The Effect of Muscle Relaxation on Dialysis Adequacy in Hemodialysis Patients

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Abstract

Aims and objectives: Hemodialysis is a main treatment for patients with renal failure. The improvement of dialysis adequacy is the most important factor in reducing complications and mortality in hemodialysis patients. This study was conducted to examine the effect of muscle relaxation on dialysis adequacy in patients on hemodialysis.

Design and Methods: This randomized controlled clinical trial was performed on 90 hemodialysis patients in Khatam al-Anbia and Imam Ali hemodialysis centers in Zahedan, Iran in 2014. The participants were selected through convenience sampling and assigned to the control and case groups through stratified block randomization with the block size of quadripartite (23 blocks of 4 /quadripartite). The control group received routine therapeutic measures, and the case group were trained for Benson muscle relaxation in three sessions in addition to the routine therapeutic measures. The patients in the case group were requested to do relaxation exercises for 15-20 minutes twice a day for one month. The dialysis adequacy was measured using the z02 software of the Health Ministry before and after the intervention. The data were analyzed in SPSS21 software using Chi-square test, independent t test, Mann-Whitney test, Pearson's correlation coefficient, ANOVA, and ANCOVA at significance level lower than 0.05.

Results: The results showed no significant difference between the two groups in terms of dialysis adequacy before the intervention (P = 0.818) although the difference was significant after the intervention (P = 0.003). Moreover, the dialysis adequacy significantly correlated with patients' age (P = 0.001), sex (P = 0.039), and occupation (P = 0.024).

Conclusion: Regarding increased dialysis adequacy and its safety and ease of use, it is recommended that muscle relaxation be taught in hemodialysis wards.

Key words: muscle relaxation, dialysis adequacy, Hemodialysis Patients

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Introduction

Chronic renal failure is generally a progressive and irreversible disorder in renal function that creates numerous complications due to systemic effects. Dialysis and eventually renal transplantation are the main treatments for end-stage renal disease (Mollahadi et al., 2010). Hemodialysis is the most common method of treatment for kidney patients in all countries (Namdar et al., 2013). In a study published in 2012, the prevalence rate of chronic renal failure was 242 cases per million people in the world which increases by 8% annually (Tayyebi et al., 2011). The annual prevalence rate of renal failure in Iran is 375 people. Dialysis patients experience many problems regarding their special physical and mental conditions. Measuring dialysis adequacy is one of the most important influential factors for Assessment of hemodialysis process (Esmaili et al., 2016). Promotion of dialysis adequacy has attracted medical researchers because it is one of the major determinants of life adequacy, disability, and mortality in dialysis patients (Hassanzadeh et al., 2010).

It is difficult to define and determine dialysis adequacy due to its abundant and variable parameters. The best indicator for the quality of dialysis is urea clearance. The best indicator for measuring the adequacy of dialysis is amount of urea clearance which is obtained by the KT/ V formula(Tayyebi et al., 2012, Borji et al., 2016).

Dialysis adequacy is the state of having Kt/V higher than 1.2; where k is the urea clearance by the dialysis machine, t is the duration of dialysis, and v is the concentration of urea (Kalender and Tosun, 2014).

Results of numerous studies have shown that increasing the Kt/V to 1.2 and URR to 65% is effective in prognosis of dialysis patients (Kalender and Tosun, 2014, Tayyebi et al., 2012, Borzou et al., 2009). Many factors, including duration of dialysis, velocity of dialysate, the use of high-speed dialyzer, and blood flow velocity affect dialysis adequacy(Shahdadi et al., 2017 but it is not possible or cost-effective to use some of these methods, also new hemodialysis methods are not sufficiently adequate (Salehi et al., 2016, Shahdadi et al., 2017).

Studies performed on the effect of some variables on dialysis adequacy include “The effect of hatha yoga exercises on dialysis adequacy” (Tayyebi et al., 2011), “The comparison of the effect of Quran recitation with that of normal condition, silence, Arabic music, and Iranian music on dialysis adequacy” (Alavi Majd et al., 2010), and “The effect of increased blood flow on side effects and adequacy of dialysis in hemodialysis patients with a low Kt/v” (Shahdadi et al., 2017) (BasiriMoghadam et al., 2014). The use of non-pharmacological complementary therapies has been further accepted and emphasized too much in the health system, (Hadadian et al., 2011). Relaxation is one of the complementary therapies. There are various methods of relaxation, including progressive muscle relaxation (Jacobson’s), and Basirimoghadam examined the effect of progressive muscle relaxation technique on fatigue of the patients on hemodialysis (Bassiri moghadam et al., 2014). However, the method introduced by Herbert Benson in 1970 is more favorable because it is easy to learn and teach to others (Monahan et al., 2007). Benson relaxation is a method of concentration that influences a wide range of physical and mental signs and symptoms, such as anxiety, pain, depression, temper, and self-confidence, and reduces stress (Otaghi et al., 2016, Kiani et al., 2017, Hinkle and Cheever, 2013, Yazdani and Setareh, 2012). Relaxation is expected to affect dialysis adequacy. In regard to the many studies performed on effects of facial relaxation, few studies have been performed on the effects of muscle relaxation on hemodialysis patients, including the effect of progressive muscle relaxation technique on blood pressure and dialysis adequacy of patients on hemodialysis (BasiriMoghadam et al., 2014), the effect of muscle relaxation on these patients’ stress and anxiety (Elali et al., 2012), the effect of advanced muscle relaxation on these patients’ sleep quality (Saeedi et al., 2012), and that the muscle relaxation reduces heart rate, reduces blood pressure, increases vasovagal blood flow, and reduces activity of the sympathetic nervous system (MOLAIE et al., 2012). Therefore, this study was conducted to examine the effect of muscle relaxation on dialysis adequacy in hemodialysis patients.

Design and methods

This randomized controlled clinical trial was registered under the ethics code GMU.REC.1392.43 and the Iranian Registry for Clinical Trials code IRCT2014051117656N. The study population included all patients on hemodialysis in Khatam al-Anbia and Imam Ali hemodialysis centers in Zahedan, Iran in 2013-2014. The sample size was calculated as 42 patients in each group using formula for comparisons of means after a pilot study and taking into account the confidence interval of 0.95 and test power of 80%; however, 45 patients were assigned to each group to cover potential sample loss, and totally, 90 patients entered the study. The inclusion criteria of the study were as follows: minimum age of 18 years and maximum age of 65 years, a family history of hemodialysis for at least 2 months, undergoing hemodialysis 2-3 times a week, being conscious, acceptable listening and speaking ability for learning the relaxation method, no known mental diseases, such as severe anxiety and depression, no known muscular diseases, and having active medical records in the above-mentioned centers. The exclusion criteria of the study were as follows: any condition that occurred during the intervention and rendered the intervention impossible, such as death and travel, unwillingness to continue participation in the study, and failure to attend the training sessions.

Once the participants were selected on the basis of the inclusion criteria, and written consent was received from them, they were randomly assigned to the control and case groups through stratified block randomization with the block size of 4 patients. The instruments used to collect the data included a demographic questionnaire consisting of two parts, personal information (sex, age, marital status, educational level, and occupation) and information on the

disease and its treatment (a history of hypertension and diabetes and duration of renal failure and hemodialysis), a checklist for recording the dialysis adequacy before and after the intervention on the basis of the software found in the website of Transplantation and Special Diseases Management(Rafiee 2009), and relaxation record form.

First, the patients were requested to complete the demographic questionnaire, and their dialysis adequacy was determined. Then, the muscle relaxation technique was taught to the participants individually in the case group in three sessions. The patients practised the technique at home twice a day for 30 days. The patients performed the technique as follows: 1- sitting quietly in a comfortable position, 2- closing eyes gently, 3- relaxing all the muscles from the feet to the face and keeping calm, 4- breathing in through the nose, being aware of their breathing, breathing out gently through the mouth, and when the air comes out, mutter number one and breathe comfortably and normally, 5- continuing for 15-20 minutes and keeping the muscles relaxed, and then opening the eyes and not standing for a few minutes, and 6- not worrying if they have reached a deep level of relaxation but allowing relaxation to occur at its own pace. They should ignore disturbing thoughts, if any (elali et al., 2012). To ensure the exercise of the relaxation technique during the intervention, a checklist (relaxation record form) was given to the participants in order to record the day, time, and duration of relaxation and the cause of failure to exercise the technique, if any. An audio and video file of the relaxation training was also given to the patients. Furthermore, the researcher controlled the course of exercising the technique and completing the relaxation record form by telephone every other day in order to resolve possible problems related to the relaxation. The dialysis adequacy was eventually examined in both groups after the intervention. To calculate the dialysis adequacy of each session (the first and the thirtieth day), a blood sample was drawn from the patients once immediately before dialysis and once immediately after the dialysis and delivered to the laboratory for determining the level of urea. To draw the blood sample before hemodialysis, it was drawn from an arterial line before turning on the blood pump of the dialysis machine and immediately delivered to the laboratory. To draw the blood sample after hemodialysis in the last 10 minutes of dialysis: the speed of the dialysis machine's pump was set at 50 ml/m 20-30 seconds before drawing blood, and the sample was drawn from an arterial line before the sample clearance. Concentrations of urea were determined spectrophotometrically using assay kits from Pars Azmoon Company, Iran.

The patients' weight was determined before and after dialysis using a scale (Seca Co.) that was checked with a 2-kilo weight every morning. The patients' dialysis adequacy was examined using Kt/V and urea reduction ratio (URR) methods and the relevant software.

The velocity of dialysate was 500 ml/m and equal in all patients. Moreover, a dialysate containing sodium bicarbonate buffer was used for all patients, and the velocity of blood flow comprised 300 ml/m that was equal for all patients. In general, the type of filter, site of needle, speed of the machine, time of dialysis, size of needle, drugs used during dialysis, temperature of the machine, and expertise of the personnel, which all somehow affect the dialysis adequacy, were equalized in all patients (in the case and control groups) on the blood sampling day.

Qualitative variables were reported as absolute and relative frequency, and quantitative variables were reported as mean and standard deviation values. The data were collected using SPSS 21 software and paired t test for comparing the degree of dialysis adequacy before and after intervention in both groups, independent t test for comparing mean age of participants and comparing differences in means of dialysis adequacy before and after intervention in both groups, Chi-square test for comparing the qualitative variables, ANOVA for examining the correlation of some qualitative variables with dialysis adequacy, Pearson's correlation coefficient for examining the correlation of Quantitative variables (age, weight before dialysis, hemoglobin, and pain) with dialysis adequacy, and ANCOVA for variables with $P < 0.2$, at significance level lower than 0.05.

Results

The results showed that male and female patients respectively comprised 52 patients and 37 patients (totally 90 patients, of whom one patient died and was thus excluded from the study), and married and single patients respectively comprised 68 patients and 21 patients. Mean age of the participants was 43 ± 15 years. The independent t test showed no significant difference between the two groups in terms of age. Most of the participants in both groups were male, married, illiterate, and housekeeper. According to the Chi-square test, the case and control group did not differ significantly and were equal in terms of demographic variables, including sex, marital status, education, and occupation. Moreover, most of the participants had a history of hypertension with no history of diabetes. The course of treatment with hemodialysis in the patients lasted 1-10 years. The Chi-square test did not show any significant difference between two groups in terms of the mentioned variables, and the groups were similar in this regard (Table 1 - next page).

The results of the dialysis adequacy showed the mean Kt/V higher than 1.2 and the mean URR higher than 0.65 before intervention in the case and control groups. The independent t test did not show any significant difference between the two groups in terms of dialysis adequacy before intervention although it showed a significant difference between the two groups in terms of mean Kt/V, as the mean Kt/V in the case group increased to 1.5. Although mean URR increased to 0.79 after intervention in the case group, the independent t test did not show any significant difference in this regard (Table 2).

ANOVA showed a significant correlation between dialysis adequacy after intervention and occupation ($P = 0.024$), as the dialysis adequacy was higher in housekeeper patients. The independent t test showed that the dialysis adequacy significantly correlated with sex ($P = 0.039$) and marital

Table 1: Frequency distribution of demographic information and disease-related information of the participants

Variable	Control, N (%)	Case, N (%)	P-value
Age (year)*	46.11 ± 14.754	40.41 ± 15.221	0.76
Sex			
Male	29 (64.4)	23 (52.3)	0.24
Female	16 (35.6)	21 (47.7)	
Marital status			
Single	8 (18.3)	11 (26.6)	0.404
Married	36 (81.7)	32 (73.4)	
Educational level			
Illiterate	15 (33.3)	15 (34.1)	0.69
Primary school	11 (24.4)	11 (25)	
Middle school	8 (17.8)	6 (13.6)	
High school	5 (11.1)	9 (20.5)	
High education	6 (13.3)	3 (6.8)	
Occupation			
Employed	11 (24.4)	7 (15.9)	0.50
Self-employed	18 (40)	17 (38.6)	
Housekeeper	16 (35.6)	20 (45.5)	
Hypertension			
Yes	33 (73.3)	30 (68.3)	0.28
No	12 (26.7)	14 (31.8)	
Diabetes			
Yes	9 (20)	13 (29.5)	0.29
No	36 (80)	31 (70.5)	
Hemodialysis (mo)			
< 24	8 (17.7)	12 (27.3)	0.19
24-120	34 (75.5)	31 (70.4)	
>120	3 (6.6)	1 (2.3)	

Table 2. Comparison of the dialysis adequacy indexes before and after intervention in the case and control group

	Before intervention			After intervention		
	Control	Case		Control	Case	
Variable	Mean ± SD	Mean ± SD	P-value	Mean ± SD	Mean ± SD	P-value
Kt/v	1.33±0.41	1.35±0.43	0.81	1.25±0.31	1.51±0.43	0.003
URR	0.68±0.19	0.66±0.93	0.67	0.65±0.15	0.79±0.61	0.14

status (P = 0.018) in a way that female patients and single patients had higher dialysis adequacy. Pearson's correlation coefficient also showed a significant correlation between dialysis adequacy and age (P = 0.001), as the dialysis adequacy decreased with an increase in age.

There was no significant correlation between dialysis adequacy and educational level in this study (P = 0.413). There was also no significant statistical correlation between dialysis adequacy and blood pressure in this study (P = 0.882). The results of ANCOVA showed that upon reduction of the effect of confounders, including fasting, history of hemodialysis, urea nitrogen, and potassium, before intervention the two groups still differed significantly in terms of the dialysis adequacy (P = 0.012). The effect of the confounder variable of potassium on dialysis adequacy was not significant (P 0.372), but the effect of confounding variables of fasting, history of hemodialysis, and urea nitrogen before intervention on dialysis adequacy was significant (P < 0.05).

Discussion

The results showed the mean Kt/V and URR before intervention respectively as 1.3555 ± 0.3990 0.6666 ± 0.9356, which did not conform to the results of previous studies, Raeisifar's study (Raiesifar A. et al., 2009)and Tayyebi's study (Tayyebi et al., 2011) in which Kt/V was lower than the minimum level determined in Iran (1.2), and were higher than the standard values determined in Iran. These higher values might be due to timely and adequate provision of nursing care practices and instructions, following up the patients more than before, establishment of quality promotion and accreditation offices in hospitals for control of the course of treatment and patient care, daily patient visits by a nephrologist, use of more modern and efficient medical equipment, such as the new hemodialysis machine (Bibaran), and use of new high-efficient filters. Results of a study performed by Windus and Delmaz in France showed the mean Kt/V as 1.67 which, as in the present study, was higher than the standard level and resulted in survival of patients (Kelber et al., 1993).

The mean Kt/V increased in the case group after exercising the relaxation technique. The complementary medicine in other studies also tremendously affected the course of treatment in patients. The correlation of relaxation technique with variables affecting the dialysis adequacy, such as urea nitrogen and ultrafiltration, was not significant. However, the relaxation technique significantly correlated with patients' weight before dialysis, which was another influential variable ($P < 0.011$), in a way that Kt/V decreased with an increase in weight before dialysis. As shown by the formula of Kt/V (V is in the denominator and has an inverse relationship with Kt/V) V refers to distribution volume of urea in body fluids. given that urea is simply distributed in all body fluids, V equals to the volume of body fluids and depends on sex, weight, and length of the body(Druml et al., 2017). Therefore, the weight before dialysis is inversely related to Kt/V, and this was confirmed also by the results of this study. As quoted by Daugidas, variations in body mass index (BMI) also affected the mean blood urea in Covasys's study(Druml et al., 2017, Daugirds et al., 2007).

The effect of relaxation technique has been examined in Ilali's study "The effect of Benson relaxation on the level of stress in hemodialysis patients" (elali et al., 2012) and Koushan's study "The effect of Benson relaxation techniques on the level of fatigue in hemodialysis patients" (Koushan et al., 2014) They achieved a decrease in the patients' stress and fatigue after intervention; patients undergoing hemodialysis for a long time suffer physiological mental stressors and experience changes in personality and lifestyle (elali et al., 2012). Furthermore, dialysis is a stressful process and is followed by various psychological and social problems that predispose patients to mental disorders (Elali et al., 2012). Fatigue is an important normal response to physical activities and long-term mental stressors (Koushan et al., 2014a). It seems that the relaxation technique affects the dialysis adequacy in regard to its influence on patients' stress and fatigue.

In Tayyebi et al.'s study "The effect of hatha yoga exercises on dialysis adequacy," the patients' dialysis adequacy increased significantly" (Tayyebi et al., 2011), and this agreed with the results of the present study. In Hojjat et al.'s study (2008) on the effect of Quran recitation and music on dialysis adequacy in hemodialysis patients, mean dialysis adequacy increased significantly (Alavi Majd et al., 2010), and more interestingly, Quran recitation was more efficient than music in dialysis adequacy. Basiri Moghadam et al.'s study (Basiri Moghadam et al., 2014) on the effect of advanced relaxation technique on blood pressure and dialysis adequacy in patients on hemodialysis in 2013 showed the improvement of dialysis adequacy by that technique, and this conformed to the results of the present study. Although Jacobson's technique was used in the above study, the duration of exercising the technique (one month) was equal to that in the present study. The results of this study showed a significant correlation between sex and Kt/V ($P = 0.039$). Results of Raeisifar et al.'s study (Raiesifar A. et al., 2009) did not show any significant correlation between sex and dialysis adequacy. The mean Kt/V in men and women in Lesan Pezeshki et al.'s study (Lesan Pezeshki et al., 2001) was respectively 0.45 and 0.48, and they associated this result with the better administration of dialysis in women probably due to the use of filters similar to those used for men although women are smaller than men. The result in the above study agreed with that in the present study. The independent t test showed a significant correlation between Kt/V and marital status ($P = 0.018$), as the mean Kt/V in single patients was significantly higher than that in married patients probably due to the higher mental relief, lower daily preoccupation, and lower age of single patients against married patients.

Moreover, the results of ANOVA in this study showed a significant correlation between Kt/V and occupation, and the results of Tukey's post hoc test showed a significant correlation between dialysis and adequacy and employed and housekeeper patients, as employed patients had higher dialysis adequacy probably due to the mental relief and lower mental and physical stresses caused by the occupation in housekeeper patients against those in employed patients. According to the results of this study, there was a significant correlation between age and Kt/V ($P = 0.001$), as Kt/V decreased with an increase in age, and this conformed to results of Mogharab et al.'s study (2010) in which the dialysis adequacy decreased with an increase in age although the correlation was not significant. However, Mousavi Movahed et al (2007) found a significant correlation in this regard; it seems that the dialysis adequacy greatly decreased with an increase in age and its adverse effects on the body, including lower concentration and learning ability. Therefore, it is suggested to take steps, such as increasing the duration of dialysis, changing the type of dialysis, and performing more sessions of dialysis, to improve dialysis adequacy.

Conclusion

Methods used today to increase dialysis adequacy in patients include increasing the speed of pump, using high-flux filters, and increasing number and duration of hemodialysis sessions. Regarding the results of this study, the dialysis adequacy can be easily improved in hemodialysis patients through simple and costless Benson relaxation technique.

References

Alavi Majd H, Yaghmayee F & Nasr Esfahani M (2010). Comparing the lilt voice of Koran with normal situation, silence, Arabic music and Iranian music on adequacy of dialysis. Journal of Critical Care Nursing; 3: 9-10.

Basiri Moghadam M, Madadkar Dehkordi S, Mohammadpour A & Vaezi A (2014). The effect of progressive muscle relaxation technique on blood pressure and dialysis adequacy in patients undergoing hemodialysis. Modern Care Journal; 11: 169-176.

Bassiri Moghadam M, Madadkar Dehkordi S, Mohammadpour A & Vaezi Aa (2014). Effect of Progressive Muscle Relaxation Technique on Fatigue in Patients Undergoing Hemodialysis. Preventive Care In Nursing & Midwifery Journal; 3: 24-32.

Borji M, Tavan H, Azami M & Otaghi M (2016). The Effect of Continuous Care Model on Blood Pressure and Quality of Life in Patients on Hemodialysis. Biomedical and Pharmacology Journal; 9: 689-695.

Borzou SR, Gholyaf M, Zandiha M, Amini R, Goodarzi MT & Torkaman B (2009). The effect of increasing blood flow rate on dialysis adequacy in hemodialysis patients. Saudi J Kidney Dis Transpl; 20: 639-42.

Daugirds J, Blake P & Ing T (2007). Handbook of Dialysis. Philadelphia: Lippincott
Williams & Wilkins.

Druml W, Winnicki W, Metnitz P, Zajic P, Fellinger T & Metnitz B (2017). Association of body mass index and outcome in chronic hemodialysis patients requiring intensive care therapy. Aktuelle Ernährungsmedizin; 42: O-07.

Elali ES, Mahdavi A, Jannati Y, Yazdani J & Setareh J (2012). Effect of Benson Relaxation Response on Stress Among Hemodialysis Patients. Journal of Mazandaran University of Medical Sciences; 22: 61-68.

Esmaili H, Majlessi F, Montazeri A, Sadeghi R, Nedjat S & Zeinali J (2016). Dialysis adequacy and necessity of implementing health education models to its promotion in Iran. Health Sciences; 5: 116-121.

Hadadian F, Ghorbani A, Falah H & Latifi SM (2011). The effect of trancscutaneus electrical acupoint stimulation (TEAS) on fatigue reduction in hemodialysis patients. Journal of Kermanshah University of Medical Sciences (J Kermanshah Univ Med Sci); 15.

Hassanzadeh J, Hashiani A, Rajaeefard A, Salahi H, Khedmati E, Kakaei F, Nikeghbalian S & Malek-Hossein A (2010). Long-term survival of living donor renal transplants: A single center study. Indian journal of nephrology; 20: 179.

Hinkle JL & Cheever KH (2013). Brunner & Suddarth's textbook of medical-surgical nursing. Lippincott Williams & Wilkins.

Kalender N & Tosun N (2014). Determination of the relationship between adequacy of dialysis and quality of life and self-care agency. J Clin Nurs; 23: 820-8.

Kelber J, Delmez JA & Windus DW (1993). Factors affecting delivery of high-efficiency dialysis using temporary vascular access. Am J Kidney Dis; 22: 24-9.

Kiani F, Zadeh MAH & Shahrakipour M (2017). The effect of Benson's relaxation method on hemodialysis patients' anxiety. Biomedical Research; 28.

koushan M, Rakhshan iMH, Mohsenpour M & Heshmatifar N (2014a). The effect of Benson Relaxation Response on Hemodialysis Patients Fatigue.

koushan M, Rakhshani MH, Mohsenpour M & Heshmatifar N (2014b). The effect of Benson Relaxation Response on Hemodialysis Patients' Fatigue.

Lesan Pezeshki m, Matini SM, Taghadosi M & Moosavi SGA (2001). Evaluation of the sufficiency of dialysis in patients with renal disease in Kashan from 1997 to 1998. Feyz Journal of Kashan University of Medical Sciences; 5: 82-87.

Mogharab M, Madarshahian F, Rezai N & Mohammadi A (2010). Dialysis adequacy in chronic hemodialysis patients in educational center Vali-Asr in Birjand. Journal of Birjand University of Medical Sciences; 17: 206-214.

Molaie E, Ghari S, Moujerloo M, Behnampour N, Shariati A, Aghakhani Mj, Khari M & Salehi R (2012). The Impact of Sodium and Ultrafiltration Profiling on Hemodialysis-Related Complications.

Mollahadi M, Tayyebi A, Ebadi A & Daneshmandi M (2010). Comparison between anxiety, depression and stress in hemodialysis and kidney transplantation patients. Journal of Critical Care Nursing; 2: 9-10.

Monahan F, Sands J, Nighbors M, Marek J & Green C (2007). Complementary and Alternative Therapies, Text book of Phipps medical surgical nursing. Philadelphia: Lippincott Williams and Wilkins.

Mousavi Movahed M, Komeili Movahed T, Komeili Movahed A & Dolati M (2007). Assessment of adequacy of dialysis in patients under continuous hemodialysis in Kamkar and Hazrat Vali Asr Hospitals, State of Qom, 2006.

Namdar A, Beigizadeh S & Najafipour S (2013). Health-related quality of life in dialysis patients. J Jahrom Univ Med Sci; 10: 19-27.

Otaghi M, Borji M, Bastami S & Solymanian L (2016). The Effect of Benson's Relaxation on depression, anxiety and stress in patients undergoing hemodialysis. International Journal Of Medical Research & Health Sciences; 5: 76-83.

Rafiee H (2009). Effect of exercise movements during hemodialysis selected hospitals in Tehran. School of Nursing and Midwifery, Volume MS. Tehran: Tehran University of Medical Sciences.

Raiesifar A., Torabpour M., Mohsenizad P., Sha'bani H., Tayyebi A. & Masoumi M. (2009). Dialysis adequacy in patients of Abadan hemodialysis center. Iranian Journal of Critical Care Nursing; 2: 87-90.

Saeedi M, Ashk Torab T, Saatchi K, Zayeri F & Amir Ali Akbari S (2012). The effect of progressive muscle relaxation on sleep quality of patients undergoing hemodialysis. Journal

sleep quality of patients undergoing hemodialysis. Journal of Critical Care Nursing; 5: 23-28.
Salehi A, Shahgholian N & Mortazavi M (2016). Investigation of the Effects of Stepwise Sodium and Ultrafiltration Profile on Dialysis Adequacy. Journal of Critical Care Nursing; 9: e5105.
Shahdadi H, Haghighi MJ, Sharafi E, Moghadam MP, Balouchi A & Bandadni E (2017). Efficiency of High Blood Flow in Increasing Dialysis Efficacy versus Dialysis Complications. Indian Journal of Public Health; 8: 247.
Tayyebi A, Babahaji M, Ebadi A & Eynollahi B (2011). Study of the effect of Hatha Yoga exercises on stress, anxiety and depression among hemodialysis patients. Journal of Critical Care Nursing; 4: 67-72.
Tayyebi A, Shasti S, Ebadi A, Eynollahi B & Tadrisi SD (2012). The relationship between blood pressure and dialysis adequacy in dialysis patients. Iranian Journal of Critical Care Nursing; 5: 49-54.
Yazdani J & Setareh J (2012). Effect of Benson relaxation response on stress among in hemodialysis patients. Journal of Mazandaran University of Medical Sciences; 22: 61-68.