Adherence to therapeutic regimens among patients undergoing hemodialysis

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Abstract: Patients on hemodialysis (HD) make critical changes to their long term survival and health. The behavioral adaption is challenging, requiring continuous regulation and is central to effective management. Non-adherence is associated with a range of adverse clinical consequences and reduces the patients' quality of life. **Aim of the study:** to determine the overall adherence practices to therapeutic regimens among patients undergoing hemodialysis. **Setting**: The study was performed at Nephrology Department in National Medical Institute in Damanhour, El-Behera Governorate. **Sampling**: all patients who were undergoing hemodialysis during August 2016 to November 2016. 98 patients were eligible and accepted to participate. **Tools:** one tool was used for the purpose of data collection. Including **part 1**: the Socio demographic data and medical history **Part 2:** The End-Stage Renal Disease-Adherence Questionnaire (ESRD-AQ). **Results:** 51%of the studied subjects were high adherence with therapeutic regimens. Also statistically significantly difference was found between the overall adherence and subjects' gender, educational level, duration of dialysis and intradialytic weight gain. **Conclusion** Successful treatment of patients with end-stage renal disease requires the individual's adherence with a complex and critically important therapeutic regimen. The results of this study indicated that restrictions of the therapeutic regimen were problematic for many hemodialysis patients. Also, this study showed that hemodialysis patients had low adherence to dietary recommendations and fluid restriction. **Recommendation:** The findings indicate the need to establish strategies to improve adherence, such as patient education programs, and strategies to maintain adherence, such as regular educational follow-ups, are indicated.

Key words: Adherence, therapeutic regimens, hemodialysis.

1. Introduction:

End-stage renal disease (ESRD) can be defined asan irreversible decline in kidney function, when renal replacement therapy (RRT) is required for patients' survival. Dialysis and kidney transplantation considered the main types of renal replacement therapy [1].

Patients on hemodialysis (HD) make critical changes to their long term survival and health, including regular visits to a dialysis center three times a week, being connected to a dialysis machine three to four hours at a time, monitoring intake of fluids and adjusting diet to restrict foods that are high in potassium, sodium, and phosphorus and taking multiple daily medications. The patient adaption with these changes isa defying, requiring continuous arrangement; so that patient adherence to their prescribed therapeutic regimen is core for efficient management. Adverse clinical outcomes and deceased in quality of life is related to non-adherence.

Non-adherence among hemodialysis patients is a major medical problem despite current research indicating non-adherence increases the risk of death. Adherence with the dialysis treatment and diet could lead to increased life expectancy by 20 years or more and improved quality of life [5]. Poor adherence often led to additional and unnecessary tests, dosage adjustments, changes in treatment plans, emergency room visits or hospitalization [6]. The effectiveness of dialysis was lessened by non-adherence to dietary and medication regimens and dialysis treatments as skipping or shortening dialysis sessions that were necessary to improve nutritional status, reduce uremic toxicity and delay renal deterioration [7].

Adherence which is used interchangeable as compliance and can be defined as: "the extent to which a person's behavior corresponds with the agreed recommendations of a healthcare provider in terms of taking medicines, following the recommended diet and executing lifestyle changes"[4]. Hence, in ESRD is serous to earn a better perception of adherence. Adherence issues must receive more attention and become the subject of innovative studies in the hopes of reducing or eliminating a major impediment to achieving a healthier population [2, 3].

Interdialytic weight gains (IDWG), potassium and phosphorus blood concentration were biochemical markers that were most often utilized as objective measures of adherence in hemodialysis patients [8].

Non-adherence can be either intended or non-intended. Intended non-adherence means a deliberate effort to go against or not adhere to medical advice. While, unwillingly (as missing or forgetting) contradict the advice given by a healthcare professional indicates non-intended non-adherence. Totally adhere to treatment is not reported in most dialysis patients, whether it is intended or non-intended. Indeed, hemodialysis (HD) patients have knowing what they can "flee away with" in terms of adherence to dietary and fluid restrictions and modify their lifestyle accordingly. Improving perceptions of internal control and mastery, and upholding self-esteem is psychological benefits the hemodialysis (HD) patients may have related to lifestyle changes or coping restrain [9,10]. Non-adherence may be particular to a certain aspect of ESRD medication, dietary instructions, fluid intake, and dialysis schedule [11, 12].

Effective hemodialysis (HD) is strongly depend on the long life patients pledge to some aspects of regimens, namely dietary guidelines, fluid restriction, medication and dialysis [13]. Failure of adherence with these therapeutic regimens aspects is critical as it's associated with increased risk of complications including cardiac diseases, decreased in quality of life and life expectancy [14].

Worldwide, there was a wide variation in published reports regarding the rates of non adherence among hemodialysis patients, where fluid restrictions ranged from 30–74% and diet restrictions was from 2–81%, while the prescribed medications was from 17–46% [15-17].

The methods used to define and assess adherent behavior may cause diversity in published rates of non-adherence. Lack of standardized measurement in the dialysis population is problematic. Non-adherence may be specific to a particular aspect. In comparison with other chronic diseases, it was estimated that around half of hemodialysis patients were non- adhere to some aspect of the dialysis regimen [18-20].

In view of the prompt growing of ESRD in Egypt, there isa necessity to identify the adherence rate to therapeutic regimen among patients undergoing hemodialysis. Additionally there is a gape of knowledge and data on adherence regarding therapeutic regimes (dietary, fluid, medication and dialysis attendance) in our country. So our study aims to determine the overall adherence to therapeutic regimens among patients undergoing hemodialysis.

Aims of the study:

To determine the overall adherence to therapeutic regimens among patients undergoing hemodialysis.

2. Material and Methods:
Research design:

A descriptive research design was utilized.

Setting:

The study was performed at Nephrology Department in National Medical Institute in Damanhour, El-Behera Governorate. The hospital contains one department for hemodialysis which is divided into eight rooms and each room contains approximately from 3to 6 Patients.

Subject:

The study included all patients who were undergoing hemodialysis during August 2016 to November 2016. Inclusion criteria were adult patient, being in maintenance hemodialysis for at least 3 months, and being able to understand and answer the information sheets and questionnaires. Of 109 patients in the hemodialysis unit, 98 were eligible and accepted to participate.

Tools:

One tool was used for data collection. Including **part 1:** the Socio demographic data and medical history include; sex, age, educational level, causes of disease and Duration of dialysis. **Part 2:** The End-Stage Renal Disease-Adherence Questionnaire (ESRD-AQ) was designed by Kim et al [21] to measure treatment adherence behaviors.

The final version of the ESRD-AQ includes 46 questions/items sectioned into five parts. Patients' history explored with 5 questions in the first part, and the remaining four parts ask about adherence to HD schedule (14 questions), prescribed medications (9 questions), fluid restrictions (10 questions), and diet recommendations (8 questions). Integration between Likert scales and multiple choices, as well as "yes/no" was utilized as responses to the questions in (ESRD-AQ).

Adherence was graded as high, medium, and low and higher score indicates high adherence. The score from150-200 is highly adherence, 100-150 score medium adherence and less than100 is low adherence.

Methods
1.   Administrative process:

Before the conduction of the study, official permission was obtained from hospital administrators and heads of the departments to conduct the study after explanation of its purpose.

2.   Tools' validity and reliability:

The tool used in this study: The End-Stage Renal Disease-Adherence Questionnaire (ESRD-AQ)**.** Content validity was tested by 5 professors in medical and nursing fields and necessary modifications were done. The tool was tested for its reliability by measuring the internal consistency of items using Cronbach's alpha. The value was 0.76.

3.   Pilot study:

Pilot study was carried out on 10 patients, (10%) who were not included in the study sample in order to ensure the clarity and applicability of the tool

additionally its comprehension by the target population.

4. Data collection:

-Obtaining of the consent was acquired from those who met the criteria and accept to participate in the study after explaining the aim of the study.

- The data were collected using tool I by the researcher through the face-to-face interview method in the morning shifts. The interviews lasted approximately 30 min. with each patient. Weight and laboratory values were obtained from the medical records in the dialysis centers.

- Reviewing of the medical record was done by the researcher to collect the data about serum phosphors, serum potassium, and post dialysis weight gain in the previous HD session; and predialysis weight. Interdialytic weight gain was calculated by subtracting the post dialysis weight gain from the predialysis weight.

5. Ethical considerations:

A written informed consent to participate in the study was obtained from the students. The questionnaire was accompanied with a letter explaining the purpose of research. Anonymity and confidentiality were considered.

6. Statistical analysis

After data collection, it was revised, coded and fed to statistical software SPSS version 20. The given graphs were constructed using Microsoft excel software. All statistical analysis was done using two tailed tests and alpha error of 0.05.

4.   Results:

Table (1) showed that socio-demographic and clinical data of the studied subject. As regard to age half of subjects (46.1%) were less than 30 years old. About two third of them (60.8%) were females and most of them were married (69.6%). Moreover about half of the studied subjects (46.1%) had secondary school and above. Moreover 52.9% of the studied subjects were on dialysis from more than 5year ago.

As regard to medication, the number of daily tablet (s) taken by patients was ranged between (1 to 5) in the majority of the sample (79.4%). The presence of associated disease (s) was presents in (43.1%) of this sample. The main causes of renal failure reported by the studied subjects were hypertension (27.5%), glomerulonephritis (37.3%), unknown cause (9.8%); and other causes in (25.5%) of the studied subjects. About half of patients (52.6%) had less than one Kg interdialytic weight gain, compared to (44.4%) had from 1-2 Kg. About (57.8%) and (54.9%) of patients were had abnormal elevation in serum potassium and phosphors consequently.

Table (2): revealed that 40.2%of the studied subjects reported that it's very important to follow

dialysis schedule and this because it's important to their body healthy while only 11.8 % showed that it's very important to adhere with medication schedule and about one third of the studied subjects (30.4%) and (33.3%) revealed moderate importance to fluid restriction adherence and dietary instructions consequently.

Table (1): Distribution of the studied subjects according to demographic and clinical data (n=102)

	No.	%
Age		
Less than 30 year	47	46.1
30 – 40	32	31.4
40 – 50	14	13.7
More than 50	9	8.8
Gender		
Male	40	39.2
Female	62	60.8
Marital status		
Single	24	23.5
Married	71	69.6
Divorced	2	2.0
Widow	5	4.9
Educational level		
Illiterate	18	17.6
Read & write	37	36.3
Secondary school	15	14.77
High school	32	31.4
Causes of renal failure		
Hypertension	28	27.5
Glomerulonepheritis	38	37.3
Unknown	10	9.8
Others	26	25.5
Duration of dialysis		
Less than one year	8	7.8
1-5year	40	39.2
More than 5 year	54	52.9
Presence of associated disease		
Yes	44	43.1
No	58	56.9
Number of tablets		
1-5	81	79.4
6 – 10	21	20.6
More than10	0	0.0
Interdailytic weight gain		
Less than 1kg	53	52.0
1- 2 kg	45	44.1
More than 2kg	4	3.9
Potassium level		
Normal	42	41.2
Abnormal elevation	59	57.8
Abnormal decreasing	1	1.0
Phosphors level		
Normal	46	45.1
Abnormal elevation	56	54.9
Abnormal decreasing	0	0.0

Table (3): More than one third of the subjects have difficulties to fluid restriction and majority of them (78.4%) because they don't know how to control the fluid intake in relation to dietary recommendation

half of the subjects (52%) have moderate difficult to follow dietary recommendation and 45.3%of them because they were unable to avoid certain food.

Table (4) & figure (1): revealed that most of the studied subjects (93.9%) highly adhere to dialysis schedule while 80.4% of them was highly adhere with prescribed medications but only one third of them (33.3%) was highly adherence with fluid restrictions and about half of the subjects (47.1%) was highly adherence with dietary recommendations.

Regarding studied subjects total adherence level **table 5** showed that 51%of the studied subjects had

high adherence with therapeutic regimens with mean score and standard deviation (73.0 ± 14.4).

Table (6): Demonstrated the relationship between the overall adherence and studied subjects' demographic characteristics; it was found that female subjects had high adherence than male subjects. Besides that highly education had higher adherence (44.2%). Statistically significantly difference was found between the overall adherence behaviors and subjects' gender, educational level, duration of dialysis and intradialytic weight gain. ($P= 0.001$, 0.001, 0.002, 0.001) consequently.

Table (2): Distribution of the studied subjects knowledge related to importance of hemodialysis schedule adherence, medication adherence, fluid restriction and dietary recommendation (n=102)

Items	dialysis schedule adherence		Medications adherence		fluid restriction		Dietary recommendation	
	No.	%	No.	%	No.	%	No.	%
Importance to adherence schedule								
Highly important	41	40.2	12	11.8	14	13.7	1	1.0
Very important	22	21.6	43	42.2	22	21.6	18	17.6
Moderately important	16	15.7	26	25.5	31	30.4	34	33.3
A little important	12	11.8	17	16.7	24	23.5	29	28.4
Not important	11	10.8	4	3.9	11	10.8	20	19.6
Causes of the importance to adhere with treatment schedule								
a-My condition requires adherence with treatment scheduled	32	31.4	24	23.5	29	28.4	18	17.6
b-It is important to keep my body healthy	41	40.2	46	45.1	20	19.6	13	12.7
c- It is order from medical staff (doctor, nurse, or dietitian).	9	8.8	14	13.7	11	10.8	8	7.8
d- I had bad experience after non-adhere with treatment dialysis	9	8.9	14	13.7	31	30.4	43	42.2
e-I don't think it is very important to me	11	10.8	4	3.9	11	10.8	20	19.6

Table (3): Difficulties to fluid restrictions and dietary recommendations adherence (n=102)

Items	No.	%
Have any difficulty in restricting fluid intake?		
Yes	37	36.3
No	65	63.7
How much difficulty you had? (if yes)		
A little difficulty	16	43.2
Moderate difficulty	9	24.3
A lot of difficulty	12	32.5
What type of difficulty have you had?		
Not interested	0	0.0
Unable to control fluid intake	8	21.6
Don't know how to control fluid intake	29	78.4
Have any difficulty to follow dietary recommendations?		
Yes	53	52.0
No	49	48.0
(if yes)		
How much difficulty you had to follow the dietary recommendations? N (53)		
A little difficulty	17	32
Moderate difficulty	28	52.9
A lot of difficulty	8	15.1
What type of difficulty have you had?		
Not willing to control what I want to eat	11	20.8
Unable to avoid certain recommended food	24	45.3
Don't know which type of diet to follow	18	33.9

Table (4): Distribution of the studied subjects according to their adherence scoring related to therapeutic regimen (n=102)

|	No.	%
During the last month, how many dialysis treatments did you miss completely?		
Never (score 200)	55	53.9
Missed one sessions (score 150)	41	40.2
Missed two sessions (score 100)	6	5.9
Missed three sessions (score 50)	0	0.0
Missed four or more sessions (score 0)	0	0.0
During the last month, how many times have you shortened your dialysis time?		
None (score 200)	51	50.0
Once (score 150)	37	36.3
Twice (score 100)	12	11.8
Three times (score 50)	2	2.0
Four to five times (score 0)	0	0.0
During the past week, how often have you missed the prescribed medicines?		
None (score 200)	61	59.8
Very seldom (score 150)	21	20.6
About half of the time (score 100)	7	6.9
Most of the time (score 50)	13	12.7
All time (score 0)	0	0.0
During the past week, how often have you followed the fluid restriction recommendations?		
All time (score 200)	4	3.9
Most of the time (score 150)	30	29.4
About half of the time (score 100)	19	18.6
Very seldom (score 50)	42	41.2
None (score 0)	7	6.9
During the past week, how many times have you followed the diet recommendations?		
All time (score 200)	14	13.7
Most of the time (score 150)	34	33.3
About half of the time (score 100)	29	28.4
Very seldom (score 50)	25	24.5
None (score 0)	0	0.0
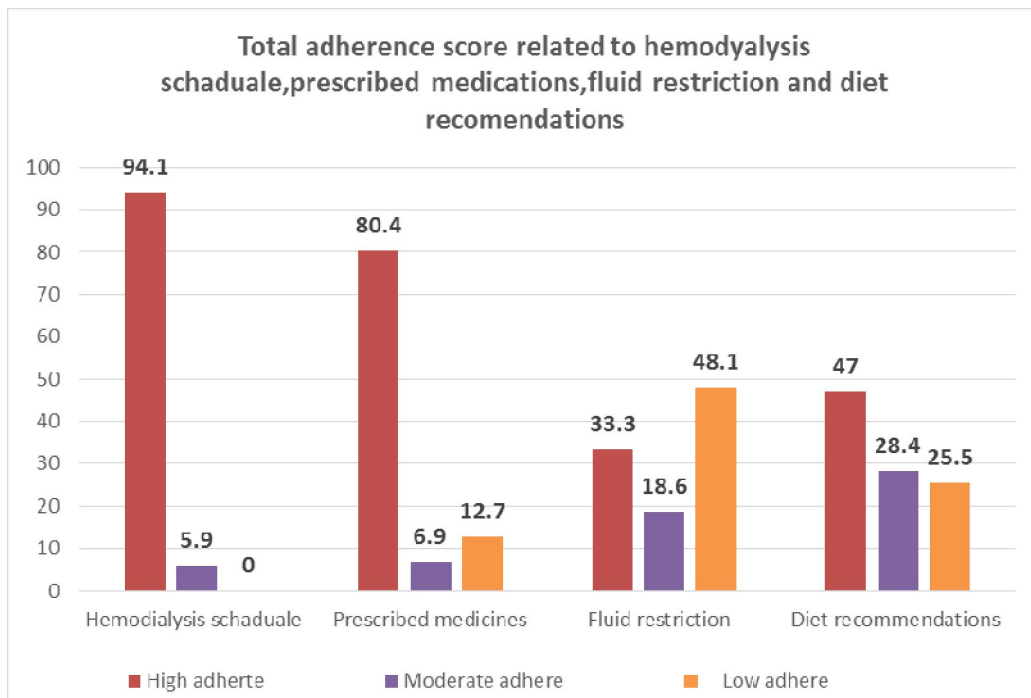
Figure (1): Total adherence scorerelated to hemodialysis schedule, prescribed medications, fluid and diet recommendations.

Table (5): Distribution of the studied subjects according to their level of adherence regarding to hemodialysis therapeutic regimen (n=102)

	No.	%
Scoring Adherence		
Low (<50%)	6	5.9
Moderate (50 - <74%)	44	43.1
High (≥75)	52	51.0
Total score		
Min. – Max.	450.0 – 1200	
Mean ± SD	876.0 ± 173.2	
%score		
Min. – Max.	37.50 – 100.0	
Mean ± SD	73.0 ± 14.4	

Table (6): Relation between overall adherence and demographic data

	Overall Adherence							MCp
	low (n=6)		Moderate (n=44)		High (n=52)			
	No.	%	No.	%	No.	%		
Age								
Less than 30 year	2	33.3	22	50.0	23	44.2		
30 – 40	4	66.7	11	25.0	17	32.7	7.226	0.250
40 – 50	0	0.0	9	20.5	5	9.6		
More than 50	0	0.0	2	4.5	7	13.5		
Gender								
Female	0	0.0	23	52.3	39	75.0	14.860*	<0.001*
Male	6	100.0	21	47.7	13	25.0		
Marital status								
Single	0	0.0	13	29.5	11	21.2		
Married	6	100.0	30	68.2	35	67.3	5.888	0.419
Divorced	0	0.0	0	0.0	2	3.8		
Widow	0	0.0	1	2.3	4	7.7		
Educational level								
Illiterate	0	0.0	9	20.5	9	17.3		
Read & write	2	33.3	17	38.6	18	34.6	19.551*	0.001*
Secondary school	4	66.7	9	20.5	2	3.8		
High school	0	0.0	9	20.5	23	44.2		
Causes of renal failure								
Hypertension	0	0.0	10	22.7	18	34.6		
Glomerulonepheritis	6	100.0	12	27.3	20	38.5	14.957*	0.010*
Unknown	0	0.0	8	18.2	2	3.8		
Others	0	0.0	14	31.8	12	23.1		
Duration of dialysis								
Less than one year	2	33.3	6	13.6	0	0.0		
1-5year	0	0.0	19	43.2	21	40.4	15.238*	0.002*
More than 5 year	4	66.7	19	43.2	31	59.6		
Presence of associated dis								
Yes	4	66.7	15	34.1	25	48.1	3.307	0.200
No	2	33.3	29	65.9	27	51.9		
Interdailytic weight gain								
Less than 1kg	2	33.3	20	45.5	31	59.6		
1- 2 kg	0	0.0	24	54.5	21	40.4	25.373*	<0.001*
More than 2kg	4	66.7	0	0.0	0	0.0		
Potassium level								
Normal	2	33.3	13	29.5	27	51.9		
Abnormal elevation	4	66.7	30	68.2	25	48.1	7.082	0.127
Abnormal decreasing	0	0.0	1	2.3	0	0.0		
Phosphors level								
Normal	2	33.3	20	45.5	24	46.2		
Abnormal elevation	4	66.7	24	54.5	28	53.8	0.379	0.901
Abnormal decreasing	0	0.0	0	0.0	0	0.0		

χ2, p: χ2 and p values for Chi square test   MC: Monte Carlo for Chi square test
*: Statistically significant at p ≤ 0.05

4. Discussion:

Adherence to fluid and dietary restrictions and medication guidelines as well as attendance to prescribed hemodialysis sessions of a hemodialysis regimen is essential to manage renal failure patients. Morbidity and mortality was reported to increase with non-adherence to the prescribed regimen. This plays an important part in achieving better quality of life. Many studies have been conducted to analyze the adherence of patients [22-24] in particular patients with Chronic Renal Disease (CRD) which is a cumulative, irreversible deterioration in renal function in which the body's not able to preserve metabolic and fluid and electrolyte balance, resulting in uremia or azotemia. Therefore, the degree of adherence to treatment has impact on the clinical outcomes of patients with CRD.

Adherence with various aspects of management is uncommon and is understandable from the patient's perspective [25]. Our study was conducted to assess overall adherence to therapeutic regimen of patients undergoing maintenance HD.

The demographic findings of the present study showed that the majority of the study subjects were male, low educated and on hemodialysis form more than 5years ago.

A high intradialytic weight gain (IDWG) is considered one of the most common non-adherent indicators; in the present study notified that about half of patients had high IDWG. This finding is concrete with the results of Euro-DOPPS; which reported a high IDWG as non-adherent behavior in France and Italy [26].

Most of the studied subjects had abnormal elevation in serum potassium and phosphors consequently. This may be due to Egyptian patients are living in extended families, which make preparing food with specific consideration related to potassium, phosphorus, and protein restriction is very difficult. Besides that, most of the studied subjects are low educated and low economy, which make purchasing the prescribed food and reading food labels hard. This finding were consistent with the results of zirinyi (2003) who found that increased serum phosphate levels and IDWG was reported in patients who living with family members [27].

Moreover in the present study, studied subjects reported that it's very important to follow dialysis schedule and this because it's important to their body healthy while about one third of the studied subjects adherence to fluid restriction and dietary instructions were moderately importance to them, This may be due to most of the studied subjects don't know how to control their fluid intake and didn't suppose attaching therapeutic regimen is important.

In relation to dietary recommendation half of the subjects had moderate difficult to follow dietary recommendation and this because they were unable to avoid certain food. In Egypt, cultural factors such as, eating with the family may increase the temptation to eat also having difficulty in controlling their sodium levels. Because salt is a major component of the most traditional Egyptian foods, prescribing low-salt foods to restrict the sodium and water intake is often not acceptable to patients. These results were supported by Baraz et al (2010) [28]. Additionally, depressive symptoms and lack of social support also played a respectable role in adherence to diet and fluid restrictions. Hence, difficulties for adhering to sodium intake recommendations among dialysis patient indicating that there may need individualize counseling and interventions.

On the other hand, only one third of the studied subjects were highly adherence with fluid restrictions and about half of the subjects were highly adherence with dietary recommendations this finding is in agree with other studies about adherence among hemodialysis patients [29-31]. Also a study in United States [32] mentioned that the adherence rates regarding diet instructions was reported in 26% and fluid restrictions adherence was in 47% of the studied subjects.

Furthermore, the present study showed the majority of the studied subjects highly adhere to dialysis schedule and prescribed medications. The findings can be explained as our subjects perceived themselves more adherences to dialysis schedule and prescribed medication is important and vital for their life than diet or fluid restrictions. Moreover, this is can be related to the long duration of dependence on dialysis (length of time on dialysis) which may cause hemodialysis patients to habituate to the restrictions obligated by the disease and sense themselves as having better adherence than they actually did. On the other hand, this finding contradicting with others findings which reported that medication adherence was found by 16% only of the studied sample. [32-34] Alsoa similar finding reported in Tomasello et al. (2004) [35] where non-adherence to treatment was 58%. This may be highlighting the need for rising willpower, further convenient knowledge and skills to obtain dietary and fluid instructions.

Also in the present study only half of the studied subjects had high adherence with overall therapeutic regimens, this can be due to a patient's lack of understanding, forgetfulness or miscommunication with healthcare providers. Another study conducted by Chan, et al (2012) in Malaysia found the adherence rates of dietary, fluid, medication and dialysis were 27.7%, 24.5%, 66.5% and 91.0%, respectively [30].

The variations in the adherence rate may be related to the using of different adherence

measurement instruments and variations in studies settings.

The adherence of patients undergoing hemodialysis may be influenced by the socio-demographic characteristics as this present study findings found that female subjects had high adherence than male subjects. In our study findings, we did not find a relationship between marital status and the level adherence, the same result was found in Zrinyi et al study [27]. Moreover in the present study, highly education was higher adherence; this presumed that education level have a significant impact in adherence to therapy. Our results also showed that educational level is associated with adherence. This is in agreement with Baraz et al 2010[28] and it assert that knowledge may be a predictor of adherence behavior. However, this finding is in contrast with some other reports of no relationship between knowledge and adherence [36]. This is supported by our data showing that young and more educated patients were more adherent with the dietary and fluid regimens, and showed better adherence compared with older and less educated patients.

Statistically significantly difference was found between the overall adherence and subjects' gender, educational level, duration of dialysis and intradialytic weight gain.

On the contrary of our results there were studies reported that highly adhere to fluid intake and prescribed medications was correlated with old age patients [32, 37, 38]. This can be explained by, steadiness lifestyle of old age patients may accommodates the requirements of the treatment regimen while younger patients may understood themselves as less vulnerable to negative health consequences [39]

Also, in this study, women were more adherent to therapeutic regimen than men and these findings are homogenous with studies conducted by Kugler et. al (2005) and Lam et.al. (2010) [29, 33]. It is probably that women are more health awareness than men [40]. How gender differences in adherence may benefit patients concerning health outcomes in the long run however deserves for longitudinal research. This finding is congruent with other studies [29, 41].

Our study findings found that the studied subjects with longer duration on hemodialysis were more non-adherent. This finding in agreement with the study done by Lee and Molassiotis (2002) [42]. This can be related to those patients may feel monotony and be disappointed with the need to respond with the many restrictions regarding diet, fluid and prescribed medications [33]. While recent hemodialysis patients also receive more social support and therefore more adherence is expected [33]. So, resistance to varieties of foods available and control fluid intake will be difficult for those patients. Therefore, the nurse should

expect the individual's perceived barrier; scout patients' willingness and have desire to make modifications to their habits to obtain the optimum effect of adherence.

Conclusion:

Based on the results of the present study, the following can be concluded:

- The majority of the studied subjects had poor knowledge about the importance of adherence to hemodialysis therapeutic regimen.

- Half of the studied subjects had high adherence to overall HD therapeutic regimen.

- Most of the studied subjects were highly adhere to dialysis schedule and prescribed medications. while they were low adherence to fluid restrictions and dietary recommendations.

Recommendation:

Based on the results of the present study, the following recommendations were suggested:

- provide evidence and direction for the design of interventions to enhance patient adherence.

-Assess the potential of patient-nurse interactions to influence adherence.

- Development of patient education programs to improve patient adherence.

- Establish strategies to maintain and reactivate adherence, such as regular educational follow-ups.

- It emphasizes the need for nephrologists and dietitians to strengthen efforts toward educational and clinical approaches to correct this situation.

-Further studies are required to assess the factors and predictors of non-adherence.

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