

Effect of stretching, strengthening exercises and walking on the management of restless legs syndrome: A cross sectional study

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ABSTRACT

Background: Restless Leg Syndrome (RLS) is one of the most common causes of sleep disorders that cause functional disability in the lower limb. Due to it is self-limiting, it forces the person to seek treatment. Unfortunately, most of the times, it is misdiagnosed by the doctors and even if it is diagnosed, till date there is no guide program or treatment in the physical therapy. There is huge dearth of knowledge regarding benefits of physical therapy in RLS.

Objective: The aim of the present study was to investigate the effect of stretching, strengthening exercises as well as walking on RLS symptoms. Also, to find out the impact of muscle strength and flexibility in relation to the severity of RLS symptoms.

Methods: An inquiry of 418 questionnaires randomly distributed was done. A total of 20 participants diagnosed with Restless Leg Syndrome were included in the current study. Pre-post assessment was done for range of motion (by goniometer), functional testing of the foot and ankle, RLS rating scale and RLS ordinal scale. Six participants received physical therapy program for a total of 4 weeks. Twenty patients who had one visit to have the measurement were studied for the correlation study.

Results: There was a significant correlation between leg muscles flexibility, strength and the severity of the symptoms. Also, there was a highly significant alleviation of symptoms in the other 6 patients.

Conclusion: It can be concluded that physical therapy is effective in relieving symptoms of RLS.

KEYWORDS

Restless leg syndrome; Exercise; Physical therapy

1. INTRODUCTION

“Lower extremity” in human anatomy is designated as the segment of the lower part of the body lying in the middle of knees and ankles (Allen, et al., 2003). Humans’ use legs to stand, walk, jump, run, kick, and alike movements, besides setting up a substantial share of body frame (Andrew Davies et al., 2001).

RLS is describes as a unique sensation in the leg. Affected individuals usually experience sensations as ongoing hypodermal creeping, dragging, burning, achy, or pin-and-needle type of sensations which usually get worse in the afternoon and in the evening. (Silber, Krahn, & Morgenthaler, 2016). However, RLS has appealed slight recognition in medicinal texts just lately, and, until nowadays, RLS is frequently undistinguished, wrongly diagnosed and rarely prevented or treated (Lewis and Merritt's, 1995).

RLS is characterized as a sensation in the legs (most commonly between the knee & ankle) or arm which is usually described as feeling of burn, itch, or tickling sense in the muscle (Christopher, 2007). RLS is known by a variety of symptoms which vary from person to person. Some individuals experience slight irritation, while other persons experience severe troubles. In most of the cases, the cause of RLS remain unknown, but the major cause reported in affected persons is iron insufficiency. Additional disorders linked to RLS comprise varicose veins, peripheral neuropathy, and Parkinson's disease (Hening, 2004).

Any motion causes alleviation in symptoms of pain but this alleviation remains momentary and limited. Ambulation is better; still, gentle stretching, yoga, cycling, or extra body movement could reduce the annoying feelings. Though Ambulation helps but sometimes constant and fast movements of leg also help in relieving symptoms of RLS especially if the person cannot walk. Occasionally a definite motion helps a subject better than other motion (Kushida, 2007 and Hays, 2021). Sometimes, sedentary life style may also produce a sense and urgency for moving (Lewis and Merritt's, 1995). Persistence of RLS symptoms may affect daily routine activities of the affected individual. Many pharmacological and non-pharmacological options exist as treatment for RLS (Mitchell et al., 2011 and Dinkins & Stevens-Lapsley, 2013). One of the commonest non-pharmacological intervention for RLS is repetitive emotional behavioral therapy (REBT) (Newman, 2014).

RLS has varying aetiology. In some patients it was familial, while in others it was idiopathic or symptomatic associated with some underlying pathology. Approximately, 50% of patients with RLS had a family history (Silber, Krahn, & Morgenthaler, 2016). A significant incidence of RLS was observed in grown-up Saudis attending primary health care (Bahammam et al., 2011). Moreover, it

was reported that prevalence of restless legs syndrome as well as its related threatening factors amid adult Saudi people (Wali & Abaalkhail, 2015 and Wali et al., 2015). In addition, prevalence of sleep disorders in Saudi health care workers was also investigated (Wali et al., 1999). Moreover, the influence of RLS on controlling diabetes mellitus (DM) among type-2 DM individuals in Saudi Arabia's North region, was proven to have a significant negative impact on their movement & pain sensation along with symptoms of RLS (Merchant et al., 2016).

2. METHODS

In the present study twenty participants were included. Pre –post assessment was done for ROM measurement, Functional Testing of the Foot and Ankle, RLS Rating Scale, and RLS Ordinal Scale. All the participants received the physical therapy home program including; stretching, strengthening exercises and walking exercise for 30 min. They were given 2 sessions per month, at a maximum of 4 weeks. Exercise group was also instructed to practice lifestyle modifications for improving RLS, comprising giving up cigarette and alcohol use, avoiding too much caffeine, besides maintaining good sleep.

2.1. Participants

Individuals falling within the age group of 20 to 40 years, medically diagnosed with RLS constituted the population of the study. Participants were recruited from the outpatient clinic of National Guard Sample selection was done using random sampling method where each individual had an equal opportunity of getting selected as participant of the study. A total of 20 participants constituted the sample of the study. Sample selection was done based on the inclusion and exclusion criteria. Inclusion criteria was

Individuals who were medically diagnosed with RLS, having limited ROM of ankle, L-dopa medication control. However, individuals having severe apnea or suffering from any heart diseases were excluded from the study.

2.2. Instruments

2.2.1. Range of Motion Testing via Manual Goniometer

In the present study range of motion measurement was done for ankle dorsiflexion and plantarflexion, Ankle dorsiflexion and ankle plantar flexion measurement was done by keeping the participant in the supine lying position. The fulcrum of the goniometer was placed two fingers below the lateral malleolus. Immovable arm was aligned parallel to the fibula whereas movable arm was

kept parallel to the lateral side of the foot (little toe). Normal range of motion of ankle dorsiflexion is approximately 15-20 degree. Normal range of motion of ankle planter flexion is approximately 50-60 degree.

2.2.2. Functional Testing of the Foot and Ankle

Muscular function was assessed using a standardized 15-repetition maximum approach.

2.2.3. Restless Legs Syndrome Rating and Ordinal Scales

Evaluation of RLS degree was done via the International RLS Study Group (IRLSSG) Scale. It is a valid 10-item survey form intended to measure symptoms intensity, occurrence, and influence on activity of daily life (ADL). Applicants finalized the survey at baseline circumstances (with accessible help once desired).

Severity scores were calculated via summation of survey responses. Maximum scoring was 40, and high range of scores indicate more severity. The total scores were considered as the primary outcome grading of the severity.

2.3. Data analysis and interpretations

Data analysis was done as descriptive statistics, including frequency, percentage, mean, and standard deviation calculation. Correlation testing was done to test if there was any significant relationship between practicing exercises and improvement from such extraneous feeling in the leg. The statistical software used was SPSS and the level of significance $p < 0.05$.

3. RESULTS

Regarding the results of the study group in the RLS Rating Scale and RLS Ordinal Scale, after treatment a highly significant improvement was found in the study group regarding to the Rating Scale ($p=0.007$) and Ordinal Scale ($p=0.00$), in both we found that the (p value < 0.05), which mean that there is significant different in the symptoms of severity after the home exercises program (Christopher, 2007; Hening, 2004).

Regarding the correlational study, we did the following analyses for the right leg and the left leg:

- A) *Dependent variable:* RLS Rating Scale & RLS Ordinal Scale. *Independent variable:* toes flexion functional test, ankle planter flexion range of motion, foot eversion functional test, foot inversion functional test, ankle dorsiflexion range of motion, ankle dorsiflexion functional test and ankle planter flexion functional test for the right leg (Table 1).
- B) *Dependent variable:* RLS Rating Scale& RLS Ordinal Scale. *Independent variable:* toes flexion functional test, ankle planter flexion range of motion, foot eversion functional test, foot inversion functional test, ankle dorsiflexion range of motion, ankle dorsiflexion functional test, and ankle planter flexion functional test for the left leg (Table 2).

Table 1. RLS in Rating Scale & Ordinal Scale of Right Leg (No=20)

		Restless Leg Syndrome Rating Scale	Restless Leg Syndrome Ordinal Scale for Patients
Restless Leg Syndrome Rating Scale	Pearson Correlation	1	1
	Sig. (2-tailed)		
Right ankle dorsiflexion range of motion	Pearson Correlation	-.229-	-.119-
	Sig. (2-tailed)	.332	.617
Right ankle planterflexion range of motion	Pearson Correlation	-.510*	-.302-
	Sig. (2-tailed)	.022	.195
Right ankle dorsiflexion functional test	Pearson Correlation	-.543*	-.509*
	Sig. (2-tailed)	.013	.022
Right ankle planter flexion functional test	Pearson Correlation	-.692**	-.780**
	Sig. (2-tailed)	.001	.000
Right foot eversion functional test	Pearson Correlation	-.524*	-.584**
	Sig. (2-tailed)	.018	.007
Right foot inversion functional test	Pearson Correlation	-.873**	-.795**
	Sig. (2-tailed)	.000	.000
Right toes flexion functional test	Pearson Correlation	-.512*	-.469*
	Sig. (2-tailed)	.021	.037
Right toes extension functional test	Pearson Correlation	. ^a	. ^a
	Sig. (2-tailed)	.	.

Table 2. RLS in Rating Scale & Ordinal Scale of Left Leg (No=20)

		Restless Leg Syndrome Rating Scale	Restless Leg Syndrome Ordinal Scale for Patients
Restless Leg Syndrome Rating Scale	Pearson Correlation	1	1
	Sig. (2-tailed)		
Left ankle dorsiflexion range of motion	Pearson Correlation	-.008-	.047
	Sig. (2-tailed)	.974	.842
Left ankle planter flexion range of motion	Pearson Correlation	-.578**	-.557*
	Sig. (2-tailed)	.008	.011
Left ankle dorsiflexion functional test	Pearson Correlation	-.418-	-.335-
	Sig. (2-tailed)	.067	.149
Left ankle planter flexion functional test	Pearson Correlation	-.664**	-.765**
	Sig. (2-tailed)	.001	.000
Left foot eversion functional test	Pearson Correlation	-.670**	-.669**
	Sig. (2-tailed)	.001	.001
Left foot inversion functional test	Pearson Correlation	-.843**	-.773**
	Sig. (2-tailed)	.000	.000
Left toes flexion functional test	Pearson Correlation	-.294-	-.442-
	Sig. (2-tailed)	.208	.051
Left toes extension functional test	Pearson Correlation	-.373-	-.168-
	Sig. (2-tailed)	.106	.478

The result of correlation studies depends on the positivity or negativity of the Pearson correlation number, with zero meaning no relation at all. If the number is negative means that there is an inverse relation between the scale and the variable, and if the number is positive means that there is a direct relation between the scale and the variable.

Table 3 shows the paired samples test for pre & post RLS Rating Scale in the right leg, and Table 4 shows the paired samples test for pre & post RLS Rating Scale in the left leg. The results showed significant improvements in both legs.

Table 3. Paired Samples Test pre & post RLS Rating Scale Right Leg

	Mean	SD	Std. Error	95% Confidence Interval of the Difference		t	df	p
				Lower	Upper			
				Pair 1 Pre RLS Rating Scale - Post RLS Rating Scale	1.63			

Table 4. Paired Samples Test pre & post RLS Rating Scale Left Leg

	Mean	SD	Std. Error	95% Confidence Interval of the Difference		t	df	p
				Lower	Upper			
				Pair1 Pre RLS Ordinal Scale - Post RLS Ordinal Scale	2.67			

4. DISCUSSION

Restless leg syndrome (RLS) is today recognized as one of the commonest neurological disorders with a prevalence rate of at least one in ten (Silber and Avidan, 2018). Untreated RLS leads to sleep disorder, large number of persons suffer from insomnia, struggle to get to sleep besides recurrent arousals through which they might bend and spread their legs, frequently roll while sleeping, or leave the couch and go for a walk (Silber and Avidan, 2018).

This is one of the few randomized controlled trials in the Middle East for evaluating efficiency of exercises in the management of RLS symptoms. Up to now, almost all therapeutic interventions used for RLS are relying on pharmacologic treatment. In the present experiment, the included aerobics, stretches and resistance exercises significantly decreased RLS symptoms severity.

First: Statistical analysis of the collected data from public questionnaire of the present study showed that:

1. Distribution of sample according to their ages shows that ages range from 20 to less than 40 years, which indicates most participants were in the youth ages. The majority of the sample heights in the study range from 160 to 170 cm, and the majority of weights range from 50 to 70 kg (48.6%).
2. Concerning sex distribution, it is clear that females were the majority (56.8%).
3. The study detected that the majority of the individuals who participated in this study were married (63.5%), and this may be attributed to that the most of married women do not have enough time for practicing exercises.
4. The data analysis had shown that the majority are living in Jeddah city (82.4%).

5. The results have shown that more than half of the sample sometimes complain of extraneous feeling and discomfort in their legs. In addition, 48.6% sometimes complain of uncomfortable sensation within the legs while sleeping, which make them get out of bed and walk.
6. The results confirmed all individuals participated in the study complain of extraneous feeling and discomfort in their legs and these feelings come to be evident or worsening during resting (while being inactive or relaxed). Similarly, these feelings happen habitually in late afternoons or at the beginning of nights and this sensation temporarily diminished by voluntary movements of the legs (100%).
7. The results clearly showed that the majority of the participants (81.1%) felt comfort when they move and shake their legs.
8. The result confirmed that the ratio of persons who do not practice exercise is high (51.4%). This may be attributed to many factors, particularly that people do not well understand the benefits of practicing exercise for their health.
9. Also results have shown that the majority did not receive any physical therapy to relieve uncomfortable sensations within the legs, which indicate that the majority do not give importance to physical therapy to get rid of such pains and feelings in their legs, which may be attributed to people's concept about the importance of physical therapy as a solution. Also most people may think that such feeling is not a medical disease, coinciding with that is mentioned by other researchers (Montplaisir et al., 2010).
10. The study shows that the majority (86.4%) agree that they feel improvement in their legs with physiotherapy or when they practice exercises. Also, it is clearly seen that the most important exercise being practiced is walking (41.9%), while the second is stretching (21.6%), agreeing with the opinion of other authors (Aurora et al., 2012).
11. It is obvious that the majority (94.6%) takes drinks or foods containing caffeine. Also, (67.6%) of the samples were not anemic.
12. The study confirms that the majority (68.9%) do not consult any specialist about their symptoms. Also, a 44.6% of the participants were suffering from other medical conditions.
13. The results indicate that about 66.2% are not under any medications now.
14. Concerning whether there is a relationship between practicing exercises or receiving physical therapy and improvement of the symptoms, the results have shown that there is a positive significant relationship.

Second: A correlation study was undertaken to find out whether there is an association between the muscle strength and flexibility with the severity of the symptoms, after that we investigated the effect of the physical therapy on a small sample with restless leg syndrome.

We selected 20 RLS patients from KAMC. All subjects were assessed according to ROM and Functional Testing of the foot and ankle, in relation to RLS Rating Scale and RLS Ordinal Scale.

The results of the co-relation study revealed positive findings and significant inverse relation between the two components, as the ROM and function of the leg increased, the severity of the RLS symptoms declined.

Third: We selected 6 of our RLS patients to receive the physical therapy home program including: stretching, strengthening and walking exercises for a total duration of 4 weeks.

The results of the third study show that the exercising group had significant lower scores of all total RLS severity and rates, signifying symptomatic relief. In spite of that the patients were not obliged to discontinue medications that may improve RLS symptoms, they stopped taking their medication themselves under the supervision of their sleep disorder consultant, which was matching with previous studies (Ackerman et al., 2006).

In accordance to the findings of the present work, the exercise program of both resistance and aerobic works was efficient for RLS symptom improvement. In a study with 41 trial contributors, who were randomly divided in exercise group or control group (Ackerman et al., 2006), they had twenty-eight applicants who began a twelve-week exercise, three days weekly. Assessment of RLS symptoms was done via the IRLSSG severity scale, besides an ordinal RLS severity scale at the start of the study, at the third, sixth, ninth, and the twelfth weeks (Yoingstedt et al., 2021 and Kline et al., 2021). This study showed effectiveness of the exercise in improving RLS symptoms, similar to our findings.

As it was recognized in the literature, no experimental studies to evaluate exercise effectiveness in treating RLS in the overall population were done. Only an investigation was done, which studied RLS in pregnancy, and incidence, probable pathophysiological mechanisms, and medical and other non-pharmacological treatments (Gupta et al., 2016).

5. CONCLUSIONS

Symptoms of RLS classically arise while being inactive and they are usually relieved however momentarily via movement; though, the relation between bodily movement and RLS symptoms still is uncertain. People suffering from RLS often refrain from forceful exercises since it has been

described that this may aggravate symptoms. Moreover, present proven strategies did not show reference exercises or bodily movement recommendations. On the other hand, widespread patient-oriented websites support light to moderate exercising above forceful exercises. Although there is no convincing investigation supporting these recommendations.

Our study concluded from analysis of 418 responses to the questionnaire that prevalence of RLS is affecting almost 17-18% of the Saudi Arabia people. Our correlation study showed a link between RLS and physical activity, which described a significant relationship between deficient exercises and RLD risks.

Regarding our study findings, the exercised group showed that the resistance, stretching and aerobic exercises program appeared to be functioning for reducing RLS symptoms. Therefore, according to our results, we can conclude that physical activity has the effect of alleviating RLS symptoms. We recommend that education and physiotherapy play a significant role in public orientation about RLS, and we suggest that upcoming studies examine the efficiency of other types of exercises.

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AUTHOR CONTRIBUTIONS

Dr. Salwa Elgendy had the idea of the research, prepared the protocol draft, conducted the reference search, collected and analyzed data, and wrote the document. Dr. Afnan Alkhateeb participated in the data collection and statistical analysis of data. Both authors revised the manuscript and approved it for publication.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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