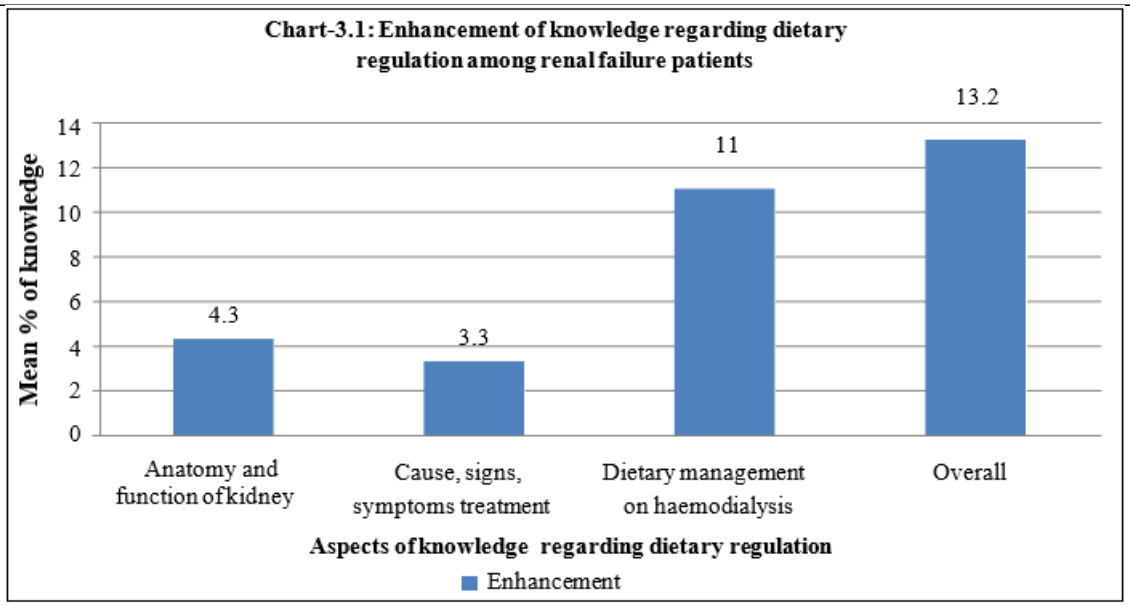
H0: There is **no** significant difference between the pre and post-test knowledge regarding dietary regulation among renal failure patients undergoing hemodialysis

Vs

H1: There is significant difference between the pre and post-test knowledge regarding dietary regulation among renal failure patients undergoing hemodialysis

The table 3.1 represents the pre and post-test knowledge regarding dietary regulation **among** renal failure patients undergoing hemodialysis. The paired t-test was carried out and it was found to be remain significant for all the three aspects of knowledge regarding dietary regulation and also the overall knowledge regarding dietary regulation. Hence, the null hypothesis (H01) was rejected and the research hypothesis (H1) was accepted. It provided the evidence that the intervention of SIM was significantly effective in improving the knowledge regarding dietary regulation among renal failure patients undergoing hemodialysis.





Section-4: Association between knowledge regarding dietary regulation with selected variables of renal failure patients undergoing hemodialysis.

Table 4.1: Association between pre-test level of knowledge regarding knowledge regarding dietary regulation with selected variables of renal failure patients undergoing hemodialysis, n=60

S. No	Demographic variables	Sample (n=60)		Pre-test knowledge				Chi- square value	p- value
				Below average		Above average			
		F	%	F	%	F	%		
	Age (Years)								
1.	a. 25-35	9	15.0	2	8.7	7	18.9	4.076, df=3, NS	P>0.00 5
	b. 36-45	6	10.0	2	8.7	4	10.0		
	c. 46-55	7	11.7	1	4.3	6	16.2		
	d. 56 & above	38	63.3	18	78.3	20	54.1		
2.	**Gender**								
	a. Male	38	63.3	10	43.5	28	75.7	**6.832, df=1, S**	**p<0.05**
	b. Female	22	36.7	13	56.5	9	24.3		

3	**Education status**								
	a. Professional degree	16	26.7	5	21.7	11	29.7	5.494, df=3, NS	p>0.05
	b. Graduate	25	41.7	8	34.8	12	45.9		
	c. Intermediate/ Diploma	5	8.3	1	4.3	4	10.8		
	d. High school/middle school	14	23.3	9	39.4	5	13.5		
	e. Illiterate	--	-	-	-	-	-		
4	**Occupational status**								
	a. Professional	22	36.7	6	26.1	16	26.1	4.737, df=3, NS	p>0.05
	b. Clerical/ Shop/ Farmer	2	3.3	0	0	2	5.4		
	c. Skilled worker	16	26.7	6	26.1	10	27.0		
	d. Unskilled worker	20	33.3	11	47.6	9	24.3		
	e. Unemployed	-	-	-	-	-	-		
5	**Religion**								
	a. Hindu	47	78.3	21	91.3	26	70.3	3.934, df=2, NS	p>0.05
	b. Muslim	11	18.3	2	8.7	9	24.3		
	c. Christian	2	3.3	0	0	2	5.4		
	d. Any other specify								
	Type of family								
6	a. Joint	28	46.7	14	60.9	14	37.8	3.023, df=1, NS	p>0.05
	b. Nuclear	32	53.3	9	39.1	23	62.2		
	c. Extended	-	-	-	-	-	-		
7	**Family income per month**								
	a. Below 10,000	2	3.3	0	0	2	5.4	6.819, df=4, NS	p>0.05
	b. 10,001-15,000	3	5.0	1	4.3	2	5.4		
	c. 15,001-20,000	9	15.0	6	26.1	3	8.1		
	d. 20,001-25,000	4	6.7	0	0	4	10.8		
	e. Above 25,001	42	70.0	16	69.6	26	70.3		
8	**Dietary pattern**								
	a. Vegetarian	33	55.0	14	60.9	19	51.4	0.519, df=1, NS	p>0.05
	b. No-vegetarian	27	45.0	9	39.1	18	48.6		
9	**Duration of illness**								
	a. Below one year	2	3.3	2	8.7	0	0	3.329, df=2, NS	p>0.05
	b. 1-2 years	22	36.7	8	34.8	14	37.8		
	c. 2-3 years	-	-	-	-	-	-		
	d. >3 years	36	60.0	13	56.5	23	62.2		
10	**Duration of dialysis**								
	a. <1 years	5	8.3	4	17.4	1	2.7	5.054, df=3	p>0.05
	b. 1- 2years	25	41.7	9	39.1	16	43.2		
	c. years	2	3.3	0	0	2	5.4		
	d. >3 years	28	46.7	10	43.5	18	48.6		
11	**History of any other chronic diseases**								
	a. Diabetic mellitus	24	40.0	11	47.6	13	35.1	4.532, df=4, NS	p>0.05
	b. Hypertension	22	36.7	7	30.4	15	40.5		
	c. Both diabetic and hypertension	4	6.7	0	0	4	10.8		
	d. Any other specify	7	11.7	4	17.4	3	8.1		
	e. None	3	5.0	1	4.3	2	5.4		
12	**Source of information regarding dietary regulation**								
	a. Family members	-	-	-	-	-	-	0.006, df=1, NS	p>0.05
	b. Friends	5	8.3	2	8.7	3	8.1		
	c. Mass media	-	-	-	-	-	-		
	d. Members health team	55	91.7	21	91.3	34	91.9		

Hypothesis testing-2:

H0: There is no significant association between the knowledge regarding dietary regulation among renal failure patients undergoing hemodialysis with their selected demographic variables

Vs

H1: There is significant association between the knowledge regarding dietary regulation **among** renal failure patients undergoing hemodialysis with their selected demographic variables.

Represents the association between knowledge regarding dietary regulation **a**mong renal failure patients undergoing hemodialysis with their selected demographic variables .The Chi- square test was carried out to assess the association, it was found to be significantly associated with gender (Chi-square =6.832, df=1, $p<0.05$) at $p<0.05$ level and for all other variables were found to be insignificant ($p>0.05$) hence the null hypothesis (H02) was rejected and the research hypothesis (H2) was accepted. It provides the evidence that there was significant association between knowledge regarding dietary regulation among renal failure patients undergoing hemodialysis with their selected demographic variables.

4. Discussion

Hypothesis testing -1

H1: There is significant difference between the pre and post-

test knowledge regarding dietary regulation among renal failure patients undergoing hemodialysis.

The pre and post-test knowledge regarding dietary regulation among renal failure patients undergoing hemodialysis. The paired t-test was carried out and it was found to be remain significant for all the three aspects of knowledge regarding dietary regulation and also the overall knowledge regarding dietary regulation. Hence, the null hypothesis (H01) was rejected and the research hypothesis (H1) was accepted. It provided the evidence that the intervention of SIM was significantly effective in improving the knowledge regarding dietary regulation among renal failure patients undergoing hemodialysis.

Similar cross-sectional cohort study was conducted to determine the effectiveness of patient knowledge in improving calcium-phosphate (Ca x P) balance among hemodialysis patients at 2 centers in Singapore with serum phosphate levels ≥ 4.5 mg/dL and a Ca × P product > 55 mg^2/dl^2. The patients were interviewed to determine their knowledge of phosphate binders, compliance and dietary restrictions. 31 patients were enrolled in the study and 30 patients were kept as controls. In the control group, no formal counseling was done. Formal counseling was provided to study group to ensure that the patients were aware of the importance of taking their phosphate binders and maintaining dietary regulations. After counseling 39% of patients in the study group were having significant decrease in the serum phosphate level (8.6 ± 0.4 vs 7.4 ± 0.6 mg/dl, $p < 0.05$) and Ca × P product (83.6 ± 4.9 vs 68.9 ± 5.6 mg^2/dl^2, $p < 0.01$), which showed an increase in the knowledge level regarding phosphate binders and dietary restrictions[40]

Association between knowledge regarding knowledge regarding dietary regulation with selected variables of renal failure patients undergoing hemodialysis.

H2: There is significant association between the knowledge regarding dietary regulation among renal failure patients undergoing hemodialysis with their selected demographic variables.

The association between knowledge regarding dietary regulation **a**mong renal failure patients undergoing hemodialysis with their selected demographic variables .The Chi-square test was carried out to assess the association, it was found to be significantly associated with gender (Chi-square =6.832, df=1, $p<0.05$) at $p<0.05$ level and for all other variables were found to be insignificant ($p>0.05$) hence the null hypothesis (H02) was rejected and the research hypothesis (H2) was accepted. It provides the evidence that there was significant association between knowledge regarding dietary regulation among renal failure patients undergoing hemodialysis with their selected demographic variables

A study involving 60 hemodialysis patients in Bangladesh undergoing hemodialysis demonstrated significant improvements in dietary practices after the introduction of the nutrition booklet. Key findings included: Reduction in serum potassium and phosphorus levels. Increased frequency of meals consumed per day. Enhanced adherence to renal-specific cooking methods and vegetable preferences. The study utilized a 30-item by convenience sampling technique. After 7 days of post-test was to assess the effectiveness of the study. The statistical analysis shows that 86.7% of patients had moderate knowledge and 13.3% of the patients had inadequate knowledge. The mean pre-test knowledge score regarding dietary management was 13.96 with standard deviation of 3.39. After intervention the mean score increased to 23.00 with a standard deviation of 2.38 the study was effective in improving the knowledge. It was showed that there was association with pre-test knowledge and selected variables and association of post-test knowledge and selected variables. The provision of renal-specific nutrition knowledge through the developed booklet has shown promising results in improving dietary practices among Bangladeshi hemodialysis patients[46]

5. Conclusion

The findings of this study suggest that the self-instructional module was effective in enhancing the knowledge of chronic renal failure patients regarding dietary regulations. Health professionals should continue to provide education and reinforce adherence to dietary regulations to improve the quality of life for these patients.

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