Therapeutic Nutrition Adherence among Hemodialysis Patient's: Nursing Instructions

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Abstract

Background: The success of dialysis depends on the patient's adherence to the prescribed treatment regimen, fluids, and dietary plans, and non-compliance will lead to deterioration in the patient's condition. **The aim of the study** is to evaluate the therapeutic nutrition adherence level among hemodialysis patients after receiving nursing instructions. **Research design:** A quasi-experimental research design will be utilized to fulfill the aim of this study. Setting: This study will be carried out at the hemodialysis unit at the Nephrology and Urology Hospital at Minia University, Minia City, Egypt. Subjects: A purposive sample is composed of 87 patients according to the sample size formula, and those willing to participate in the study will be included. **Tools of Data Collection:** Three tools were designed and used for collecting data for this study. The first tool was an interview questionnaire sheet, which includes two parts. 1st Part: Socio demographics, and 2nd Part: Medical Data of the Patient, Second Tool: Therapeutic Nutrition Adherence Questionnaire, which includes three parts. 1st Part: Diet Adherence Questionnaire, 2nd Part: Fluid Adherence, 3rd Part: Weight Measurements and Third Tool: Pitting Edema Scale Educational Protocol about Nursing Instruction for Hemodialysis Patients' **Results**: There was a highly statistically significant improvement in the patient's response to diet and fluid restrictions compared to pre- and post-intervention. **Recommendation**: Greater attention and close observation from the hospital on patient adherence to therapeutic nutrition and replication of the study should be done on a large sample.

Key Words: Adherence, Hemodialysis, Nursing Instructions, Therapeutic Nutrition

Introduction

Hemodialysis is a life-saving therapy for people with end-stage renal disease (ESRD) that entails utilizing an artificial kidney to remove toxins and extra fluids from the blood. **(Kassim et al., 2023)**

Patients with end-stage renal disease (ESRD) get renal replacement treatment (RRT), mostly through hemodialysis (HD). It makes up over 89% of all dialysis patients worldwide, and over the next few decades, it is anticipated that HD utilization will continue to rise. **(Gan et al., 2023).**

The success of a dialysis modality for any given individual is not simply a function of medical suitability, but is crucially dependent on the continued support and effectiveness of the dialysis provider. For most people, both the main dialysis modalities, hemodialysis (HD) and peritoneal dialysis (PD), are feasible, and a long life on kidney replacement therapy may well be best achieved by integrating more than one modality over time, typically in combination with transplantation. **(Lambie et al., 2023).**

Non adherence among HD patients includes the following, according to the National Kidney Foundation-Kidney Disease Outcomes Quality Initiative (NKF-KDOQI): (a) skipping or reducing the HD session; (b) consuming excessive amounts of potassium- and phosphorus-containing beverages and foods; and (c) failing to take medication as prescribed. Non adherence to dialysis treatment has been generally reported at rates between 8.5% and 22.1% worldwide. Non adherence is associated with increased mortality risk (skipping treatment, excessive IDWG, and high phosphate) and with hospitalization risk. The success of treatment depends to a large extent on adherence to the strictly recommended therapeutic regimen. To improve adherence, patients' knowledge of disease management should be improved. Some studies have shown that patients' knowledge of disease and treatment is associated with an increased level of adherence. **(Dsouza et al., 2023).**

Adherence is the degree to which a person follows a prescribed therapeutic regimen including taking medications, adhering to a recommended diet regimen, and implementing lifestyle changes.**(Sultan et al., 2022).**

The dialysis nurse must receive additional training to be able to provide care for ESRD patient. Nurse are responsible for direct care for patients undergoing hemodialysis, making assessment patient's condition and making conferences when needed as necessary based on the patient's physical, emotional, and social condition. **(Kallenbach, 2020)** Hemodialysis patients' dietary restrictions are recommended to prevent deterioration of kidney functions and reduce the risk of morbidity and mortality.**(Opiyo et al., 2019).**

SIGNIFICANCE of THE STUDY

The success of dialysis depends on the patient's adherence to the prescribed treatment regimen, fluids, and dietary plans, and non-compliance will lead to deterioration in the patient's condition. **(Maxudova, 2019).**

Chronic kidney disease (CKD) is a major public health problem worldwide; hemodialysis (HD) treatment is effectively used to manage the condition. In Egypt, there are

nearly 56,000 hemodialysis patients all over the country, as recorded by the Egyptian Ministry of Health Registry.**(Megahed *et al.*, 2019).**

Number of patients undergoing hemodialysis at the nephrology and urology hospital at Minia University in 2019 (175 patients) and number of patients in 2020 (164 patients).

Investigator observed that hemodialysis patients' lack of knowledge about the recommended diet and fluid intake. Patients eat at the dialysis unit any food and drink a large amount of fluid. They thought it was right to eat any kind of food and drink a large volume of fluid because they are on dialysis, and hemodialysis machines make filtration of the blood.

Aim of the Study

Evaluate the therapeutic nutrition adherence level among hemodialysis patients after receiving nursing instructions.

Research Hypotheses

Therapeutic nutrition adherence among hemodialysis patients will be improved after the nursing instruction**.**

Subjects and Methods
Research Design:

A quasi-experimental research design (pretest and post-test after one month and follow-up after two months) was utilized to fulfill the aim of this study.

Setting:

This study was carried out at the Hemodialysis Unit at the Nephrology and Urology Hospital at Minia University, Minia City, Egypt.

Study Duration:

The current study was conducted over a period of six months (starting in July 2021 and ending in December 2021).

Subjects:

A purposive sample was composed of **(87)** patients who were willing to participate in the study according to the sample size formula:

Sample Size

N= required sample size. T= confidence level at 95% (standard value of 1.960). P= estimated prevalence of fluid and dietary adherence among patients undergoing hemodialysis at Minia University Nephrology and Urology Hospital 2019 (0.06).

$$ N = \frac{t^2 \times p(1-p)}{m^2} $$

$$ N = \frac{(1.96)^2 \times 0.06(1-0.06)}{0.05^2} \quad N = 87 $$

m = margin of error at 5 % (standard value of 0.050).

Inclusion Criteria:

End Stage Renal Disease (ESRD) patients ranging in age from 18 years to < 65 years who are undergoing hemodialysis and have completed at least three months to less than five years of maintenance hemodialysis on a regular basis, as well as hemodialysis patients who have hypertension disease

Exclusion Criteria

Patients with acute renal failure and patients undergoing peritoneal dialysis.

Tools of Data Collection

The current study data was collected over a period of six months (starting in July 2021 and ending in December 2021) by using three tools. These tools were developed by the investigator after revising an extensive relevant literature review and being revised by a panel of five experts in the fields of Medical Surgical Nursing and Critical Care Nursing at the Faculty of Nursing at Minia and Assuit University.

First Tool: "Interview Questionnaire" to assess socio-demographic and medical data of the patient, adapted from**(Beerappa *et al.*, 2019).** Filled by the investigator, it includes (two parts):

First Part: Socio-demographic Data of the patient includes age, gender, level of education, occupation, income, marital status, religion, and residency.

Second Part: Medical Data of the patient, including source of information about therapeutic nutrition (doctor, dietitian television, social media, educational program, Non) - the length of time on hemodialysis; - family history of renal failure; - vascular access. weight, height, and body mass index blood pressure respiration; interdialytic weight gain (good adherence: IDWG < 1 kg/day; fair adherence: IDWG) 1–2 kg/day (poor adherence: IDWG > 2 kg/day) - attendance to dialysis for 3 months (not missed any dialysis session, missed out on 1 dialysis session, missed out on 2 dialysis sessions, biochemical marker (serum creatinine level, serum urea level, blood hemoglobin).

Second Tool: Therapeutic Nutrition Adherence Questionnaire

Comprised of three parts The first part of the diet adherence questioner includes ten items; the second part of the fluid adherence questioner includes four items; and the third part of the weight measurements includes one item adapted from **(Bishop *et al.*, 2019; Kim *et al.*, 2010). And** modified by the investigator.

First Part: Diet Adherence Questionnaire includes ten items that cover the types and amounts of diet recommended per day. The scoring system is: Each item was observed, categorized, and scored as either none of the time response = (1), once response = (2), or twice response = (3). The correct answer is once.

Second Part Fluid Adherence includes four items that cover the types and amounts of fluid recommended per day in the scoring system: Each item was observed, categorized, and scored as either a none of the time response = (1), a once response = (2), or a twice response = (3). The correct answer is once.

Third Part: Weight Measurements include one item that covers daily weight measurement at home. The item was observed, categorized, and scored as either none of the time response = (1), once response = (2), or twice response = (3). The correct answer is twice.

Third Tool: Pitting Edema Scale, the third tool adopted from (Brodovicz *et al.*, 2009). Used as an indication of the patient's therapeutic nutrition adherence. The items of the tool were observed, categorized, and scored into:

0 + No pitting edema.

1 + Mild pitting edema 2 mm of depression that disappears rapidly.

2 + Moderate pitting edema 4 mm of depression that disappears in 10-15 seconds.

3 + moderately severe pitting edema. 6 mm of depression that may last more than 1 minute.

4 + Severe pitting edema. 8 mm of depression that can last more than 2 minutes.

Validity and Reliability:

Content and construct validity of the study tools were tested by a jury committee that consists of five experts in the field of Medical Surgical nursing from the Faculty of Nursing at Minia and Assuit University to assure the content and construct validity, completeness, clarity of items, and necessary modifications were done accordingly.

Reliability for the study tools was estimated using the Cronbach's Alpha test to measure their internal consistency and evaluate how well the tools consistently measure what they were designed to measure. It was ((0.96)) for the first tool, ((0.86)) for the second tool, and (0.89) for the third tool.

Pilot Study

A pilot study was conducted to ascertain the clarity, feasibility, and applicability of the study tools. It was conducted on 10% of the study patients at the hemodialysis unit at the Nephrology and Urology Hospital at Minia University who fulfilled the inclusion criteria to test the feasibility, objectivity, and applicability of the study tools and to estimate the needed time to complete the data collection.

Ethical Consideration

Official permission to conduct the study was obtained from the Nursing Faculty Research Ethics Committee at Minia University in Egypt. The aim and importance of the study were clearly explained to each participant. Following that, informed consent was obtained from participants who accepted to be included in the study. Agreement from Egypt's academics for the research center and technology and from the Directors of Dialysis Units at Minia Nephrology and Urology Hospital. Patients were informed that their data would not be included in any further research without their consent. The confidentiality and anonymity of each subject were assured through the coding of all data.

Procedure

The current study was achieved through three phases: the assessment phase pre-test, the implementation phase, and the evaluation phase: the first post-test after one month, and the second post-test follow-up phase after two months.

Assessment and Planning Phase:

Once official permission was granted, the assessment phase and pre-test were collected for four weeks to test the studied patients' actual level of knowledge about therapeutic nutrition adherence among hemodialysis patients.

The investigator collected the sample three days per week (in the morning and evening shifts). During the assessment phase, the investigator held the first meeting with patients to introduce herself and give an explanation about the nature and purpose of the study. After obtaining the patient's acceptance (oral consent) to participate in the current study, the investigator provided an overview and clarification about the assessment questionnaire. The questionnaire was filled out by the investigator the total sample of 87 was divided into nine groups, and each group received (4) sessions.

First Patient Interview of the Assessment Phase (pre-test) the investigator used the first **tool. 1st Part: Socio Demographic Data:** 2nd Part: Medical Data to assess the medical data of the patient **Second Tool: Therapeutic Nutrition Adherence Questionnaire,** which includes the 1st Part: Diet Adherence Questionnaire, the 2nd Part: fluid adherence, and the 3rd Part: Weight Measurements.

Third Tool: Pitting Edema Scale.
B. Implementation Phase:

The investigator provided each patient group with the same number of teaching sessions regarding therapeutic nutrition adherence; each session takes about 30–45 minutes. The appointment for an educational session is scheduled with each patient according to their clinical condition.

The Implementation Phase

This phase includes four sessions: First session: the investigator explained to the patient the introduction to the kidneys, its function, chronic renal failure definition, causes, signs, and symptoms, complications, laboratory investigation to diagnose the condition, and treatment. **Second session:** the investigator clarified to the patient the definition of dialysis, types of vascular access used, dangerous symptoms that require going to the hospital, and instructions to maintain fistula vascular access. **Third session:** the investigator discussed with the patient therapeutic nutrition related to diet for hemodialysis, problems that occur to the patient, and how to overcome them. **Fourth session:** the investigator discussed with the patient therapeutic nutrition related to fluid for hemodialysis and measures to control thirst.

The entire study sample received a booklet as a guide (in Arabic) it was developed by the investigator and revised by 5 panels of medical surgical nursing staff; it was included (knowledge about Therapeutic nutrition adherence among hemodialysis patients. Then allow patients to ask questions, discuss, and reach a high level of understanding.

Evaluation Phase:

Evaluation was done for each patient twice. The first-time evaluation (the first post-test) was done one month after the end of the explanation and receipt of the booklet about therapeutic nutrition adherence for hemodialysis patients. The investigator used the first tool, the second part of medical data; the second tool, the therapeutic nutrition adherence questionnaire; and the third tool, the Pitting Edema Scale. A second-time evaluation (second post-test) was conducted two months after receiving the booklet about therapeutic nutrition adherence for hemodialysis patients. The investigator used the previously listed tool parts mentioned in the first evaluation.

IV. Statistical Design:
Statistical methods for data analysis

The collected data were organized, tabulated, categorized analyzed, and data entry was performed using the Statistical Package of Social Science **(SPSS)** version **(20)**. Descriptive statistics were applied (e. g mean, standard deviation, frequency, and percentage). Pearson's correlation coefficient was applied between quantitative variables. A significant level value was considered when $p < 0.05$. The smaller the p-value obtained, the more significant the result (*); less than (0.001) was considered highly significant (**). The P-value is the probability of error of the conclusion

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Results

Table (1): Medical Data Mean Score among Studied Patient Pre and Post Test   (n=87)

| Variable	Pretest n=87)	Post Test (n=87)		ANOVA Test	P-value
	Mean ± SD	Mean ± SD 1st Observation Post One Month	Mean ± SD 2nd Observation Post Two Month		
Respiration	24.4 ± 1.34	23 ± 1.23	23.2 ± 1.29	38.3	0.001**
Systolic Blood Pressure	129.8 ± 18.4	119.7 ± 8.34	118.7 ± 6.4	45.2	0.001**
Diastolic Blood Pressure	83.2 ± 11.4	77.2 ± 5.21	77.4 ± 4.37	30.2	0.001**
BMI	24.8 ± 4.76	24.8 ± 4.90	24.8 ± 4.79	0.88	0.916

* Statistical Significant Difference (P ≤ 0.05)   ** Highly Statistical Significant Difference (P ≤ 0.01)

Table (1): Reveals a significant improvement in blood pressure and respiration parameters posttest, represented by a P value (0.001). In addition, it shows that the mean and standard deviation of BMI among the studied patients pre- and post-test remained relatively constant, with no statistically significant difference represented by a P value (0. 916).
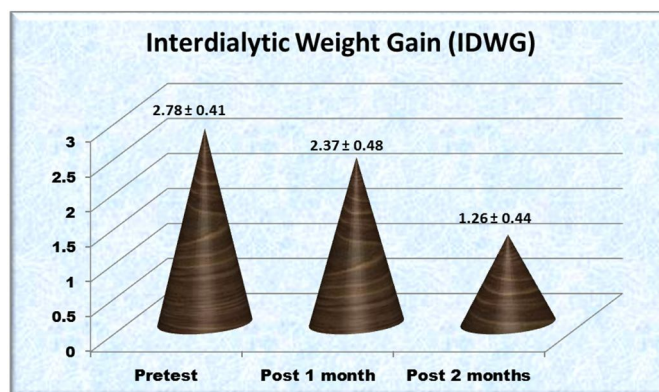

Figure (1): Mean Score of Interdialytic Weight Gain Pre and Post Test

Figure (1): Illustrates a reduction in the mean and standard deviation of interdialytic weight gain at the 1st and 2nd observations compared with the pretest.
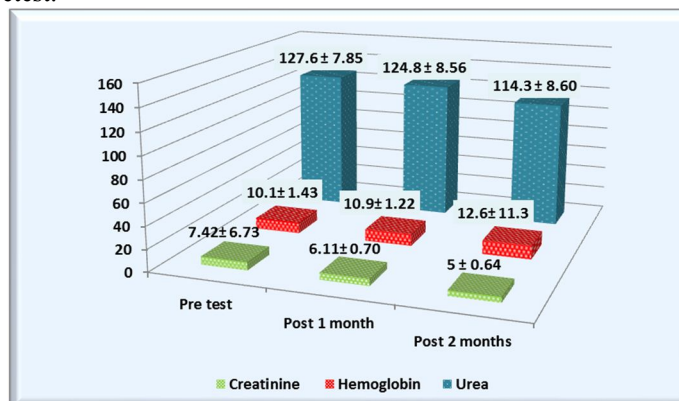
Figure (2): Biochemical Marker Mean Score of Studied Patient Pre and Post Test (n=87)

Figure (2): Reveals a significant reduction in the mean and standard deviation of urea and creatinine post-first and second observation. In addition, the figure shows a significant improvement in haemoglobin level post-first and second observation.
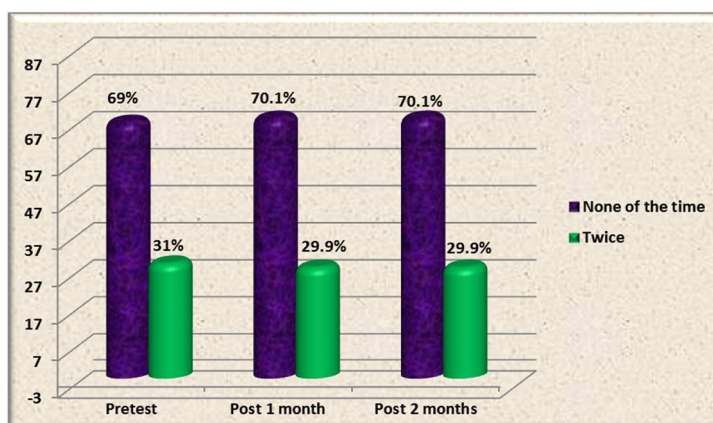
Figure (3): Frequency & Percentage Distribution of Studied Patient Regarding Weight Measurements At Home between Sessions (n=87) Figure (3): Shows that the highest percentage of studied patients never weigh themselves at home before and after nursing instructions.

Table (2): Distribution of Studied Patient Regarding to Their Total Diet and Fluid Adherence Pre and Post Test (n=87).

Variable	Pretest (n=87)		Posttest (n=87)				Friedman test (P-value)
			1st Observation Post One Month		2nd Observation Post Two Month		
	No	%	No	%	No	%	
1. Diet Adherence							
- Poor	87	100	5	5.74	0	0	164.5
- Good	0	0	82	94.25	87	100	(0.001**)
2. Fluid Adherence							
- Poor	87	100	6	6.89	21	24.13	121.1
- Good	0	0	81	93.10	66	75.86	(0.001**)

* Statistical Significant Difference (P ≤ 0.05)   ** Highly Statistical Significant Difference (P ≤ 0.01)

     Table (2): demonstrated that the highest percentage of the studied patients had a good adherence level regarding diet and fluids at the 1st and 2nd observations after nursing instructions, with a highly statistically significant difference.
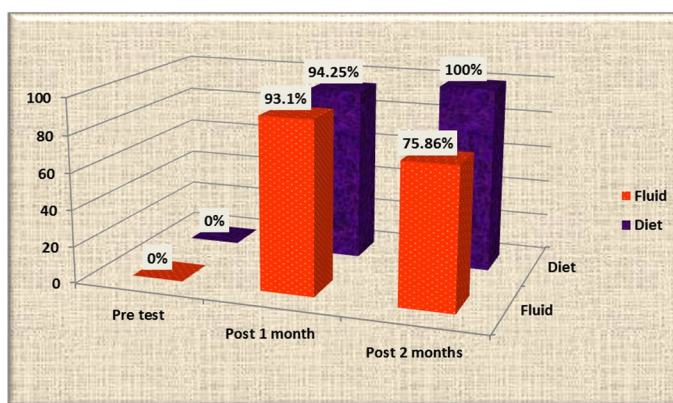

Figure (4): Frequency & Percentage Distribution of Studied Patient Regarding to Their Total Diet and Fluid Adherence Pre and Post Test (n=87).

     Figure (4): Illustrated that all studied patients did not adhere to the therapeutic diet and fluids at the pretest, while the percentage of adherence regarding diet increased at the 1st and 2nd observations post-nursing instructions presented by (94.25%, 100%) respectively. in relation to fluid adherence among studied patients increased at the 1st observation while declining at the 2nd observation post-nursing instructions presented by (93.1% and 75.86%), respectively.
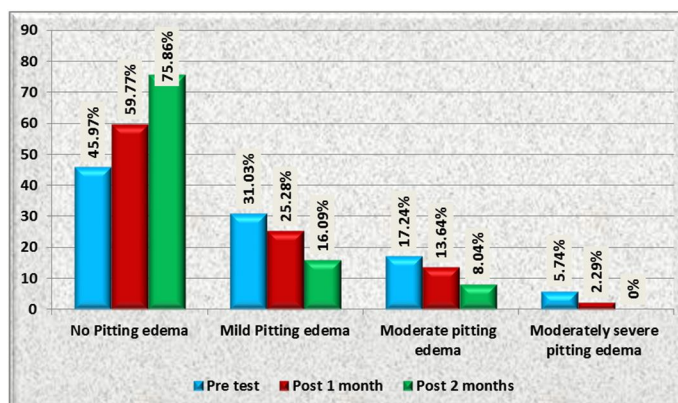

Figure (5): Frequency & Percentage Distribution of Studied Patient Regarding to Pitting Edema Degree Pre and Post Test (n=87)

     Figure (5): Reveals that there is a significant improvement in the pitting edema degree among the studied patients at the 2nd observation compared to the pretest, represented by (75.86% and 45.97%) respectively.

Table (3): Relation between Socio-demographic Data and Diet Adherence among Studied Patient (n= 87)

Socio-demographic Data	Diet Adherence (n=87)				P value
	Good (n=86)		Poor (n=1)		
	No	%	No	%	
Age / Years					
18-39	27	31.39	0	0	1.24
40-59	38	44.18	1	100	0.537
60-64	21	24.41	0	0	
Gender					
Male	45	52.32	1	100	0.902
Female	41	47.67	0	0	0.342
Marital Status					
Single	15	17.44	0	0	
Married	68	79.06	1	100	0.264

Socio-demographic Data	Diet Adherence (n=87)				P value
	Good (n=86)		Poor (n=1)		
	No	%	No	%	
Divorced	2	2.32	0	0	0.969
Widow	1	1.16	0	0	
Level of Education					
Illiterate	34	39.53	1	100	
Read and Write	28	32.55	0	0	3.62
Primary – Preparatory	5	5.81	0	0	
University	19	22.09	0	0	0.305
Occupation					
Employee	8	9.30	1	100	6.04
Unemployed / Retired	49	56.97	0	0	
House wife	24	27.90	0	0	0.161
Farmer	5	5.81	0	0	
Residence					
Rural	61	70.93	0	0	2.37
Urban	25	29.06	1	100	0.123
Monthly Income					
Enough	86	100	1	100	………
Not-enough	0	0	0	0	

* Statistical Significant Difference (P ≤ 0.05)   ** Highly Statistical Significant Difference (P ≤ 0.01)

Table (3): Reveals that less than half of the studied patients who had good adherence to diet instructions were in the age group of 40–59 years. Moreover, it was found that the (52.32%) of them were males. In addition, it was noticed that 79.06 percent of them were married. Also, the table revealed that (32.55%) of them read and write. In relation to occupation, (56.97%) of them were unemployed, and (70.93%) of them came from rural areas. It can be noticed that (100%) of the studied patients have a sufficient monthly income.

Table (4): Relation between Medical Data and Diet Adherence among Studied Patient (n= 87)

Variables	Diet Adherence				P value
	Good (n=86)		Poor (n=1)		
	No	%	No	%	
Family History of Renal Failure:-					
Yes	17	19.76	0	0	0.246
No	69	80.23	1	100	0.620
Vascular Access used					
Fistula	79	91.86	1	100	0.089
Catheter	7	8.13	0	0	0.766
Graft	0	0	0	0	
Duration of End-Stage Renal Disease (ESRD):-					
3 Months to 1 year	22	25.58	0	0	
More than a year to 2 years	6	6.97	1	100	6.45
More than 2 years to 3 years	9	10.46	0	0	0.080
More than 3 years to 5 years	21	24.41	0	0	
More than 5 years to 10 years	28	32.55	0	0	
Information about Therapeutic Nutrition					
Yes	13	15.11	0	0	0.178
No	73	84.88	1	100	0.673
Attendance to dialysis 3 months					
Not missed any dialysis session	79	91.86	1	100	0.089
missed out 1 dialysis session	0	0	0	0	0.766
missed out 2 dialysis session	7	8.13	0	0	

* Statistical Significant Difference (P ≤ 0.05)   ** Highly Statistical Significant Difference (P ≤ 0.01)

Table (4): In addition the table reveals that the highest percentage among studied patient who had a good adherence to diet instructions didn't have any family history of renal failure (80.23%), have a fistula as an access for dialysis (91.86%) and didn't missed any dialysis session (91.86%).

Table (5): Correlations between Diet and Fluid Adherence and Interadialytic Weight Gain (IDWG) among Studied Patient Post Test (n= 87)

IDWG	Diet		Fluid	
	r	*P*	*r*	*p*
	- 0.340	0.001**	0.594	0.000**

* Statistical Significant Difference (P ≤ 0.05)   ** Highly Statistical Significant Difference (P ≤ 0.01)

Table (5): Shows a no significant positive correlation between diet adherence and interadialytic weight gain among the studied patients at the 1st and 2nd observations post-nursing instructions, while it was noticed that there was a significant positive correlation between fluid adherence and interadialytic weight gain among the studied patients after one and two months post-nursing instructions.

Table (6): Correlations between Diet and Fluid Adherence and Pitting Edema among Studied Patient Post Test (n= 87)

Pitting Edema	Post Test			
	Diet		Fluid	
	R	P	r	P
	- 0.030	0.780	- 0.311	0.001*

* Statistical Significant Difference (P ≤ 0.05)   ** Highly Statistical Significant Difference (P ≤ 0.01)

Table (6): Reveals a no significant positive correlation between diet adherence and pitting edema degree among studied patients at the 1st and 2nd observations post-nursing instructions, while it was noticed that there was a significant positive correlation between fluid adherences and pitting edema degree among them post-nursing instructions.

Discussion

Peoples with ESRD need strict medical dietary therapy throughout the duration of their illness. It is very essential for the Peoples to be aware about the proper nutritional requirements, such as a low sodium, low potassium, low phosphorus, low fluid, and high protein diet to prevent dietary issues. The need for constant dietary instructions must be given, especially for Peoples receiving long-term HD.**(Kanagarajah et al., 2022).**

Concerning the patient's BMI It was noted that they remained relatively constant before and after nursing instructions. A possible explanation of this result would be attributed to the fact that BMI requires a longer time to become ideal. This result is opposite **(Mohamed et al., 2018)** who revealed that there was a significant reduction in BMI during the posttest.

The findings of the current study are explained by the investigator's perspectives as a significant reduction in serum urea and creatinine levels and also a significant improvement in haemoglobin levels after nursing instructions. These results might be attributed to therapeutic nutrition adherence. This finding was similar to a study by **(Aboserea et al., 2019)** who found a highly statistically significant decrease in creatinine and urea levels after intervention, in addition to a highly statistically significant improvement in hemoglobin levels after intervention.

The present result revealed a significant improvement in patients' therapeutic adherence. From the investigator's point of view, the patient responses improved after implementing nursing instructions about recommended diets and fluids, as the studied patients understood the importance of those instructions in controlling their conditions and overcame difficulties adhering to therapeutic diet and fluid instructions. In the same line study by **(Fadlalmola et al., 2020).** It was demonstrated that the patient's knowledge about the dietary fluid requirements during hemodialysis treatment increased from pretest to posttest. Also, a recent finding was consistent with **(Fauzi et al., 2022)** finding that diet and fluid self-care performance were higher after the hemodialysis diet education program than before participation among the studied subjects.

Concerning the edema, it was observed that increased adherence to nursing instructions decreased the degree of edema. This outcome was similar to the study conducted by **(Kaplan et al., 2022),** which documented that regular education of patients' about therapeutic diet, fluid intake, and disease management affects their adherence to the disease positively.

According to the present study, there was a statistically significant relationship between therapeutic nutrition adherence and the age of the studied patients. The findings of the current study explain, from the perspective of the investigator, that young adults face difficulties in complying with dietary and fluid restrictions more easily than the elderly. The present study finding was supported by **(Tashani et al., 2021)** Also, the current result agreed with **(Başer et al., 2019).**The study demonstrated that non-adherence to diet and fluid restrictions decreased as age increased.

The current study revealed that males had a higher adherence to therapeutic diet instructions than females. From the investigator's point of view, male patients may have more responsibilities in their families, so they had the highest adherence. The current study findings agreed with those of the **(Luitel et al., 2020)** study, which reported that males had higher adherence to therapeutic instructions than females.

The current study revealed that the majority of studied patients who had good diet and fluid adherence were married; the investigators perspectives were that the families of patients support and encourage them to follow the therapeutic instructions. These findings were in line with those of **(Victoria et al., 2015)** who reported that social support affected patient results and their adherence to treatment.

Regarding level of education, the current study revealed that patients with a higher level of education had good adherence to therapeutic diet and fluid instructions. From the investigator's point of view, patients with a higher education level had the highest knowledge regarding the importance of therapeutic adherence in maintaining their health status. The current study was in agreement with **(Alikari et al., 2018)** who reported that an important aspect that affected adherence was the educational level.

The current study revealed that more than half of the studied patient who had a good adherence level to diet and fluid restrictions were unemployed, **from the investigator's point of view**, being unemployed make the patients more likely to adhere to dialysis sessions and so more likely to adhere to nursing instructions regarding diet and fluid restrictions. This is supported by **(Lambert et al., 2017)** who reported that samples who were not working were more likely to adhere to a renal diet than employed patients.

The current study revealed that the majority of patients who displayed a good adherence level to diet and fluid restrictions had enough income. This is agreed by **(Benjamin et al., 2021)** who suggests that having a reliable income may facilitate adherence because of the ability to purchase the recommended foods.

The current study revealed that the adherence to diet and fluid restrictions is associated with increased duration of end stage renal disease; this is contradicted with **(Benjamin et al., 2021)** study reported that Patients with short duration of illness tended to adhere to dietary recommendations more than those with a long duration of illness. A previous study suggested that patients with long duration of CKD. From the investigator's point of view, this suggested that patient with long duration of CKD encounter challenges in managing a complex diet that they are required to practice for years.

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The current study revealed a significant positive correlation between fluid adherence and interdialytic weight gain among the studied patients after one and two months post-nursing instructions. A similar finding was established by (Raveinal *et al.*, 2020) who concluded that the IDWG for hemodialysis patients was influenced by many factors, and one of the causes was the adherence to restrictions on fluid intake and dietary salt. These results were matched with (Muliani *et al.*, 2021) who reported that the non-adherence of kidney patients to a low-sodium diet can endanger their health in terms of fluid retention and peripheral edema.

Conclusion

In light of the current study results and research hypothesis, the present result revealed a significant improvement in patient's therapeutic adherence after implementing nursing instruction about recommended diets and fluids.

Recommendations

Based on the findings of the recent study the researcher suggested that:

Nurses Recommendations:

Orientation and in-service training for nurses to advance nurse's knowledge and practice regarding therapeutic nutrition adherence.

Patients Recommendations:

Design leaflet includes instructions for hemodialysis patients regarding the importance of therapeutic nutrition adherence to improve patient's knowledge and practice regarding therapeutic nutrition adherence.

Future Research Recommendations:

Replication of the current study on a larger sample size from different Egyptian geographical areas to generalize the findings

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