Prevalence of Restless Leg Syndrome and its Association with Physical Activity and Stress in Working Women

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Abstract- **Background: Restless leg syndrome (RLS) is a neurological sensory-motor disorder. It is an underdiagnosed condition. Low iron levels and dopamine dysregulation are the factors that play a role in this condition. Working women have varying levels of stress and physical activity due to their numerous responsibilities and activities. Neurotransmitter activity is known to be influenced by physical activity.**
Aims and Objectives: This study aimed to find the prevalence of RLS and its association with stress and physical activity.
Methods: 161 working women were included in this study based on the inclusion and exclusion criteria. International Restless Legs Syndrome Study Group Criteria was used to screen the subjects for RLS. Possible associations between RLS and stress and Physical activity were also investigated. The Perceived Stress Scale and International Physical Activity Questionnaire were used to measure the stress and physical activity levels respectively.
Results: The frequency of RLS was found to be 4% among working women. A positive relationship was found between RLS with stress. There was no significant association found between Physical activity and RLS.
Conclusion: The present study concluded that there is a low prevalence of Restless Leg Syndrome in working women. Physical activity levels do not contribute to the development of RLS but elevated stress levels can play a role in causing RLS.

Keywords: **Restless Leg Syndrome, Stress, Physical Activity, Working Women, Prevalence, Association**

I.INTRODUCTION

Restless leg syndrome is a common neurological sensory-motor disorder which is also known as "Willis Ekbom Disease".[1] It is characterized by an irresistible urge to move the leg or abnormal sensation such as tingling, creeping or pulling and sometimes pain in severe cases. These symptoms are relieved by movement and worsen at night.[1] It is also associated with age, low iron levels, low socioeconomic status, poor mental and physical health and various lifestyle factors such as alcohol consumption, and caffeine intake which may lead to poor sleep quality and can lead to daytime drowsiness, lack of concentration and depression.[2,3]

The pathology is unknown. However, few studies state that iron deficiency and dopamine dysregulation can lead to restless leg syndrome.[4] Dopamine acts as a messenger between the brain and the CNS to help the brain in coordinating and regulating movement.[5] Failure to get iron across the blood-brain barrier and failure to import iron into the cells of the substantia niagra leads to brain iron deficiency. This low brain iron activates the hypoxic pathway which increases the dopaminergic activity. As the nerve cells get damaged the dopamine levels are reduced which causes muscle spasms and involuntary movements. The dopamine levels follow a circadian pattern wherein the levels of dopamine rise during the day and decrease during the night which causes worsening of the symptoms in the night.[5]

A study conducted in 2012 states that the prevalence of RLS increases with age with a rate of 3.9- 15% in the general population whereas 2.9% in the Indian population.[6,7] Whereas, a study in pregnant women suggested that there was a worsening of symptoms during the end stages of pregnancy due to increased levels of estrogen during the end of the pregnancy by 23% and 69% of women showed worsening of symptoms following menopause.[8]

However, Restless Leg Syndrome affects the productivity of the individual and causes irritation due to the affected sleep quality and the person appears to be agitated. RLS is an underdiagnosed disorder. The International Restless Leg Syndrome Study [IRLSS] group rating scale is a tool used for the diagnosis of RLS that shows high reliability, clinical validity and high internal consistency.[3] The IRLS total score, symptoms and symptoms impact subscales had acceptable internal consistency ranging from .93 to .95, inter-rater reliability of .93 to .97, a test–retest reliability of .87, and concurrent validity of .78 to .84.

Indian women have always been housewives, and those that worked did so in the agricultural or industrial sectors. However due to advancements in education, increased knowledge, and rising family financial needs, women are now choosing occupations as well in the 21st century. Some of the causes that contribute to stress are housework, economic challenges, childcare responsibilities, being unable to spend time with the family, work overload, etc. and these roles also affect their physical activity levels.[9]

Stress is a non-specific response by the body which is seen as a result of the demands placed on it or due to disturbing events in the environment. Stress has a negative impact on the body and it affects the immune system, cognition, learning, memory, cardiovascular system, endocrine system and gastrointestinal system. These same effects give rise to disorders if the duration of the stress is prolonged.[10] Psychological stress is found to affect serum iron levels.[11] The Perceived Stress Scale is used to calculate the levels of stress and it demonstrated adequate internal consistency reliability (α = .78). [12]

According to WHO, physical activity is defined as any bodily movement produced by skeletal muscles that require energy expenditure. Physical activity includes all motions, whether they occur while a person is at work, in their free time, or while traveling. It has a direct association with the risk of chronic health problems.[13] All adults should undertake 150–300 min of moderate-intensity or 75–150 min of vigorous-intensity physical activity, or an equivalent combination of moderate-intensity and vigorous-intensity aerobic physical activity, per week as some physical activity is better than none.[14] Few working-age women meet current moderate-to-vigorous–intensity physical activity (MVPA) recommendations.[15] Despite the majority of women being employed in some capacity, time restrictions brought on by juggling several tasks among other things are variables that help working women specifically meet physical activity recommendations. [15] The International Physical Activity Questionnaire is a scale used to assess the levels of intensity of physical activity and sitting time that people do as part of their daily lives are considered to estimate total physical activity in MET-min/week and time spent sitting with test-rest reliability indicated good stability and high reliability $(\alpha > 80)$ [16].

This study attempts to strengthen the evidence that RLS is likely as common among working women as found in the studies mentioned above. Additionally, we want to investigate the relationship between RLS and stress and physical activity.

Abbreviations and Acronyms

RLS – Restless Leg Syndrome
CNS – Central Nervous System
IPAQ – International Physical Activity Questionnaire
PA – Physical Activity
IRLSSG – International Restless Legs Syndrome Study Group Criteria

II.OBJECTIVES:

- To find the prevalence of Restless Leg Syndrome using the International Restless Leg Syndrome Study Group Rating Scale
- To Find the association between stress with RLS using the Perceived Stress Scale
- To Find the association between physical activity with RLS using International Physical Activity Questionnaire (IPAQ) - Short Form

III.MATERIALS AND METHODS:

The study is a cross-sectional study where 161 women were selected using convenient sampling. Working women who agreed to participate between the ages of 25 and 60 and that worked for a minimum of 5 hours per day were included in the study. The exclusion criteria were Recent fracture of the lower limb, Diabetes, Pregnant and Postpartum Women, radiating low back pain and women with neurological problems were excluded from the study. Materials used in the study included a consent form**,** pen, pencil**,** and demographic data form.

IV.PROCEDURE:

Ethical clearance from the ethical committee was taken. Willing subjects were screened according to the inclusion and exclusion criteria. The purpose of the study and procedure was explained to the subject before the assessment. The written consent was signed by the subject. Demographic data was written down, Then the assessment was further carried out using the IRLSSG criteria for the diagnosis of RLS (Table 1). The women who tested positive for RLS had to meet all four IRLSSG criteria. These women's physical activity and stress levels were assessed using the IPAQ and Perceived Stress Scale respectively. Then Statistical Analysis was done.

Table 1 International Restless Legs Syndrome Study Group Criteria (IRLSSG)

A	Desire to move the extremities, usually associated with discomfort or disagreeable sensations in the extremities
B	patients move to relieve the discomfort, for example, walking, or to provide a counter-stimulus to relieve the discomfort, for example, rubbing the legs
C	Symptoms are worse at rest with at least temporary relief by activity
D	Symptoms are worse later in the day or at night

V.STATISTICAL ANALYSIS:

Data were collected on a data sheet and encoded for computer analysis. Tables were made using Microsoft word. Computerized statistical analysis of the data is done using Microsoft Excel Data Analysis. The statistical test used was the Chi-Square test to find the association between stress and RLS and physical activity and RLS.

VI.RESULTS;

A total of 161 women participated in the study. The mean age of the working women was 42.53 ± 10.25 years. The study population included, 52(32%) women between 25-35 years of age, 31(19%) women between 36-45 years of age, 78(49%) women between 46-60 years of age. Out of 161 women, six women were positive for RLS.
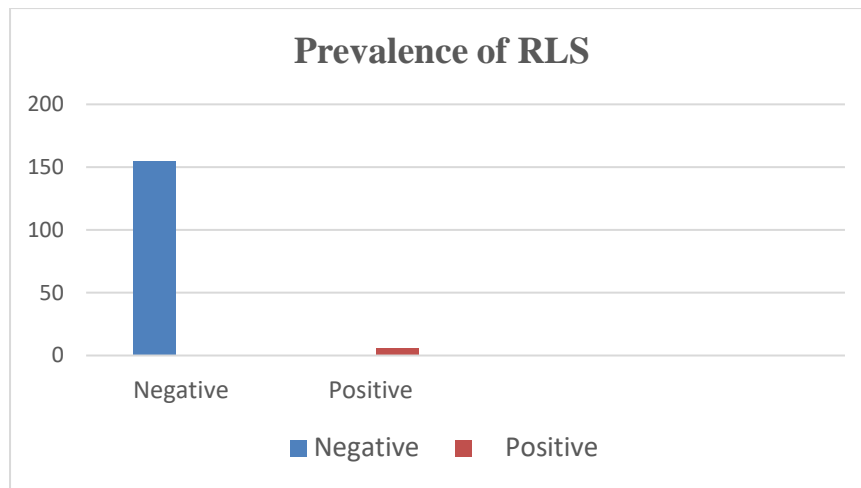
Chart 1: Prevalence of RLS

Chart 1 illustrates a bar graph that demonstrates the prevalence of Restless Leg Syndrome in working women. The prevalence of RLS was found to be 4% in working women.

Table 2: Chi-square Test for Association between RLS and Physical Activity.

IPAQ	RLS			Chi-square	
	NEGATIVE	POSITIVE	Grand Total	p-value 0.87	Accept H0.
Inactive	132.86	5.14	138		
Minimally Active	22.14	0.86	23		
Grand Total	155	6	161		

Table 2 illustrates the Chi-square test done to compare Physical Activity levels (Inactive vs Minimally active) and RLS (negative vs. positive). We accept the Null Hypothesis because the p-value is 0.87, which suggests that there is no significant association between physical activity level and RLS. Thus, the physical activity level is not significantly related to RLS since the $p > 0.05$.

Table 3: - Chi-square Test for Association between RLS and Stress.

Perceived Stress Scale	RLS			Chi-square	
	NEGATIVE	POSITIVE	Grand Total	p-value 0.02	Reject H0.
Low stress level	12.52	0.48	13		
Moderate stress level	142.48	5.52	148		
Grand Total	155	6	161		

Table 3 illustrates the Chi-square test done to compare stress levels (low vs. moderate) and RLS (negative vs. positive). We reject the Null Hypothesis because the p-value is 0.02, which suggests that there is a significant association between stress level and RLS. indicating that stress level is significantly related to RLS since the $p < 0.05$.
As a result, increased stress levels increase the likelihood of developing RLS. Physical activity levels are not associated with the likelihood of acquiring RLS.

VII.DISCUSSION
A cross-sectional study was carried out for a period of 18 months to find the prevalence of RLS in working women and to determine whether there is a link between stress and physical activity and RLS. The study was carried out by screening working women for RLS. Exclusion criteria included factors that have already been linked to RLS or illnesses that can cause false positive

results by mimicking RLS symptoms, such as a recent lower limb fracture and radiating low back pain, which can resemble RLS symptoms like discomfort, tingling, and disrupted sleep. Diabetes has been excluded as many studies have shown that it has an association with RLS and elevated levels of glucose also present with symptoms such as tingling, and numbness. The incidence rate of RLS is higher in the third trimester due to low iron levels and high estrogen levels and disappears either immediately post-delivery or 2 months postpartum, hence pregnant women and postpartum females were excluded from the study. Women with any type of neurological condition were not allowed to participate in the study since it could interfere with our findings.

In this study, 161 women were screened for RLS. The mean age was 42.53 years. Out of all participants, 32% of women are between the ages of 25-35, 19% are between the ages of 36-45, and 49% are between the ages of 46-60 with a mean work duration of 8.10 hours. In this study, face-to-face interviews were carried out and standard guidelines were used for the diagnosis of the syndrome, any uncertainties the respondents had regarding the questions were cleared up and thus helped in eliminating any mistakes in the results. 6 women met the criteria mentioned in the IRLSSG and hence tested positive for RLS. Compared to Western countries, Asia has a lower prevalence of RLS. The prevalence of RLS among working women was found to be 4% in the current study. The women who tested positive were older than 48, which is in line with past studies demonstrating that the incidence of RLS rises with age. Several studies have indicated that the frequency of RLS is higher in females than in males and is closely correlated with advancing age due to arising comorbidities. Three women who tested positive for RLS shared a history of hypertension. The presence of hypertension in those who tested positive was consistent with prior research that showed a connection between RLS and hypertension.

RLS is likely caused by a combination of systemic or brain iron deficiency and hampered dopaminergic neurotransmission in the subcortical region of the brain. Due to the unknown pathophysiology of RLS, many studies were conducted to identify its potential risk factors. However, based on previous studies age, low iron levels, low socioeconomic status, poor mental and physical health, and different lifestyle factors like excess alcohol and caffeine intake were found to play a role in developing RLS.

This study aimed to evaluate the relationship between physical activity and RLS. Based on previous research that suggested using exercise as a therapeutic intervention in RLS, physical activity has been shown to help regulate dopamine levels in the brain and thus an increase in physical activity either by aerobic exercise or elevated step counts helps in the reduction of the symptoms of RLS. However, our analysis revealed that there was no significant association between physical activity and RLS (p-value= 0.87) which may suggest that patients can still develop RLS regardless of the levels of physical activity performed on a daily basis. Even though low PA levels do not contribute to the onset of RLS, it can be used as an intervention to lessen the symptoms of the condition. It was observed that most of the women in the current study suffered from moderate stress levels and this was assessed using the Perceived Stress Scale. The women diagnosed with RLS experienced moderate stress levels. The statistical analysis revealed that there is a significant association between stress and RLS (p-value = 0.02) which may be evidence that the likelihood of acquiring RLS increases with increasing amounts of stress and elevated stress levels can play a role in causing it. This stress negatively affects different systems in the body. Prolonged periods of stress or high levels of stress can consequently produce a drop in serum iron levels, which in turn affects dopamine regulation leading to the production of the symptoms.

Interventions like yoga, aerobic training, and meditation have been shown to reduce the severity of symptoms of RLS and also help improve dopamine regulation and iron synthesis and thus help improve an individual's physical and mental health.

VIII. CONCLUSION:

There is a low prevalence of Restless Leg Syndrome in working women and it has an association with stress but doesn't have an association with physical activity.

IX. LIMITATIONS:

- Study area was limited to Mumbai.
- The Sample size was limited.
- This study was based on Indian women and so it cannot be generalized to a larger population.
- Hypertension was included in this study.
- The study was limited to interviews; no investigations were done.

X. FURTHER SCOPE:

- A similar study can be carried out on a broad scale with a larger sample size to get a clearer picture.
- Future research can be conducted to examine the entire body and to find links between the same.
- A similar study can be carried out using more reliable outcome measures.
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REFERENCES:

[1] Guo S, Huang J, Jiang H, Han C, Li J, Xu X, Zhang G, Lin Z, Xiong N, Wang T. Restless legs syndrome: from pathophysiology to clinical diagnosis and management. Frontiers in aging neuroscience. 2017 Jun 2;9:171.

[2] Ishaq M, Riaz SU, Iqbal N, Siddiqui S, Moin A, Sajjad S, Ali T, Jamali S. Prevalence of restless legs syndrome among medical students of Karachi: an experience from a developing country. Sleep Disorders. 2020 Feb 18;2020.

[3] Nagandla K, De S. Restless legs syndrome: pathophysiology and modern management. Postgraduate Medical Journal. 2013 Jul 1;89(1053):402-10.

[4] Yeh P, Walters AS, Tsuang JW. Restless legs syndrome: a comprehensive overview on its epidemiology, risk factors, and treatment.USA : *Sleep and Breathing*; 2011: 16(4):987–1007

[5] Vlasie A, Trifu SC, Lupuleac C, Kohn B, Cristea MB. Restless legs syndrome: An overview of pathophysiology, comorbidities and therapeutic approaches. Experimental and therapeutic medicine. 2022 Feb 1;23(2):1-0.

[6] Ohayon MM, O'Hara R, Vitiello MV. Epidemiology of restless legs syndrome: A synthesis of the literature. *Sleep Medicine Reviews*. 2012 Aug;16(4):283–95.

[7] Panda S, Taly AB, Sinha S, Gururaj G, Girish N, Nagaraja D. Sleep-related disorders among a healthy population in South India. *Neurology India*. 2012 Jan 1;60(1):68.

[8] Ghorayeb I, Bioulac B, Scribans C, Tison F. Perceived severity of restless legs syndrome across the female life cycle. France : *Sleep Medicine* Oct;9(7):799–802 ;2008

[9] Verma M, Srivastva P, Sharma P, Mishra P, Gupta P, Dwivedi A. Challenges and Issues of Working Woman in 21st Century. Kutch: *International Journal of Research in all Subjects in Multi Languages*; 2018

[10] Yaribeygi H, Panahi Y, Sahraei H, Johnston TP, Sahebkar A. The impact of stress on body function: A review. *EXCLI journal*. 2017; 16:1057.

[11] Wei C, Zhou J, Huang X, Li M. Effects of psychological stress on serum iron and erythropoiesis. *International Journal of Hematology*. 2008 Jul 1; 88(1):52–6.

[12] Baik SH, Fox RS, Mills SD, Roesch SC, Sadler GR, Klonoff EA, et al. Reliability and validity of the Perceived Stress Scale-10 in Hispanic Americans with English or Spanish language preference. *Journal of health psychology.* 2019 Apr 1;24(5):628–39.

[13] Bull FC, Al-Ansari SS, Biddle S, Borodulin K, Buman MP, Cardon G, et al. World Health Organization 2020 guidelines on physical activity and sedentary behavior. British Journal of Sports and Medicine 54(24);2020

[14] Reed JL, Prince SA, Elliott CG, Mullen KA, Tulloch HE, Hiremath S, Cotie LM, Pipe AL, Reid RD. Impact of workplace physical activity interventions on physical activity and cardiometabolic health among working-age women: a systematic review and meta-analysis. *Circulation: and Cardiovascular Quality Outcomes*. 2017 Feb;10(2):e003516.

[15] Gell NM, Wadsworth DD. How do they do it: working women meeting physical activity recommendations. *American journal of health behavior*. 2014;38(2):208–17.

[16] Ulfberg J, Nyström B, Carter N, Edling C. Restless legs syndrome among working-aged women. *European neurology*. 2001;46(1):17-9.