The Effect of Nursing Educational Guideline on Fluid and Dietary Adherence Among Patient Undergoing Haemodialysis

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Abstract

Background: Adjusting lifestyle of end stage renal disease (ESRD) patients receiving haemodialysis by regulating fluid and dietary intake is important. In particular, adherence to the recommended dietary regimen is a key factor in achieving optimal clinical outcomes for dialysis patients. **Study aim**: This study aimed to assess the effect of nursing educational guideline on fluid and dietary adherence among patient undergoing haemodialysis. **Method:** a quantitative Pre and post quasi-experimental research design. A convenience sample of 60 patients was selected from Haemodialysis Units at the International Dialysis Centre, Jeddah, Saudi Arabia. Data was collected through using three tools: Patient assessment data sheet, adherence assessment data sheet, and Pre/post knowledge assessment data sheet. **Results:** There was a significant improvement in the mean total patients' knowledge after counselling regarding general knowledge, knowledge about fluid, knowledge about diet and overall knowledge with p value <0.001. In additional there was a significant improvement in the mean total patients' adherence after counselling regarding adherence about fluid, adherence about diet and overall adherence with p value <0.001. **Conclusion:** One of the most significant issues faced by haemodialysis patients is the non-adherence to fluid and diet restrictions. This study concluded that adherence to fluid and diet among the haemodialysis patient improved after providing nursing educational guideline as well as patients' knowledge increased. **Recommendation:** Further studies should be conducted for investigation of other barriers that increase non-adherence to fluid and diet restrictions.

Key Words: Nursing educational guideline, Haemodialysis patients, fluid, and dietary adherence.

Background:

End stage renal disease (ESRD) is one of largest worldwide public health disorder, that cause complete or nearly total chronic kidney failure. ESRD is gradual and sometimes irreversible decrease in the function of the kidneys, which is eventually fatal without the replacement therapy and transplantation of the kidney (Mersal et al., 2016). The prevalence of end-stage renal failure managed by dialysis is estimated at 604 cases, with a total mortality of 1,726 (9%), while the incidence of treated end-stage renal failure is calculated at 163 cases (Saudi Centre for Organ Transplantation [SCOT], 2018).

The primary cause of ESRD is diabetes, the second leading cause is hypertension, followed by glomerulonephritis and pyelonephritis; hereditary, polycystic, or congenital disorders; and renal cancers (Hinkle, & Cheever, 2018; U.S. Renal Data System [USRDS], 2016). Conversely, numerous risk factors contribute to end-stage renal disease, including age, race, gender, elderly status, and low birth weight. A

familial history of renal disease constitutes a significant risk factor for chronic kidney disease. Furthermore, smoking and obesity may contribute to the development of renal disease (Kazancioğlu, 2013).

End stage renal disease results in retention of uremic waste products, volume overload refractory to diuretics, hypertension, anaemia. In addition, mineral and metabolic disorder including hyperkalaemia, hyponatremia, metabolic acidosis, hypo/hypercalcemia, and hyperphosphatemia (Hinkle, & Cheever, 2018). Furthermore, when blood levels of calcium and phosphorus are out of balance it could leading to bone and/or heart disease. When the kidneys can no longer filter the blood of waste and extra fluid, patient need dialysis or a kidney transplant to survive (Alkhaqani, 2022: Nisha etal., 2017).

End stage renal disease managed with various method of treatment, peritoneal dialysis (PD), haemodialysis (HD), pharmacological therapy, or kidney transplantation (Centres for Disease Control and Prevention [CDC], 2014). Haemodialysis is one of the most significant and successful method of treatment for renal failure that can help to maintain patient's life (Hinkle, & Cheever, 2018). There are 271 dialysis centres in the kingdom of Saudi Arabia with 7,987 machines caring to 18,270 patients (SCOT, 2018). Haemodialysis is treatment used when the kidneys are in a state of renal failure to extract waste materials extra corporeally such as creatinine and urea, also free of water from the blood (Roberts, 2016). HD treatment is unable to replace all the kidney functions so, patients need to manage and adhere with a complex regimen of treatment that required frequent HD sessions and extreme dietary and fluid restriction (Khalil & Frazier, 2010).

Many of the most prevalent issues faced by HD patients are due to their non-adherence with treatment regimens. Following diet and fluid restriction are essential for caring of haemodialysis patients. (Roberts, 2016: Vijay & Kang, 2022). Non-adherence to diet and fluid restriction may lead to some problems and complications due to excessive fluid overload which linked to an increased morbidity. Fluid retention is a serious clinical concern in people with ESRD because urine production typically drops, and patients gain weight between dialysis treatments. Restricting dietary protein decreases the accumulation of nitrogenous wastes, reduces uremic symptoms, and may even postpone the initiation of dialysis for a few months. The goal of the diet adherence is to reduce the uremic symptoms, and to maintain good nutritional status through adequate intake of protein, calories, vitamins, and minerals; as well as to enable the patient to eat a palatable and healthy diet (Hinkle, & Cheever, 2018: anuja et al., 2020). Moreover, fluid adherence is important to maintain fluid and electrolyte balance and avoid fluid accumulation, which is the leading cause of weight gain, heart failure, and pulmonary edema (Roberts, 2016).

Most of the studies indicate that many haemodialysis patients do not adhere to proper limits on diet and fluid intake and seem to be not aware by diet and fluid limits (Jafari et al. 2014; Sharaf, 2016; Mersal et al, 2016). So, patient needs to be educated about important of fluid and diet adherence as it considered one of the important treatment plans for haemodialysis patients (Hegazy, et al., 2013).

The majority of patients can make informed decisions regarding adherence to dietary and fluid restrictions after receiving education about their therapeutic regimen, as the absence of information is considered a primary factor contributing to non-adherence, particularly in relation to dietary and fluid restrictions, which may subsequently result in heightened morbidity (Rahimi et al, 2014; Mersal et al, 2016).

Nurses are in an excellent position to evaluate and improve adherence of the Haemodialysis patients, in comparison to other healthcare practitioners, they are spending more time with the patients. The role of nurse is vital in teaching and encouraging the adoption of patients to new life. Nurses work hard to provide patients with instructional materials such as pamphlets ,fact sheets , lists of food, and continuing education to help patients manage their dietary and fluid prescription. Nurses must establish a patient-specific technique of dietary and fluid management to encourage and improve hemodialysis patients' adherence (Duzalan et. Al., 2021).

Significant of study

The effect of chronic diseases on health care systems around the world and in developing countries in particular is increased. According to the last accessible statistics in Saudi Arabia a total of 19,659 patients are on dialysis, 18,270 of them are treated by haemodialysis and the remaining 1,389 treated by peritoneal dialysis. Adjusting their lifestyle by regulating fluid and dietary intake is important. In particular, adherence to the recommended dietary and fluid regimen is a key factor in achieving optimal clinical outcomes for haemodialysis patients. It also leads to better outcomes (SCOT, 2017). There are a few studies in Saudi Arabia discuss the effects of nursing educational in improving haemodialysis patient's fluid and dietary adherence therefore, this study aimed to assess the effect of nursing educational guideline on fluid and dietary adherence among patient undergoing haemodialysis.

Aim of the study

This study aimed to determine the effect of nursing educational guideline on fluid and dietary adherence among patient undergoing haemodialysis.

Hypothesis: In order to accomplish the research, aim the following hypothesis will be suggested:

- There will be a significant improvement of patient's knowledge after implementation of the nursing educational guideline than before.
- There will be a significant improvement of patient's fluid and dietary adherence after implementation of the nursing educational guideline than before.

Methodology

Research Design: a quantitative Pre\post quasi-experimental research design (single group) was used to examine the effect of nursing educational guideline on fluid and dietary adherence among patient undergoing haemodialysis.

Study setting: This study was conducted at the Privat Haemodialysis Units in the International Dialysis Centre, Jeddah, Saudi Arabia. The centre services all ages and nationalities of man and women who meet the centre specific criteria. The centre includes haemodialysis, peritoneal dialysis, kidney disease clinics, outpatient clinics and home renal services . It has two haemodialysis rooms for man and women, one VIP room and additional room for HIV haemodialysis patients, also the centre has diabetes mellites services, and department for children.

Study sample: The target population of the study was approximately around 70 patients who are visiting the Haemodialysis Unit. Convenience sample of patient was recruited for this study. The sample size was calculated according to Raosoft, Inc software (2004), with the margin of error 5% and the confidence level 95%. The estimated sample size was 60 participants according to the following criteria:

Inclusion criteria:

- Adult patients diagnosed with ESRD aged from 20 to 65 years old.
- On maintenance haemodialysis for at least 6 months.
- Alert, able to communicate.
- Agree to participate in the current study.

Exclusion criteria:

- Patient had mental diseases.
- Patients receive any education regarding fluid and diet adherence.
- Patients with hearing or visual impairments.

Study Tool: Three Tools were used by the researcher in this study as following:

TOOL I: Patient assessment data sheet:

This sheet was developed by the researchers based on literature review (Dsouza et al., 2023; Sharaf, 2016; kim et al., 2010), and consisted of three parts as following:

1. Socio-demographic data: This part aimed to assess patients' socio-demographic data. It was included data such as age, gender, nationality, level of education, marital status, income, occupation, smoking, and source of information.

2. Clinical data: This part aimed to assess patients' Clinical data, it includes patient duration of HD treatment in month or years, frequency of HD per week, duration of dialysis sessions, blood pressure measurement, BMI, weight, and height.

3.Biochemical Data: This part aimed to assess patients' Biochemical Data. It included patient biochemical parameters before and after the implementation of nursing educational guideline as creatinine, phosphorus, sodium, potassium, haemoglobin level, albumin, uric acid, and BUN level.

TOOL II: Pre/post knowledge assessment data sheet:

This tool was developed by the researcher based on a review of literature (Dsouza et al., 2023; Sharaf, 2016; Kim et al., 2010). It aimed to assess pre and post patient's knowledge. It was included three parts:

Part 1: General knowledge: This part encompassed information regarding renal failure and hemodialysis, including the normal functions of the kidneys, the definition of kidney failure, the signs of uremia, and the definition of hemodialysis.

Part 2: knowledge about fluid: This part encompassed the definition and classification of fluids, examples of fluids, the definition of dry or ideal body weight for hemodialysis patients, the acceptable fluid gain per kilogram between dialysis sessions, the medical consequences associated with fluid nonadherence, and the precise daily fluid requirement.

Part 3: knowledge about Diet: This part included knowledge about type of diet, the appropriate diet for HD, what need to be limited in the diet, the amount of diet needed/day, examples of food that appropriate, the consequences of too eating inappropriate diet, and way to decrease inappropriate food in diet. This sheet consisted of 16 questions utilize true/ do not know (unknown) / wrong answer format using the following scoring system: 0 indicate wrong answer, 1 indicate unknown answer (don't know), while two indicate true answer.

- Scores less than (< 50%) were considered unsatisfactory level of knowledge.
- Scores from (50 ≥75%) were considered satisfactory level of knowledge.
- Scores from (>75%) were considered good level of knowledge.

TOOL III: Adherence assessment data sheet:

It was adapted from (Kim et al, 2010). It aimed to assess HD patient's adherence to fluid and diet restrictions. It was consisted of 18 questions or items related to fluid restrictions (10 items), and diet restrictions (8 items).

It utilizes always /sometimes /never answer format using the following scoring system: 3 indicate always, 2 indicate sometimes while 1 indicate never.

- Scores less than (< 50%) were considered unsatisfactory level of adherence.
- Scores from (50 ≥75%) were considered satisfactory level of adherence.
- Scores from (> 75 %) were considered good level of adherence.

Nursing educational guideline:

It was designed by the researcher based on literature review (Jafari et al. 2014; Sharaf, 2016; Mersal et al., 2016; Leniya, 2019). It was intended to help HD patients gain awareness of their fluid and diet that should be reflected in their adherence to fluid and diet. The nursing educational guideline discussed the problems related to kidney function, renal failure manifestation, treatment regimens like diet and fluid limits, the importance of adhering to fluid therapy, and how to adhere to the minimal amount of fluid and diet. Moreover, it included clear concise information related to each diet component as protein, fat, carbohydrate, phosphor, sodium, mineral, and vitamin. Furthermore, information about fluid estimation and what excess fluid can build up. Nursing educational guideline was provided through booklet. It was illustrated with pictures and diagram about fluid and diet management. It was developed in English language then translated to Arabic to be easy for the patient to understand.

Validity:

Tools and designed nursing educational guideline were revised by 5 experts in the medical surgical department at king Abdul-Aziz university to test content validity, completeness, and clarity of items, the comments and suggestion were considered, and modification were done accordingly.

Reliability:

Cronbach's alpha was used to test tool's reliability. Cronbach's alpha used to measure internal consistency of the tool. It was reliable for tool two (0.85) and for tool three (0.87).

Pilot study:

Pilot study was conducted on10% of participants (6) to test visibility and applicability of study and tools. Pilot participants were excluded from the main sample.

Data Collection Procedure

After obtaining administrative and ethical approval, data collection was conducted over a period of six months. A total of 60 patients with end-stage renal disease (ESRD) undergoing haemodialysis were recruited from the dialysis unit using a convenience sampling method. All participants met the inclusion criteria. The purpose of the study was clearly explained to each patient, and written informed consent was obtained prior to participation.

Participants were approached during their scheduled haemodialysis sessions. Given that some patients were elderly or unable to use their dominant hand for writing due to the presence of an arteriovenous fistula, the researcher conducted face-to-face interviews. Each question from the data collection tools was read aloud, and the patients' responses were recorded by the researcher to ensure accuracy. To minimize patient discomfort and maximize attention and engagement, data collection was

conducted during the first two hours of the dialysis session. Data were collected through the follwing three phases:

1. Assessment Phase (Pre-Implementation)

Before delivering the educational intervention, baseline data were collected using three validated assessment tools. Sociodemograghic, clinclal and biochemical parameters meaured using tool I. Patients' knowledge regarding fluid and dietary management meaured using tool II and patients adherence to fluid and dietary guidelines meaured using tool III. Each participant was interviewed individually to ensure clarity and understanding. This phase provided the base data for evaluating the effect of the nursing educational guideline.

2. Implementation Phase

During this phase, the nursing educational guideline was delivered to all 60 patients through structured and interactive educational sessions. The eductional guidelines sessions were deliverd to the studied patients two times per week through first, second and third week during their routine hemodialysis treatment. the sessions were conducted individually depending on the dialysis schedule and patient availability. Each session lasted approximately 30 minutes and was scheduled during haemodialysis treatment to ensure convenience and continuity. A written instructional booklet containing demonstrative illustrations was distributed to all participants to reinforce the content presented during session. Oral explanations were provided to clarify key points. Each session ended with a brief summary, and the subsequent session began with a review of the previous content to reinforce understanding. Studied patients were encouraged to engage actively by asking questions and participating in two-way discussions to enhance learning.

3. Evaluation Phase (Post-Implementation)

Following the completion of the educational sessions, a post-intervention assessment was conducted in the fourth week using the same tools administered during the pre-assessment phase. The researcher met with each studied patient individually to collect post-intervention data.Tool I, Part 3 was used to reassess biochemical indicators, tool II evaluated post-education knowledge, and tool III measured adherence to fluid and dietary restrictions.

Data analysis: The data was coded and analysed using Statistical Package for Social Science program (SPSS. version 26). To achieve the study objectives, the researchers utilized descriptive analysis in the form of frequencies, percentages, mean and standard deviation. Inferential statistics including paired t test was used for comparing knowledge and adherence pre and post education about fluid and diet. Paired t- test used to compare between studied patients' pre and post education. One way ANOVA used to find the relation between socio-demographic data and clinical data with knowledge and adherence pre and post education. Pearson Correlation coefficients used to find correlation between studied patients' knowledge and their adherence to fluid and diet. Statistically significant at $p \leq 0.05$ was used. The result was presented in tables and graphs for analysis.

Ethical considerations: The researchers met the head of the institutional review board (IRB) at King Abdul-Aziz University Hospital, in Jeddah and explain the aim of the study before initiate data

collection. The researchers also assured the administrator that conduction of the study does not affect the work in the study setting. King Abdul-Aziz University was sent an official letter from the Faculty of Nursing to the International Renal Care Centre (IRCC) authorities in Jeddah to obtain their permission to collect the data. Permission to carry out the analysis was obtained from the administration of the selected setting after the aim of the study has been clarified. Written consent was obtained from patients to participate in the study after confirmation of the aim of the study. Patients was informed that he can withdraw from study at any time. The name or identity of personal data are not included in the digital data. In addition, information received from the patient was handled confidently and privacy was guaranteed for all patients, and a code was given to each patient to ensure confidentiality of the data obtained.

Result:

Table 1 shows frequency distribution regrading demographic characteristics of the studied patients. It was noticed that more than half of the studied patients (53.3%) were males, while (46.7%) of them were females. 60% of the studied patients were aged between 40 and 60 years old. Nearly two third of the studied patients (63.3%) were non-Saudis and (36.7%) were Saudis. Concerning marital status nearly two third of the studied patients (60%) were married while only (8.3%) were single. More than half of the studied patients (51.7%) had enough income, while 48.3% had not enough income. About one third of the studied patients (33.3%) had secondary or either university education. More than half of the studied patients (56.7%) were not working, while 43.3% were working.

Table 1: Frequency distribution regrading demographic characteristics of the studied patients

Demographic Characteristics	No (n= 60)	%
1) Age		
a- 20- <30	2	3.3
b- 30-<40	15	25.0
c- 40-<50	18	30.0
d- 50-≤60	18	30.0
e- 60-≤65	7	11.7
2) Gender:		
a- Male	32	53.3
b- Female	28	46.7
3) Nationality:		
a- Saudi	22	36.7
b- Non-Saudi	38	63.3
4) Marital Status:		
a- Married	36	60.0
b- Single	5	8.3
c- Widow	13	21.7
d- Divorce	6	10.0
5) Level of Education:		
a- Illiterate	10	16.7
b- Basic education	7	11.7
c- Secondary Level	20	33.3
d- University Level	20	33.3
e- High Education (Master/PHD)	3	5.0
6) Monthly Income:		
a- Enough	31	51.7
b- Not enough	29	48.3
7) Occupation:		
a- Work	26	43.3
b- Not work	34	56.7

Table 2 shows frequency distribution of studied patient according to their clinical data. It was revealed that the mean duration of HD treatment years and standard deviation was 3.70 ± 4.182. nearly three quarter of the studied patients (71.7%) were scheduled on three haemodialysis sessions per week, while (28.3%) of them had two haemodialysis sessions. Regarding duration of dialysis session, more than half of the studied patients (55%) had 3 hours session, while (45%) of them had 4 hours session. Nearly half of the studied patients (46.7%) had high blood pressure, while (36.7%) had normal blood pressure and only (16.7%) had low blood pressure. Regarding body mass index, (35%) the studied patients were overweight, (33.3%) normal weight, (26.7%) underweight, and only (5%) were obese.

Table 2. Frequency distribution of studied patient according to their clinical data

Clinical Data	No (n= 60)	%
Duration of HD treatment	(Mean ± SD). 3.70±4.182	
Frequency of HD per week		
• One time	0	0
• Two times	17	28.3
• Three times	43	71.7
Duration of Dialysis session		
• 1 Hour	0	0
• 2 Hours	0	0
• 3 Hours	33	55.0
• 4 Hours	27	45.0
• 5 Hours	0	0
Blood pressure measurement		
• Low	10	16.7
• Normal	22	36.7
• High	28	46.7
Body mass index		
• Normal	20	33.3
• Underweight	16	26.7
• Overweight	21	35.0
• Obese	3	5.0

Table (3) shows Paired t- test Comparing patients' Biochemical parameters pre and post education. It was revealed that the majority of studied patients' biochemical parameters result were higher before education and significantly decreased to normal values after education which meaning that there was total improvement in biochemical data after education. Before education 65%, 58.3%, 63.3%, 81.7%, 53.3%, and 70% and 61.7% of the studied patients had high value of Creatinine, Sodium, Phosphorus, Potassium, Uric Acid, BUN, and Albumin respectively while after education 63.3%, 61.7 %, 85%, 70%, 83%, 85%, and 81.7% of the studied patients had normal value of Creatinine, Sodium, Phosphorus, Potassium, Uric Acid, BUN, and Albumin respectively. This result revealed there were statistically significant differences before and after education as data showed total improvement in Creatinine, sodium,

Phosphorus, Potassium, Uric Acid, BUN, and Albumin after providing the educational guidelines where $p < 0.05$.

Nearly third of studied patients (41.7%) had normal haemoglobin level and (38.3%) had low level before education while after education nearly three quarter of the studied patients (75%) had normal haemoglobin level but this improvement in haemoglobin level was statistically not significant with ($p = 0.335$).

Table 3. Paired t- test Comparing patients' Biochemical parameters pre and post education.

Biochemical Parameters	Pre education		Post education		T Test	P value
	No.	%	No.	%		
1) **Creatinine**						
Low	2	3.3	6	10	3.755	0.000*
Normal	19	31.7	38	63.3		
High	39	65.0	16	26.7		
2) **Sodium**						
Low	2	3.3	4	6.7	2.801	0.007*
Normal	23	38.3	37	61.7		
High	35	58.3	19	31.7		
3) **Phosphorus**						
Low	3	5.0	2	3.3	5.343	0.000*
Normal	19	31.7	51	85		
High	38	63.3	7	11.7		
4) **Potassium**						
Low	0	0	6	10	9.053	0.000*
Normal	11	18.3	42	70		
High	49	81.7	12	20		
5) **Haemoglobin Level**						
Low	23	38.3	10	16.7	0.973	0.335
Normal	25	41.7	45	75		
High	12	20	5	8.3		
6) **Uric Acid**						
Low	4	6.7	1	1.7	3.435	0.001*
Normal	24	40	50	83.3		
High	32	53.3	9	15		
7) **BUN**						
Low	3	5	2	3.3	7.071	0.000*
Normal	15	25	51	85		
High	42	70	7	11.7		
8) **Albumin**						
Low	4	6.7	5	8.3	6.355	0.000*
Normal	19	31.7	49	81.7		
High	37	61.7	6	10		

BUN: blood urea nitrogen. t: Paired t-test. Statistically significant at $p \leq 0.05$

Table (4) reveals Paired t- test Comparing studied patients' knowledge score pre and post education. It was noticed that majority of studied patients had satisfactory level of knowledge before education which improved to good level after education done. therefore, there was a significant statistically improvement in the mean total patients' knowledge after education regarding general knowledge, knowledge about fluid, knowledge about diet and overall knowledge with ($p= 0.000$, 0.002, 0.000, and 0.000) respectively.

Table 4. Paired t- test Comparing studied patients' knowledge score pre and post education. (n= 60)

Knowledge Level	Pre education						Post education						T Test	P value
	< 50% unsatisfactory		50 <75% satisfactory		≥75% Good		< 50% Unsatisfactory		50 <75% satisfactory		≥75% good			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%		
General Knowledge	0	0.0	10	16.7	50	83.3	0	0.0	0	0.0	60	100	-11.411	0.000*
Total Score (Mean ± SD)	10.27±.936						11.83±.376							
% Score (Mean ± SD)	85.556±7.8033						98.611±3.1319							
Knowledge about fluid	3	5.0	28	46.7	29	48.3	0	0.0	1	1.7	59	98.3	-3.256	0.002*
Total Score (Mean ± SD)	13.62±2.100						14.62±.585							
% Score (Mean ± SD)	75.648±11.6665						81.204±3.2494							
Knowledge about diet	4	6.7	26	43.3	30	50.0	0	0.0	0	0.0	60	100	-11.116	0.000*
Total Score (Mean ± SD)	10.95±1.961						14.22±.783							
% Score (Mean ± SD)	73.000±13.0723						94.778±5.2208							
Overall, Knowledge	0	0.0	31	51.7	29	48.3	0	0.0	0	0.0	60	100	-57.966	0.000*
Total Score (Mean±SD)	32.93±4.506						43.63±1.301							
% Score (Mean±SD)	73.185±10.0125						96.963±2.8921							

t: Paired t-test. Statistically significant at $p \leq 0.05$

Table (5) shows Paired t- test Comparing studied patients' adherence score pre and post education. It was revealed that majority of studied patients had satisfactory level of adherence before education which improved to good level after education. therefore, there was statistically significant improvement in the mean total patients' adherence after education regarding adherence about fluid, adherence about diet and overall adherence with ($p = 0.039$, 0.000, and 0.000) respectively.

Table 5. Paired t- test Comparing studied patients' adherence score pre and post education. (n= 60)

Adherence Level	Pre education						Post education						T Test	P value
	< 50% unsatisfactory		50 <75% satisfactory		≥75% good		< 50% unsatisfactory		50 <75% satisfactory		≥75% good			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%		
Fluid Adherence	9	15.0	45	75.0	6	10.0	0	0.0	4	6.7	56	93.3	-11.608	0.039*
Total Score (Mean±SD)	18.88±3.465						26.02±2.467							
% Score (Mean±SD)	62.944±11.5485						86.722±8.2222							
Diet Adherence	14	23.3	42	70.0	4	6.7	0	0.0	4	6.7	56	93.3	-10.656	0.000*
Total Score (Mean±SD)	14.43±2.948						20.20±2.385							
% Score (Mean±SD)	60.139±12.2831						84.167±9.9374							
General Adherence	7	11.7	50	83.3	3	5.0	0	0.0	3	5.0	57	95.0	-10.309	0.000*
Total Score (Mean±SD)	33.32±5.157						46.22±4.411							
% Score (Mean±SD)	61.698±9.5497						85.586±8.1693							

t: Paired t-test. Statistically significant at $p \leq 0.05$

Table (6) illustrates the relationship between socio-demographic data with total adherence scores pre and post education. It was found that there was statistically significant relation between studied patients' socio-demographic data and their total adherence scores after providing the educational sessions in which, male patients, married, Secondary and bachelor's degree achieved more significant improvements in their adherence. While there was no statistically significant relation between studied patients' socio-demographic data and their total adherence scores after providing the educational sessions in age, nationality, monthly income, and occupation with (P = 0.05).

Table 6. Relationship between socio-demographic data with total adherence scores pre and post education.

Socio-demographic data		n = 60	Total Adherence scores			
			Pre education		Post education	
			Mean ± SD	P value	Mean ± SD	Test of Sig.
Age	20- <30	2	26.50±2.121	F=1.188	50.00±5.657	F=1.079
	30-<40	15	32.87±5.194	P=0.326	46.80±4.632	P=0.376
	40-<50	18	33.61±5.282		47.00±3.896	
	50-≤60	18	33.39±5.392		45.17±5.102	
	60-≤65	7	35.29±3.946		44.57±2.299	
Gender	Male	32	33.41±5.363	F=0.020	45.00±4.340	F=5.625
	Female	28	33.21±5.006	P=0.887	47.61±4.140	P=0.021*
Nationality	Saudi	22	34.41±4.521	F=1.574	46.14±5.120	F=0.011
	Non-Saudi	38	32.68±5.448	P=0.215	46.26±4.018	P=0.916
Marital Status	Married	36	33.42±5.684	F=0.643	46.19±4.241	F=0.996
	Single	5	30.80±4.604	P=0.562	45.80±1.095	P=0.022*
	Widow	13	33.31±4.516		46.38±6.225	
	Divorce	6	34.83±3.545		46.33±3.077	
Level of Education	Illiterate	10	33.50±4.249	F=1.373	46.50±3.567	F=0.995
	Basic education	7	36.71±4.386	P=0.255	46.14±3.237	P=0.050*
	Secondary Level	20	31.75±5.674		46.45±4.883	
	University Level	20	33.30±5.222		45.95±5.196	
	High Education (Master/PHD)	3	35.33±3.055		45.67±.577	
Monthly Income	Enough	31	33.26±5.501	F=0.008	45.65±4.687	F=1.078
	Not enough	29	33.38±4.858	P=0.928	46.83±4.089	P=0.303
Occupation	Work	26	31.81±4.691	F=4.138	45.62±4.309	F=0.850
	Not work	34	34.47±5.264	P=0.067	46.68±4.497	P=0.360

F: F test (ANOVA) Statistically significant at $p \leq 0.05$

Table (7) reveals relationship between socio-demographic data with total knowledge score pre and post education. It was showed that there was no statistically significant relation between studied patients' socio-demographic data and their total knowledge scores after providing the educational sessions with P values >0.05.

Table 7. Relationship between socio-demographic data with total knowledge score pre and post education.

Socio-demographic data		n= 60	Total Knowledge scores			
			Pre education		Post education	
			Mean±SD	P value	Mean±SD	Test of Sig.
Age	20- <30	2	29.00±1.414	F=0.718	44.50±.707	F=0.941
	30-<40	15	32.27±4.652	P=0.583	43.87±1.356	P=0.447
	40-<50	18	33.33±4.256		43.44±1.504	
	50-≤60	18	33.83±4.926		43.33±1.188	
	60-≤65	7	32.14±4.337		44.14±.900	
Gender	Male	32	33.16±4.228	F=0.165	43.59±1.434	F=0.062
	Female	28	32.68±4.869	P=0.686	43.68±1.156	P=0.804
Nationality	Saudi	22	32.05±4.370	F=1.357	43.23±1.572	F=3.526
	Non-Saudi	38	33.45±4.560	P=0.249	43.87±1.070	P=0.065
Marital Status	Married	36	34.28±4.501	F=2.967	43.75±1.131	F=0.700
	Single	5	30.60±2.881	P=0.040	43.20±1.924	P=0.556
	Widow	13	31.15±3.805		43.31±1.548	
	Divorce	6	30.67±4.844		44.00±1.265	
Level of Education	Illiterate	10	33.20±5.224	F=0.343	43.80±1.317	F=0.269
	Basic education	7	33.86±5.210	P=0.848	43.43±1.134	P=0.897
	Secondary Level	20	32.05±4.582		43.45±1.356	
	University Level	20	33.15±3.977		43.75±1.410	
	High Education (Master/PHD)	3	34.33±5.508		44.00±1.000	
Monthly Income	Enough	31	32.71±4.291	F=0.156	43.55±1.502	F=0.270
	Not enough	29	33.17±4.789	P=0.695	43.72±1.066	P=0.605
Occupation	Work	26	33.00±4.578	F=0.010	43.42±1.391	F=1.202
	Not work	34	32.88±4.518	P=0.921	43.79±1.225	P=0.278

F: F test (ANOVA) Statistically significant at $p \leq 0.05$

Table (8) shows relationship between clinical data with total adherence scores pre and post education. there was no statistically significant relation between studied patients' clinical data and their total adherence scores after providing the educational sessions with (P >0.05).

Table 8. Relationship between clinical data with total adherence scores pre and post education.

Clinical data		n= 60	Total Adherence scores			
			Pre education		Post education	
			Mean±SD	P value	Mean±SD	Test of Sig.
Frequency of HD per week	One time	0		F=1.595		F=0.002
	Two times	17	34.65±5.623	P=0.212	46.18±5.491	P=0.965
	Three times	43	32.79±4.931		46.23±3.981	
Duration of Dialysis session	1 Hour	0	0	F=4.492	0	F=3.743
	2 Hours	0	0	P=0.058	0	P=0.060
	3 Hours	33	34.97±4.978		45.24±3.929	
	4 Hours	27	31.30±4.705		47.41±4.741	
	5 Hours	0	0		0	
Blood pressure measurement	Low	10	34.00±4.028	F=0.651	45.20±5.116	F=2.053
	Normal	22	34.05±5.438	P=0.525	45.14±4.335	P=0.138
	High	28	32.50±5.330		47.43±4.041	
Body mass index	Normal	20	32.85±6.072	F=0.269	45.85±4.295	F=0.590
	Underweight	16	34.31±5.225	P=0.847	45.50±5.808	P=0.624
	Overweight	21	33.00±4.648		46.76±3.270	
	Obese	3	33.33±1.528		48.67±4.619	

F: F test (ANOVA) Statistically significant at $p \leq 0.05$

Table (9) shows relationship between clinical data with total knowledge score pre and post education. there was no statistically significant relation between studied patients' clinical data and their total knowledge scores after providing the educational sessions with (P >0.05).

Table 9. Relationship between clinical data with total knowledge score pre and post education.

Clinical data		n= 60	Total Knowledge scores			
			Pre education		Post education	
			Mean±SD	Test of Sig.	Mean±SD	Test of Sig.
Frequency of HD per week	One time	0	0	F=0.033	0	F=0.073
	Two times	17	32.76±4.294	P=0.857	43.71±1.490	P=0.789
	Three times	43	33.00±4.634		43.60±1.237	
Duration of Dialysis session	1 Hour	0	0	F= 32.302	0	F=1.393
	2 Hours	0	0	P=0.000	0	P=0.243
	3 Hours	33	36.30±2.778		43.45±1.277	
	4 Hours	27	28.81±2.131		43.85±1.322	
	5 Hours	0	0		0	
Blood pressure measurement	Low	10	31.30±3.713	F=0.840	43.30±1.160	F=0.432
	Normal	22	33.50±3.839	P=0.437	43.64±1.432	P=0.651
	High	28	33.07±5.199		43.75±1.266	
Body mass index	Normal	20	33.30±4.846	F=0.687	43.65±1.182	F=0.171
	Underweight	16	32.88±4.113	P=0.563	43.50±1.155	P=0.916
	Overweight	21	33.14±4.746		43.76±1.480	
	Obese	3	29.33±1.528		43.33±2.082	

F: F test (ANOVA) Statistically significant at $p \leq 0.05$

Table (10) reveals Pearson Correlation coefficients between studied patients' knowledge and their Adherence to fluid and diet. It was showed that there were

positive significant correlations between studied patients' knowledge and their adherence regarding to fluid and diet restrictions after providing the educational sessions with ($p < 0.05$).

Table 10. Pearson Correlation coefficients between studied patients' knowledge and their Adherence to fluid and diet

Adherence to fluid and diet	Patients' Knowledge	
	Pre education	Post education
Fluid Restrictions	r=0.351 p=0.006*	r=0.770 p=0.000*
Diet Restrictions	r=0.255 p=0.049*	r=0.811 p=0.000*
Overall adherence Scores	r=0.382 p=0.003*	r=0.497 p=0.000*

r: Pearson coefficient
*: Statistically significant at $p \leq 0.05$

Discussion

Advanced chronic renal failure is a progressive and irreversible condition characterized by the loss of the kidneys' capacity to filter metabolic waste from the blood and regulate water and electrolyte balance. Individuals with severe chronic renal failure cannot survive without effective alternative treatment (Bindroo et al., 2023). Haemodialysis is currently the most prominent alternative treatment, having enhanced renal disease management and prolonged patient longevity; nevertheless, its efficacy is significantly diminished without appropriate diet and fluid restrictions. Evidence indicates that numerous haemodialysis patients fail to adhere to prescribed diet and fluid restrictions (Beerappa & Chandrababu, 2019). The deficiency in knowledge as well as inadequate adherence to fluid and dietary restrictions may adversely impact the patient and elevate hospitalization costs and mortality rates (Victoria et al., 2018). This study demonstrated that the educational intervention could enhance knowledge and adherence with fluid and diet restrictions by increasing information and reducing misconceptions about the disease. Barnett et al. (2018) underscore the significance of adherence, asserting that 'the most well-established health care regimens are worthless if a patient decides not to adhere with the instructions of the health care system. The current study was conducted to assess the effect of nursing educational guideline on haemodialysis patient fluid and dietary adherence. The results of this study indicated that nursing educational guidelines was an effective method to improve the knowledge and adherence of HD patients to fluid and Dietary restrictions.

Regarding socio-demographic data, the results showed that more than half of the participants were males, aged between 40 and 60 years old, nearly two third are married, and about one third had university educational level. This result is consistent with Sharaf, (2016) who mentioned that more than half of the participant (53.3%) was male, and about 80% was married as well as nearly one third had university education. Similarly, the result is consistent with Mersal et al., (2016) who found that the mean age of the studied participant was 45.33±18.66 and 43.50±15.58 for the study and control groups respectively, near three quarter of study and control group were married, about 33.3% and 30% of the study and control groups respectively had university

education. In addition, the result consistent with Bakarman et al., (2019) who mentioned that more than half (54%) of the participant were married. concerning educational, about 26% were college graduates.

Regrading patient work, more than half of participants in the present study were not working. This result agreed with Qadhi et al., (2021) who found that about 58.5% of the patients were unemployed. Moreover Mersal et al., (2016) mentioned that 66.7% of the study group and 83.3% of the control group had no work. Furthermore Bakarman et al., (2019) emphasized that 76% of the participant were unemployed.

In relation to nationality, nearly two third of patients in this study were non-Saudis, this result disagreed with Qadhi et al., (2021) who found that Around 90.2% of the patients were Saudi. This result may be related to the present study done in the international dialysis centre which consider private that serves all ages and nationalities of man and women, but other study done in government hospitals that accepts non-Saudi under rules and regulation as children of female Saudi citizens and government employee. About 40% of the population in Saudi Arabia is non-Saudi as a result free health care is only available to citizens of Saudi Arabia and if patients are expiated, he should have health issuance to cover medical needs (Rahman, 2020).

Nearly half of the participants had enough income, this result agreed with study done by Bakarman et al., (2019) in Jeddah, Saudi Arabia as he mentioned that 56% of the participant had enough income. While this result disagreed with Sharaf, (2016) and Mersal et al., (2016) in Egypt who found that most patients were hadn't enough income. The current result may be related to different countries region income.

In relation to frequency of haemodialysis session per week, nearly three quarter of the participants scheduled on 3 haemodialysis sessions per week. This result is consistent with Bakarman et al., (2019) who mentioned that 98% of the participants received 3 dialysis sessions per week. Moreover, this finding agreed with Mersal et al., (2016) who revealed that 90% of the study group and 93.3% of the control group were scheduled on 3 hemodialysis sessions per week. Furthermore, Beerappa, & Chandrababu, (2019) found that 65% of the patients received three weekly haemodialysis sessions.

The current study results also indicated that majority of participants' biochemical parameters were higher before nursing education and significantly decrease to normal values after educational guidelines received and this result related to the adherence of the participants to fluid and diet restriction during the study period. There were statistically significant differences before and after patients received nursing educational guidelines as data showed total improvement in Creatinine, Phosphorus, sodium, Potassium, Uric Acid, BUN, and Albumin after applying the nursing educational guidelines. This result was consistent with Arad, et al., (2021) who found a significant difference in the mean score of laboratory values of Creatinine, Phosphorus, sodium, Potassium, Uric Acid, BUN, and Albumin between the two groups after the intervention. In addition, Baraz, et al., (2010) reported that phosphate and uric acid level means statistically significant decreased after oral education which indicated improvement in these results. Moreover, Jafari, et al., (2014) reported that there was a significant difference between the Creatinine of the patients before and after the training of haemodialysis patients. while this result is disagreed with Bakarman et al., (2019) who revealed that urea, creatinine, and

albumin showed no significant changes between the intervention and control group after the educational program for HD patients. Moreover, the result was inconsistent with the study conducted by Mersal, et al., (2016) who reported no statistically significant differences between the study and control groups in relation to creatinine, and phosphorus values along the study period.

Nearly third of patients had normal level of haemoglobin before the education and improved to three quarters after, but this improvement is not statically significant due to short period time of measurement. This finding is in accordance with the result of Mersal, et al., (2016) who showed no statistically significant differences between the study and control groups in relation to haemoglobin values along the study period. In contrast, the present results contradict with Hassen, et al. (2018) and Bakarman et al., (2019) who revealed a significant decrease in haemoglobin in study group compared with control group after educational program. Similarly contradict with Bakarman et al., (2019) who stated that there was statistically significant change in haemoglobin level after the educational program.

This study revealed that majority of patient had satisfactory level of knowledge before which improved to good level after patients received nursing educational guidelines. So, there were a statically significant improvement in the mean total patients' knowledge after nursing educational guidelines regarding general knowledge, fluid knowledge, diet knowledge and overall knowledge. The improvement of patient's knowledge might be attributed to their willingness to acquire knowledge because nearly two third of them were secondary and university educated. This result was similar to the study conducted by Sharaf, (2016) who emphasized that all patients had unsatisfactory level of knowledge before interventions which improved to satisfactory level after interventions. There is significant improvement in the mean total patients' knowledge of general, fluid and diet restriction knowledge after interventions received. In addition, Hegazy, et al., (2013) reported that nutritional counselling session resulted in statistically significant post-intervention improvements in nutritional knowledge of the patients. Furthermore, Mersal, (2016) revealed that after implementation of the nursing guideline, the study group had statistically significant higher mean scores of fluids and diet knowledge. In the same line Leniya, (2019) and Dsouza et al., (2023) reported that patient's level of knowledge was improved after receiving the educational intervention.

Regarding fluid and diet adherence the current result revealed that the majority of participants had satisfactory level of adherence before receiving educational guidelines which improved to good level after. In which, there were a statistically significant improvement in the mean total patients' adherence after nursing educational guidelines implemented regarding adherence about fluid, diet, and overall adherence. This result may be due to knowledge improvement in this study after the implementation of nursing educational guidelines which contribute to patients' perception of the benefits of fluid and diet adherence as well as the negative consequences of nonadherence, especially that the present result revealed highly positive astatically significant correlations between patients' knowledge and their adherence regarding to fluid and diet after nursing educational guidelines implemented.

This finding agreed with a study conducted by sharaf et al (2016), who reported that there was a highly statically significant improvement in level of adherence to fluid and sodium restrictions, post the interventions implemented. As well as there was highly positive

significant correlation between patient's total knowledge and adherence to fluid & sodium restrictions post interventions. Moreover, Ramezani, et al., (2018) and Arad, et al., (2021) mentioned that the educational intervention has high significant effect on haemodialysis patient's adherence to diet and fluid restriction. Furthermore, Mersal, (2016) mentioned that there were astatically significant improvement of knowledge and compliance regarding diet and fluid restriction after implementation of nursing guidelines with highly positive correlation between knowledge compliance regarding diet and fluid.

On the other hand, Alikari, et al., (2018) and Dsouza et al., (2023) revealed that although, the educational intervention improve knowledge, adherence but there was no significant correlation between changes in the knowledge scale and the adherence scale among patients on haemodialysis after intervention.

The present result revealed that there was statistically significant relation between patients' socio-demographic data and their total adherence scores after applying the nursing educational guidelines, since male patients, married, educational level (Secondary and bachelor's degree) achieved more statically significant improvements in their adherence. The study findings are consistent with sharaf, (2016) who showed that high significant correlations were found between patient's gender and total adherence scores after applying the interventions in which male patients showed high adherence rather than female patients. In addition, Ross, & Brittany, (2017) emphasized that being married demonstrated a statistically significant correlation with patient's adherence. This result may be related to married patients take support and encouragement from his family which enable them to be more adherent to fluid and diet restrictions. In the same line die fetal., (2015) mentioned that there was a statistically significant relation between sex and level of education with total adherence scores. Furthermore, the present result is consisting with Baraz et al (2010) who mentioned that the higher the educational level the better adherence to fluid and diet. This result may be related to the educated patients more able to acquire knowledge through the educated sessions and review the content at any time so, they were more adherent to diet and fluid restrictions.

Conclusion

One of the most significant issues faced by haemodialysis patients is the non-adherence to fluid and diet restrictions. The research hypothesis is substantiated by the study's findings, which indicate that the patient's knowledge and adherence to fluid and diet were statistically enhanced by the nursing educational guidelines. Furthermore, there were significant positive correlations between patients' adherence to fluid and diet restrictions and their knowledge Finally, there were statistically significant relation between patients' socio-demographic data and their total adherence scores since male patients, married, educational level (Secondary and bachelor's degree) achieved more statistically significant improvements in their adherence to fluid and diet.

Recommendations

This study recommended the following:

1. Apply nursing educational guidelines in the beginning for patient recently started haemodialysis to be more effected and benefits for them.
2. Further studies should be conducted for on larger sample and different setting to generalize the resulted data.
3. Conducting training educational program to the nurses caring for

haemodialysis patient to improve patient care.

4. Further studies to evaluate other effect of education and longer duration to find long term outcomes.
5. Keep the nursing educational guidelines printed in the haemodialysis unit to be as reference guide for nurses.

Implication

When it comes to nursing implications, the nurses play a crucial role in implementing the nursing educational guidelines for diet and fluid regimen to enhance patient adherence to fluid and diet restriction as well as decrease patient complication. In terms of nursing education implications, the nursing guideline would serve as a reference framework to be incorporated into both basic and continuing education programs, serving as a standard practice for healthcare professionals. This study has the potential to establish a practical foundation for the future advancement of evidence-based practice in nursing.

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