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Research Article

Effect of Progressive Muscle Relaxation and Aerobic Exercise on Anxiety, Sleep Quality, and Fatigue in Patients with Chronic Renal Failure Undergoing Hemodialysis

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ABSTRACT

Insomnia, anxiety, and fatigue are more common in hemodialysis patients than in healthy people and affect patients' quality of life. In the present study, the effects of progressive muscle relaxation (PMR) and aerobic exercise on anxiety, sleep quality, and fatigue in patients with chronic renal failure undergoing hemodialysis were evaluated. In this double-blind clinical trial, 100 hemodialysis patients were randomly assigned to three groups: PMR, aerobic exercise, and control. Patients performed relaxation and aerobic exercise daily for 60 days. Questionnaires of anxiety, sleep quality, and fatigue were completed by participants before and after the interventions. Data were analyzed by Stata software. PMR program significantly decreased general anxiety, trait anxiety, state anxiety, and Beck anxiety and aerobic exercise significantly reduced beck anxiety. PMR program and aerobic exercise both significantly improved sleep quality in hemodialysis patients. PMR program significantly reduced Rhoten fatigue but did not affect Piper fatigue. Aerobic exercise had no effect on Rhoten and Piper fatigue. Results showed better function of PMR compared to aerobic exercise in improving the symptoms of anxiety, sleep disorders, and fatigue in hemodialysis patients. Given that fatigue and sleep quality cause severe anxiety and somehow undermine quality of life in hemodialysis patients, taking into account non-pharmacological treatments such as aerobic exercise particularly PMR is a highly economical but efficient and efficacious strategy to manage several problems of these patients. Healthcare teams can incorporate these safe programs in care designs.

Keywords: Progressive muscle relaxation, Aerobic exercise, Sleep quality.

INTRODUCTION

Incidence and prevalence of chronic renal failure (CRF) is increasing worldwide and has recently been threatening global health. Currently, over 5.1 million people worldwide are able to survive only through hemodialysis, peritoneal dialysis, and kidney transplant and are estimated to double within the following decade. Over 360000 patients with end stage renal disease, increasing by 5.12% each year, are living In Iran with 80 million population[1,2]. Although enhanced dialysis techniques in the recent years has caused increase in the longevity of the patients with CRF, these techniques may bring about several physical and mental complications prevention of which can lead to improved quality of life among the patients[3].

Fatigue is one of the most common side effects of hemodialysis and the most important nursing diagnosis in CRF patients. The prevalence of this debilitating symptom which is the leading stressor among hemodialysis patients has been reported to be 60-90%[3]. Fatigue causes physical, social, and psychological dysfunction and adversely affects daily life and quality of life[4]. Different studies have demonstrated significant association between fatigue and demographic, laboratory, clinical, and social variables such as underlying diseases particularly diabetes, taking hypnotic drugs, low sleep quality, nutritional deficiencies, physiological changes, abnormal serum levels of urea, hemoglobin, and albumin, hemodialysis-related concerns including low-sodium dialysis solution and high-speed ultrafiltration as well as psychological factors such as depression[5].

Certain factors in hemodialysis patients such as dietary restrictions, reduction in physical function, changes in social life, job loss, impotence, feeling unwell, pain, medications, treatment costs, and fear of death are associated with prevalence of psychiatric disorders particularly depression and anxiety[1]. Besides that, the levels of albumin and pro-inflammatory cytokines have been reported to be significantly and positively associated with development of psychiatric disorders in hemodialysis patients[6]. A study reported the prevalence of anxiety, depression, and stress in hemodialysis patients

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to be 63.9%, 60.5%, and 51.7% and in patients undergoing kidney transplantation to be 48.6%, 39%, and 38.4%, respectively[7]. Anxiety and depression in these patients cause declined quality of life and increased risk of mortality[6].

Sleep is needed to remain healthy and restore neurological, immune, and musculoskeletal systems. Approximately, 25-36% of healthy adults suffer from sleep disorders while 40-85% of CRF patients suffer from these disorders that is much higher than its prevalence rate in general population[8]. Accumulation of uremic toxins, anemia, and nightly hypoxia are some of the reasons for sleep disorders among these patients. Some of the effective factors are anxiety, sadness, worry, and history of depression[9]. Sleep disorders affect individual physical and mental function adversely and cause executive, cognitive, and memory dysfunctions[2].

Given that management and treatment of fatigue, sleep disorders, and mental problems due to hemodialysis using chemical drugs are mainly costly and are associated with side effects, it is necessary to seek out appropriate alternative treatments. Recently, supplementary and side effect-free therapies such as aerobic exercise and progressive muscle relaxation (PMR) to treat physical and mental disorders due to chronic diseases have attracted researchers' attention. Programs of PMR and aerobic exercise are inexpensive and accessible treatments whose efficacy has been demonstrated for patients with multiple sclerosis disease[10] and cancer[11,12] as well as the elderly[13-15]. These programs could be beneficial for hemodialysis patients as well. The effects of PMR program in relieving anxiety and improving quality of life have been demonstrated in some studies[16,17]. The present study was conducted to investigate the effect of aerobic exercise on relief of anxiety, fatigue, and sleep disorders in comparison with a PMR program.

MATERIALS AND METHODS

In this double-blind clinical trial, 100 patients with CRF referred to the Hemodialysis Ward of Hajar Hospital, Shahrekord in 2016 were selected according to convenience sampling and randomly assigned to three groups: aerobic exercise, PMR, and control. The inclusion criteria were signing the informed consent form to participate in the study, history of undergoing regular hemodialysis for at least 12 months, lack of suffering from severe neuromuscular diseases, depression, severe and unmanaged underlying diseases, lack of taking antidepressants and anti-anxiety and hypnotic medicines, lack of participating in exercise or non-pharmacological programs within the past 6 months, and being able to perform interventional exercises. All patients signed the informed consent form of participation in the study and the study protocol was approved by the Ethics Committee of the Shahrekord University of Medical Sciences.

After making necessary coordinations, the data on demographic characteristics such as age, gender, marital status, educational level, occupation, and history of undergoing hemodialysis in month and year were gathered. To conduct intervention in the PMR group, the procedure of performing the program was explained to the patients for the first time as they were undergoing hemodialysis, and recorded CDs were distributed among the patients so that the PMR program was conducted during hemodialysis session and under the supervision of the researcher. By this way, the defective performance of the patients could be corrected; besides that, the researcher's phone number was given to the patients so that they could call the researcher to resolve the potential problems related to implementation of the program. Then, the patients were asked to perform the PMR program in the same way at home every day for 60 days using the CD. To achieve this purpose, before going to sleep at night, the patients displayed the CD and contract and then relax the muscles of each part separately as they were lying down with accordance to the respective instructions.

In the aerobic exercise group, the predetermined exercise was performed in the presence of researcher for the first time and then after delivering initial explanations as the patients were undergoing hemodialysis. If necessary, the defective performance of the patients was corrected and the patients were asked to perform the exercise in the same manner for the next eight weeks. To ensure that the patients do not forget the procedure of performing the exercise, a checklist of the exercise was developed and delivered to the patients. The researcher's phone number was given to the patients so that they could call the researcher to resolve the potential problems related to performance of the exercise. The patients were asked to perform the exercise at a certain time of the day so that they had enough time to complete the program. The researcher supervised the implementation of the exercise program and followed up the patients once every two weeks through telephone call or in person so that the patients would be encouraged to continue implementing the exercise program or excluded from the study if they did not adhere to it for more than two days a week.

The mean scores for sleep quality, anxiety, and fatigue before and after the interventions were determined. To investigate sleep quality, Pittsburgh Sleep Quality Index with validity and reliability already confirmed by Ağargün et al.[18] was used. To investigate anxiety, Spielberger and Beck Anxiety Inventory with already confirmed validity and reliability[19,20] was used. In addition, Piper and Rhoten Fatigue Scale whose validity and reliability had been confirmed in a number of studies[21-22] was used to measure fatigue. Data collected analyzed by Stata software version 13 using ANOVA, chi-square and t-test.

RESULTS

One hundred hemodialysis patients (64 women and 36 men) hospitalized in the Hemodialysis Ward of Hajar Hospital were enrolled in this clinical trial and randomly assigned to three groups: aerobic exercise (n: 32), PMR (n: 33), and control (n: 35). The patients' Mean ages in PMR group was 56.12 year and in aerobic exercise was 54.31 years and in control group was 55.22 years. The patients performed the aerobic exercise and the PMR

Table 1: Demographic characteristics of the studied hemodialysis patients.

Variable		Groups			Significance
		CD	Case	Control	
Sex	male	22	21	21	0.826
	female	11	11	14	
Education	Illiterate	11	7	14	0.117
	Primary education	9	7	11	
	Secondary education	4	8	3	
	High school diploma	9	8	3	
	Academic	0	2	4	
Occupation	Civil servant	0	1	1	0.206
	Labor	2	0	2	
	Farmer	3	5	7	
	Retired	6	4	4	
	Self-employed	11	9	7	
	Miscellaneous	2	2	1	
	Housewife	9	11	13	
History of hospitalization	.00	10	11	11	0.937
	1.00	8	10	9	
	2.00	2	3	3	
	3.00	5	4	3	
	4.00	2	0	3	
	5.00	6	4	6	
Smoking	yes	14	12	8	0.206
	no	19	20	27	
Marriage	Single	2	3	1	0.080
	Married	29	27	26	
	Divorced	0	2	0	
	Widow/Widower	1	0	5	
	Miscellaneous	0	0	1	

* Significant difference at $p<0.05$.

program on a daily basis for eight weeks. Table 1 shows the demographic characteristics of the studied patients. The mean scores for anxiety, depression and sleep quality before and after the interventions are shown in Table 2. According to the findings, general anxiety, trait anxiety, state anxiety, and Beck anxiety were significantly lower after the intervention than before in the PMR group ($p<0.05$). In the aerobic exercise group, Beck anxiety was significantly lower after the intervention than before ($p<0.05$) but Piper fatigue was not significantly different between before and after the intervention. The mean score for sleep quality decreased significantly after the intervention in the PMR and aerobic exercise groups, which represents the significant improvement of sleep quality ($p<0.05$).

DISCUSSION

The present study investigated the effects of aerobic exercise and PMR on anxiety, sleep quality, and fatigue in CRF patients undergoing hemodialysis. The findings of this study indicated that aerobic exercise caused significant relief of Beck anxiety and improvement of sleep quality in the hemodialysis patients but had no significant effect on these patients' fatigue. It has been argued that aerobic exercise causes increase in oxygen intake and intensification of the process of producing energy. The beneficial effects of aerobic exercise on atherosclerosis, insulin sensitivity and increased HDL-C level have been demonstrated[23]. In addition, aerobic exercise has been reported to exert beneficial effects on the functioning of the body, quality of life, cardiovascular diseases, anemia, cholesterol levels, and insulin resistance in CRF patients[24].

Kouidi et al. reported that aerobic exercise was associated with reduced symptoms of anxiety and depression and enhanced quality of life in hemodialysis patients[25]. Reid et al. study indicated that aerobic exercise exerted beneficial effects on sleep disorders and consequently quality of life among the elderly[15]. A clinical trial showed that bicycle ergometer, treadmill, and stationary bike of upper limb three 60-minute sessions per week for four months caused significant relief of anxiety and depression as well as significant improvement of quality of life in hemodialysis patients[26]. In the current study, consistent with previous studies, the aerobic exercise caused significant relief of anxiety and improvement of sleep quality in the hemodialysis patients. This study is the first to provide evidence on the beneficial effects of aerobic exercise on sleep quality of hemodialysis patients.

In the light of the findings of the current study, the PMR program caused significant relief of general anxiety, trait anxiety, state anxiety, Beck anxiety, and Rhoten fatigue, and improvement of sleep quality in the hemodialysis patients, which is consistent with previous studies.

Table 2: Comparison of mean scores of anxiety, fatigue, and sleep quality between before and after the intervention in the groups of the study.

Variable	Groups of study	Before intervention Mean (standard deviation)	After intervention Mean (standard deviation)	Significance
General Anxiety	Progressive muscle relaxation	80.45±21.59	62.87±12.59	<0.001
	Aerobic exercise	75.32±22.76	68.87±11.83	0.13
	Control	77.14±18.03	74.34±11.67	0.44
State anxiety	Progressive muscle relaxation	39.03±11.93	30.12±8.05	<0.001
	Aerobic exercise	36.83±11.12	33.51±5.92	0.09
	Control	58.51±20.59	36.68±6.10	<0.001
Trait anxiety	Progressive muscle relaxation	43.09±13.06	32.93±5.99	<0.001
	Aerobic exercise	38.25±12.13	35.15±7.67	0.21
	Control	43.96±11.73	37.81±7.11	0.01
Beck anxiety	Progressive muscle relaxation	41.60±12.97	30.21±5.56	<0.001
	Aerobic exercise	37.80±13.12	31.73±13.17	0.01
	Control	41.45±10.76	31.61±7.58	<0.001
Piper fatigue	Progressive muscle relaxation	63.71±49.35	42.26±22.74	0.055
	Aerobic exercise	57.67±39.33	59.92±28.87	0.77
	Control	83.85±35.89	81.17±32.55	0.33
Rhoten fatigue	Progressive muscle relaxation	6.28±2.67	3.96±2.23	<0.001
	Aerobic exercise	5.46±2.89	4.37±1.62	0.08
	Control	6.65±2.66	6.2±2.15	0.40
Sleep quality	Progressive muscle relaxation	11.26±2.53	4.57±1.74	<0.001
	Aerobic exercise	10.92±1.81	4.26±1.65	<0.001
	Control	11.74±2.39	11.09±2.72	<0.001

* Significant difference at $p<0.05$.

Yildrim et al. investigated the effect of a PMR program (PMRT) on anxiety level and sleep quality among hemodialysis patients. The mean score for anxiety before and after the PMR program was derived 43.6±5.9 and 31.1±5.6, respectively, with a significant difference. Yildrim et al. study demonstrated that the PMR program caused a significant improvement of quality of life and relieved anxiety among CRF patients[16]. A study investigated 38 hemodialysis patients undergoing PMR program self-training using videotape and reported significant reduction in anxiety levels compared to controls[27].

Saeedi et al. investigated the effect of PMR on sleep quality of hemodialysis patients, and found that the mean total score for sleep quality after the PMR was significantly lower than that before the PMR. Moreover, the scores for dimensions of sleep quality (except for taking hypnotic drugs) were significantly lower before the PMR than after[17]. Rambod et al. study indicated that PMR program caused significant improvement of sleep quality and decreased use of hypnotic drugs[8]. There are some controversies about the action mechanism of PMR effect on insomnia in hemodialysis patients. It is argued that uremia, anxiety, worry, and depression play an important role in emergence and development of insomnia in hemodialysis patients. Given that PMR can relieve anxiety, depression, and stress in hemodialysis patients, this type of exercise seems to help improve sleep quality of these patients as well.

The effects of the PMR on fatigue in hemodialysis patients have not yet been investigated. Dimeo et al. reported that the PMR exercise program could improve physical function and reduce fatigue levels in cancer patients undergoing surgery[12]. Demirlap et al. study demonstrated the positive effects of PMR in reducing fatigue among patients with breast cancer undergoing chemotherapy[11]. The present study too demonstrated the positive effects of the PMR program in reducing fatigue in the hemodialysis patients.

CONCLUSION

The PMR program caused significant relief of general anxiety, trait anxiety, Beck anxiety, and Rhoten fatigue and improvement of sleep quality in the hemodialysis patients. The aerobic exercise caused significant relief of Beck anxiety and improvement of sleep quality in the patients. Taken together, the PMR program was more

efficient than the aerobic exercise to reduce anxiety level, fatigue, and sleep disorders in the hemodialysis patients.

REFERENCES

1. Rabiei L, Eslami AA, Abedi H, Masoudi R, Sharifirad GR. Caring in an atmosphere of uncertainty: perspectives and experiences of caregivers of peoples undergoing haemodialysis in Iran. Scandinavian Journal of Caring Sciences. 2015.
2. Eslami AA, Rabiei L, Khayri F, Nooshabadi MRR, Masoudi R. Sleep quality and spiritual well-being in hemodialysis patients. Iranian Red Crescent Medical Journal. 2014;16(7).
3. Eslami AA, Rabiei L, Abedi HA, Shirani M, Masoudi R. Coping skills of iranian family caregivers' in caretaking of patients undergoing haemodialysis: a qualitative study. Journal of Renal Care. 2016;42(3):162-71.
4. Haddadian F, Fayyazi S, Ghorbani A, Fallah H, Latifi M. Cutaneous electrical stimulation of acupuncture points on fatigue in hemodialysis patients. Journal of Kermanshah University of Medical Sciences. 2012;15(3):45-8.
5. Biniyaz V, Tayebi A, Sadeghi Shermeh M, Ebadi A, Neamati E. The effect of supplementation with intravenous vitamin C on fatigue of hemodialysis patients. Journal of Critical Care Nursing. 2013;6(3):145-54.
6. Wang L-J, Wu M-S, Hsu H-J, Wu I-W, Sun C-Y, Chou C-C, et al. The relationship between psychological factors, inflammation, and nutrition in patients with chronic renal failure undergoing hemodialysis. The International Journal of Psychiatry in Medicine. 2012;44(2):105-18.
7. Mollahadi M, Tayyebi A, Ebadi A, Daneshmandi M. Comparison between anxiety, depression and stress in hemodialysis and kidney transplantation patients. Journal of Critical Care Nursing. 2010;2(4):9-10.
8. Rambod M, Pourali-Mohammadi N, Pasyar N, Rafii F, Sharif F. The effect of Benson's relaxation technique on the quality of sleep of Iranian hemodialysis patients: A randomized trial. Complementary therapies in medicine. 2013;21(6):577-84.
9. Gusbeth-Tatomir P, Boisteanu D, Seica A, Buga C, Covic A. Sleep disorders: a systematic review of an emerging major clinical issue in renal patients. International urology and nephrology. 2007;39(4):1217-26.
10. Masoudi R, Sharifi Faradonbeh A, Mobasheri M, Moghadasi J. Evaluating the effectiveness of using a progressive muscle relaxation technique in reducing the pain of multiple sclerosis patients. Journal of Musculoskeletal Pain. 2013;21(4):350-7.
11. Demiralp M, Oflaz F, Komurcu S. Effects of relaxation training on sleep quality and fatigue in patients with breast cancer undergoing adjuvant chemotherapy. Journal of clinical nursing. 2010;19(7-8):1073-83.
12. Dimeo FC, Thomas F, Raabe-Menssen C, Pröpper F, Mathias M. Effect of aerobic exercise and relaxation training on fatigue and physical performance of cancer patients after surgery. A randomised controlled trial. Supportive care in cancer. 2004;12(11):774-9.
13. Blumenthal JA, Emery CF, Madden DJ, George LK, Coleman RE, Riddle MW, et al. Cardiovascular and behavioral effects of aerobic exercise training in healthy older men and women. Journal of Gerontology. 1989;44(5):M147-M57.
14. Montgomery P, Dennis JA. Physical exercise for sleep problems in adults aged 60+. The Cochrane Library. 2002.
15. Reid KJ, Baron KG, Lu B, Naylor E, Wolfe L, Zee PC. Aerobic exercise improves self-reported sleep and quality of life in older adults with insomnia. Sleep medicine. 2010;11(9):934-40.
16. Yildirim Y, Fadiloglu C. The effect of progressive muscle relaxation training on anxiety levels and quality of life in dialysis patients. Edtna-Erca Journal. 2006;32(2):86-8.
17. Saeedi M, Ashk Torab T, Saatchi K, Zayeri F, Amir Ali Akbari S. The effect of progressive muscle relaxation on sleep quality of patients undergoing hemodialysis. Journal of Critical Care Nursing. 2012;5(1):23-8.
18. Ağargün MY, Kara H, Anlar Ö. The validity and reliability of the Pittsburgh Sleep Quality Index. Turk Psikiyatri Derg. 1996;7(2):107-15.
19. Quek K, Low W, Razack A, Loh C, Chua C. Reliability and validity of the Spielberger State-Trait Anxiety Inventory (STAI) among urological patients: a Malaysian study. The Medical Journal of Malaysia. 2004;59(2):258-67.
20. Fydrich T, Dowdall D, Chambless DL. Reliability and validity of the Beck Anxiety Inventory. Journal of Anxiety Disorders. 1992;6(1):55-61.
21. Strohschein FJ, Kelly CG, Clarke AG, Westbury CF, Shuaib A, Chan KM. Applicability, validity, and reliability of the Piper Fatigue Scale in postpolio patients. American journal of physical medicine & rehabilitation. 2003;82(2):122-9.
22. Khayeri F, Rabiei L, Shamsalinia A, Masoudi R. Effect of Fordyce Happiness Model on depression, stress, anxiety, and fatigue in patients with multiple sclerosis. Complementary Therapies in Clinical Practice. 2016;25:130-5.
23. Rauramaa R, Halonen P, Väisänen SB, Lakka TA, Schmidt-Trucksass A, Berg A, et al. Effects of aerobic physical exercise on inflammation and atherosclerosis in men: the DNASCO Study: a six-year randomized, controlled trial. Annals of internal medicine. 2004;140(12):1007-14.
24. Afshar R, Shegarfy L, Shavandi N, Sanavi S. Effects of aerobic exercise and resistance training on lipid profiles and inflammation status in patients on maintenance hemodialysis. Indian journal of Nephrology. 2010;20(4):185.
25. Kouidi E, Iacovides A, Iordanidis P, Vassiliou S, Deligiatmis A, Ierodiakonou C, et al. Exercise renal

rehabilitation program: psychosocial effects. Nephron. 1997;77(2):152-8.
26. Mi Rye Suh R, Hyuk Jung H, Bae Kim S, Sik Park J, Seok Yang W. Effects of regular exercise on anxiety, depression, and quality of life in maintenance hemodialysis patients. Renal failure. 2002;24(3):337-45.
27. Alarcon RD, Jenkins CS, Heestand DE, Scott LK, Cantor L. The effectiveness of progressive relaxation in chronic hemodialysis patients. Journal of chronic diseases. 1982;35(10):797-802.