Effect of educational intervention on knowledge and level of adherence among hemodialysis patients – A randomized control Trial

Brayal Dsouza (✉ brayal.dsouza@manipal.edu)

Manipal Academy of Higher Education

Ravindra . A Prabhu

Manipal Academy of Higher Education

B Unnikrishnan

Manipal Academy of Higher Education

sudarshan Ballal

Manipal Academy of Higher Education

Asha kamath

Manipal Academy of Higher Education

Research Article

Keywords:

Posted Date: February 1st, 2022

DOI: <https://doi.org/10.21203/rs.3.rs-1194596/v1>

License: © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Abstract

Purpose:

The purpose of the study was to assess the impact of an educational intervention on the level of knowledge, and adherence to the treatment regimen among haemodialysis (HD) patients as well as to describe the association between these variables.

Methods: In this randomised control study, 160 HD patients at a HD centre of a 2030 bed tertiary teaching hospital in Southern India were randomly assigned into intervention (N = 80, received education and a booklet) and control (N = 80, received standard care) groups. Knowledge, adherence were measured pre- and post-intervention using a validated questionnaire for knowledge and ESRDAQ – End stage renal disease questionnaire for level of adherence. The statistical analysis of the data was performed with the help of the Statistical Program SPSS version 19.0. The statistical significance level was set up at 0.05.

Results: The increase of knowledge on disease management and adherence in the intervention group was significantly higher compared to the control group. There was no significant correlation between knowledge and adherence. Adherence improved for all the domains ie dialysis attendance, episode of shortening, adherence to medication, fluid restriction and dietary restriction. Adherence to Fluid and dietary restriction were statistically significant

Introduction

Patients on dialysis experience assimilating complex treatment regimens, that includes monitoring blood glucose, intra dialytic weight gain, bp monitoring, bill burden, physical activity, investigation routine and adhering to treatment regimens. Patient education is not only a critical mechanism through which patients can have their questions, concerns, and needs regarding kidney disease care addressed, but it is also a crucial pathway to ensuring that patients can be taught to engage in self-management. ¹

Non-adherence among HD patients includes the following, according to the National Kidney Foundation-Kidney Disease Outcomes Quality Initiative (NKF-KDOQI) (a) skipping or reducing the HD session; (b) consuming excessive amounts of potassium and phosphorus-containing beverages and foods; and (c) failing to take medication as prescribed. ²

Nonadherence to dialysis treatment has been generally reported at rates between 8.5% and 22.1% worldwide ³. According to Dialysis Outcomes and Practice Patterns Study (DOPPS), it is estimated that 9.7% of US patients skipped ≥ 1 HD sessions (for over a month), while the rate for both Japanese and European patients was 0.6%⁴. The success of treatment depends to a large extent on the adherence to the strictly recommended therapeutic regimen. In order to improve adherence patient's knowledge on disease management should be improved. Some studies have shown that patient knowledge on disease and treatment is associated with increased level of adherence^{5,6,7}

Need for Education Program and rationale for the current study

1. Patients' understanding of haemodialysis and end-stage renal disease (ESRD) is essential for effective self-management and patient outcomes. There is a need for evidence and trials on the effect of therapeutic education among dialysis patients
2. The literature review confirms the benefits on pre dialysis education on patient outcomes in terms of delayed dialysis initiation, reduce all-cause mortality, decrease hospitalization rates, increase use of self-care-based dialysis modalities, extend dialysis survival, and improve overall quality of life. Similarly post dialysis therapeutic interventions of a focused nature demonstrated positive effects. Evidence on use of multidisciplinary care lacks certainty and majorly constitutes observational studies and non-randomised control trials
3. Patient education is a vital component of care, according to national programmes and CKD care standards. Furthermore, many CKD patients express a desire for CKD education. Hence there is a need to study the effect of an educational intervention on patient outcomes using randomised trial.
4. Patient education barriers may have ramifications for patient education implementation. These factors must be researched and addressed during the implementation of education in order for it to be effective.
5. Barriers in patient education may affect the implementation of education. Therefore there is a need to identify barriers in order to improve implementation
6. Most patients have many questions they would like to ask but either don't know how to project their questions to the health care providers. At the time of admission, the patient there is a information overload and takes a considerable amount of time to imbibe information, therefore, a structured educational program can be beneficial.
7. Non-adherence to treatment is an increasing problem for patients with CKD and it has not been extensively studied in patients with CKD. Hence, the present study was carried out to assess the knowledge on disease management, adherence practice, factors affecting adherence, quality of life and effect of a structured educational intervention on these outcomes
8. The question of whether multidisciplinary educational intervention can affect end stage renal disease therapeutic outcomes, and if so, can a nephrologist and nurse sufficient to meet the aim, has yet to be solved in the dialysis population.

Design And Sample

A randomised control trial conducted from June 2017 to December 2020 was performed among 160 HD patients at a 2030 bed tertiary teaching hospital using block randomisation, allocation concealment and outcomes assessment was blinded. The criteria for selecting the sample were as follows: (i) HD program two times a week (ii) above 18 years of age (iii) ability to write, read and understand the local language Patients with cognitive and psychologically differently abled and limited self-care were excluded. The study population was randomly divided into two groups: The intervention group (received an educational

intervention and a booklet) and the control group (standard care at the dialysis centre). The educational session for each patient was administered for 6 months with reinforcement and addressing patients queries and patients were followed up for one year. The beeline data demographics were collected with a proforma, knowledge on disease management was assessed with a self-administered validated questionnaire and for measurement of level of adherence, ESRD-AQ questionnaire was used

CONSORT DIAGRAM

Ethical clearance (441/2015) was obtained from the Institutional Ethics Committee of Kasturba Hospital, MAHE, Manipal and registered under Clinical trial registry of India CTRI Registration number: Trial REF/2017/12/016258. As per the ethical guidelines, participant information sheet (PIS) and informed consent (IC) for parent participants. The data collection forms had indirect identifiers. The informed consent forms were separated from the data sheets to maintain confidentiality. Information from the study was kept confidential. The data was stored in file cabinets and was accessible only to the core research team. Following data entry, the data records were securely stored on a password-protected device. The data will be stored for a period of three years following the study and then destroyed.

PHASE 01: Module development

PHASE 02: Interventional study: RCT

Ethical considerations

Ethical clearance (441/2015) was obtained from the Institutional Ethics Committee of Kasturba Hospital, MAHE, Manipal.

Phase 01: Inputs from the KDOQI guidelines and expert opinion on its adaptation and modification and cultural adaptation to current population in the study was used to design the educational module. A judgmental validity was done. Judges who are professionals in the fields of nephrology, nutrition, pharmacy, and physical therapy evaluated this intervention guide. The intervention guide was forwarded to the professionals listed above for feedback. The PI discussed to the specialists the aim and goals of this stage. They were told to read the intervention guide attentively and report any challenges they encountered while testing it, as well as to look for the following: ambiguity, such as ambiguous or badly

phrased products, double-barrelled remarks, or jargons. For each item, the percentages of entire agreement, agreement with small modifications, agreement with large changes, and total disagreement were calculated. Any issue that received 70% or more total disagreement from the experts was removed from the teaching material. All the specialists were alerted to the elements that were in agreement with small and substantial adjustments. Many minor adjustments were fixed with their permission, and some important alterations were altered once a majority of experts agreed to that particular change.

The educational materials were written in English, and the first step was to convert the guide into Kannada. During the translation process, the back translation approach was applied. Two independent language specialists translated the intervention guide into Kannada. They were told to keep as much of the original structure and text as feasible. Variations were discussed with the two specialists, and changes were agreed upon. Other two English-Tamil language experts back converted the accepted Kannada version of the intervention guide into English. For consistency, the back translated version was compared to the original intervention guide. Following consultations with the experienced translators, any discrepancies were fixed once more.

- Basic information about Chronic kidney disease, ESRD, RRT modalities
- Complications of ESRD and haemodialysis and its management
- Nutrition, dietary principles, and its importance of adherence in CKD
- Pharmaceutical regimen and its importance of adherence
- Vascular access- care of vascular access & infection prevention
- Patient safety in haemodialysis
- Biochemical variables and monitoring
- Lifestyle modification and Patient self-management

Phase 02:

After the inclusion of the patients into one of the two groups, the following questionnaires were followed

(a) Patients were given a questionnaire on sociodemographic and clinical characteristics in order to characterize patients and identify their background information.

(b) For the assessment of knowledge on disease management a structured questionnaire was used. Each correct answer is scored by 1 and each wrong answer by 0. The higher the score, the higher the level of knowledge

(c) The ESRD -AQ questionnaire explores all dimensions of HD patient adherence: (i) Episode of shortening (ii) attendance at HD session and (iii) diet and fluid restrictions. The End-Stage Renal Disease-Adherence Questionnaire measures treatment adherence behaviours in four dimensions: HD attendance,

medication use, fluid restrictions, and diet recommendations. The final version of the ESRD-AQ consists of 46 questions/items divided into five sections. The first section pursues general information about patients' ESRD and RRT-related history (5 items), and the remaining four sections ask about treatment adherence to HD treatment (14 items), medications (9 items), fluid restrictions (10 items), and diet recommendations (8 items). These four final sections directly measure adherence behaviours (14, 17, 18, 26, 31, and 46), and patients' knowledge and perceptions about treatment (11, 12, 22, 23, 32, 33, 41, and 42). Responses to the ESRD-AQ utilize a combination of Likert scales and multiple choice, as well as "yes/no" answer format. A score of less than 1100 was mild compliance, 1100 -1149 moderate compliance, 1150 and above as high compliance and 1200 as full compliance. The mild and moderate scores were combined to form low category of adherence and high and full compliance were combined to form the high category of adherence.

Statistical Analysis

A mixed ANOVA (repeated measure) is performed to check is there any significance difference in the average knowledge/adherence across different time points as well as between intervention group and control group. A non-parametric approach of mixed ANOVA is performed using the R package "nparLD" to check is there any significance deference in the average adherence/QoL across different time points as well as between intervention group and control group as data violated the normality assumptions As the outcome variable 'Knowledge' was not normally distributed, quantile regression was used to determine the factors related to this outcome. As the outcome variable 'Adherence' was not normally distributed, quantile regression was used to determine the factors related to this outcome. $P < 0.05$ is considered as statistically significant and analysis is performed using SPSS software.

Results

Table 01

Demographic and clinical characteristics of patients

Variable	Intervention(n=80)	Control(n=80)	P value
Gender			
Male	64(80%)	61(75.3%)	0.566
Female	16(20%)	19(23.75)	
Education			
No education	03 (3.75%)	09 (11.25%)	0.135
Less than higher secondary	42 (52.5%)	35 (43.75%)	
Higher secondary	16 (20%)	19 (23.75%)	
Graduate	16 (20%)	23 (28.75%)	
Post Graduate and above	3 (3.75)	4 (5%)	
Employment status			0.164
Employed	23 (28.75)	33 (41.25)	
Unemployed	48 (60%)	43 (53.75)	
Retired	09 (11.25%)	04 (5%)	
Vintage			0.502
>3months	3 (3.75%)	06 (7.5%)	
3month to 1 year	20 (25%)	23 (28.75%)	
>1year	57 (71.25%)	51 (63.75%)	
Mode of payment			0.298
Scheme	11 (13.75%)	8 (10%)	
Cash	42 (52.5%)	42 (52.5%)	
Trust	02 (2.5%)	09 (11.25%)	
ESI	16 (20%)	14 (17.5%)	
ECHS	01 (1.25%)	1 (1.25%)	
Private insurance	08 (10%)	05 (6.25%)	
employer	0	01 (1.25%)	
Aetiology			0.001*
Diabetes mellitus	26 (32.5%)	45 (56.25%)	
HTN	33 (41.25%)	8 (10%)	

DM and HTN	03 (3.75%)	6 (7.5%)
Medication	4 (5%)	11 (13.75%)
other	14 (17.5%)	10 (12.5%)
Comorbidity		0.002*
No comorbidity	0	07 (8.75%)
HTN	48 (60%)	27 (33.75%)
DM	01 (1.35%)	01 (1.25%)
DM and HTN	26 (32.5%)	39 (48.75%)
Cardiac	02 (2.5%)	02(2.5%)
others	03 (3.75%)	04(5%)

The sample characteristics of the study population are described in Table 01. Participants in the intervention group and control group constituted i.e., male (80%) in intervention and (75.3%) in control group. A higher proportion of participants in both groups had less than Secondary Education (52.2%, 43.8%) and were largely unemployed. Vintage of more than a year was comparably higher in both groups. Aetiology-wise, hypertension predominated among those in the intervention group (41.3%) while in the control group, diabetes mellitus predominated (56.3%). All participants in the intervention group had comorbidities, while 7 (8.75%) in the control group did not. There was statistically significant difference between the groups in the aetiology of diseases ($p=0.001$) and presence of comorbidities (0.002). Regarding the mode of payment for treatment, cash payments were higher in both groups.

Table 02

Mean scores of Knowledge before and after intervention

Groups	Knowledge: Mean (SD)			With group comparison [p value]	Between group comparison [p value]
	Pre test n= (80)	Post test_6m n= (80)	Post test_1yr n= (80)		
Intervention	18.91 (7.02)	20.41 (6.29)	25.00 (4.01)	<0.001*	0.044
Control	18.65 (6.27)	19.69 (7.11)	22.14 (7.38)	0.003*	

Table 03

Mean scores of Adherence before and after intervention

Groups	Adherence: Mean SD		With group comparison [p value]	Between group comparison [p value]
	Pre-test	Post test		
Control	1160.83(56.0)	1132.19(82.11)	<0.007*	<0.001*
Intervention	1125.31(77.0)	1168.12(57.3)	<0.001*	

Table 04

Mean scores domain wise adherence before and after intervention

Domains	Groups	Range of Scores	Adherence: Mean SD		With group comparison [p value]	Between group comparison [p value]
			Baseline	Follow up		
HD attendance	Control	100-300	286.25(33.1)	287.5(33.2)	0.708	0.187
	Intervention		290(33.1)	297.5(15.7)	0.026	
Episode of Shortening	Control	0-200	195.0(15.0)	194.38(15.8)	.639	0.320
	Intervention		196.88(12.1)	198.12(9.5)	.349	
Duration of shortening HD	Control	0-100	98.12(6.6)	98.44(6.09)	.704	0.284
	Intervention		97.81(8.14)	99.37(3.9)	.059	
Adherence to medication	Control	0-200	196.25(13.2)	195(15.0)	.566	0.417
	Intervention		196.25(19.11)	197.5(17.6)	.566	
Adherence to fluid restriction	Control	0-200	195.25(15.0)	193.13(17.3)	.657	0.048*
	Intervention		180(28.0)	190(28.0)	.019*	
Adherence to dietary restriction	Control	0-200	190(24.3)	163(69.3)	<0.001*	<0.001*
	Intervention		164.37(48.5)	185.62(31.0)	.004	

This study showed that the educational intervention can improve knowledge (Table 02 and Figure 01) and adherence (Table 03, Figure 02), by way of improving information, reinforcement and limiting misconceptions about the disease. Prior to the intervention, both groups had similar levels of knowledge. After the intervention, while there was a significant increase for both groups, the increase in the intervention group was significantly higher, resulting in a significantly higher score compared to the

control group (Table 02). Underline that educational programmes can help people with chronic conditions in a variety of ways (physical, mental, self-care, clinical decision-making). The relevance of a patient-centered approach is emphasised in these studies. The patient is treated as a partner in this approach, and is fully educated about his or her health and participates in therapeutic decision-making.^{8,9}

While there are many studies that have shown improvement in the comprehensive knowledge levels of knowledge. There are also research studies on education interventions that have improved targeted knowledge among the dialysis population like knowledge on vascular access, nutrition, biochemical parameters. Souza et al investigated how effective a teaching intervention was at promoting vascular self care and the results showed that the teaching intervention greatly enhanced knowledge regarding vascular access care.⁽⁹⁵⁾ (Saelim, Kusrithepratan, Sodomthian, & Chinwongprom, 2005)⁽⁹⁶⁾ effectively improved patients knowledge on disease management and dietary behavior through a health education program. similarly, Ebrahimi et al observed a considerable improvement in their patients understanding of the food limitations.⁽¹⁴⁾

Ford et al (USA, 2004) tested the effectiveness of educational intervention for 30 min per month on biochemical lab values and knowledge of dietary phosphorus management among hyperphosphemic patients in a quasi experimental design and results reported increase in knowledge of 9%, decrease in serum phosphorus and no effect on calcium. Reddy et al 2009 found that one month of nutrition education enhanced understanding of phosphate and phosphate binders but had no effect on serum phosphate levels in the group. Therefore targeted educational interventions or comprehensive educational interventions largely have an impact on the patients knowledge of disease management with parallel reinforcement and even while knowledge improves it may not translate to change in or improvement in outcomes measures.^{10, 11, 12, 13}

There was an improvement in all the domains of adherence in the intervention group and statistically significant difference was observed for adherence to fluid and dietary restriction. (Table 04) However, adherence to HD attendance, episode of shortening, duration of shortening and medication adherence were not statistically significant. There was a decrease in medication, fluid and dietary adherence in control group. The findings imply that there is an improvement in the adherence level following the intervention. While other studies on patient compliance have also reported an improvement, there are studies which have reported contrasting results. In the study conducted by Elain and colleagues (2003) use of educational intervention resulted in significant increase in the Knowledge scores in intervention group ($P < 0.001$) during the course of the intervention.¹⁴ However, it did not produce any behaviour change among the patients and the compliance to fluid restrictions did not improve.

Similarly wells Jr (JR., 2011) educational intervention to improve knowledge and medical adherence in African Americans on dialysis Witnessed no significant difference between pre and post intervention in relation to medical adherence however the paired sample t-test revealed higher knowledge scores in the post test group compared to the pretest group.¹⁵ (Nooriani Narjes, 2019) after the trial, the intervention group exhibited substantial gains in scores on the nutrition knowledge exam, perceived

vulnerability, perceived severity, perceived barriers, perceived advantages and self efficacy. Energy protein high biological value protein carbohydrate, fat, cholesterol, vitamins , calcium phosphorus and potassium consumption did not differ significantly between the 2 groups. The health belief structure model was also used in this investigation. However there was number significant difference between the two groups in terms of calories protein, carbohydrate, fat, cholesterol intake . ¹⁶

Several studies reported an improved overall adherence among HD patients . (Zhianfar L, 2020) Iranian patients were given a multi modal educational intervention, and after one month, the interventions group adherence school were much higher than baseline levels. The intervention group participants had statistically significant changes in means codes in all sub skills of ESRD-AQ. the intervention involves showing videos to the patient and family members to emphasize the significance of adhering to the therapeutic regimen, as well as cognitive behavioral therapy group meetings for patients and telephone based counselling. Conciliation with beard support the encounter with educational videos for three consecutive sessions for half an hour following the start of dialysis therapy kept the patients table and convenient for the third session, and experience methodologist was invited to answer the patients concerns and dilemmas. The practicing nurse was also subjected to educational video tracks to familiarise them with the content in order to answer patients probable questions ¹⁷.

In an investigation by Hala I. Abo Deif (2017) et al on the impact of educational program on therapeutic regimen adherence in patients with chronic kidney disease stage 5, an improved adherence for HD treatment, medication, fluid restriction and diet was noted.⁽¹⁰⁴⁾ (Parvan K, 2015) also reported improved adherence through educational interventions, the effectiveness was measured between face to face training and training pamphlets and the study reported an overall improved status of adherence .The knowledge scores of both intervention group (Pamphlet training - 10.1 pre, 16.57. Post ; Face to Face training - 9.20 pre, 19.45 post) and control group (6.89 pre , 7.78 post) pre and post intervention were statistically significant. The adherence scores of control group before and after intervention were not statistically significant. However, a significant rise was observed in the intervention group in both training pamphlet group and face to face intervention group. ¹⁸

Limitation

Patient compliance were purely subjective in nature and objective measurement of compliance was not done eg: missed dialysis session, emergency, biochemical parameters . This study was limited to educational/ cognitive interventions Psychologic/affective interventions that appealed to the patient's feelings and emotions or social support and mixed interventions that involved a combination of the above-mentioned intervention types were not tested

Conclusion

This study was a comprehensive approach, and helped to improve patients' knowledge on disease management and level of adherence. This education module can be used as nurse led interventions to

improve patients' outcomes

Abbreviations

ESRD – End stage renal disease , HD- hemodialysis , RRT- renal replacement therapy , CKD- chronic kidney disease

Declarations

• Ethics approval:

This study is approved by the institution ethics committee (441/2015) and registered under the clinical trial registry of India. The registration number for this trial is CTRI/2018/05/014166 on (29/12/2017).

All methods were performed in accordance with the relevant guidelines and regulations (Declaration of Helsinki).

• Consent for publication:

Informed consents were obtained from all patients and all authors declare no conflict of interest

• Availability of data and materials:

Available with the Primary investigator

• Competing interest:

No competing interest

• Funding:

Not applicable

• Authors contribution

BD: conceived and designed the analysis, data collection,

BU: data analysis, paper writing

RP: intellectual input, paper writing

SB: paper writing

AK: Data Analysis

. Acknowledgment :

we acknowledge the support given my Kasturba Hospital , Manipal and Marketing Team for the support in conducting the study

References

1. Narva, A. S., Norton, J. M., & Boulware, L. E. (2016). Educating Patients about CKD: The Path to Self-Management and Patient-Centered Care. *Clinical journal of the American Society of Nephrology: CJASN*, 11(4), 694–703. <https://doi.org/10.2215/CJN.07680715>
2. Matteson M. L., & Russell C. (2010). Interventions to improve hemodialysis adherence: A systematic review of randomized controlled trials. *Hemodialysis International*, 14(4), 370–382. 10.1111/j.1542-4758.2010.00462.x [PubMed] [CrossRef] [Google Scholar]
3. Saran, R., Bragg-Gresham, J., Rayner, H., Goodkin, D., Keen, M., Van Dijk, P., et al. (2003). Non-adherence in hemodialysis: Associations with mortality, hospitalization, and practice patterns in the DOPPS. *Kidney International*, 64(1), 254–262.
4. Amany, Y. S. (2016). The impact of educational interventions on hemodialysis patients' adherence to fluid and sodium restrictions. *Journal of Nursing and Health Science*, 5(3), 55–60. Return to ref 14 in article
5. Milazi, M., Bonner, A., & Douglas, C. (2017). Effectiveness of educational or behavioral interventions on adherence to phosphate control in adults receiving hemodialysis: A systematic review. *JBI Database of Systematic Reviews and Implementation Reports*, 15(4), 971–1010. Return to ref 15 in article
6. Parvan, K., Hasankhani, H., Seyyedrasooli, A., Riahi, S. M., & Ghorbani, M. (2015). The effect of two educational methods on knowledge and adherence to treatment in hemodialysis patients: Clinical trial. *Journal of Caring Sciences*, 4(1), 83–93.
7. Brown, R. (2015). Asthma patient education: Partnership in care. *International Forum of Allergy & Rhinology*, 5(Suppl 1), S68–S70.
8. Jakovenko, D. (2016). Doctor-nurse cooperation in a therapeutic education pathway at home. *Soins*, 61(809), 23–26.
9. Fukuhara S, Lopes AA, Bragg-Gresham JL, Kurokawa K, Mapes DL, Akizawa T, et al. Health-related quality of life among dialysis patients on three continents: The Dialysis Outcomes and Practice Patterns Study. *Kidney International* [Internet]. 2003 Nov 1 [cited 2021 Nov 11];64(5):1903–10. Available from: <http://www.kidney-international.org/article/S0085253815495444/fulltext>
10. al Salmi I, Kamble P, Lazarus ER, D'Souza MS, al Maimani Y, Hannawi S. Kidney Disease-Specific Quality of Life among Patients on Hemodialysis. *International Journal of Nephrology*. 2021;2021.
11. Abraham S, Ramachandran A. Estimation of Quality of Life in Haemodialysis Patients. *Indian Journal of Pharmaceutical Sciences* [Internet]. 2012 Nov [cited 2021 Nov 11];74(6):583. Available

from: /pmc/articles/PMC3687932/

12. Molnar AO, Moist L, Klarenbach S, Lafrance JP, Kim SJ, Tennankore K, et al. Hospitalizations in Dialysis Patients in Canada: A National Cohort Study. *Canadian Journal of Kidney Health and Disease* [Internet]. 2018 Jun 1 [cited 2021 Jul 1];5. Available from: <https://doi.org/10.1177/2054358118780372>
13. Bikbov B, Perico N, Remuzzi G. Disparities in Chronic Kidney Disease Prevalence among Males and Females in 195 Countries: Analysis of the Global Burden of Disease 2016 Study. *Nephron* [Internet]. 2018 Jul 1 [cited 2021 Nov 20];139(4):313–8. Available from: <https://www.karger.com/Article/FullText/489897>
14. V A, M T, V M, F T, J S, F B, et al. The impact of education on knowledge, adherence and quality of life among patients on haemodialysis. *Quality of life research: an international journal of quality of life aspects of treatment, care and rehabilitation* [Internet]. 2019 Jan 15 [cited 2021 Nov 8];28(1):73–83. Available from: <https://pubmed.ncbi.nlm.nih.gov/30178430/>
15. Esmaili H, Majlessi F, Montazeri A, Sadeghi R, Nedjat S, Zeinali J. Dialysis adequacy and necessity of implement health education models to its promotion in Iran. *International Journal of Medical Research & Health Sciences* [Internet]. 2018 [cited 2021 Nov 11];5(10):116–21. Available from: <https://www.indianjournals.com/ijor.aspx?target=ijor:ijmrhs&volume=5&issue=10&article=020>
16. Fadlalmola HA, Elkareem EMA. Impact of an educational program on knowledge and quality of life among hemodialysis patients in Khartoum state. *International Journal of Africa Nursing Sciences*. 2020 Jan 1;12:100205.
17. CN S, JL A, MH F, MM M, VF D. Interventions to promote self-care of people with arteriovenous fistula. *Journal of clinical nursing* [Internet]. 2014 [cited 2021 Nov 8];23(13–14):1796–802. Available from: <https://pubmed.ncbi.nlm.nih.gov/23773233/>
18. Saelim R, Kusrithepratan M, Sodomthian W, Chinwongprom K. Effects of a Health Education Program on Improving Patients' Behaviors, and Clinical and Laboratory Parameters, among Chronic Hemodialysis Patients at the Hospital for Tropical Diseases. undefined. 2005;

Figures

Figure 1

Figure 2

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [printprotocol.docx](#)
- [CONSORT2010Checklist1.doc](#)
- [CONSORT2010Checklist1.doc](#)
- [printprotocol.docx](#)