

Effect of Developed Nutritional Guidelines on Interdialytic Weight Gain among Hemodialysis Patients

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Abstract: Despite recent advances in knowledge and improvements in the technology of the hemodialysis, the prognosis of patients receiving hemodialysis (HD) remains poor due to insufficient knowledge about nutrition which results in interdialytic weight gain. Education enables hemodialysis patients overcome interdialytic weight gain, correct the nutritional habit and improve knowledge and awareness. Aim of the study was to evaluate the effect of developed nutritional guidelines on interdialytic weight gain among hemodialysis patients. Quasi experimental research design was utilized in this study. The study was conducted at New General Mansoura Hospital. Purposive sample of 70 adult hemodialysis patients was included in this study. Two tools were used in this study, nutritional assessment and interdialytic weight gain assessment sheet. The results revealed significant improvement in hemodialysis patients' knowledge regarding the developed nutritional guidelines. There was significant reduction in mean score of body mass index, interdialytic weight gain and serum sodium. There was significant improvement in fluid adherence among hemodialysis patients after implementation of developed nutritional guidelines. The study concluded that implementation of the developed nutritional guidelines had a positive effect in improving hemodialysis patient's knowledge and decrease interdialytic weight gain. Recommendations include continuous evaluation of knowledge and interdialytic weight gain among hemodialysis patients'. Colored booklet regarding developed nutritional guidelines should be available for all hemodialysis patients.

Key words: Hemodialysis • Interdialytic Weight Gain • Nutritional Guidelines

INTRODUCTION

Hemodialysis (HD) is one of renal replacement therapy used to remove accumulated toxins and excess fluid resulting from loss of kidney function [1]. It is the most common form of dialysis, typically requiring the patient to attend hospital three times per week [2]. Despite recent advances in knowledge and improvements in the technology of the hemodialysis, the prognosis of those patients remains poor due to non-adherence to nutritional guidelines which result in interdialytic weight gain (IDWG) which is mainly result from salt and water ingestion between hemodialysis sessions, which directly reflects the compliance with diet and fluid restriction [3].

The most frequent measure of hemodialysis patient's adherence to fluid is (IDWG) which is used as an outcome measure. Intradialytic weight gain should be less than 2.5 kg or 5% of dry body weight between sessions to lower the risk of volume overload between thrice-weekly

dialysis [4]. Hemodialysis patients are characterized by having more difficulties in accommodating their condition and usually have noncompliance to fluid intake until the occurrence of complications [5].

Patients with intradialytic weight gain have more risk to suffer elevated blood pressure, drowsiness, shortness of breath and severe muscle cramping, interdialytic hypotension and cardiovascular mortality which increase rates of hospitalizations and increase health care costs [6]. Control of interdialytic fluid gains is important for maintenance of near-normal hydration and the minimization of intradialytic hypotension and discomfort. So hemodialysis patient should follow proper nutritional guidelines that involve change normal fluid and food intake [7]. Comprehensive health education should be provided to those patients to satisfy patient individual needs, review their dietary restrictions and rationale for these restrictions based on medical complications of non-compliance [8].

Significance of the Study: Overall, about 80% of hemodialysis patients' don't follow their regimen. Those patients who convinced with the importance of dietary and fluid restrictions were able to fight the desire to drink, despite their thirst, were more likely to adhere to fluid limitations, however John, Alpert, Kawi and Tandy [9] reported that no Egyptian or approved guidelines to standardize or implement the nutrition for hemodialysis patients in Egypt. Health care facilities are seeking nowadays to develop practice guidelines for improving health care service, so hemodialysis morbidity and mortality is increasing among those patients compared with other diseases [10].

Aim of Study: Evaluate the effect of developed nutritional guidelines on interdialytic weight gain among hemodialysis patients.

Hypothesis: There will be a decrease in interdialytic weight gain after implementation of developed nutritional guidelines.

MATERIAL AND METHODS

Study Design: Quasi- experimental research design was utilized in this study.

Setting: This study was conducted at hemodialysis unit at New General Mansoura Hospital.

Subjects: A purposive sample of 70 adult patients was recruited to achieve the aim of this study according the following criteria

Inclusion Criteria:

- Adult male and female patients between 20- 60 old years with end stage renal disease and started regular hemodialysis at least three months ago for three times a week [11].
- Patients had a documented history of interdialytic weight gain of greater than 5% of dry weight between dialysis treatments over the last month [12].

Exclusion Criteria:

- Ascetic patients for any medical causes.
- Patients who receive parenteral nutrition or nasogastric tube feeding.
- Patients with body mass index more than 25 kg/m².

Tools of the Study: Two tools were used in this study.

Tool 1: Nutritional Assessment Sheet: This tool was developed by the researcher based on recent literature review to collect baseline data, assess hemodialysis patients' knowledge about nutritional guidelines and anthropometric measurements; it included three parts as follows.

Part A: Demographic characteristics and medical data such as age, gender, marital status and educational level and residence, reason of hemodialysis and years of hemodialysis.

Part B: Hemodialysis patients' knowledge related nutritional guidelines. It was consisted of major six broad items which, were subdivided into sub items with total (59) items as follow: past nutritional history within last month, fluid allotted to hemodialysis patients (9 items), food rich in salt (26 items), fruit rich in salt (12 items), Carbohydrate (5 items) and, complications of fluid over load (7 items).

Scoring System: All subjects were needed to respond "Yes," "No," to each question. A correct answer was scored 1 and an incorrect answer was scored = 0. The level of knowledge was classified as good = 75%, fair 74% to 50% and poor <50% [13].

Part C: Anthropometric Measurements.

- Height in meter and weight in kilogram were taken to calculate body mass index.
- Body mass index (BMI) was calculated by dividing the weight in kilogram on the square of height in meter (kg/m²). Standards classify BMI into several categories; below 18.5 /underweight, 18.5-24.9 / normal, 25-29.9 / overweight, 30-39.9 / obese and above 40 / morbid obese [13].

Tool 11: Interdialytic Weight Gain Assessment Sheet:

This tool was developed by the researcher based on recent literature review to assess Interdialytic weight gain, fluid overload symptomatology and laboratory investigation among hemodialysis patients. It included three parts as follows:

Part A: Interdialytic Weight Gain Measurement:

This part was carried out through estimations of pre, post dialysis weight in kilogram and interdialytic weight gain

within 12 consecutive sessions, which was calculated by subtracting post dialysis total body fluid volume of one session from pre dialysis total body fluid volume of the next session, then take mean of the twelve measurements. This part was conducted by using the adopted Watson formula [14].

Watson Formula for Women:

$$TBW = (-2.097 + [0.1069 \times \text{height}] + [0.3362 \times \text{body weight}]).$$

Watson Formula for Men:

$$TBW = (2.447 + [0.0956 \times \text{age}] + [0.1074 \times \text{height}] + [0.3362 \times \text{body weight}]).$$

Scoring System for Interdialytic Weight Gain [15]:

Mean of IDWG	Poor fluid adherence	Good fluid adherence
“Within 12 sessions”	> 2.5 kg	= 2.5 kg

Part B: Fluid over load symptomatology: It included six (6) items as follow, leg cramps, headache, dizziness, lower-extremity edema, nausea and shortness of breath [16].

Scoring system: one mark was given for present symptom and zero was given for absent symptom.

Part C: Biochemical laboratory investigations.

It included two elements such as serum sodium (Na) and serum potassium (K).

Methods

Tools Development: Tool² and tool II part B and C was developed by the researcher based on recent literature review while tool²² part A (Watson Formula) was adopted by the researcher without change in its content.

Validity and Reliability of the Instruments: The developed and the translated tools were tested for its content validity through panel of experts from medical and nursing staff. The developed tool reliability was estimated using Cronbach’s alpha test to calculate the inner consistency of the tools. It was founded as follow, questionnaire (r = 0.812). Also, reliability was calculated using test retest method by using SPSS program version 16.0 which showed that reliability for patients knowledge questionnaire was (r = 0.728).

Pilot Study: It was conducted on 10% of the subjects (8) patients to check feasibility and applicability of the tools. It helps the researcher to determine the time needed for answering the questionnaire sheet and they were excluded from total statistical analysis score. The needed correction and modifications were made.

Ethical Consideration: An Official permission was obtained from the faculty of nursing Mansoura University and responsible administrative personnel of New General Mansoura Hospital, as well as the ethical committee of Faculty of Nursing Mansoura University. Written informed consent was obtained from patients after explanation the aim of the study. Anonymity, privacy, safety and confidentiality were absolutely assured throughout the whole study. Each participant had the right to withdraw from the study at any time.

Data Collection:

- Data collection extended over a period of six months started from the 1st of April, 2016 till the end of September 2016.
- The framework of the study was carried out according to 4 phases:-

Assessment Phase:

- This phase included screening all the hemodialysis patients (235) medical records to choose the hemodialysis patients with interdialytic weight gain more than or equal 2.5 kg through measuring mean interdialytic weight gain within last twelve hemodialysis sessions.
- All patients were assessed to collect baseline data such as personal and medical data, knowledge level and anthropometric measurements, as well as body weight was assessed before and after hemodialysis session within 12 consecutive sessions to calculate weight gain as pre-test as pre-test using tool I and tool II.
- The time needed for completing the questionnaire was ranged from 30 - 40 minutes for each patient.

Planning Phase

- Based on the findings of assessment phase, goals and expected outcomes were formulated.
- In this phase the nutritional guidelines included types of food rich fluid were developed by the researcher based on the available published

guidelines that were presented in the related literature such as national, international books, scientific journal as well as, patients' needs that were carried out in the assessment phase.

- The developed nutritional guidelines were translated from English to Arabic language, supplemented by photos, illustrations to help the patients to understand of the content.

Implementation Phase:

- In this phase the developed nutritional guidelines were implemented by the researcher based on several factors that were carried out in the assessment phase.
- The instructions were presented in the form of two sessions as follow:

The First Session: It covered the information related to definition and signs and symptoms of interdialytic weight gain.

The Second Session: It covered the instructions related to developed nutritional guidelines.

- The time of the sessions was arranged within the schedule of hemodialysis patients' sessions to save time and decrease patients overload.
- These sessions were carried out in the waiting area as follow:-

The Morning Shift Patients: Received teaching session after termination of their hemodialysis session.

The Afternoon Shift Patients: Received teaching session before starting their hemodialysis session.

- Each discussion lasted for 30-45 minutes; the researcher reinforced the patients to follow the prescribed diet.
- The colored hand out was distributed to the patients to be a guide at any time.

Evaluation Phase:

- This phase focused on evaluation the effect of developed nutritional guidelines on interdialytic weight gain among hemodialysis patients using the same tools applied in the pretest.

First Time: At the beginning of the study as baseline measurement (Pre-test).

Second Time: After two weeks from applications of nutritional guidelines and extended for 12 consecutive HD sessions (Post-test).

- Comparison of each finding to evaluate the effect of developed nutritional guidelines on patients' knowledge and interdialytic weight gain.

RESULTS

Table 1 revealed that more than half (60%) of study sample were male and 48.6% of them were in age group of 51-60 years. In relation to occupation, more than two thirds of the studied patients (71.4%) do not work, as well as (48.6%) of those spent 5-10 years on hemodialysis therapy. Finally half of the study sample (55.7%) developed renal failure due to chronic diseases and about one third (35.7%) due to renal diseases.

The figure shows that the majority of the study sample (84.28%) had poor knowledge score about hemodialysis nutritional guidelines pre-test compared to (47.1%) post-test. In addition to (15.72%) of the study sample had moderate knowledge score about hemodialysis nutritional guidelines during pre-test compared to about (52.9%) during post-test.

In relation to, fluid adherence among studied hemodialysis patients Table 2 revealed that the majority of the study sample (98.6%) had poor fluid adherence during pre-test compared to (40%) during post-test. While, the minority of the sample (1.4%) has good fluid adherence during pre-test compared to (60%) during post-test. It is clear from the table that there is significant improvement between pre-test compared to post-test, P value is 0.023.

Table 3 shows that there is significant improvement between mean interdialytic weight gain during pre and post-test (4.08 ± 0.91 & 2.89 ± 0.87) respectively. As regarding to, total body water volume, it was noticed that there is significant difference between mean total body water volume pre and posttest (40.00 ± 7.83 & 39.60 ± 6.91) respectively. In addition to, theirs significant correlations between total body water and interdialytic weight gain. Finally, finding of the present study was noted statistical significance of all interdialytic weight symptoms except headache.

Table 4 shows that there was mild significant correlation between total knowledge score pre and post implementing developed nutritional guidelines ($p= 0.002$, $r =0.369$). Also, there was moderate significant

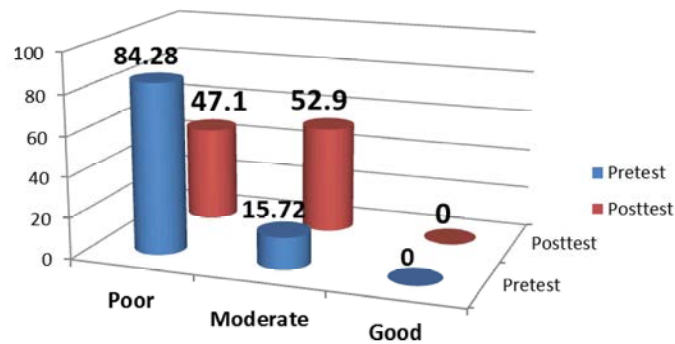


Fig. 1: Total score of hemodialysis patients' knowledge about nutritional guidelines pre and post-test. (No = 70)

Table 1: Demographic characteristics of HD patients with IDWG. (No = 70)

Items	No	%
Sex		
- Male	42	60
- Female	28	40
Age		
- 20-35 years	8	11.4
- 36-50 years	28	40
- 51-60 years	34	48.6
Marital status		
- Single	0	0.0
- Married	67	95.7
- Divorced	1	1.4
- Widow	2	2.9
Residence		
- Rural	51	72.9
- Urban	19	27.1
Educational level		
- Illiterate	30	42.9
- Read & write	27	38.6
- Secondary	8	11.4
- University	5	7.1
Occupation		
- No work	20	28.6
- work	50	71.4
hemodialysis years		
- < 5 years	14	20
- 5-10 years	34	48.6
- > 10 years	22	31.4
Cause of renal failure		
- Renal disease	26	37.2
- Chronic disease	39	55.7
- Others (Drugs- genetic diseases)	5	7.1

Table 2: Fluid adherence among studied hemodialysis patients pre and post-test. (No = 70)

Items	Pre test		Post test		Significance test	
	No	%	No	%	P	X ²
Poor adherence	69	98.6	28	10	0.023*	0676
Good adherence	1	1.4	42	60		

*Significant if (p≤0.05)

**Highly significant (p≤0.001)

Table 3: Comparison between mean interdialytic weight gain variables within 12 consecutive hemodialysis sessions pre and post-test. (No = 70)

Items	Pre test Mean ±SD	Post-test Mean ±SD	P value	t value
Body mass index	25.20±3.56	25.16±2.4	0.000**	0.195
Pre hemodialysis weight	77.48±14.64	76.27±14.63	0.000**	-0.972
Post hemodialysis weight	73.26±14.16	73.35±14.42	0.000**	0.546
Interdialytic weight gain	4.08±0.91	2.89±0.87	0.000**	10.762
Total body water “Watson formula”	40.00±7.83	39.60±6.91	0.000**	0.917
Serum electrolyte				
Serum sodium	144.02±13.14	131.99±4.91	0.000**	-8.086
Serum potassium	5.17±1.06	4.84±4.20	0.526	-0.637
Interdialytic weight gain symptoms				
• Cramps	8.22±2.45	5.37±2.35	0.000**	-8.130
• Headache	3.60±2.72	3.28±2.24	0.388	0.868
• Dizziness	3.74±3.02	2.88±2.07	0.047*	2.026
• Nausea	3.35±3.31	0.75±1.71	0.000**	-6.693
• Shortness of breath	2.70±3.70	0.24±1.06	0.000**	-5.682
• Lower limb edema	2.88±3.61	1.34±2.11	0.001**	-3.591
Complications occurrence	24.51±14.43	13.88±8.433	0.000**	6.827

* Significant if (p ≤ 0.05)** Highly significant (p ≤ 0.001)

Table 4: Correlations between different variables of interdialytic weight gain. (No = 70)

Variables	P value	r value
Knowledge about types of food rich fluid score pre and post	0.000**	0.422
Total knowledge score pre and post	0.002*	0.369
Total knowledge score “Post”& serum potassium (K) “Post”	0.079	0.227
Total knowledge score “Post”& serum sodium (Na) “Post”	0.034*	0.254
Total knowledge score & mean IDWG “Post”	0.000**	-0.556
Food rich fluid and interdialytic weight gain “Post”	0.000**	-0.637
Knowledge of food rich fluid and total body water “Post”	0.004*	-0.337
Total body water and body mass index “Post”	0.000**	0.484
Total body water and interdialytic weight gain “Post”	0.046*	0.212
Interdialytic weight gain & serum sodium (Na)	0.441	0.094
Interdialytic weight gain & serum Potassium (K)	0.112	0.318

* Significant if (p = 0.05)** Highly significant (p = 0.001)

correlation between total knowledge score and serum sodium after implementing developed nutritional guidelines (p= 0.034, r =0.254). Moreover, there was significant correlation in between total knowledge score and IDWG after implementing developed nutritional guidelines (p= 0.000, r =-0.556). On the other hand, there was significant correlation between knowledge score about types of food rich fluid and total body water after implementing developed nutritional guidelines (p= 0.004, r = -0.337). Finally, there was significant correlation between total body water and interdialytic weight gain after implementing developed nutritional guidelines (p= 0.046, r =0.212).

DISCUSSION

Hemodialysis (HD) is one of the most effective and important renal replacement therapies that can save life of patients with renal failure Montazeri and Sharifi [17].

Because fluid removal is intermittent, patients are at high risk for fluid volume overload between treatment sessions and developing interdialytic weight gain Clark-Cutaia, Ren, Hoffman, Burke and Sevick [18]. Therefore, hemodialysis nurse plays an important role in informing the hemodialysis patient about proper nutritional guidelines to decrease interdialytic weight gain among hemodialysis sessions Mahan, Escott-Stump, Raymond and Krause [19]. So the present study was carried to determine the effect of developed nutritional guidelines on interdialytic weight gain among hemodialysis patients.

As Regarding to Demographic Data: It was revealed from the current study that, two fifths of the studied patients were middle aged. This finding is on the line with Wong *et al.* [20]. That studied evaluation of patients’ knowledge in outpatient clinic and mentioned that two fifths of patients were middle aged. Moreover, half of the studied patients developed

renal failure due to chronic diseases; this finding is supported by Djukanović *et al.* [21] who reported that about one half of the hemodialysis patients developed renal failure due to chronic disease.

As Regarding to Hemodialysis Patients' Knowledge:

About developed nutritional guidelines, the current study showed significant improvement in patient's knowledge regarding nutritional guidelines post-test which are agreed by Sharaf [22] who reported significant improvement of mean score for both adherence and knowledge of hemodialysis patients after intervention. Additionally, these results are in agreement with Ryu, Jeon, Sun, Han, Whang and Han [23] who mentioned that patient education strategies improve adherence level plus teaching patients safe alternatives of restricted food items is a facilitator to dietary adherence.

In Relation to Interdialytic Weight Gain: From the current study, it was noticed significant adherence of hemodialysis patients to nutritional guidelines post intervention compared to pre intervention which was achieved obviously through four indicators.

The First Indicator: Was IDWG, as the current study revealed significant reduction in IDWG during post-test compared to pre-test; this finding is in the same line with Telini *et al.* [24] who reported significant reductions in IDWG after intervention. Furthermore, Sharaf [22] mentioned that three fifths of the hemodialysis patients reach the target weight. On the contrary, a study entitled no difference in average interdialytic weight gain observed in adults undergoing maintenance hemodialysis conducted by Sevick *et al.* [25] who noticed that there was no difference seen in IDWG.

The Second Indicator: Of nutritional guidelines compliance was electrolytes, the current study revealed that the studied patients were adherent to diet low in sodium and potassium which appeared with normal range in the laboratory data, this finding is in the line with Chan, Zalilah, & Hii [26] who stated that hemodialysis patients were more compliant with phosphorus, sodium and fluid restrictions. On contrary, Baraz, Parvardeh, Mohammadi, & Broumand [4] who found no differences noticed in serum sodium post intervention, this back to most patients mentioned that they can't avoid or decrease common sources of sodium because it is the main ingredient of the most Egyptian foods and the taste of the foods are not appetizing.

The Third Indicator Was total body water volume, the current study showed significant reduction in the mean score of total body water volume during posttest, this finding is supported by Caria, Cupisti, Sau, & Bolasco [27] who reported significant reduction in total body water observed after intervention. On the contrary, Hecking *et al.* [28] reported that most of hemodialysis patients still have fluid overload after hemodialysis sessions. In my opinion, the reduction of total body water may be related to teaching those patients about "Hidden fluid" founded in types of food, amount of fluid allotted per day and salt substitutes.

Finally, the Fourth Indicator: Was body mass index (BMI), the study revealed that there was significant reduction in BMI during posttest, which agreed with Kalainy, Reid, Jindal Pannu, & Braam [29] who mentioned that there is lower BMI after intervention. On contrast, Chen, Chen, Pan, Chang, & Wu [3] mentioned that BMI remained relatively constant. In my point of view, this reduction in body mass index back to decrease total body water and interdialytic weight gain which are achieved through adherence to fluid intake and compliance to developed nutritional guidelines.

On the other hand, the minority of the study sample didn't reach normal weight and still have interdialytic weight gain. From researcher point of view, this is related to lack of control towards choosing what they want to eat. Patients spoke about having life's pleasures removed and food had become tasteless. Some hemodialysis patients described their restrictions using violent terms, such as "Having no life at all," "Having a meaningless existence," or as like being a prisoner, being condemned to death, or being tied up. Additionally, they still consume types of foods rich in fluid "hidden fluid".

The findings of the current study revealed that increase hemodialysis patient knowledge had positive effect on improving adherence to nutritional guidelines. Moreover, there was significant correlation in between total knowledge score and IDWG after implementing developed nutritional guidelines. This finding is supported by Karavetian, de Vries, Elzein, Rizk, & Bechwaty [30] who mentioned that the nutritional education for hemodialysis patients achieved better patient' adherence post intervention. On contrast, a study conducted by Martin and Gonzalez [31] mentioned that improving hemodialysis patient's knowledge has no role or effect on HD patients' adherence.

CONCLUSIONS

Implementation of the developed nutritional guidelines had a positive effect in improving hemodialysis patient's knowledge and decrease interdialytic weight gain.

Recommendations:

- Colored booklet regarding developed nutritional guidelines should be available for hemodialysis patients.
- Continuous periodical evaluation of the level of knowledge and interdialytic weight gain among hemodialysis patients'.

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