

Prevalence of Restless Leg Syndrome in School Going Students and Assessment of Fatigue

Ms. Pranjal Fulsundar¹, Dr. Priyamwada Hinge (PT)², Dr. Mahendra Shende (PT)³, Dr. Kalpana Ghatpande⁴

¹Intern, Department of Physiotherapy, TMV's Indutai Tilak College of Physiotherapy

²Assistant Professor, Department of Physiotherapy, TMV's Indutai Tilak College of Physiotherapy.

³Professor, Department of Physiotherapy, TMV's Indutai Tilak College of Physiotherapy

⁴Professor, Department of Management, Tilak Maharashtra Vidyapeeth.

Abstract

Background:

Restless Legs Syndrome (RLS), also known as Willis-Ekbom Disease (WED), is a common condition where you feel an uncontrollable urge to move your legs because they feel uncomfortable, occasionally as painful sensations in the legs. This study investigates the prevalence of Restless Legs Syndrome (RLS) among school-going students and examines the variation in fatigue scores between restless leg syndrome-positive and restless leg syndrome-negative individuals.

Materials and methods:

A sample of 142 students from Pune, India participated in this cross-sectional study. RLS prevalence was determined using standardized diagnostic criteria, while fatigue scores were assessed using the Multidimensional Fatigue Inventory (MFI) scale. Data was analysed using descriptive statistics.

Result:

Results revealed a 51.40% prevalence of restless leg syndrome among the sampled population. 47.37% students exhibit mild RLS, 35.53% students have moderate out of total diagnosed cases. Statistical analysis demonstrated slight differences in fatigue scores between restless leg syndrome -positive and restless leg syndrome-negative students, with mean fatigue score of 54.12 in restless leg syndrome positive students, highlighting the impact of RLS on fatigue levels. These findings underscore the importance of early detection and intervention strategies for RLS in school-aged individuals to mitigate its effects on daily functioning and well-being.

Conclusion: A considerably higher prevalence of restless leg syndrome was found in school going students with female predominance. A slight increase in fatigue score was seen on fatigue score analysis in restless leg syndrome positive students compared to their nonaffected counterparts.

Keywords: Restless leg syndrome, fatigue, Anxiety, students, movement disorder, periodic leg movement, quality of life, neurological disorder, school-aged, mental health.

1. Introduction

Restless Legs Syndrome (RLS), also known as Willis-Ekbom Disease (WED), is a common condition where you feel an uncontrollable urge to move your legs because they feel uncomfortable, occasionally as

painful sensations in the legs. These sensations exhibit a diurnal variation and are relieved through movement. Individuals experience a compelling urge to move their legs, which is not accompanied by pain but is notably strong, especially when the legs are at rest. Relief is achieved through leg motion. The symptoms follow a diurnal pattern, worsening at night, often leading to sleep disturbances. Additionally, there's a connection with leg movements that happen involuntarily during sleep, known as periodic leg movements of sleep.^[1]

The etiologic of restless leg syndrome can be either primary which is idiopathic or secondary. The majority of cases are in primary category, where the origin is unknown. The pathophysiology can be partially understood and involves a genetic component; six specific genes (BTBD9, MEIS1, PTPRD, MAP2K5, SKOR1, TOX3) play a crucial role, in addition to dopaminergic dysfunction and dysregulation of brain iron. Psychiatric factors, stress, and fatigue may further contribute to the exacerbation of symptoms.^[2]

Dopamine follows a circadian rhythm, with elevated levels in the morning and a decline in the evening and night. This accounts for the observed pattern of nighttime restless leg syndrome symptoms.^[3]

Both acute and long-term changes in neuronal functions can occur when brain dopaminergic circuits are activated by physical and psychological stressors.^[4]

Secondary restless leg syndrome can arise from various conditions, and among the three significant reversible causes are iron deficiency anemia, pregnancy, and end-stage renal disease.^[4,5]

Other possible reasons can be a lack of vitamin B12 or folate, nerve problems related to diabetes, arthritis, spinal issues like irritation of spinal nerves, Parkinson's disease, fibromyalgia, spinocerebellar ataxia (especially SCA 3), and Charcot-Marie-Tooth disease. (type 2).^[2]

The symptoms of restless legs syndrome can be caused or worsened by certain medications. These include antidopaminergic medications (such as neuroleptics), tricyclic antidepressants, selective serotonin uptake inhibitors (SSRIs), serotonin- norepinephrine reuptake inhibitors, alcohol, caffeine, beta blockers, and lithium.^[1]

Among students gearing up for examinations, anxiety disorders stand out as the most prevalent mental health condition. Common symptoms include stress, apprehension, irritability, and difficulty concentrating. Additionally, depression may be occasionally observed in students preparing for competitive exams. Stress leads to the depletion of healthy brain cells and triggers a negative surge of adrenaline.^[6]

Students often feel extremely tired because of their studies and struggle with managing themselves. This shows up as challenges in planning study sessions, setting goals, using time wisely, and reviewing their learning.^[7]

High levels of academic-related stress pose a risk of developing preventable physical health problems later in life.^[8]

Fatigue, sleep problems, daytime sleepiness, and depression were relatively prevalent among high school adolescents.^[9]

Fatigue, being a subjective experience, manifests its adverse effects in various ways, including a decrease in task performance, cognitive impairment, and emotional disturbance. In school children, fatigue can result in diminished academic performance, negative health outcomes, and reluctance to attend school.^[9]

Almost two-thirds (63.5%) of the students experienced stress which was due to academic pressure, and there were no significant differences observed across gender, age, grade, and various other personal factors. Additionally, about two-thirds (66%) of the students were feeling pressure from their parents for improved academic performance.^[10]

In adolescents, iron-deficiency anemia can be primary cause of lost disability-adjusted life years.^[11] This means that adolescents affected by this condition experience both premature death and years lived with disability, resulting in a substantial impact on their overall health and well-being.

During the later school age and early adolescence, girls are prone to developing iron deficiency. This deficiency can lead to non-haematological disruptions, which can impact growth and development, immune function in infants, physical work capacity, and cognitive function in both infants and adolescents. In a study, the prevalence of anemia was 63%, while the prevalence of iron deficiency anemia was 50%.^[12]

The diagnosis of restless legs syndrome relies on tests that exclude secondary causes, as there is no specific test to directly identify the condition.^[11] Essential diagnostic criteria is used to diagnose the restless leg syndrome, and a valid reliable international restless legs syndrome rating scale is used to assess the severity of restless leg syndrome^[13,14] Multidimensional Fatigue inventory is used to evaluate five dimensions of fatigue: physical fatigue, reduced motivation, reduced activity, and mental fatigue, general fatigue.

The purpose of the study is to find out the prevalence of restless leg syndrome among school going students. This will make students more aware of RLS. Learning about significant issues in the study can reduce the impact of the syndrome and enable the use of effective treatment strategies for improvement. Knowing how common RLS is among students can help deal with these problems properly. The findings from this research could offer valuable information to educational institutions and healthcare professionals, emphasizing the significance of early detection and effective management of Restless Legs Syndrome (RLS) in students. This knowledge could help mitigate the negative impact on academic performance and overall well-being.

Objectives

To find out restless legs syndrome in school going students.

To find the severity of restless legs syndrome by using restless leg syndrome rating scale.

2. MATERIALS AND METHODS

2.1 Study design. Cross sectional analytical study.

2.2 Research setting: The study was conducted in different coaching institutes and school in Pune, India. Duration: 6 months.

2.3 Participants:

Eligibility criteria

- Students enrolled in educational institutes (Private and public school)
- Age 13-18
- Students giving consent
- Students who can read English.

method of selection of participants- Convenience sampling

Variables: Outcome measures- Restless legs syndrome rating scale.

-Multi dimensional fatigue inventory

Diagnostic criteria.^[13]

All these should be present to diagnose restless leg syndrome

1. An urge to move the legs, usually accompanied or caused by uncomfortable and unpleasant sensations in the legs. (Sometimes the urge to move is present without the uncomfortable sensations and sometimes the arms or other body parts are involved in addition to the legs.)

2. The urge to move or unpleasant sensations begin or worsen during periods of rest or inactivity such as lying or sitting.
3. The urge to move or unpleasant sensations are partially or totally relieved by movement, such as walking or stretching, at least as long as the activity continues
4. The urge to move or unpleasant sensations are worse in the evening or night than during the day or only occur in the evening or night. (When symptoms are very severe, the worsening at night may not be noticeable but must have been previously present.)

Data sources – Survey and questionnaire

- Essential diagnostic criteria was used to diagnose the restless leg syndrome, and a valid reliable international restless legs syndrome rating scale was used to assess the severity of restless leg syndrome(RLS).^[13], Multidimensional Fatigue inventory was used to evaluate five dimensions of fatigue: physical fatigue, reduced motivation, reduced activity, and mental fatigue, general fatigue.^[19]

Study size- For 8% allowed error: sample size-141

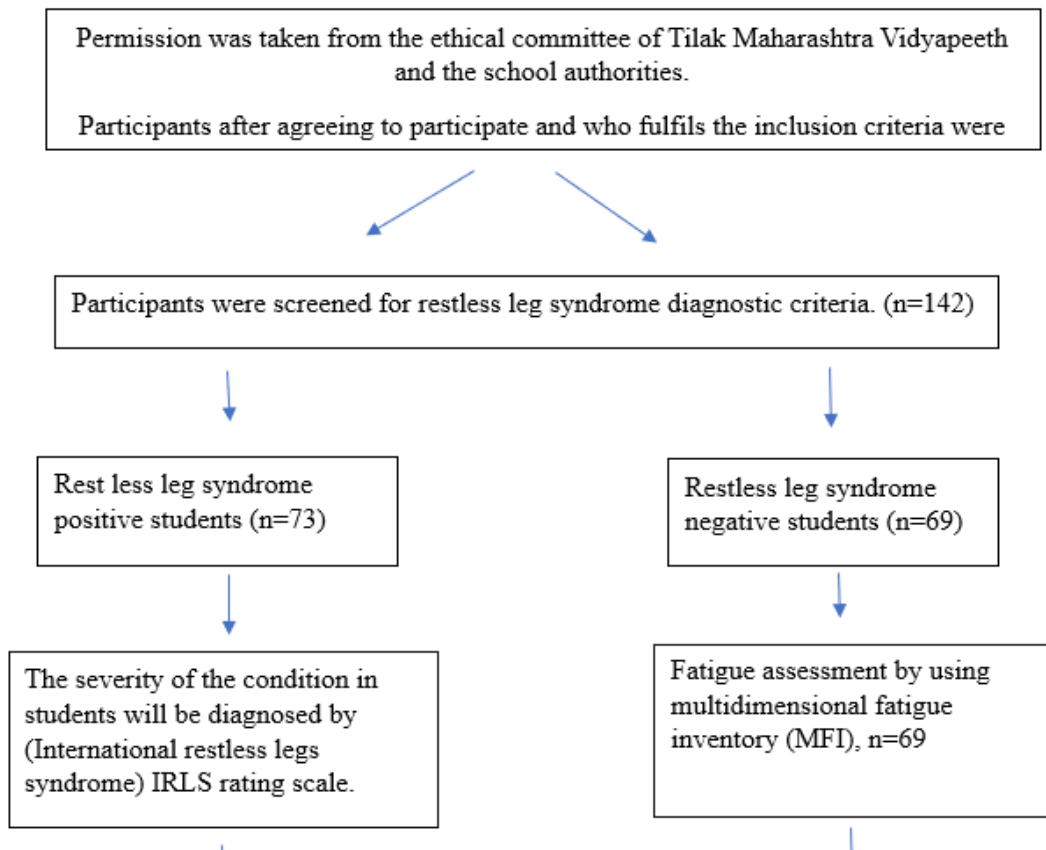
For 12% probability error: allowed sample size - 63

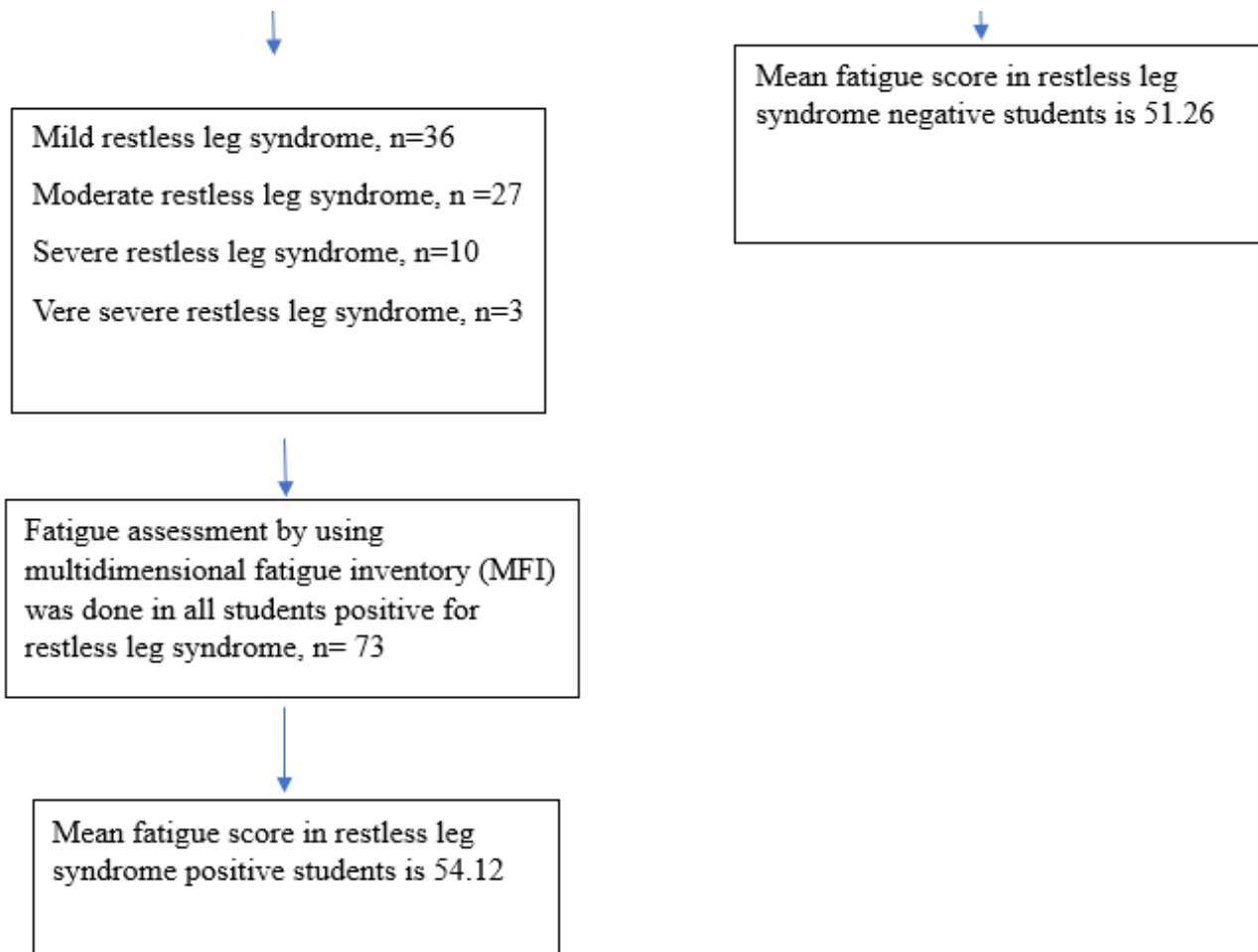
Statistical methods- Descriptive statistics was used

Inferential statistics- t-test was used to compare and determine the statistically significant difference between the fatigue score mean in RLS positive and negative students. t-calculated :0.686, t- table: 1.65

We utilised convenience sampling to gather data, selecting participants based on their accessibility and willingness to participate.

3. RESULT:





Descriptive data – A total of 142 school going students were studied. According to the diagnostic criteria of RLS, specified by International restless leg syndrome study group(IRLSSG), Restless leg syndrome prevalence was 51.40%(n =142) (table 1).

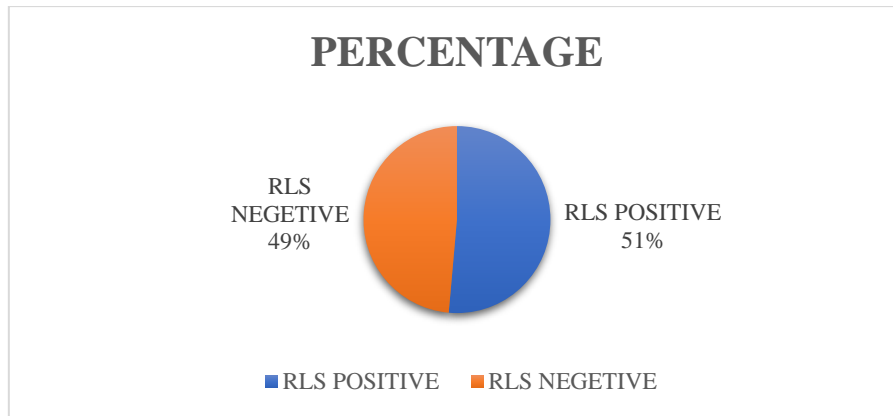
The students diagnosed with RLS were 73. They were further assessed for severity with RLS rating scale. Of the 73 students with RLS ,47.37% students have mild RLS, 35.53% students have moderate RLS, 13.18% students have severe RLS, 3.94% students have very severe RLS (Table 2).

A gender-based analysis indicated a slightly higher prevalence of RLS in females compared to males. Out of 83 females and 59 males studied 51.81% and 50.85% were positive for RLS respectively (Table 3). All students were further assessed for fatigue with the help of multidimensional fatigue inventory (MFI). Mean score of fatigue for RLS positive students was 54.12 with the standard deviation of 3.52, and mean score for RLS negative students was 51.26 with the standard deviation of 4.61 (Table 4).

t -test was used to compare and determine the statistically significant difference between the fatigue score mean in RLS positive and negative students. t-calculated – 0.686, t- table – 1.65

Table 1: Number and percentage of RLS in students

	No. of students	Percentage
RLS Positive	73	51.40
RLS Negative	69	48.59



Graph 1 : Number and percentage of RLS positive and RLS negative students

Table 2: Gender analysis of RLS in students

	Males	Females	Total
No of students	59	83	142
RLS positive	30	43	73
RLS negative	29	40	69
Percentage of RLS positive students	50.8	51.80	

Graph 2 : Gender analysis of RLS

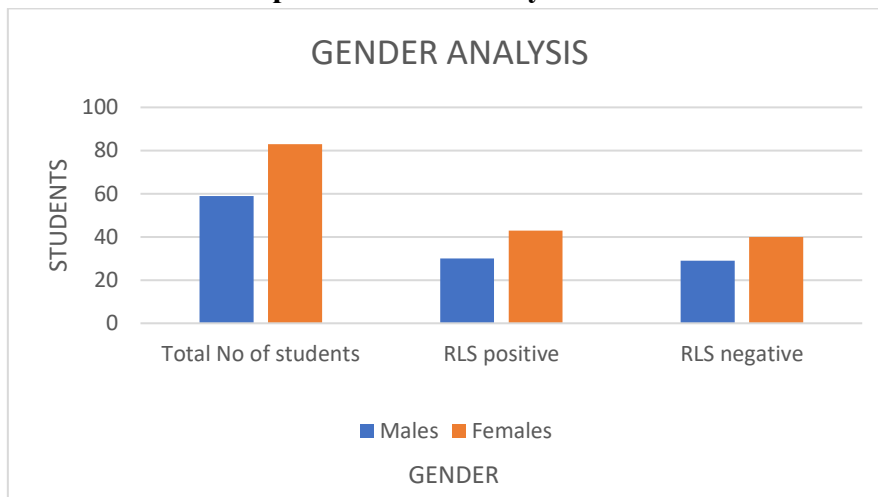


Table3: Distribution of RLS severity in students positive for RLS

Class score	fi (no of students)	Percentage%
1-10 (MILD)	36	47.37
11-20(MODERATE)	27	35.53
21-30(SEVERE)	10	13.18
31-40(VERE SEVERE)	3	3.94

Graph3: Distribution of RLS severity in RLS Positive students

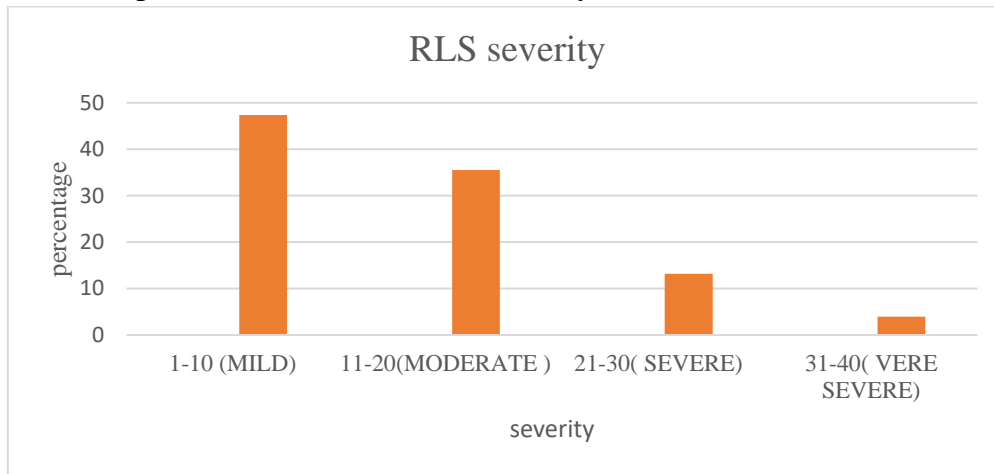


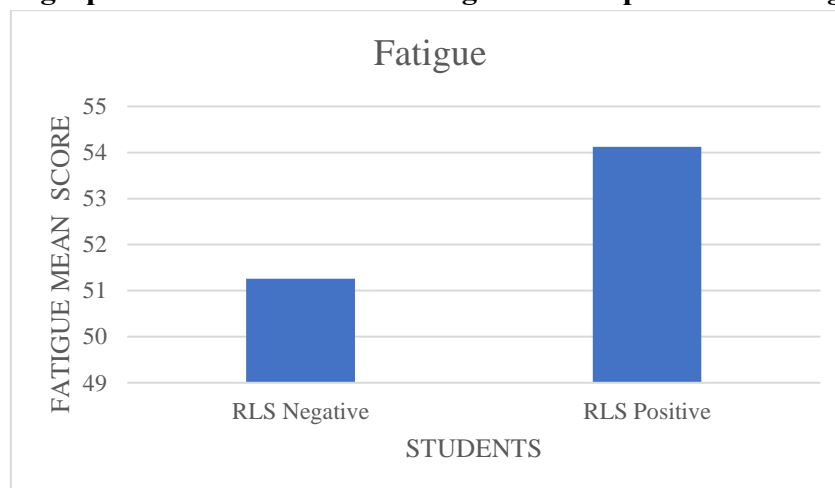
Table 4: Mean score of fatigue In RLS positive and negative students

	RLS Negative	RLS Positive
Mean	51.26	54.12
S.D.	3.52	4.61
C.V.	6.86	8.52

S.D – standard deviation

C.V- coefficient of variation

Graph 4 : Bar graph shows mean score of fatigue in RLS positive and negative students



4. DISCUSSION

Key results. Restless leg syndrome prevalence rate of 51.40% was seen. On severity assessment 47.37% students have mild RLS, 35.53% students have moderate RLS, 13.18% students have severe RLS, 3.94% students have very severe. A slight increase in fatigue score was seen on fatigue score analysis in RLS positive students which is 54.12 compared to their nonaffected counterparts which is 51.26.

Interpretation Prevalence of RLS in this study is 51.48%(n=142). In previous study, prevalence of Restless leg syndrome among health care students was 35.6% , 30.8% participants had iron deficiency, and most of them were females , participants also showed a positive family history.^[15]

The slightly higher prevalence of RLS in female school-going students in this study prompts a closer examination of the contributing factors. The reason for female predominance is not clear. Hormonal changes during adolescence, iron deficiency, anxiety, and genetic predispositions can be among the potential influences that need further exploration. Previous study.^[12] show that girls are susceptible to developing iron deficiency, which can result in impaired growth and development, Prevalence of anemia was 63%, while the prevalence of iron deficiency anemia was 50% Iron deficiency stems in both physiological and pathological factors. Physiological causes are associated with heightened iron requirements during periods of growth and development, while pathological causes iron losses due to chronic medical conditions.

Symptoms of RLS can be exacerbated by anxiety, stress, and psychiatric factors^[2]. In another study in India Approximately 63.5% of Indian students expressed stress attributed to academic pressure, with no noteworthy variation based on gender, age, grade, or other personal factor. Moreover, 66% of Indian students acknowledged experiencing parental pressure for improved academic performance.^[10]

While the root cause of restless legs syndrome remains unidentified, genetic factors can contribute to its development, especially when the onset occurs during youth, it has autosomal dominant mode of inheritance.^[16]

Additionally, in this study, a slight higher fatigue score (mean 54.12) was also seen in RLS positive students compared to their nonaffected counterparts. In this study, multi-dimensional fatigue inventory (MFI) was used to evaluate five dimensions of fatigue, general fatigue, physical fatigue, reduced motivation, reduced activity and mental Fatigue.

Fatigue is a frequently seen symptom and is experienced by both healthy individuals and individuals with acute or chronic medical conditions. Although there isn't complete agreement on what Fatigue is, there seem to be a general acknowledgement that Fatigue is multidimensional and was demonstrated by the use of multiple definitions of fatigue in different article.^[17]

In a article.^[17] A scoping literature review was conducted to investigate how fatigue is defined and measured. In 26 of the 47 articles (55%), fatigue was explained as having various aspects. The most common words and phrases used to describe fatigue were "disruptive," "how you feel," "distressing," "makes things hard," "feeling very tired," "lasting for a long time," "feeling like too much," and "not having much energy." During period of increased growth requirement, low iron status can also happen, this can lead to fatigue, weakness, and reduced work capacity. In previous studies it has been noted that senior high school adolescents experience elevated levels of fatigue, sleep issues, daytime sleepiness, and depression at relatively high rates.

Early detection of restless leg syndrome is important because it can significantly improve the quality of life for individuals affected by the condition. In another study 96.6% of the RLS students, from various medical institutions, either did not report their restless leg syndrome (RLS) to any doctor or did not seek medical consultation.^[15] It highlights the widespread lack of awareness about RLS and the perception that its not a medical concern.

In another study.^[18] which evaluated the quality of life of patients with restless leg syndrome, the data indicated that restless leg syndrome exerts a significant impact on quality of life (QOL), comparable or even worse than other medical conditions.

Long term consequences of rest less leg syndrome can include various impacts on, physical health, mental wellbeing and overall quality of life. Insomnia is a prominent consequence of untreated RLS, leading to sleep disturbance and reduced sleep efficiency. Heart problems, like a higher chance of heart diseases and risk of coronary artery disease, might be because of ongoing sleep issues. There is also increase risk of mental health disorders such as anxiety and depression.^[18] This underscores the seriousness of RLS and highlights the crucial needs for developing treatments.

Our result confirms the higher incidence of RLS in school going students with female predominance. A close examination is needed to find out the potential confounding variables, such as comorbidities and lifestyle factors like sleep hygiene, physical activity and sedentary behaviour, dietary habits, stress and coping mechanism, caffeine and substance uses, screen time and digital devices, study and workload to elucidate the underlying mechanism contributing to increased fatigue. Dysfunction and dysregulation of brain iron, Psychiatric factors, stress, and fatigue may further contribute to the exacerbation of symptoms.^[2]

certain medications like antidopaminergic medications (such as neuroleptics), tricyclic antidepressants, selective serotonin uptake inhibitors (SSRIs), serotonin- norepinephrine reuptake inhibitors, alcohol, caffeine, beta blockers, and lithium can worsen the RLS symptoms.^[1]

To the best of our knowledge, no study has systematically evaluated fatigue variation in restless leg syndrome positive and negative students and prevalence of restless leg syndrome in school going students in Pune, India.

Our study contributes to the growing body of literature on restless leg syndrome. Insights gained from this research could inform educational institutions and healthcare professionals on the importance of early detection and management of RLS in students to mitigate the adverse effects on academic performance and overall well-being.

Limitations The Multidimensional Fatigue Inventory (MFI) scale is primarily considered subjective because it relies on self-reported perceptions of fatigue across various dimensions. While it can provide valuable insights into an individual's experience of fatigue, it's important to recognize that subjective measures may be influenced by factors such as mood, personality, and individual interpretation.

5. OTHER INFORMATION

Funding: No funding has been used for this study

6. ACKNOWLEDGE We are thankful to the students who participated in this study

7. REFERENCES

1. Mansur A, Castillo PR, Rocha Cabrero F, et al. Restless Legs Syndrome. [Updated 2023 Feb 27]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan.
2. Lisa Klingehoefer , Kalyan bhattacharya and Heinz Reichmann. Restless legs syndrome. *Clinical Medicine* 2016 Vol 16, No 4: 379–87.
3. Vlasie A, Trifu SC, Lupuleac C, Kohn B, Cristea MB. Restless legs syndrome: An overview of pathophysiology, comorbidities and therapeutic approaches (Review). *Exp Ther Med*. 2022 Feb;23(2):185. doi: 10.3892/etm.2021.11108. Epub 2021 Dec 30. PMID: 35069866; PMCID: PMC8764906.

4. Department of Biomedical Sciences, Florida State University College of Medicine, Tallahassee, FL, United States, Chapter 9 - Dopamine and Stress. *Stress: Physiology, Biochemistry, and Pathology Handbook of Stress Series*, 2019 Volume 3 , 105-114.
5. Winkelmann J, Prager M, Lieb R, Pfister H, Spiegel B, Wittchen HU, Holsboer F, Trenkwalder C, Ströhle A. "Anxietas tibiaram". Depression and anxiety disorders in patients with restless legs syndrome. *J Neurol*. 2005 Jan;252(1):67-71. doi: 10.1007/s00415-005-0604-7. PMID: 15654556.
6. Rajesh.E,Dr KDV Prasad, Dr Naveen kumar,et al, Stress,presure &anxiety of competitive exams: An empirical study on students psychological approach,UGC CARE Listed (Group -I) Journal,2022, 1057-1067.
7. Milla Räisänen¹ & Liisa Postareff² & Sari Lindblom-Ylänne¹. Students' experiences of study-related exhaustion, regulation of learning, peer learning and peer support during university studies, *European Journal of Psychology of Education* (2021) 36:1135–1157.
8. Michaela C. Pascoe, Sarah E. Hetrick et al. The impact of stress on students in secondary school and higher education.2020 , 25:1, 104-112.
9. Chen TY, Chou YC, Tzeng NS, Chang HA, Kuo SC, Pan PY, Yeh YW, Yeh CB, Mao WC. Effects of a selective educational system on fatigue, sleep problems, daytime sleepiness, and depression among senior high school adolescents in Taiwan. *Neuropsychiatr Dis Treat*. 2015 Mar 19;11:741-50. doi: 10.2147/NDT.S77179. PMID: 25834449; PMCID: PMC4372029.
10. Sibnath Deb¹, Esben Strodl², Jiandong Sun³ Academic Stress, Parental Pressure, Anxiety and Mental Health among Indian High School Students *International Journal of Psychology and Behavioral Sciences* 2015 p-ISSN: 2163-1948.
11. Samson KLI, Fischer JAJ, Roche ML. Iron Status, Anemia, and Iron Interventions and Their Associations with Cognitive and Academic Performance in Adolescents: A Systematic Review. *Nutrients*. 2022 Jan 5;14(1):224. doi: 10.3390/nu14010224. PMID: 35011099; PMCID: PMC8746955.
12. More S, Shivkumar VB, Gangane N, Shende S. Effects of iron deficiency on cognitive function in school going adolescent females in rural area of central India. *Anemia*. 2013;2013:819136. doi: 10.1155/2013/819136. Epub 2013 Dec 10. PMID: 24386560; PMCID: PMC3872396.
13. Allen RP, Picchietti D, Hening WA, Trenkwalder C, Walters AS, Montplaisi J; Restless Legs Syndrome Diagnosis and Epidemiology workshop at the National Institutes of Health; International Restless Legs Syndrome Study Group. Restless legs syndrome: diagnostic criteria, special considerations, and epidemiology. A report from the restless legs syndrome diagnosis and epidemiology workshop at the National Institutes of Health. *Sleep Med*. 2003 Mar;4(2):101-19. doi: 10.1016/s1389-9457(03)00010-8. PMID: 14592341.
14. Abetz L, Arbuckle R, Allen RP, Mavragi E, Kirsch J. The reliability, validity and responsiveness of the Restless Legs Syndrome Quality of Life questionnaire (RLSQoL) in a trial population. *Health Qual Life Outcomes*. 2005 Dec 5;3:79. doi: 10.1186/1477-7525-3-79. PMID: 16329756; PMCID: PMC1322229.
15. 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 Disord*. 2020 Feb 18;2020:7302828. doi: 10.1155/2020/7302828. PMID: 32148967; PMCID: PMC7049861.

16. Dhawan V, Ali M, Chaudhuri KR. Genetic aspects of restless legs syndrome. *Postgrad Med J.* 2006 Oct;82(972):626-9. doi: 10.1136/pgmj.2006.045690. PMID: 17068272; PMCID: PMC2653903
17. Billones R, Liwang JK, Butler K, Graves L, Saligan LN. Dissecting the fatigue experience: A scoping review of fatigue definitions, dimensions, and measures in non-oncologic medical conditions. *Brain Behav Immun Health.* 2021 May 21;15:100266. doi: 10.1016/j.bbih.2021.100266. PMID: 34589772; PMCID: PMC8474156.
18. Abetz L, Allen R, Follet A, Washburn T, Earley C, Kirsch J, Knight H. Evaluating the quality of life of patients with restless legs syndrome. *Clin Ther.* 2004 Jun;26(6):925-35. doi: 10.1016/s0149-2918(04)90136-1. PMID: 15262463.
19. Smets EM, Garssen B, Bonke B, De Haes JC. The Multidimensional Fatigue Inventory (MFI) psychometric qualities of an instrument to assess fatigue. *J Psychosom Res.* 1995 Apr;39(3):315-25. doi: 10.1016/0022-3999(94)00125-o. PMID: 7636775.