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The Effect of Stretching Exercises on Sleep Quality in Type 2 Diabetic Patients with Restless Legs Syndrome

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Abstract: Restless leg syndrome is a sensory-motor disorder with an unknown cause that is highly prevalent among patients with diabetes and causes severe sleep disturbance. The study aimed to investigate the effect of stretching exercises on sleep quality in type 2 diabetic patients with restless legs syndrome. This is a semi-experimental clinical trial study with control group that was conductedon 80 patients admitted to endocrine ward of Firoozgar Hospital in 1394. Samples were selected through convenient method. The cards were prepared based on the number of samples the word "control" was written on the half of cards and the word "intervention" on the other half. Then, all the cards were placed in a bag. Every patient was asked to take a card out of the bag and then included in a group. Stretching exercises were performed for 3 nights for 30 min before bedtime to patients in the intervention group and patients in the control group received usual care. The data was collected through Pittsburgh sleep quality the severity of RLS and Restless Leg Syndrome screening questionnaires. The data were analyzed by Wilcoxon and Mann-Whitney tests in SPSS Version 22. The results showed that there is a statistical significant differencein the mean and standard deviation of the two groups after intervention ($p<0/001$) indicating the positive effect of stretching exercises to improve sleep quality in patients with type 2 diabetes mellitus. Also, the results of comparing sleep quality before and after the intervention was not significant in control group ($p = 1$) while the comparison in the intervention group was significant ($p<0/001$). The results of this study suggest that stretching exercises of leg is effective on improving sleep quality in patients with restless leg syndrome so thecare and treatment staff including nurses are recommended to apply this procedure in the care of type 2 diabetic patients with restless legs syndrome in order to improve sleep quality and reduce the severity of symptoms.

Key words: Diabetes, sleep quality, restless leg syndrome, stretching exercises, severity of symptoms

INTRODUCTION

According to the International Diabetes Association in 2015, 415 million people worldwide have diabetes that this figure will increase to 642 million by 2040. In Iran in 2014>5.4 million diabetes have been reported (Piemonte, 2016). According to the prediction of the world health organization, people with diabetes will be doubled by 2030 (Hu *et al*., 2012). Diabetes and its complications as a chronic disease require life long on going care and monitoring. However, about 50-80% of diabetic patients do not have enough self-care skills and knowledge of the disease (Yuan *et al*., 2014).

One of the most common complications of the disease is peripheral nervous system disorders such as restless in the legs. Actually, restless leg syndrome is a sensory-motor disorder that can be accompanied with a strong desire to move the legs with discomfort, pain, tingling and numbness in the legs and other parts of the body which gets worse by rest and inactivity, particularly at nights and causes disorder in night sleep. It will be also reduced by activity (Aurora *et al*., 2012).

Nightly exacerbation of the restless leg syndrome symptoms in moderate to severe cases will lead to sleep disorder and nightly sleep <5 h so that people with restless leg syndrome may experience chronic sleep deprivation, daytime sleepiness and stress that can be interfered with daily functioning of patients and bring negative effects on social activities, family life and employment and finally reduce the quality of life of these people (Ghanei *et al*., 2011). As the study by Chasens *et al*. (2012) on simultaneous occurrence of restless leg syndrome and sleep disorder, social dysfunction and reduced quality of life in patients with diabetes has been emphasized (Chasens *et al*., 2012).

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Health care workers, especially nurses should examine the patient's sleep quality and implement effective adaptation strategies to improve sleep quality (Gilsenan *et al*., 2012). Patient's training is one of main activities of nursing and considered as a patient-centered process that should be established based on the patient's needs (Arian *et al*., 2015). The nurse's role in the past few years as the basic member of the healthcare team have undergone a change and transformation from patient-centered health education to the empowerment of patients for self-care and improving the level of health. Making the patients aware and involving them in decision-making will accelerate the recovery and lead to a decline in the term of hospitalization and readmission therefore it is very important economically and socially (Arian, 2013).

Given the above, measures to reduce the symptoms caused by this syndrome and improve sleep quality of type 2 diabetic patients with restless legs syndrome is necessary. Controlling the symptoms of restless leg and improving sleep quality involve medicinal and non-medicinal measures. Non-medicinal measures include sleep hygiene, behavioral therapy, cognitive therapy, muscle strengthening or stretching exercises. The use of medicinal measures is more common among them but it is better to use non-medicinal measures together with medicinal therapy due to the several pharmaceutical complications. Therefore, the use of non-medicinal methods based exercise therapy in controlling symptoms of this syndrome can play a positive role to improve daily performance of patients and reduce sleep disorders.

In exercise therapy, stretching exercises are one of the the rapies that increase the vascularization to the muscles and facilitate the transfer of nutrients to the cells. Since, the weak circulation leads to severe symptoms of restless leg syndrome and mobility leads to improve it, perhaps stretching exercises are helpful in reducing the intensity of the syndrome (Ryan, 2011). This study aimed to determine the effect of stretching exercises on sleep quality in patients with type 2 diabetes with restless leg syndrome.

MATERIALS AND METHODS

This is a semi-experimental clinical trial study with control group that was conducted in endocrine ward of Firoozgar Education and Health Center of Iran Medical University from 1394 until 1395. In this study, 80 patients were selected through convenient sampling method and then divided into two intervention and control groups by simple random method. Inclusion criteria of the study included: having type 2 diabetes according to medical records, admission only to control blood sugar having at least ability of reading and writing having sleep disorders and restless leg syndrome according to a standard questionnaire and a sleep quality score >5 having 30 year of age no drug addiction no mental illness and depression according to the history, ability to understand Farsi, ability to communicate verbally, non-restriction of leg motion in cases prescribed by the doctor no use of hypnotic, analgesic and drugs. Exclusion criteria from the study included: discharge during the study, not wanting to continue the cooperation or lack of cooperation even for one night. The minimum sample size in each group was estimated 40 according to the formula of sample size determination in 2 independent groups and considering the confidence level of 95%, testability of 80% and prediction of 10% drop in the sample. After getting the permission of study and reference to the hospital and introduction of the research objectives and then getting written consent from the patients with inclusion criteria the researcher prepared cards based on the number of samples the word "control" was written on the half of cards and the word "intervention" on the other half. Then, all the cards were placed in a bag. Every patient was asked to take a card out of the bag and then they were included in a group.

The data collection tools included: a questionnaire containing demographic information and clinical data completed by the patient and with the help of medical records, pittsburgh sleep quality index, RLS screening questionnaire and the RLS severity questionnaire. RLS screening questionnaire was used to identify patients with this syndrome and the subjects who positively responded to four questions were included in the study. About 80 subjects out of 150 had RLS. Pittsburgh sleep quality index is a self-control and self-report questionnaire developed by Buysse at the Institute of Psychiatry of Pittsburgh in 1989, made to measure the sleep quality. The questionnaire has been widely used in clinical and non-clinical research to evaluate sleep quality. Neyse in a study in 1390 entitled "The effect of earplugs and a blindfold on sleep quality in patients with acute coronary syndrome admitted to CCU of military hospital" showed that the questionnaire has a sensitivity of 90% and specificity of 87%. The reliability of the questionnaire was calculated 88% by in their study to "investigate acupressure on sleep quality in the elderly". Gholami in a study entitled "The Effect of Music on Sleep Quality in Old Men Member of Naft Shahr Retired Association" reported the reliability of this questionnaire 77% using retest on 10 elders. The questionnaire includes

7 subscales, general description of the person about sleeping, delay in falling asleep, useful sleep duration, sleep sufficiency (it is calculated based on the ratio of sleep duration to the total time spent in bed), sleep disorders (defined as waking at nights), sleep aid supplies and morning performance (defines as the difficulties experienced by the person during the day because of poor sleep). Grading each of the scales ranges from 0-3 in a way that the item "I have not experienced at all" is zero, "less than one" is one, "one or two times" is two and finally "three times or more" is equivalent to three. The sum of 7 scales forms the total score ranging from 0-21. Total score higher than 5 means inappropriate sleep quality and the patients with sleep quality score higher than 5 were also included in the study. The RLS severity questionnaire has ten five-choice questions each of which has zero to four points. The severity of this disorder is classifiedin to five categories based on the points earned: no problem (0), mild (1-10), medium (11-20), severe (21-30) and very severe (31-40). The questionnaire has been used in a study by Abbasi and Aliasgharpour (2013) entitled "The Effect of Stretching Exercises on the Severity of the Restless Leg Syndrome" symptoms and sleep quality in patients under Hemodialysis. All samples (both control groupand intervention group) filled the pittsburgh sleep quality index andthe RLS severity questionnaire for 3 day without intervention indicating good sleep quality at zero, first and second nights (3 nights without intervention). In the morning of the 4th day, stretching exercises were trained individually in a separated room by the researcher to any patient of the intervention group. The exercises were carried out at the same night under the supervision of the researcher. Next night (5th night) before doing stretching exercises, sleep quality questionnaire and the RLS severity scale related to the last night was completed. Then, the stretching exercises were done and repeated for 2 nights. It should be noted that the subjects were transferred to a separated room for doing stretching exercises in order to prevent from data pollution. The subjects of the intervention group were asked not to train stretching exercises to others until the end of study. The data were analyzed by SPPS Version 22. Chi statistical tests were used for the analysis of individual variables, Mann-Whitney test to compare mean and standard deviation for each group before and after the intervention. And Wilcoxon test was used to compare standard deviation and mean of each group before and after the intervention.

RESULTS

According to the results obtained in the study, most of participants in the study were women that 70% of the control group and 65% of the intervention group were women. In terms of age, a high percentage of the participants in the study were between 55-66 years old (62.5% in the control group and 52.5% in the intervention group). Regarding the duration of diabetes, 55% of the control group and 47.5% of the intervention group cited a history of diabetes between 10-20 year. FBS rate in 57.5% of the control group was in the range of 130-200 while 40% of the intervention group had FBS rate >200. The 45% of people in the control group and 42.5% of those in the intervention group had HbA1C between 8 and 10.99. The 42.5% of the control group and 77.5% of the intervention group use insulin. A high percentage of people participating in the study didn't do any kind of sports (67.5% of the control group and 87.5% of the intervention group). Both groups had not statistically significant difference in terms of all the individual variables that may affect the outcome of the test, except sports and medicines for diabetes (Table 1).

Table 1: Frequency distribution of demographic characteristics of type 2 diabetic patients with restless legs syndrome

	Control (40)		Intervention (40)		
Personal characters	Number	Percent	Number	Percent	p-value
Sex					
Female	28	70	26	65	63/0
Male	12	30	14	35	
Age (years)					
31-42	2	5	3	5/7	34/0
43-54	7	5/17	13	5/32	
55-66	25	5/62	21	5/52	
Above 66	6	15	3	5/7	
Duration of diabetes (years)					
<10	14	35	14	35	59/0
10-20	22	55	19	5/47	
>20	4	10	7	5/17	
FBS					
80-129	4	10	12	30	02/0
130-200	23	5/75	12	30	
200<	13	5/32	16	40	-

Table 1: Continue

Personal characters	Control (40) Number	Control (40) Percent	Intervention (40) Number	Intervention (40) Percent	p-value
HbA1C					
99/7-5	14	35	12	30	72/0
99/10-8	18	45	17	5/42	
15-11	8	20	11	5/27	
Drugs used for diabetes					
Oral medication	13	5/32	5	5/12	007/0
Insulin	17	5/42	31	5/77	
Doing exercises					
Yes	13	5/32	5	5/12	05/0
No	27	5/67	35	5/87	

Table 2: Mean and standard deviation of sleep quality before and after intervention in the intervention and control groups

Variables	Control (40) Mean	Control (40) SD	Intervention (40) Mean	Intervention (40) SD	p-value
Sleep quality before intervention	12.50	2.39	13.20	2.93	0.112
Sleep quality after intervention	9.30	3.01	13.20	2.93	<0.001

Table 3: Comparing the mean and standard deviation of control group's sleep quality before and after the intervention

Variables	Sleep quality before intervention Mean	Sleep quality before intervention SD	Sleep quality after intervention Mean	Sleep quality after intervention SD	p-value
Comparison of the control group's sleep quality before and after the intervention	13.02	2.39	13.20	2.93	1.000

Table 4: Comparison between the mean and standard deviation of theintervention group's quality of sleep before and after the intervention

Variables	Sleep quality before intervention Mean	Sleep quality before intervention SD	Sleep quality after intervention Mean	Sleep quality after intervention SD	p-value
Comparison of the intervention group's sleep quality before and after the intervention	12.55	2.39	9.30	3.01	<0.001

Mann-Whitney test results showed that sleep quality before the intervention was not significantly different between the two groups, i.e., the two groups were homogeneous in this respect (p = 0/112). But this difference was statistically significant after the intervention (p<0/001) (Table 2).

Wilcoxon test was used to compare the quality of sleep before and after the intervention in both groups that was not statistically significant in the control group (p = 1) but thesleep quality before and after the intervention has a significant difference in the intervention (p<0.001) (Table 3 and 4).

DISCUSSION

The results of this study showed stretching sports improve the quality of sleep in patients with type 2 diabetes suffering from restless leg syndrome. According to the results obtained in this study the mean and standard deviation of sleep quality in type 2 diabetic patients with restless leg syndrome in two intervention and control groups before the intervention was not statistically different (p = 0/112) but the difference was significant after the intervention (p<0.001). Also, the results of comparing the quality of sleep before and after the intervention in two groups show that the quality of sleep before and after the intervention in the control group was significantly different (p = 1) while it was significant in the intervention group (p<0/001). In general, the results indicate that doing stretching exercise by type 2 diabetic patients with restless leg syndrome improve the quality of their sleep. The study by Abbasi and Aliasgharpour (2013) shows that doing eight weeks of stretching sports for dialysis patients will improve the quality of their sleep which is consistent with the results of the present study. In the study carried out by on the restless leg syndrome and sleep quality of patients with type 2 diabetes the disturbed sleep quality in people with restless leg syndrome has been emphasized. In the study conducted by Alidosti *et al.* (2013) on the relationship between sleep quality and restless leg syndrome in dialysis patients the focus was on the disturbed sleep quality in dialysis patients with restless leg syndrome (Alidosti *et al.*, 2013).

CONCLUSION

The results of this study showed the disturbed sleep quality in patients with type 2 diabetes suffering from restless legs syndrome. Also, the positive impact of stretching exercises on the sleep quality in these patients has been emphasized in this study. As a result, the present study suggests the use of non-pharmacological methods to help these patients.

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