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Nursing instructions Improve Medication Adherence among Patients undergoing Haemodialysis

Dalia Salah El-Deen[1], Amel Saied Mahmoud[2*]

[1]Assistant Professor of Medical Surgical Nursing, Faculty of Nursing, Cairo University, Egypt
[2]Lecturer of Medical surgical Nursing, Faculty of Nursing, Cairo University, Egypt
*Corresponding Author's Email: amalsaied19@yahoo.com

Abstract: End-stage kidney disease has become a major concern worldwide the total number of these patients receiving hemodialysis has been grown globally. Medication nonadherence is highly prevalent in such patients with an average prevalence rate of 52.5%.

Aim: The aim of the current study was to evaluate the effect of nursing instructions on knowledge, attitude and medication adherence among patients undergoing hemodialysis.

Methodology: A quazi experimental nonequivalent control group design was utilized. A convenient sample of 60 adult patients on hemodialysis, randomly divided into study and control groups (30 patients each).The study conducted in the hemodialysis department at one of the University hospital in Cairo, Egypt. Data were collected through; Demographic and Medical Data Sheet, Knowledge Assessment Sheet, 13-Item Semantic Differential Scale, and 8-Item Morisky Medication Adherence Scale.

Results: There were statistically significant improvement of knowledge; attitude and adherence regarding medication regimen in the study group after implementation of the nursing instructions in comparison to the control group.

Conclusion: nursing instructions improve patients' knowledge, attitude and adherence to medications. Undoubtedly, this is an important factor in preserving and improving patients' health among patients undergoing hemodialysis.

Recommendation: It is suggested to apply these nursing instructions for patients undergoing hemodialysis in the early course of the treatment.

Keywords: **Nursing instructions, medication adherence, haemodialysis.**

I. INTRODUCTION

Chronic kidney disease (CKD) is a modern day global epidemic and is currently recognized as a public health issue [1,2]. The burden of CKD continues to increase, affecting 10–15% of individuals and health systems in low-, middle-, and high-income countries with significant mortality and morbidity [3]. Chronic kidney disease, as it continues from early stage (stage 1) to late stage (stage 5) which is called End-stage Kidney disease (ESKD), requires renal replacement therapy [4,5].

End-stage kidney disease has become a major concern worldwide as the total number of ESKD patients receiving hemodialysis has been grown globally and the cost is increasing substantially [6,7]. In USA, there are more than (65%) of patients with chronic kidney disease under haemodialysis treatment, more than (28%) have transplanted kidney, and more than (7%) are under peritoneal dialysis treatment [8]. Moreover, an estimated 2.6 million people worldwide received dialysis treatment for ESKD in 2010, and a two-fold increase is expected by 2030 [9].

The United States Renal (Kidney) Data System has just released its Annual Data Report for 2018, and highlights the fact that American rates with ESKD that require dialysis or kidney transplantation rank among the highest in the world and continue to rise. The death rates among patients on dialysis are no longer decreasing. This development deserves greater attention by practitioners and researchers [10].

Haemodialysis (HD) is one of the most common, important and effective treatment modalities that can help to sustain the life of such patients [11]. Many of the most common problems experienced by patients having HD are related to their nonadherence with the treatment regimens [7]. End-stage kidney disease patients undergoing HD are prescribed with multiple complex regimens[2].

Patients with ESKD are at high risk of developing imbalances in calcium and phosphate haemostasis, anemia, hyperlipidemia, and secondary hyperparathyroidism. Consequently, patients on HD often require an average of 10–12 regular medications including but not limited to, phosphate binders, vitamin D preparations, calcimimetics, antihypertensive, antidiabetics, erythropoiesis-stimulating agents and iron supplements. The resultant complexity of medication regimen in patients with ESKD predisposes them to subsequent nonadherence [12].

Developing a new drug for clinical use costs companies about $2.6 billion [13], however the cost of treating complications from medication nonadherence averages about $100 billion a year. Medication nonadherence is highly prevalent in patients undergoing HD [12]. Nonadherence to treatments can affect many care aspects, including but not limited to prescriptions of medication. Furthermore, documented literature revealed that approximately 50% - 52.5% of individuals with ESKD undergoing HD were not adhering to their prescribed treatment regimen [14]. The consequences of medication nonadherence are detrimental and costly in patients on haemodialysis [15,16]. Survival of the ESKD population depends on strict adherence to integrated management [5].

According to the World Health Organization (WHO), adherence is defined as ―the extent to which a person's behavior as taking medication, following a diet, and/or executing lifestyle change, corresponds with agreed recommendations from a health care provider [7]. Medications will not be effective if patients do not follow prescribed treatment, yet in developed countries only 50% of patients who suffer from chronic diseases adhere to treatment recommendations. In developing countries, the rates are even higher, when taken together with poor access to health care, lack of appropriate diagnosis and limited access to medicines, poor adherence is threatening to render futile any effort to tackle chronic conditions. Improving adherence enhances patients' safety. Because most of the care needed for chronic conditions is based on patient self-management, patients face several potentially life-threatening risks if not appropriately supported by the health system. Adherence needs to be followed up. Improving adherence requires a continuous and dynamic process
[17].

Studies have shown that many people with advanced renal diseases do not have sufficient knowledge for managing their treatment regimen. Patients with chronic diseases do not consume a half of their prescribed drugs. As it has been reported, many patients eliminate their drug dosage and stop their medication without consultation with physicians or improperly change the drug dosages. These decisions are made because of not having the required knowledge [8].

The research studies have revealed giving information to patients about their chronic diseases, is followed by improvement. Limited studies have worked on the association between dialysis patients' knowledge and the adherence to the medical prescriptions [8]. However, effective interventions for adherence in this population are lacking [18]. As stated by American Kidney Fund and Adherence Survey (2018) medication nonadherence was an example of a difficult behavior, which has a significant negative effect on HD patient outcomes. Many renal professionals said factors within their control may contribute to patients' medication nonadherence: 48% said, staff had difficulty explaining the importance of medication adherence and following medication regimens to patients [19].

Teaching and learning generally fall within the scope of the independent realm of nursing interventions; the nephrology nurse can use them to assist patients to adhere to their therapeutic regimen. If patients receive education regarding their therapeutic regimen, they will be able to make informed decisions about whether or not to adhere to medication regimen [20,21]. Inherent in the previous statements is the belief that lack of information is the most important factor contributing to non-adherence with therapeutic regimen, conclusively, promotion of patients' knowledge about adherence to therapeutic regimen is important, and nurses' role is extremely significant [7]. Thus the aim of the current study was to assess the effect of nursing instructions on Knowledge, attitude and medication adherence among patients undergoing haemodialysis.

Significance of the study:

The burden of chronic disease on health care services worldwide and especially in developing countries like Egypt is growing, and the increased development of educational interventions which help patients to better manage their conditions is evident internationally. In developing countries like Egypt, there is an increase in prevalence and incidence of ESKD exerting a great burden on health system. In the whole of Egypt, there is no recent exact registered number about the prevalence; however, the last statistics were from 2004 indicated a prevalence of 483 per million populations. In the EL-Minia Governorate, one of the Upper Egypt governorates, the prevalence was 308 pmp [22]. Moreover, the prevalence of medication nonadherence varied from 12.5% to 98.6% [12]. However, some of the interventional strategies focusing patient centered care such as patient education will increase the adherence to treatment regimen [23].

In addition, few studies to date have examined HD patients' knowledge, attitude and adherence to medication regimen in Egypt which justifies the significance of the present study. It is also imperative to improve education regarding patient's medication regimen, and provide concise instructions to prevent confusion.

II. RESEARCH METHODOLOGY

Aim

The aim of the current study was to assess the effect of nursing instructions on knowledge, attitude and medication adherence among patients undergoing hemodialysis.

Research Hypotheses

H1: The intervention group who will receive the nursing instructions will have significant higher mean knowledge scores regarding medication than the control group who will receive the routine hospital care.

H2: The intervention group who will receive the nursing instructions will have significant higher mean attitude towards medication adherence scores than the control group who will receive the routine hospital care.

H3: The intervention group who will receive the nursing instructions will have significant higher mean medication adherence scores than the control group who will receive the routine hospital care.

Research design

A quasi experimental nonequivalent control group design was utilized to accomplish the aim of this study.

Setting

The study was conducted in the hemodialysis department at one of the University hospital in Cairo, Egypt.

Subject

Convenient sample of adult male and female participants were illegible in the current study, Epi Info program was utilized to calculate the sample size, whereas, 220 patients attending to the hemodialysis department, at 95% confidence level and 30% as an expected frequency and 20% as the lowest accepted frequency level, the total sample size was 60 patients. The inclusion criteria were (1) patients with ESKD on hemodialysis regimen for not less than six months, (2) they did not adhere to medication regimen as, had score less than 6 on the 8-item Morisky Medication Adherence Scale. Patients were randomly equally assigned into control or intervention group as the first patient selected, considered the first one in the control group and second patient was in the intervention group and so on.

Study Period

Data collection phase was conducted over a period from August 2016 and extended up to February 2017 in the targeted hospital.

Tools for data collection:

In order to achieve the aim of the current study, four tools were utilized as follows:

1. Demographic and medical data sheet: it covers data regarding the demographic characteristics such as age, gender, marital status, level of education, and occupation. Medical information including data related to duration of hemodialysis session, time of dialysis per hour and frequency of dialysis per week.

2. **Knowledge data sheet**: it was designed by the researchers after extensive literature review, to measure the medication knowledge for those patients, it had 25 statements. The patients sign either right or wrong. The scoring system would be (0) if the answer is incorrect and (1) if the answer is correct with total scores ranged from 0-25. The patients had satisfactory level of knowledge if he had approximately 75% of total knowledge scores (18 score or more).

Content validity & Reliability

To guarantee the content validity of the tool, it was revised and approved by board of 5 specialists in medical surgical nursing; the suggested modifications were done. Internal consistency among the questionnaire items was evaluated. The tool is reliable at 0.75using Cronbach's alpha.

3. 13-item semantic differential scale: [24] it was used to measure attitude toward taking prescribed medication, the scale had a 7-point Likert ranging from "very closely related" to "very closely unrelated", with total score ranged from 13 to 91.The 13 items were bipolar adjectives such as "easy to hard", whereas; positive adjectives received higher assigned numbers. The tool was reliable at 0.89 using the alpha coefficient.

4. 8-item Morisky Medication Adherence Scale (MMAS-8) [25]: The MMAS-8 it measure patient's medication-taking adherence. It consists of 8 items, questions 1 to 7 consisted of yes/no responses, with a value of 1 assigned to all no responses except question 5, in which the yes response was assigned a value of 1. Question 8 consisted of 5 possible options, with never/rarely assigned a value of 0 and all other possible options assigned a value of 1. The summative score could range from zero to eight. Patients are classified, according to the score obtained, as no-adherent (score<6), and adherent (6 - 8). With regard to test-retest reliability, it was 0.81.

Ethical consideration

An official permission was obtained from the director of the department in which the study was conducted. Prior to conducting the study, each potential patient was fully informed with the purpose and nature of the study, and then informed consent was taken from the patients. In addition, the researchers emphasized to each patient that participation in the study is entirely voluntary; anonymity and confidentiality were assured through coding of data, yet, withdrawal from the study is permitted as it is one of their rights without any penalty.

Pilot study:

A pilot study was conducted on 6 patients at hemodialysis unit, and these patients were excluded from the study sample. The objectives of the pilot study were: (a) estimate the time necessary to fill out the entire questionnaires and (b) test the clarity of the Arabic form of the tools as well as the feasibility of the study. Almost all items were clearly understood. Modifications were done in the final form of the tools. The result of the pilot study confirmed that the study is feasible.

Procedure of the study:

The study conducted through the following three phases: preparatory, implementation and evaluation phase.

Preparatory phase: Once official permission was taken, the researchers started to collect data from those patients who met the inclusion criteria. 8-item Morisky Medication Adherence Scale was applied for those patients first; the patient included in the study if they score was less than six on the scale. The purpose of the study was explained to the patients and those who agreed to participate were recruited. In order to have baseline data, demographic and medical data sheet, Knowledge data sheet, 13-item semantic differential scale, and 8-item Morisky Medication Adherence Scale (MMAS-8) tools were filled in during the initial interview for the entire study sample.

Implementation phase: Sixty patients were equally and randomly assigned into two groups, the control group, received the routine hospital care, and the intervention group received the nursing instructions, and patients were interviewed individually. The intervention group received teaching sessions during the hemodialysis session two times per week in the 1^{st} , 2^{nd} and 3^{rd} weeks. The nursing instructions covered information regarding definition, signs and symptoms of renal failure, hemodialysis. Also information was provided regarding the standard of the medication regimen (calcium supplementation, vitamin, vitaminB_6, B_{12}, antioxidant, dietary supplementation, iron supplementation, antihypertensive,

and erythropoietin) main action, main side effects, and, finally the hazards the patient may suffer if he did not follow the medication regimen. Each session lasted for around 15–20 minutes based on patients' understanding. The time taken by the patients to complete all the tools was approximately from 20 to 30 minutes.

Evaluation phase: The entire study sample was followed up for two consecutive months. By the end of the 4th week, Knowledge data sheet, 13-item semantic differential scale, and 8-item Morisky Medication Adherence Scale (MMAS-8) tools were collected from both the intervention and control groups in order to assess the post intervention effect, as well as, by the end of the 8th week to have follow-up information.

Statistical design:

Data were revised, coded, analyzed and tabulated using the number and percentage distribution and carried out using SPSS version 20. In order to compare means between groups, t-test as well as ANOVA test was used. Chi square was applied for qualitative variables; finally, r-test was used to test relationship between quantitative variables. A value of $p \leq 0.05$ was considered to be statistically significant.

III. RESULTS

The current study findings are presented in two sections: 1) Description of the study samples' demographic characteristics, and medical related information, and 2) Comparison of mean knowledge, attitude and adherence to medication regimen scores between intervention and control groups along the study period, correlation between medication adherences, knowledge and attitude scores of the intervention and control groups, as well as, the relationship between medication adherence scores and selected demographic characteristics.

Section (1)

Table (1): Frequency percentage distribution of the demographic data of the intervention and control groups (n= 60)

Parameters	Intervention group n=30		Control group n=30		X^2 Test	P value
	No	%	No	%		
Age/years						
20 - <30	10	33.3	6	20		
30 - <40	3	10	9	30	4.50	0.212
40 - <50	4	13.4	5	16.7		
50 and more	13	43.3	10	33.3		
Mean ± SD of age	45.33±18.66		43.50±15.58			
Gender						
Male	13	43.3	11	36.7	0.278	0. 792
female	17	56.7	19	63.3		
Marital status						
Married	22	73.3	23	76.7	0.089	0.766
Not married	8	26.7	7	23.3		
Education						
Illiterate	7	23.3	8	26.7		
Read and write	6	20	6	20	0.119	0.989
Secondary	7	23.3	7	23.3		
Higher	10	33.3	9	30		

* Significant ≤ 0.05

Table (1) shows that 43.3% of the intervention group and 33.3% of the control group had age 50 years and more, with mean age 45.33±18.66 and 43.50±15.58 respectively of the intervention and control groups. In addition, 56.7% and 63.3% of the intervention and control groups respectively were females, while, 73.3% and 76.7% of the intervention and control groups respectively were married. Moreover, 33.3% and 30% of the intervention and control groups respectively had high education level, with no statistically significant difference between two groups regarding demographic characteristics.

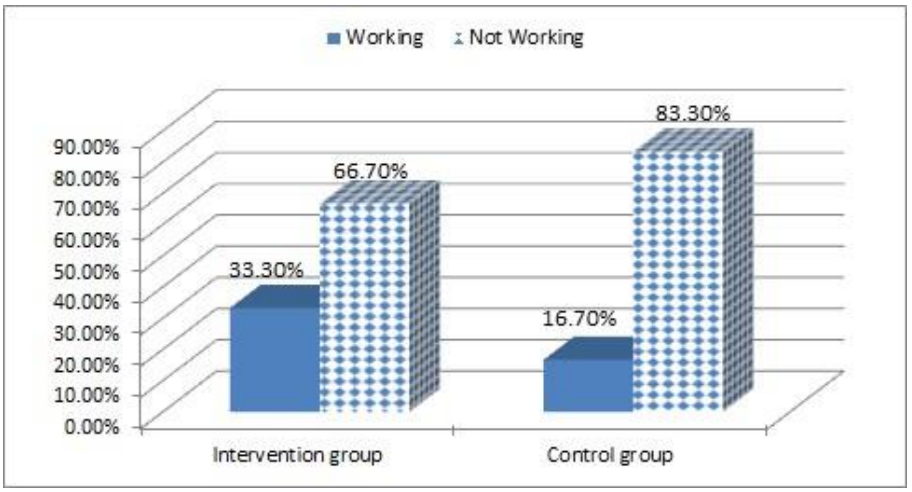

Figure (1) percentage distribution of the working status of the intervention and control groups (n= 60).

Regarding working status figure (1) displays that, 66.7% and 83.3% of the intervention and control groups respectively had no work, with no statistically significant difference between both groups.

Table (2): Frequency percentage distribution of the hemodialysis session information of the intervention and control groups (n= 60)

Variables	Intervention group n=30		Control group n=30		Test X^2	p-value
	No	%	No	%		
Duration of dialysis						
< 5 years	22	73.3	20	66.7	0.317	0.779
≥5 years	8	26.7	10	33.3		
Mean and SD of dialysis duration	3.96±2.23		2.80±1.95			
Time of dialysis per hours						
3 hours	8	26.7	2	6.7	4.32	0.08
4 hours	22	73.3	28	93.3		

* Significant ≤ 0.05

Table (2) shows that 73.3% and 66.7% of the intervention group and control group on hemodialysis for less than 5 years. Duration of hemodialysis session lasted for 4 hours for 73.3% and 93.3% of the intervention and control groups respectively. Moreover, there was no statistically significant difference between two groups regarding hemodialysis variables.

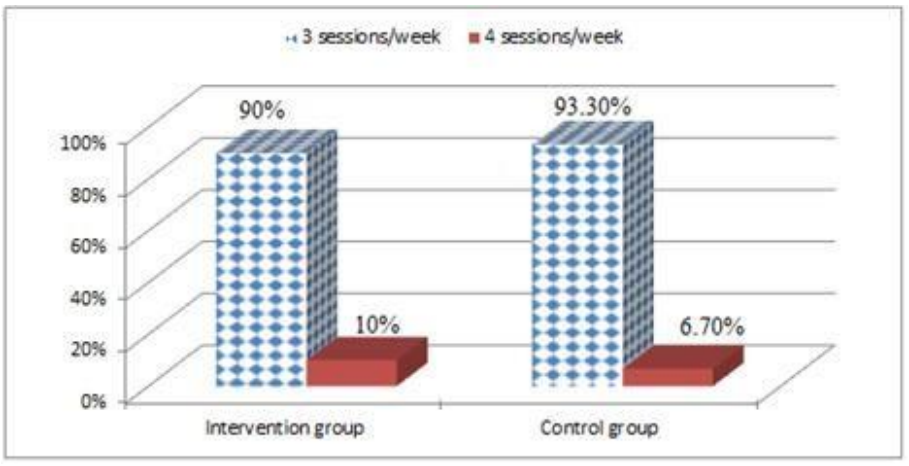

Figure (2) percentage distribution of frequency of dialysis per week for the intervention and control groups (n=60).

Concerning frequency of dialysis per week figure (2) illustrates that, 90% and 93.3% of the intervention and control groups respectively had three hemodialysis sessions per week, with no statistical significant difference between two groups.

Section (2)

Table (3): Frequency percentage distribution of knowledge level and comparison of mean knowledge scores between the intervention and control groups during the study period (n= 60).

Parameters	1st week (base line assessment)				4th week (post intervention)				8th week (follow up)			
	Intervention		Control		Intervention		Control		Intervention		Control	
	No.	%	No	%	No.	%	No	%	No.	%	No	%
Level of satisfaction:												
-Satisfactory (18-25)	10	33.3	8	26.7	24	80	10	33t3	27	90	10	33.3
-Unsatisfactory (0-17)	20	66.7	22	73.3	6	20	20	66.7	3	10	20	66.7
X^2	3.333				10.8				19.2			
p-value	0.068				0.001*				0.000*			
Mean ± SD	13 ± 4.4		13.2 ± 4.2		20.7 ± 3.2		15.1 ± 4.1		21.7 ± 2.6		15.2 ± 4.2	
t-test	0.960				6.424				7.780			
p- value	0.345				0.000*				0.000*			

* Significant ≤ 0.05

Table (3) shows that 33.3% and 26.7% of the intervention and control groups respectively had satisfactory level of knowledge in the 1st week, while in the 8th week, 90% and 33.3% of the intervention and control groups respectively had satisfactory level of knowledge regarding medication. Moreover, there was no statistically significant difference in mean knowledge scores between the intervention and control groups in the first week, (t-test= 0.960, p-value= 0.345). However, there was statistically significant differences between the intervention group and control groups in the 4th and 8th weeks whereas t-test= 6.424, p-value= 0.000 and t-test= 7.780, p-value= 0.000 respectively.

Table (4): Comparison of mean scores of attitude toward medication between the intervention and control groups during the study period (n= 60).

Parameters	1st week (base line assessment)		4th week (post intervention)		8th week (follow up)	
	Intervention	Control	Intervention	Control	Intervention	Control
Mean ± SD	50.3 ± 24.3	51.9 ± 23.2	72.3 ± 1.6	53.6 ± 4.5	76.4 ± 1.9	55.6 ± 4.2
t-test	0.806		5.133		5.985	
p- value	0.427		0.000*		0.000*	

* Significant ≤ 0.05

Regarding attitude toward medication, there was no a statistically significant difference between the intervention and control groups in the 1st week in mean scores of attitude (t-test= 0.806, p-value= 0.427). While, the mean attitude scores were significantly higher among the intervention group than the control group in the 4th and 8th weeks, with a statistically significant difference between both groups whereas t-test= 5.133, p-value= 0.000 and t-test= 5.985, p-value= 0.000 respectively.

Table (5): Frequency and percentage distribution of adherence level and comparison of mean scores of adherence to medication regimen between intervention and control groups along the study period (n= 60).

Parameters	1st week (base line assessment)				4th week (post intervention)				8th week (follow up)			
	Intervention		Control		Intervention		Control		Intervention		Control	
	No.	%	No	%	No.	%	No	%	No.	%	No	%
Level of adherence												
-adhere (6-8)	0	0	0	0	19	63.3	2	6.7	25	83.3	4	13.4
-Non-adhere (0-5)	30	100	30	100	11	36.7	28	93.3	5	16.7	26	86.6
X^2	-				22.5				19.2			
p-value	-				0.000*				0.000*			
Mean ± SD	3 ± 1		3 ± 1.1		6.2 ± 1.8		3.2 ± 1.6		6.7 ± 1.5		3.4 ± 1.8	
t-test	0.205				9.650				10.105			
p- value	0.839				0.000*				0.000*			

* Significant ≤ 0.05

Table (5) shows that in the 1st week all the intervention and control groups had no adherence to medication regimen as it is one of the inclusion criteria, while in the 8th week, 83.3% and 13.3% of the intervention and control groups respectively adhere to medication regimen. Moreover, there was no statistically significant difference was detected between both groups in the first week (t-test= 0.205, p-value= 0.839), while in the 4th and 8th weeks, the mean scores of the intervention group significantly increased than the control group with (t-test = 9.650, p-value= 0.000), and (t-test =10.105, p-value =0.000) respectively.

Table 6: Correlation between medication knowledge, attitude and medication adherence of the intervention and control groups (n= 60).

Variables	Medication adherence			
	Intervention group		Control group	
	r-test	p- value	r-test	p- value
knowledge	0.651	0.000*	0.391	0.000*
attitude	0.665	0.000*	0.389	0.000*

* Significant ≤ 0.05.

Table (6) indicates that, there were positive correlations between knowledge, attitude and adherence regarding medication regimen among the intervention and control groups after implementation of the nursing intervention.

Table 7: Relationship between medication Adherence and selected demographic characteristics of the intervention and control groups (n=60).

Variables	Medication Adherence			
	Intervention group		Control group	
	Test	p- value	Test	p- value
Age : (r-test)	0.179	0.343	0.042	0.825
Gender (t-test)	0t200	0.427	1.664	0.1
Education (ANOVA)	4.852	0.011*	4.221	0.02*
Working status (t-test)	0.678	0.50	0.849	0.40

* Significant < 0.05

Table (7) articulates that there was no relationship between medication adherence and age of the intervention and control groups, moreover, there was no statistical significant difference between males and females, working and not working and medication adherence among intervention and control groups. While, there was a statistically significant difference between educational level and medication adherence in both groups (ANOVA= 4.852, p-value=0.011) and control group (ANOVA= 4.221 p-value= 0.02).

IV. DISCUSSION

The epidemiology of ESKD is one of the major phenomena and the health societies are dealing with the threshold of twenty first century. Haemodialysis is one of the common treatment modality. It is a long-term process, patients need to use a set of medications to manage and deal with their illness. However, many patients are not obedient to their prescribed treatment regimen of dialysis. Adherence to medical directions is the secret of survival for the patients [12]. So the purpose of this study was to assess the effect of nursing instructions on knowledge, attitude and medication adherence among patients undergoing hemodialysis.

The discussion will be presented into two sections: first section; Description of the study samples' demographic characteristics, and medical related information. Second section; Comparison of knowledge, attitude and adherence to medication regimen mean scores between intervention and control groups along the study period, correlation between medication adherences, knowledge and attitude scores of the intervention and control groups, as well as, the relationship between medication adherence scores and selected demographic characteristics, these data will support the research hypotheses.

First section: Findings of the current study showed similarity between the two groups' patients in the demographic characteristics and medical data, and there was no statistical significant difference between both groups in relation to those variables, so that it had no influence on the research results. Correspondingly [26] in their study displayed, the baseline characteristics of the education group and the usual care control group were similar.

With reference to demographic characteristics, the current study results revealed that the mean age were 45.33±18.66 and 43.50±15.58 respectively of the intervention and control groups. In addition, more than half of the intervention and control groups were females. Moreover, nearly one third of the intervention and control groups had higher education. These study results compatible with another study, who found that the mean age of their study sample were 47.5 ± 14.89 years and more than half of the sample were females. One third of the participants had diploma degree, while about one fourth had bachelor degree [6]. Contrary to these study results, in a study done by [22] the mean age was 51 years, male patients comprise nearly two thirds. Additionally, another study reported that the mean age in Egypt increased from 45.6 years in 1996 to 49.8 years in 2008. The increasing mean age of ESKD patients reflects the improvement in healthcare; however, we are still much behind developed countries, as the mean age in the USA was 61.1 years and the median age in the UK was 65.9 years [27].

Concerning the duration, frequency and for how long the patients have been on haemodialysis, in the current study, there was no statistical significant difference between both intervention and control groups regarding haemodialysis variables. In addition, more than two thirds of the sample was on hemodialysis for less than 5 years, the vast majority of the sample was on 3 haemodialysis sessions per week. Moreover, nearly three quarters of the sample were scheduled on 4 hours per haemodialysis session. These findings congruent with a study found that nearly half of the studied patients were on maintenance HD for 1>5 years and the patients received 2-3 weekly hemodialysis sessions [7]. Another study proved that, the mean duration of dialysis was 4.35 ± 4.43 years [22].

In brief, the results of the demographic and medical data in the study on hand revealed that, patients in both groups were homogenous and there were no statistically significant difference between the two groups which control external variables that might apt to interfere with explanation of the study results.

Second section: The current study results disclosed that the study sample had unsatisfactory level of knowledge regarding medications prior to the implementation of the nursing instructions with no statistically significant difference in mean knowledge scores between the intervention and control groups. While after implementation of the nursing instructions, the intervention group had statistically significant higher mean knowledge scores when compared to control group in the 4th and 8th weeks. The improvement of intervention group knowledge might be attributed to their willingness to acquire knowledge because most of them started dialysis less than five years ago and nearly half of them were educated.

The current study finding was in agreement with a study delineated that nursing training program for haemodialysis patients improved the knowledge with highly statistical significant difference in the study subjects at two times follow up after program implementation, showing improvement of the post program total mean knowledge scores among the study subjects, However, at baseline the majority of haemodialysis patients had extremely unsatisfactory level of knowledge in the pre- program [28]. Another study investigated the effect of education on HD patients' drug compliance and their knowledge about the phosphate binder, speaking the same language indicated education increased patients' knowledge of when to take phosphate binder, although the increase was not statistically significant. Notably, the absolute percentage of patients who showed better knowledge after education was higher in the education group [26]. Furthermore a third study emphasizes on the need for providing medication-related information to combat patient ignorance about medications in HD patients [16].

Concerning attitude toward medication, the existing study findings displayed that patients in the intervention group achieved statistically significant higher mean attitude scores in comparison to the control group after implementation of the nursing instructions, highlighting the possibility that the nursing instructions result in positive attitude toward medication regimen. In accordance with this result [29] stressed that educating patients can have a positive effect on their attitude. Hemodialysis patients are asked to adhere to a very difficult treatment regimen consisting of fluid, diet restrictions, medications, and, usually, 3- or 4-hour HD sessions three times each week. Thus, patients should be aware and have a positive attitude toward the nature of the disease and medication regimen. So they apt to follow and adhere to the prescribed regimen for maintaining an optimal health and wellbeing [30].

With respect to medication adherence the existing study findings depicted that the instructional intervention is an efficient way to improve HD patients' knowledge and adherence to medications as the results exhibited that there were significant improvements in patients' knowledge, attitude and adherence to medication regimen after applying the instructional intervention. There was a high statistically significant improvement in the mean knowledge score and adherence score post intervention as compared with baseline (pre intervention assessment). The patients' total knowledge and adherence scores were increased after intervention. Ghimire, Castelino, Jose, and Zaidi (2017) emphasized that knowledge and beliefs about medicines were an essential patient-specific factor potentially directing adherence behavior. Additionally, the study reported that more than half of the patients were non-adherent to their medications based on self-reported measure [16]. Interestingly, and in contrary to the current study results which showed nonadherence among the entire sample before implementing the nursing intervention [30] found adherence to medications was 81% in their cross sectional study.

The researchers could explain the significant improvement in adherence score after implementing the nursing instructions, in the light of the current study results, which declared a positive correlation between knowledge, attitude and adherence to medication regimen among the intervention and control groups. These results were in agreement with [31] who emphasized that incorporation of patient education strategies is beneficial for adherence outcomes. The results of this study is matched with the study findings of [23] who found a significant relationship between knowledge on disease management and fluid and medication adherence among the patients subjected to HD. Unexpectedly, a study conducted by [32] documented an increase in knowledge does not necessarily increase a patient's adherence to the prescribed treatment.

The study on hand revealed a relationship between educational level and medication adherence. This could be justified as the educated person has the ability and curiosity to seek information so they are eager to acquire more knowledge about HD medication regimen. Also they can recognize the importance of adherence. This result matched with two studies found a significant correlation between educational level and mean knowledge scores in HD patients, since patients with bachelor degree achieved more significant improvement in knowledge [28,7].

Being aware of the consequences of nonadherence such as deterioration of medical condition and in rare cases, fear of death was found as a stimulus to be adherent. Motivated patients desiring to live longer and those expressing positive attitude towards taking medications were thus found to be adherent. Knowledge and attitude about medications are essential patient- specific factor potentially impeding adherence behavior. Prioritization of medications due to poor understanding, perceived necessity and concerns are a major reason for nonadherence. Patients' belief about necessity and concerns related to medications can be overcome through educational interventions [16].

Separately, haemodialysis patients face large pill burdens that primarily compromise adherence to medication. Some reasons for poor adherence can be modified as lack of knowledge through education [26]. Undoubtedly, because there is a high demand for more information about medication regimen for HD patients, the nurses play a crucial role in proper and effective education provided to those who need it.

V. CONCLUSION

One of the most important problems in patients undergoing HD is the nonadherence to medication prescriptions. The patients subjected to Hemodialysis need to understand the nature of the disease and realize the importance to follow the prescribed treatment. The results obtained in this study declared that nursing instructions improve patients' knowledge, attitude and adherence to medications regimen. Definitely, this is an important factor in preserving and improving patients' health. Adhering to medical prescriptions reduces mortality rate, inabilities and HD adverse effects. The study findings supported the three research hypotheses.

VI. NURSING IMPLICATIONS AND RECOMMENDATIONS

Because of the growing emphasis on the role of nurses in implementation of independent interventions with no risk to maintain patients' safety, the nurse would have a crucial role in implementing the nursing instructions regarding medication regimen of HD patients in order to reduce the risk of negative consequences of nonadherence. This study may provide a practice framework for the future development of other nursing evidence based practice. As the nursing education had a significant improvement on patient's knowledge, attitude and adherence to medication; so the following recommendations were concluded:

1. It is suggested to apply the nursing education for the hemodialysis patients in the early course of the hemodialysis, so that the patients have a maximum benefit.
2. Replicate the study on a larger study sample in different settings to generalize the results.

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