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Research Article

Tai-Chi Versus Stretching Exercises to Manage Fatigue in Patients receiving Hemodialysis: a Randomized Clinical Trial

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Abstract

Background: Fatigue is one of the common complications of hemodialysis. The purpose of this study was to compare the effect of Tai-chi (TC) and stretching exercises (SE)on fatigue in patients receiving hemodialysis.

Methods: A double-blind randomized clinical trial was undertaken with42 eligible patients receiving unit hemodialysis in Iran. Patients were randomly assigned to the first intervention (I1) (n=14), second intervention (I2) (n=14) and control (C) (n=14) group. The standard Multidimensional Fatigue Inventory (MFI) was completed at baseline and after 6 weeks else. In the I1group, SE was performed for 6 weeks and included 18 sessions for 40 to 60 minutes. In the I2group, TC was offered over 6 weeks and 18 sessions (40 to 60 minutes) were performed. During this period, the control group did not receive any training. Finally, the data were analyzed with SPSS Ver. 16 using descriptive and inferential statistics.

Results: At baseline, there was no significant difference in fatigue score between the three groups ($P>0.05$). Post-intervention the fatigue score in the intervention groups was significantly lower than the control group. ($P<0.05$). Although the fatigue score decreased in both intervention groups, this decrease was more significant in I1 than I2 ($p=0.01$).

Conclusions: SE and TC reduced fatigue in patients receiving hemodialysis in this study. Therefore, considering the simplicity, safety, and cost-effectiveness of these methods, it is suggested they are implemented for use in hemodialysis units.

Keywords: stretching exercises; tai chi; fatigue; haemo dialysis; chronic renal failure; complementary medicine

Introduction

End-stage renal disease (ESRD) is the irreversible degeneration of kidney function. At this stage, the treatment choices include dialysis (hemodialysis and peritoneal dialysis) or kidney transplantation[1,2]. Hemodialysis is the common dialysis method, used for patients with ESRD.[1] According to available data, about 89% of patients with ESRD receive hemodialysis and 11% of patients use peritoneal dialysis for their treatment.[3] Patients with chronic renal failure (CRF) can be likened to a floating iceberg, the latter being a small part outside of water and most of it is underwater[4].According to the United States Renal Data System report, the average incidence of ESRD in 2011 has reached 449 people per million population, and it is estimated that by 2020, the number of patients receiving hemodialysis will reach 3,500,000[5]. Today hemodialysis is a selective therapeutic option for patients with ESRD, but it is a stressful process often with devastating effects on the physical, sexual, psychological, and social dimensions of the patient's life[6-8]. Fatigue and weakness are the most common complications of hemodialysis seen in more than 50% of patients with hemodialysis and its debilitating effects reduce self-care activities, limit family role, decrease individual autonomy, and can lead to job loss, dependency, and mortality[9]. As adi et al. stated in a study that fatigue is the most common complication of hemodialysis inversely related to physical and psychological functions of individuals and causes functional impairment[10]. Fatigue has been defined as a mental feeling of physical and mental energy shortages for the completion of common activities[11]. Pharmacological and non-pharmacological interventions can be used to its control these patients. Most patients complain of fatigue despite the use of various complementary medicines. This method includes: muscle relaxation techniques, exercises and educational approaches[9, 12-14]. SE are a simple form of exercises requiring movement of the body[15].SE, by creating a balance condition between the body and the soul, increase comfort and induce calm, and promotion of individual functions[15, 16]. TC is one of the traditional

Chinese medicine branches based on harmonious, movements and methods of focusing the mind[17].In many sports, strength and speed are a main component, and conditions such as age, illness, or poor weather conditions can prevent them from doing these exercises. TC is suitable for any age or condition and does not require any special equipment[18].The Chinese believed that the universe was based on contradictions. According to Yin and Yang theory all organisms have two positive and negative pole that are always in balance condition[19]. TC art is based on the philosophy of Yin and Yang[19]. The properties of TC include balance between body and soul, respiratory effects, reduction of fatigue, and improvements in circulation and balance[18, 20].Since recognizing different dimensions of fatigue and understanding the impact on patient's helps nurses to plan and execute adequate nursing care, this study aims to compare the effects of SE and TC on fatigue of hemodialysis patients.

Methods

The present study was a randomized clinical trial. This study was conducted in Arak Dialysis Center (Arak is one of the central cities of Iran) from November 2018 to February 2019.

2.1. Participating and sampling

In this study, patients after receiving written consent form, according to the inclusion criteria (communicating skills, the willingness to collaborate in the study and sign the informed consent form, at least two sessions of dialysis per week, at least 3 months of dialysis history, age range between 18-65 years, no history of rheumatic diseases and arthritis and etc.) were selected using convenience sampling method and then were randomly assigned into I1 (n=14), I2 (n=14) and C (n=14) groups regards to the "CONSORT" guideline (Figure 1).The sample size was finally determined 14 patients in each group, based on similar studies,[21] using the sample size formula ($Z1-\alpha/2=1.96$, $Z1-\beta=0.85$, $\alpha=0.05$, $\mu1=21.3$, $\mu2=23.8$, $\delta1=3.56$, $\delta2=2.86$).2.2. Intervention

Before the study, participants of the I1 group and the I2 group were instructed for 6 weeks, and after learning how to do the exercises correctly, the study began. In each session before exercise, the participants of both groups warmed up their bodies for 10 minutes.

The intervention comprised two parts:

2.2.1. SE

In theI1 group the protocol of exercises was explained by physiotherapist. the exercises include: marching, back kicking exercise, front kicking exercise, knee bending exercise, shoulder rotating exercise and arm rolling exercise. The I1 group conducted SE after training and were supervised by a physiotherapist in 18 sessions over 6 weeks. Each session lasted between 40 to 60 minutes[11].

2.2.2. TC

The I2 group received Qi Gong (QC) or Chi Kung (CK)after initial training and were supervised by TC trainer in 18 sessions for 6 weeks (each session, 40 to 60 minutes). The TC trainer qualified with Malaysian and Chinese specialists in the field of Eastern medicine and was certified in Shahid Beheshti University of Medical Sciences in Tehran, Iran.

QC or CK, is one branches of TC that was used in this study. QC is Chinese form of mindful breathing and was started with several deeply and slowly breathing and then leads to soft sporting exercises. According to the Eastern Writings, the philosophy of Qi Kung is the relaxation of the mind and the flow of energy in the body [19].

2.3. Instruments

Demographic information was collected using a questionnaire. This form included variables such as age, sex, marital status, educational status, occupational status, duration of chronic kidney disease, duration of hemodialysis and smoking status. This questionnaire was completed at the beginning of the study by patients and with the help of a researcher (second author). To determine levels of fatigue, the standard Multidimensional Fatigue Inventory (MFI) was used. This inventory developed by Smets (1996), consists of 20 items and 5 subscales of general fatigue (4 questions), physical fatigue (4 questions), reduced activity (4 questions), reduced motivation (4 questions) and mental fatigue (4 Question).[22]The scoring of the MFI is a 5-point Likert scale (from "yes, that is true" to "no, that is not true").Regarding the validity and reliability of the questionnaire, confirmatory factor analysis(CFA) showed that the questions of each dimension are descriptive of the same dimension and the questionnaire has a proper internal consistency (alpha coefficient for general, physical and mental fatigue more than 8% and for reduced activity and reduced motivation was above 65%). This questionnaire has been translated into Persian and its reliability and validity have been verified[23]. The questionnaire was completed at baseline and end of study by all participants from all three groups

2.. Ethical considerations

The present study was approved by the Ethics Committee of Arak University of Medical Sciences (IR.ARAKMU.REC.1397.081), and registered on 06/04/2019 in the Iranian registry of clinical trials (IRCT20161223031522N10). All subjects voluntarily participated in the study. Informed consent was obtained from all subjects and/or their legal guardians. During the study, no financial costs were incurred by the participants. The purpose and process of the study was explained to potential participants, their families, nurses and authorities of the dialysis center. Questionnaires were completed confidentially, without the name and ID of participants. Participants were informed that they could withdraw from the study at any time without loss of benefits. The principles of the Helsinki Declaration related to medical research on human beings were respected in this study[24].

2.5. Data analysis

Data were analyzed using Statistical Package for the Social Sciences (SPSS) Ver. 16.0. The basic characteristic information of participants was demonstrated using frequency, percentage, mean and standard deviation (SD). Independent t-test and chi-square tests were used to compare the quantitative and qualitative variables of the three groups, respectively. Chi-square test was conducted to test differences in categorical data between interventions and control groups and paired t-testswere used to determine the effects of SE and TC on fatigue in patients receiving haemodialys is.

2.6. Process of study

Results

Groups					
Variable	Categories	I1	I2	C	p-value
		Frequency (%)	Frequency (%)	Frequency (%)	
Marital status	single	1 (2.38)	2 (4.76)	2 (4.76)	0.67*
	married	11 (26.18)	11 (26.18)	9 (21.42)	
	divorced	0 (0)	0 (0)	1 (2.38)	
	widowed	2 (4.76)	1 (2.38)	2 (4.76)	
Educational level	Illiterate	9 (21.42)	10 (23.81)	8 (19.05)	0.87*
	Primary school	3 (7.14)	3 (7.14)	4 (9.52)	
	High school	2 (4.76)	1 (2.38)	1 (2.38)	
	Academic	0 (0)	0 (0)	1 (2.38)	
Occupational status	Unemployed	3 (7.14)	1 (2.38)	2 (4.76)	0.74*
	Employee	4 (9.52)	3 (7.14)	2 (4.76)	
	Free work	2 (4.76)	6 (14.28)	5 (11.90)	
	Others	5 (11.90)	4 (9.52)	5 (11.90)	
Gender	Male	9 (21.42)	6 (14.29)	7 (16.66)	0.26*
	Female	5 (11.90)	8 (19.05)	7 (16.66)	

* $\chi 2$; ** t-test

Table 1: Demographic characteristics of the interventions and control groups (n=42).

value			Groups			Dimensions ofMFI	Stage	Variable
			C	I2	I1			
			Mean (SD)	Mean (SD)	Mean (SD)			
086c	0.61b	0.34a	13.53 (4.2)	14.20 (4.2)	13.20 (3.1)	General fatigue	Before intervention	Fatigue
			12.32 (3.5)	15.54 (2.9)	16.23 (4.2)	Physical fatigue		
			10.25 (3.4)	11.92 (3.5)	10.36 (3.0)	Reduced activity		
			14.23 (3.8)	10.25 (3.5)	11.30 (3.1)	Reduced motivation		
			13.00 (4.4)	11.25 (2.4)	12.90 (3.2)	Mental fatigue		
0.01c	0.01b	0.001a	14.23 (3.7)	10.65 (3.2)	9.30 (2.3)	General fatigue	After intervention	
			13.29 (3.7)	9.32 (3.0)	7.41 (2.6)	Physical fatigue		
			10.98 (3.0)	10.23 (4.1)	9.35 (3.4)	Reduced activity		
			13.50 (3.4)	9.25 (3.1)	8.34 (3.6)	Reduced motivation		
			13.60 (4.5)	10.10 (3.5)	7.23 (3.0)	Mental fatigue		
-			0.42**	0.01**	0.001**		p- value	

*paired t-tests; ** t- test; a I1 compared to C; b I2 compared to C; c I1 compared to I2

Table 2: Comparison of mean and standard deviation (SD) of fatigue in three groups

Discussion

The aim of this study was to compare the effects of SE and TC on fatigue in hemodialysis patients in the dialysis center of Arak, Iran in 2019. The results of the study will be discussed in relation to the research objectives. 42 eligible hemodialysis patients were recruited and participated. The results showed that the three groups were matched in terms of gender, educational status, occupational status, history of disease and marital status. 59.46% of patients in this study had mild fatigue, 23.12% had moderate fatigue and 17.42% had severe fatigue. In this regard, Sajjadi et al., in a study conducted at Arak University of Medical Sciences, found that 46% of patients undergoing hemodialysis suffered from fatigue. [2] In addition, Tavakoli et al. reviewed the "Fatigue status of hemodialysis patients hospitalized in AJA hospitals". In their descriptive-analytic study, 105 hemodialysis patients referred to hospitals affiliated to AJA University of Medical Sciences reported the highest incidence of fatigue in women. [26]

The findings of this study demonstrate that the mean fatigue score of participants after the SE and TC interventions was significantly decreased in the SE and TC group. This concurs with a study exploring the effect of SE on severity of symptoms of restless leg syndrome in hemodialysis patients", It showed that stretching training performed for 30 minutes three times a week (for 8 weeks), reduced the severity of the symptoms after exercise. [21] The difference in mean of fatigue scores before and after the intervention in TC group was also significant (Aliasgharpour et al.). Another study aimed at exploring the effect of 6 weeks of TC training on cognitive status, dynamic balance and quality of life in women with stroke also showed that mental health, physical functioning, and the total quality of life in the TC group was higher than the control group. Also, the role limitation due to physical disabilities after training in the intervention group decreased significantly. In their study, the dynamic balance in the intervention group was significantly higher than the control group, but, despite improvement in cognitive status, there was no significant difference between the two groups. In parallel with

our study, some studies have shown that exercise as a non-pharmacological intervention can improve quality of life, decrease fatigue and anxiety in hemodialysis patients.(11, 12)In this study, there was no significant difference in the fatigue score between the three groups before intervention. But, the comparison of the fatigue score in the interventions (I1and I2) and C groups before and after the intervention showed that the mean score of fatigue after intervention in interventions and control groups had a significant difference with each other. However, the mean fatigue scores post intervention in the control group was reduced in two dimensions, but this difference was not significant. After intervention, the comparison of SE and TC groups showed that there was no significant difference between the two groups and both interventions reduced mean fatigue scores in hemodialysis patients. Therefore, it cannot be concluded which intervention is more effective in reducing the fatigue of patients receiving hemodialysis. However, the average fatigue scores in those receiving the SE group were lower than the TC group.

4.1. Limitations

One of the limitations of this study was the small sample size, therefore, it is recommended that future studies to increase the generalizability be conducted with a larger sample size. Another limitation of this study was the perception of fatigue, could also be affected by multiple factors which was not controllable by the researchers.

Conclusion

The findings of this study showed that SE and TC are effective in reducing the mean fatigue scores of hemodialysis patients. SE can reduce and prevent immobility of patients. These exercises do not require any materials and are applicable for hemodialysis patients. Also, TC can be an effective step for improving the health, comfort, and relaxation of these patients. The findings of this study can be used in the caring process of haemodialysis patients. According to experiences of researchers during the study and the interest of the patients in learning the TC technique and SE, it seems complementary medicine interventions should be considered as non-pharmacological methods along with other conventional treatments and standard care in management of common complications of disease. It is hoped that by implementing this methods, valuable results will be obtained in improving the fatigue of patients receiving haemodialysis.

Abbreviations

Tc: Tai-chi; SE: stretching exercises; C: control; MFI: Multidimensional Fatigue Inventory; ESRD: End-stagerenal disease; CRF: chronic renal failure

Declaration

Ethical approval and consent to participate:

The present study was approved by the Ethics Committee of Arak University of Medical Sciences (IR.ARAKMU.REC.1397.081). All subjects voluntarily participated in the study. Informed consent was obtained from all subjects and/or their legal guardian(s). During the study, no financial costs were incurred by the participants. The purpose and process of the study was explained to potential participants, their families, nurses and authorities of the dialysis center. Questionnaires were completed confidentially, without the name and ID of participants. The principles of the Helsinki Declaration related to medical research on human beings were respected in this study.

Consent for publication:

Not applicable.

Availability of data and materials:

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request. the full trial protocol can be accessed in “https://fa.irct.ir/trial/31078" with Registration number (IRCT20161223031522N10)

Competing interest:

Authors of this study declare that there are no conflicts of interest related to the publication of this research.

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Authors' contribution:

NSV was responsible for the study conception and design, data collection/ analysis, drafting of manuscript. ANF as a supervision, administrative/ critical revisions for important intellectual content. SM: critical revision/technical/supervision, technical and material support. BF, SM: data analysis and supervision. All authors helped shape the research, analysis and manuscript. All authors read and approved the final manuscript.

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