Nursing Intervention for Enhancing Hemodialysis Patient Adherence to Therapeutic Regimen

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Abstract: Adherence with the prescribed medical regimen is a crucial factor for achieving good therapeutic results in dialysis patients. *Aim* The aim of this study is to evaluate the effectiveness of hemodialysis patients' education in improving their adherence to therapeutic regimens*. **Design**: A quasi-experimental research design. **Setting:** Two hemodialysis units in Urology and Nephrology Center, Mansoura City. **Sample:** A purposive sample (120 patients) was used. **Tools:** An interview questionnaire and Adherence measures form. **Results**: The study results revealed that a highly statistically significant improvement in the study subjects' knowledge about therapeutic regimen post program implementation also, daily life activities were improved. Statistically significant positive correlationswere found between scores of knowledge, awareness, self-reported practices, willingness and level of education. **Conclusion:** Patients who were exposed to the educational program showed improvement in their adherence to therapeutic regimen and daily living activities. **Recommendations:** Ongoing health education is highly needed for the hemodialysis patients, and their care givers, using a multitude of audiovisual materials that suit the needs for each patient. A booklet contained information about therapeutic regimen should be available in all units providing hemodialysis.

1. Introduction

Chronic Kidney Disease (CKD) which is a worldwide public health problem is considered endemic across global cultures. Additionally chronic kidney failure is a disease with high morbidity and mortality rates. It is characterized by a progressive decline in renal function and by its chronicity, which leads to physical, social and emotional limitations that significantly affect the quality of life (QOL) of patients **(Rastogi et al., 2008; Tanyi& Werner,2008).**

Chronic kidney disease is the ninth cause of death in the United States (US). The overall incidence of End Stage Renal Disease (ESRD) is 260 cases per one million people of populations per year and approximately increases 6% each year. On the other hand, the incidence of CKD5 is 242 persons per 1 million group; worldwide which is increased by 8% annually and its incidence is variable in different countries **(Low et al., 2008; Vardanjani et al., 2013).** The estimated prevalence of renal failure in Egypt is 109,7052 of 76,117,42122 and estimated annual incidence of CKD is around 74 per million per year according to **Ahmed et al.(2010).** The prevalence rate of Hemodialysis (HD) was 414 patients (pmp) **(Zahran,2011).**

Hemodialysis treatment is the most common type of renal replacement and a life saving procedure for patients with end stage kidney disease. Although 3 times 4 hours weekly dialysis equal less than 10% of normal renal clearance, so the patients are exposed to some problems and adverse effects. Also, the patients with ESRD need to be adherent to the therapeutic regimen which include adherence to the prescribed medications, diet, and fluid restriction, and attendance of hemodialysis sessions **(Bland et al., 2008; Hickman & Douglas, 2010; Oláhné et al.,2013).**

Non-adherence to the prescribed regimen is a common problem in hemodialysis and is associated with increased morbidity and mortality **(Alikari et al., 2015).**

Nurses are in position to influence positively patients' behavior and to change their behavior through health education. On the same way, nurses have more face-to-face time with dialysis patients than any other healthcare provider. They can use that time to educate patients and families, negotiate a treatment plan, and work with the care team to ascertain and overcome barriers to compliance (**Martchev, 2008**; **Olson& Mara, 2008).**

Aim of the study

The aim of this study is to evaluate the effectiveness of hemodialysis patients' education in improving their adherence to therapeutic regimens.

Research hypothesis

The adherence of hemodialysis patients to therapeutic regimen will significantly be improved after participation in the patients' education intervention.

I.   Technical Design:

Research design

A quasi-experimental research designwas used to carry out this study.

Setting

The study was carried out at two hemodialysis units in the Urology and Nephrology Center, Mansoura City.

Sample

A purposive sample of 120 adult clients on maintenance hemodialysis, were selected under the following criteria:

- ESRD clients.
- Adult clients aged 21 years or more.
- On hemodialysis for at least one month.
- Both sexes.
- Willing to proceed with the intervention

Sample size:

The sample size is estimated to detect the difference between the rate of pre-intervention adherence (p1=55% from pilot) and target post-intervention rate (p2=75%) with a 95% level of confidence (α error = 5%), and a study power of 80% (β error=20%). Using the equation for the difference between two proportions (EpiInfo 6.04), the estimated sample size is 107 subjects per group. After adjustment for a dropout rate of about 10%, the sample size is 120 per group.

Tools of data collection:

The researcher developed the necessary data collection tools based on the review of the related literature. The tools comprised the following:

I.   **An Interview Questionnaire**: To assess the factors affecting patient's adherence to therapeutic regimen. It consists of 5 parts:

o   **Part 1:** GeneralCharacteristics of the study subject such as; age, sex, gender, marital status, educational level, job, residence, income etc.

o   **Part 2:** MedicalData History: including present medical history, past medical history and details of the hemodialysis process.

o   **Part 3:** Patient's Pre/Post Knowledge Assessment Questionnaire:

Designed by the researcher after reviewing the related literature, to assess patient's knowledge regarding normal function of the kidney, signs and symptoms of CKDs and definition of CRF, types of dialysis, and their benefits, seriousness of hyperkalemia and hyperphosphorus, dietary regimen and fluid, in addition to prescribed medication, and its side effects, ideal weight gain between sessions, and the importance of adhering to therapeutic regimen.

Scoring system of knowledge: For the knowledge items, a correct response was scored 1 and the incorrect zero.

Total score was 23, these scores were converted into a percent score, and means and standard deviations were computed. Knowledge was considered satisfactory if the percent score was 50% or more **(11.5- 23),** and unsatisfactory if less than 50% (< 11.5).

o   ***Part 4:*** Patient's Pre/Post Self Reported Practice Adherence Data Sheet*:* To measure adherence of hemodialysis patient related to therapeutic regimen, including medications, fluids, diet, and treatment regimen. It was divided into two main sections:

A. Assessment of patient's awareness about the details of treatment which contain 4 questions: Normal body weight, prescribed medications, how many times drug to be taken every day, and the action of each type of drugs.

Scoring system of Awareness: The patient was considered fully aware if she/he was aware of all (100%) medication types, doses, and effects, and less aware if he/she misses any of these.

B. Patient's self reported adherence to therapeutic regimen. It was divided into 5 main sections; the first section, which directly assesses adherence to dialysis sessions contains 2 questions; the second section, which directly assesses adherence to medications is composed of 3 questions; the third section, which directly assesses adherence to dietary regimen consists of 5 questions; the forth section, which directly measures adherence to fluid restriction includes 3 questions; and the fifth section, which directly measures adherence to follow up with physician contains 2 questions.

Scoring system of self reported practice: The items reported by the patient "all the time" was scored "3," "most of the time" was scored "2," "and "not done" was scored "0." For each area, the scores of the items were summed-up and the total divided by the number of the items, giving a mean score for the part.

Total score was 45, these scores were converted into percent scores. The practice of the patient was considered adequate if the percent score was 60% or more **(27-45)** and inadequate if less than 60% **(<27).**

o   ***Part 5:*** Assessment of Barriers that May Influence on Patient's Adherence. It contains 2 domains:

A. The first, economic reason which includes three reasons; the second, social reason contains five reasons; the third, psychological reason consists of six reasons; the fourth reason, related to therapeutic

regimen contains four reasons; and the fifth reason, related to medical team, includes four reasons.

Scoring system of barriers: The items were scored 0, 1, and 2 for the high, moderate, and low effects, respectively.

Total score was44, these scores were converted into percent scores. The category of barriers was considered to be high in influencing compliance if the percent score was 60% or more **(26.5-44)**, and low in influencing if less than 60% **(<26.5)**.

B. Assessment of the degree of the patient's willingness for education of the health care methods.

Scoring system of willingness to improve: For each item, a positive response was scored 1 and the negative zero.

Total score was 6, the patient was considered willing if the percent score was 60% or more**(3.6-6)** and unwilling if less than 60% **(<3.6)**.

2- ***Adherence measures***: This form was used to record the findings:

A. Physical examination as; height, weight before and after session, vital signs and fistula condition (good or bad) that was obtained from patient's medical file pre and post intervention.

B. Patient reported severity of symptoms of non-adherence to therapeutic regimen pre/post intervention: It iscomposed of 10 symptoms; dyspnea, chest pain, edema, headache, fatigue, itching, insomnia, nausea/vomiting, weight loss, and arthralgia.

Scoring system of symptoms: The severity of symptoms was scored on a scale ranging from "0" or absent to "2" from "none" to "high**."**

Total score was 20, the scores of the items were summed-up and the total divided by the number of the items, giving a mean score. A patient having a mean score "0" was considered having no symptoms.

C. Patient reported independence of the activities of daily living pre/post intervention: It consists of 12 items of daily living such as; food preparation, elimination, washing head/face/brushing, bathing, clothing, home chores, taking medication, going to work, doing work, using public transportation, making social visits, and sexual life.

Scoring system of daily life activities: Items were scored 2, 1 and zero for fully independent, partially independent, and fully dependent, respectively.

Total score was 24, the patient was considered independent if the percent score was 60% or more **(14.4-24)**, and dependent if <60% **(<14.4)**.

D. Laboratory investigation finding from patient record: It aimed to assess patient's monthly serum electrolytes (i.e., serum phosphorus, serum potassium, and albumin, hemoglobin, KT/V (dialysis efficiency), as well as the inter-dialytic weight gain (IDWG), defined as the amount of weight gained calculated

between two consecutive HD sessions. The laboratory values were retrieved from patient's medical records.

II.   Operational Design:

Reliability and validity of the tools:

Cronbach alpha coefficient was calculated to assess the reliability of the developed tools through their internal consistency. Validity was done by a panel of experts in nursing and medical nephrology and hemodialysis to ascertain relevance and competences.

A.   Fieldwork

After obtaining the official permission to conduct the study and finalization of tools, the study was carried out through the following phases:

▪ ***Assessment phase:*** This was the first phase of the program to identify the study sample specific needs and knowledge such as; how to adhere to therapeutic regimen. The data collection was done first using the questionnaire sheets.

Duration of assessment phase: The assessment phase lasted over one month from May 2014. In every shift assessment was performed for four to six patients. Every patient took nearly 30 minutes during the assessment phase.

▪ ***Planning phase:*** During this phase, the researcher prepared the training program for the study sample. The researcher used the results of the assessment phase, in addition to pertinent literature, to develop a hemodialysis patient's education program.

▪ ***Implementation phase:*** The researcher implemented the educational program in the halls and rooms of hemodialysis units. This was done on small groups. The sessions were scheduled at first two hours of dialysis sesion to suit patients' time availability, and the subjects were not suffering from any dialysis-related discomfort. The intervention program was divided into three sessions, each session took about 45 - 60 minutes:

The first session: Emphasized on kidney function, renal failure, and its types, manifestations of chronic kidney disease, complications, laboratory investigations, and treatment.

The second session: Clarified knowledge about hemodialysis, hemodialysis complications, vascular access, its types, and care for each one.

The third session: Focused on therapeutic regimen for hemodialysis patient, which includes diet, fluid, medications, hemodialysis sessions, and changing and modifying life style behavior.

The teaching sessions were implemented for every 6 patients. Each group was interviewed six times.

Duration of implementation phase: The implementation phase took approximately three months, from first of June to end of August, 2014.

Teaching methods: Included lectures, small group discussions, real life situations, and direct training, with using small booklet for teaching aid.

▪ ***Evaluation phase:*** The evaluation was done through the post test. It was done for each patient to evaluate the effectiveness of the intervention immediately after completing the educational program, and after three months post program implementation. The same tools used in the assessment phase were used in this evaluation phase.

Duration of evaluation: Evaluation was performed immediately after completion of the program which took about one month from first of September to the end of September, 2014. Evaluation after three months took from first of January to end of February, 2015.

Total duration of the program: The program was started from May 1ˢᵗ, 2014 to the end of February, 2015.

III. *Administrative Design & Ethical Considerations*

The pertinent committees at the Faculty of Nursing Zagazig University approved the study protocol. An official permission was obtained from the directors of the Urology and Nephrology Center, Mansoura University. Oral consents were obtained from the subjects who agreed to participate in the study after explaining the aim and objectives of the study, as well as the procedures. The researcher clarified to them their right to refuse participation or withdraw from the study at any stage without giving any reason and assured them about the confidentiality of any obtained information.

B.   Pilot study

Before performing the main study, a pilot study was carried out on approximately 10% of calculated study sample fulfilling the inclusion criteria. The aim was to evaluate the content, test clarity, relevancy, feasibility, objectivity, and applicability of the tools and to estimate the time required for filling in the questionnaire sheets. No radical changes were done on the tools. The participants involved in the pilot study were excluded from the main study sample.

IV. Statistical Design

Data entry and statistical analysis were done using the Statistical Package for Social Science (SPSS), version 16.0 a statistical software package. Quality control was done at the stages of coding and data entry. Data were presented using descriptive statistics in the form of frequencies and percentages for qualitative variables, and means and standard deviations for quantitative variables. Quantitative continuous data were compared using the non-parametric Mann-Whitney or Kruskal-Wallis test. Qualitative categorical variables were compared using Chi-square test. Whenever the expected values in one or more of the cells in a 2x2 tables was less than 5,

Fisher exact test was used instead. Spearman rank correlation was usedfor assessment of the inter-relationships among quantitative variables and ranked ones. In order to identify the independent predictors of knowledge, practices, barriers, etc., multiple linear regression analysis were used. Statistical significance was considered at p-value <0.05.

3. Result

Table (1): shows that 45.8% of the study sample was at age group less than 40 with the mean age 40.9±10.8. Sixty five point eight percent of study sample was male, while 34.2% of them were female. In relation to marital status, 67.5% of them were married.

Table (1): Socio-demographic characteristics of patients in the study sample

Item	No	%
Age:		
<40	55	45.8
-45	34	28.3
50+	31	25.8
Range	18.0-62.0	
Mean ± SD	40.9±10.8	
Median	42	
Gender:		
Male	79	65.8
Female	41	34.2
Current marital status:		
Unmarried	39	32.5
Married	81	67.5
Education:		
Illiterate/ Read/ write	15	12.5
Basic/ Secondary	49	40.8
University	56	46.7
Job:		
Employee	35	29.2
Worker	48	40.0
Retired/ unemployed	37	30.8
Living alone:		
No	17	97.5
Yes	3	2.5
Crowdeng index:		
<2	105	87.5
2+	15	12.5
Residence:		
Rural	61	50.8
Urban	59	49.2
Income:		
Insufficient	30	25.0
Sufficient	57	47.5
Saving	33	27.5

Concerning educational level of subjects 46.7% of them had university education. Regarding to their job, 29.2% was employee and 40% worker. Only 2.5%

were living alone, while 50.8% were from rural areas and 47.5% had sufficient income.

Table (2): presents the study sample knowledge about hemodialysis throughout phases of intervention. The results revealed statistically significant difference in all items of knowledge about hemodialysis pre-post and pre-follow up (P<0.001).

Table (3): displays total patients' self reported adherence practices related to therapeutic regimen throughout the intervention phases. The present result reveals that 99.2%, and100% of the study sample reported adherence to treatment post and follow up tests. Statistically significant differences were detected between pre and post program, between pre and three months later at follow up (P <0.001).

Table (4): shows practices of daily life activities of the study sample. Results revealed improvement through the intervention phases. Statistically significant differences were detected between both pre-program vs one month post program (p= 0.001*),

and pre-program vs three month follow up (p<0.001*) respectively.

Table (5): presents that best fitting multiple linear regression model for the knowledge score. It indicates that intervention, married, education, and number of instructions were statistically significant independent positive predictors with knowledge. Conversely, age was a statistically significant independent negative predictor. The regression model explains 0.80% of the variation in the knowledge as indicated by r-square value.

Table (6): shows that age, education, and knowledge scores were statistically significantly independent positive predictor with self reported practice adherence. Conversely, duration of illness was a statistically significantly independent negative predictor. The regression model explains 0.60% of variation in self reported practice score as indicated by the r-square value.

Table (2): Distribution of study sample by their knowledge about hemodialysis throughout phases of intervention.

Satisfactory knowledge	Time						X^2 (p-value) Pre-post	X^2 (p-value) Pre-FU
	Pre (n=120)		Post (n=120)		FU (n=120)			
	No	%	No	%	No	%		
Physiology	67	55.8	120	100.0	120	100.0	68.02 (<0.001*)	68.02 (<0.001*)
Definitions	102	85.0	120	100.0	120	100.0	19.46 (<0.001*)	19.46 (<0.001*)
Dialysis	66	55.0	120	100.0	120	100.0	69.68 (<0.001*)	69.68 (<0.001*)
Salt intake	52	43.3	120	100.0	120	100.0	94.88 (<0.001*)	94.88 (<0.001*)
Nutrition	5	4.2	119	99.2	`120	100.0	216.84 (<0.001*)	220.80 (<0.001*)
Fluid intake	42	35.0	120	100.0	120	100.0	115.56 (<0.001*)	115.56 (<0.001*)
Side effects of drug	1	0.8	115	95.8	115	95.8	216.84 (<0.001*)	216.84 (<0.001*)
Adherence	4	3.3	118	98.3	118	98.3	216.66 (<0.001*)	216.66 (<0.001*)

FU= Follow Up

Table (3): Total patients' self reported adherence practices related to therapeutic regimen throughout the intervention phases (n=120).

Total Adequate Practice	Time						X^2 (P-value) Pre-post	X^2 (P-value) Pre-FU
	Pre (n=120)		Post (n=120)		FU (n=120)			
	No	%	No	%	No	%		
Self reported adherence Dialysis	117	97.5	120	100.0	120	100.0	Fisher (0.25)	Fisher (0.25)
Drug	96	80.0	119	99.2	120	100.0	23.62 (<0.001*)	26.67 (<0.001*)
Nutrition	77	64.2	119	99.2	120	100.0	49.09 (<0.001*)	52.39 (<0.001*)
Fluid	95	79.2	119	99.2	120	100.0	24.85 (<0.001*)	27.91 (<0.001*)
Follow up	116	96.7	120	100.0	120	100.0	Fisher (0.12)	Fisher (0.12)

Table (4): Study sample practice of the daily life activities (DLA) throughout the intervention phases.

Daily Life Activities	Time						X^2 (P-value) Pre-post	X^2 (P-value) Pre-FU
	Pre (n=120)		post (n=120)		FU (n=120)			
	N0	%	N0	%	N0	%		
1- 1- Food preparation	4	5.4	17	25.4	19	27.9	11.06 (0.001*)	13.26 (<0.001*)
2- Elimination	113	94.2	115	95.8	117	97.5	0.35 (0.55)	1.67 (0.02)
3- Washing head/face/ brushing	117	97.5	118	98.3	119	99.2	Fisher (1.00)	Fisher (0.62)
4- Bathing	`109	90.8	114	95.0	117	97.5	1.58 (0.21)	4.85 (0.03*)
5- Clothing	104	86.7	111	92.5	111	92.5	2.19 (0.14)	2.19 (0.14)
6- Home chores	5	6.7	18	25.4	17	23.9	9.60 (0.002*)	8.51 (0.004*)
7- Taking medication	98	81.7	117	97.5	115	95.8	16.12 (<0.001*)	12.06 (0.001*)
8- Going to work	37	45.1	64	83.1	66	85.7	24.74 (<0.001*)	28.68 (<0.001*)
9- Doing work	22	26.8	51	66.2	49	63.6	24.83 (<0.001*)	21.77 (<0.001*)
10- Using public transportation	35	29.2	66	55.5	69	58.5	16.93 (<0.001*)	20.77 (<0.001*)
11- Making social visits	21	17.5	36	30.0	41	34.2	5.18 (0.02*)	8.70 (0.003*)
12- Sexual life	1	1.2	41	50.6	37	45.7	51.43 (<0.001*)	44.56 (<0.001*)

Table (5): Best fitting multiple linear regression model for the knowledge score

Items	Unstandardized coefficient		Standardized coefficient	t-test	p-value	95%confidence interval for B	
	B	Std. Error				Lower	Upper
Constant	-11.69	3.11		-3.760	<0.001	-17.80	-5.57
Intervention	7.56	0.83	0.26	9.127	<0.001	5,93	9.19
Age	-0.11	0.04	-0.05	-2.562	<0.011	-0.19	-0.02
Married	1.92	0.90	0.04	2.132	<0.034	0.15	3.68
Education	1.69	0.32	0.10	5.354	0.001	1.07	2.31
No. of instructions	0.86	0.03	0.72	25.224	<0.001	0.80	0.93

r-square= 0.80   Model ANOVA: F= 616.697, P<0.001
Variables entered and excluded: gender, job, crowding index, income, residence, duration of illness

Table (6): Best fitting multiple linear regression model for self reported practice adherence score.

Items	Unstandardized Coefficient		Standardized Coefficient	t-test	p-value	95% Confidence Interval for B	
	B	Std.Error				lower	Upper
Constant	22.63	3.86		5.857	<0.001	15.03	30.22
Age	0.22	0.06	0.14	3.927	<0.001	0.11	0.34
Education	1.21	0.45	0.10	2.719	0.007	0.34	2.09
Duration of illness	-1.10	0.37	-0.11	-3.018	0.003	-1.82	-0.38
Knowledge score	0.53	0.02	0.76	22.447	<0.001	0.49	0.58

r-square=0.60   Model ANOVA: F=109.324, P<0.001
Variables entered and excluded: gender, marital status, job, crowding index, residence, income, instructions, and intervention.

4. Discussion

Chronic kidney disease is a progressive destruction of kidney function in which the body metabolism and water and electrolyte balance would be disturbed resulting in uremia, and those patients require treatment with dialysis or kidney transplantation tosurvive **(Vanholde et al., 2012)**. About 400,000 people worldwide are suffering from chronic renal failure, of these, more than 300,000 are under hemodialysis treatment**.** Even though HD treatment is successful in ameliorating many of the clinical manifestations of ESRD and in postponing otherwise imminent death, HD patients still have higher mortality and hospitalization rates, as well as lower QOL, compared with the general population (**Chilcot et al., 2010; Hall et al., 2011)**. So, adherence to treatment and management recommendations is essential for optimal health and survival of persons with ESRD. It is necessary to educate patients with chronic disease like chronic renal failure in order to improve their quality of life in long-term **(Wells, 2011)**.

The present study revealed that less than one half of the study subjects their age was less than 40 years. This finding might be due to that ESRD is more common among the middle adulthood persons. Conversely, in a recent study carried out by El-**Arbagyetal. (2015),** in Egypt reported that, the mean age of the hemodialysis patient was 52 years. As well, the present study result to some extent disagreed with **Afifi (2008),** in Egypt, who found that the mean age of ESRD patients, in Egypt in 2004 was 48.8 years, which has been increased from 45.6 years in 1996 to 49.8 years in 2008.

Regarding to gender, the present study clarified that almost two third of subjects were male. On the same line, the **CDC (2014),** in the United States, mentioned that men with CKD are 50% more likely than women to have kidney failure. This finding is also in accordance with **Mahmoud and Abdelaziz (2015),** in Egypt, who recently found that more than half of the study sample was male. As well, the study done by **Sharaf (2015),** in Egypt, was in agreement with the present study as more than half of subjects were male.

The results of the current study showed that slightly more than two third of the subjects were married. This might be explained as in middle age, most of people were married. This finding goes also in line with **Sharaf (2015),** in Egypt, whose results showed that the majority of study subjects were married. In relation to residence, the present study findings, revealed that slightly more than half of the study subjects reside rural areas. This finding is consistent with that found by **Abdalla et al. (2014),** in Egypt, who mentioned that more than two thirds of the

study subjects were from rural areas. This finding might be attributed to lack of adequate health care services in rural areas.

In relation to the level of education, the present study revealed that less than half of the study sample was having high education, whereas the lowest percentage of studied patients were illiterate. This finding demonstrates that, the ESRD is spread among different classes of people in the community. Similarly, **Lima (2010),** found that the little percentage of the sample were illiterates. Inconsistent with the previous results, **Yousif (2008),** in Egypt, also reported that highest percentage of the studied patients were illiterate.

Concerning job, the present study result revealed that above one third of the study sample was unemployed. This finding might be due to the impact of ESRD on physical condition of patients, the time used for hemodialysis, and difficulties to be hired after treatment initiation. In this respect, **Abd-Elhamid (2011),** in Mansoura, found that above one third of the study subjects were skilled workers.

Regarding monthly income, the present study result revealed that nearly half of the study subjects reported that their income was sufficient. This finding might be due to that the majority of patients under dialysis in the Urology and Nephrology Center were recommended cases and had enough financial income. This finding is in disagreement with that of, the study of **Nasiri *et al.*(2013)** in Iran, who reported that most of the sample expressed that the income was insufficient for living expenses.

Regarding to the subjects' level of knowledge about therapeutic regimen, the results of the current study delineated a highly statistically significant improvement in the study subjects' knowledge about therapeutic regimen post program implementation. This finding demonstrated that the improvement of knowledge among the study subjects throughout the program implementation might be related to the simplicity of the educational booklet with illustrations combined with structured verbal instructions. This finding is consistent with **AboDief et al. (2015),** in Egypt, who showed improvement of the post program total and subtotal mean knowledge scores among the study subjects.

The present study result revealed that the study sample had adequate self reported adherence related to therapeutic regimen at three months post program implementation. This might be due to that, at that time many patients are accepting their situation, facing complications of dialysis, gaining support from health team and their families additionally, they are realizing that the adherence is associated by good quality of life. On the same line, with the present study finding, **Lam et al. (2010),** in Hong Kong, clarified that patients

perceived themselves as more adherent to medication (83%; 95% confidence interval 77–88%) and dialysis (93%; 95% confidence interval 88–96%) prescriptions to fluid (64%; 95% confidence interval 56–71%) and dietary (38%; 95% confidence interval 30–45%).

The results of the present study revealed improvement of daily life activities (DLA) post program implementation, which showed a higher percentage of the study sample becoming independents of the DLA post program implementation. Possible explanation of this finding might be related to their commitment to the program instructions, which led to improvement in DLA. This result agreed with **Mahmoud et al. (2014),** in Egypt, who found that 91.1% of the total subjects' practice achieved their daily activities independently. On the contrary, **Yousif (2008),** in Egypt**,** reported that nearly half of the patients were not able to perform daily living activities. Activities of Daily Living (ADL) refers to dressing, cleaning mouth, showering, toilet hygiene, care for one's own body, feeding, medical routine, keeping health, socialization, functional mobility, and community mobility; people who undergo hemodialysis are not totally incapable ofperforming their daily tasks.

As regards the correlation between knowledge and educational level, the findings of the present study revealed a statistically significant correlation between educational level and mean knowledge scores among study subjects throughout the different assessment times. This was in agreement with Ozawa **et al. (2012),** in Japan, in which they argue that patients with a high school or university education had a better understanding toward medical management of disease than those with less education and this in turn will be reflected on adherence to therapeutic regimen. Some evidence suggested that a patient's educational level plays a role in adherence, but understanding the treatment instructions and the importance of the treatment is probably more important than the patient's level of education as clarified by **Krueger et al. (2005)**. This was in agreement with the result of **Alikari et al. (2015),** in Greece, which found the correlation between educational intervention knowledge, adherence and QoL.

The current study result revealed statistically significant independent negative predictor between knowledge and age. This finding may be due to the well mental status of young age as they are less exposed to the effect of CRF and dialysis complications than older age group of studied patients. This finding comes in the same line with **El-Emam (2010),** in Alexandria, who found that the younger the age of the studied patients, the more the knowledge he or she had and the difference was statistically significant. In this regard, **Lee and Molassiotis**

(2002), in China, found that knowledge score was inversely related to age and the educational level, indicating that young and more educated patients were more knowledgeable about the dietary and fluid regimens.

The result of the present study showed statistically significant independent positive predictor between knowledge with intervention, this result is consistent with that of **Mohamed (2014),** in Egypt, **whorevealed** that there was a positive correlation between knowledge and intervention post and after three months of intervention. Patients gained higher scores of ESRD knowledge after participation in the early intervention program in the experimental group at post and follow up program. In this respect, **Saelim et al. (2011),** in Mahidol University, showed that the health education program significantly improved patients' knowledge about the disease, dietary behaviors, weight control and clinical and laboratory parameters after participating in a health education program.

The result of the current study clarified that there was a statistically significant independent negative predictor between duration of illness with self reported adherence. This finding might be due to that these patients may feel bored and get frustrated with longer duration of therapeutic regimen. This finding is consistent with**Chan et al. (2012),** inMalaysia, who found that subjects with longer duration on hemodialysis were more non adherent to therapeutic regimen.

The present study finding demonstrated a statistically significant independent negative predictor between age, and activity of daily living. A possible explanation is that patients of advanced age usually experience physical and cognitive impairment or might have lower expectations compared with younger individuals. This result of the present study is consistent with that **Barotfit (2005),** in Semmelweis University Budapest, which showed negative correlation between patients' age and dimentions of QOL with worse QOL for elder than younger patients. The present result is also consistent with **Abd El-hamed (2011),** in Mansoura, which revealed increased QOL for studied patients aged from 18-<30 years pre, post and at follow up tests.

Conclusion:

Patients who were exposed to the educational program showed improvement in their adherence to therapeutic regimen and daily living activities.

Recommendations:

Ongoing health education is highly needed for the hemodialysis patients, and their care givers, using a multitude of audiovisual materials that suit the needs

for each patient. Booklet contained information about therapeutic regimen should be available in all units providing hemodialysis.

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