

Prevalence of restless legs syndrome among medical students and the effect of disease on academic performance

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Abstract

Aim: To investigate the prevalence of Restless Legs Syndrome (RLS) and the effect of RLS on academic performance among medical school students.

Material and Methods: Second and 3rd grade medical students were included in the study. A total of 171 students were asked to complete the questionnaires. Demographic data and sleep habits of the students were recorded. RLS was diagnosed according to the questionnaire results. The RLS severity and frequency are evaluated according to the International Restless Legs Syndrome Study Group (IRLSSG) Questionnaire results. Epworth Sleepiness Scale (ESS) scores were also noted.

Results: RLS was found in 17 (9.9%) of the students. Thirteen of the students with RLS were female (76.5%). The median grade point average (GPA) of students who had RLS (CC [60-64]) was significantly lower than those of other students (BB [70-79]) ($p = 0.02$). There was no statistically significant difference between the disease severity and GPA of the students with RLS ($p = 0.516$). The median GPA scores were lower in patients with a higher frequency of complaints ($p = 0.045$). When the GPA of students with RLS were compared in terms of the of the ESS scores, the median GPA of the students who had excessive daytime sleepiness was significantly lower ($p = 0.038$).

Conclusion: The worse academic performance of the students with RLS was more related with frequency of RLS symptoms rather than severity of symptoms. The cognitive impairment underlying worse academic performance was probably due to insomnia-related chronic sleep deprivation secondary to RLS.

Keywords: Restless Legs Syndrome; Restless Legs Syndrome severity; Restless Legs Syndrome prevalence; academic performance; Excessive daytime sleepiness; cognitive impairment

INTRODUCTION

Restless Legs syndrome (RLS) is a sensory-motor neurological disorder characterized by an urge to move the legs sometimes accompanied by unpleasant or uncomfortable sensations in the legs, which occurs primarily with rest or inactivity and is partially or totally relieved by movement that is causing sleep disturbance or impairment (1). According to the International Restless Legs Syndrome Study Group the prevalence of RLS ranges between 4% and 29% (2). The prevalence of this disorder in women is almost twice than in men (3).

RLS has a circadian peak in the evening or night. Symptoms worsen at these times and this can cause insomnia and excessive daytime sleepiness very often. As a consequence of sleep disruption due to RLS, fatigue, irritability, drowsiness, impaired concentration and depressed mood are frequently reported (4). The arguments on RLS causing cognitive dysfunction are conflicting. There are several studies supporting RLS not causing cognitive dysfunction (5,6). On the other hand there are strong proofs supporting RLS causing cognitive dysfunction (7-11). The cognitive deficits in these studies are assessed by semantic memory test, Stroop test, D2

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Cancellation Task, Wisconsin Card Sorting Test and Trail Making Test-B (10,12-14). These tests showed cognitive deficits in the area of attention and executive functioning in RLS patients. Pearson et al. found that RLS patients showed specific cognitive deficits, in tasks particularly performed by pre-frontal cortical functioning (10). There were also several electrophysiological studies supporting RLS related cognitive impairment (9,15,16). A recent event-related potential study showed longer latency and lower amplitude of P300 in RLS patients compared to control subjects (16). Another study, performed among RLS patients, showed decreased gamma-band phase synchrony, which has an important role in attention, working memory and long-term memory, supporting RLS related cortical dysfunction (15).

Despite a number of studies investigating RLS related cognitive impairment, there are few studies investigating effect of RLS on school performance, which indicates indirect effect of RLS on cognitive functions (17,18). These studies all performed among school age children. Per et al. found decreased academic success among 7th to 10th grade students with RLS compared to healthy same grade students (17). Yilmaz et al. found that academic success of high school students, aged 15 to 18 years, who have RLS, were worse compared to healthy classmates (18). Unfortunately, there isn't any study investigating effect of RLS on academic performance in young adults. In this study, we aimed to investigate the prevalence of RLS and the effect of RLS on academic performance among 2nd and 3rd grade medical school students.

MATERIAL and METHODS

This study was designed as a cross-sectional study. It was approved by the local ethics committee. Second and 3rd grade students of Ankara Yildirim Beyazit University, School of Medicine were included in the study. A total of 171 students were asked to complete the questionnaires prepared before. The questionnaire results of the students were evaluated. Demographic data, GPAs and sleep habits of the students were recorded. RLS was diagnosed to the students who stated that they need to move the legs due to disturbing feeling, unpleasant feelings are relaxed with movement and complaints are worsened in the evening. The scores of the International Restless Legs Syndrome Study Group (IRLSSG) Questionnaire consisting of the questions numbered 12-21 in the questionnaire were calculated. According to the questionnaire results, students were classified as mild, moderate, severe and very severe RLS according to the severity of RLS. According to the frequency of RLS complaints, patients were classified as mild if the complaints were 1 day or less in a week, moderate if 2-3 days in a week, severe if 4-5 days in a week, and very severe if 6-7 days in a week. The students were evaluated according to the ESS (5) scores. Those with a score of 10 or more were considered to have excessive daytime sleepiness, whereas those with a score of less than 10 were considered to have no excessive daytime sleepiness.

Statistical analysis

We analyzed data using IBM SPSS version 21. We first reviewed the distribution of data to determine normality. We report continuous data with normal distribution as means \pm standard deviations and nonparametric data as median and minimum, maximum values in brackets. We analyzed categorical data using the chi-square test. Assessment of statistical significance for nonparametric samples was performed using the Mann-Whitney U calculation. A value of $p < 0.05$ was considered as statistically significant.

RESULTS

The median age of the students was 20 [17-26]. One-hundred-and-twenty (70.2%) of the students were female and 51 (29.8%) were male. RLS was found in 17 (9.9%) of the students. Thirteen of the students diagnosed with RLS were female (76.5%) and 4 were male (23.5%). Demographic data, body mass indexes, ESS and median GPA of the students with and without RLS was given in Table 1.

Table 1. Demographic data, BMI, ESS and median GPA of the students with and without RLS

	Students with RLS	Students without RLS	p-value
Gender			
Male (%)	4 (23.5)	51 (29.8)	0.78
Female (%)	13 (76.5)	120 (70.2)	
Mean Age [Min-Max]	20.24 [18-22]	20.24 [17-26]	0.94
BMI (kg/m ²) \pm SD	21.19 \pm 4.07	21.87 \pm 16.36	0.42
ESS \pm SD	10.76 \pm 4.96	7.40 \pm 3.93	0.01
Median GPA	CC [60-64]	BB [70-79]	0.02

RLS: Restless Legs Syndrome; BMI: Body mass index; ESS: Epworth sleepiness scale; GPA: Grade point average; SD: Standard deviation

The maximum GPA of the students with RLS was BA (80-89) and the minimum GPA of the students with RLS was DC (55-59). The maximum GPA of the students without RLS was AA (90-100) and the minimum GPA of the students without RLS was DD (50-54). The GPA of students who had RLS (CC [60-64]) was significantly lower than those of other students (BB [70-79]) ($p = 0.02$) (Figure 1). According to the results of the IRLSSG questionnaire of the students with RLS, it was found that 2 students have mild, 7 students have moderate and 8 students have severe RLS. There were no students with very severe RLS. As 6 patients complained from RLS symptoms at least 1 night or less in a week, 4 patients 2-3 nights a week, 5 patients 4-5 nights a week and 2 patients complained from RLS symptoms 6-7 nights a week. There was no statistically significant difference between the disease severity and GPA of the students

with RLS ($p=0.516$). When the GPA of the students was compared according to the frequency of RLS complaints, statistically significant difference was found ($p=0.045$). The median GPA score was lower in patients with a higher frequency of complaints. Nine students with RLS suffered from excessive daytime sleepiness according to the ESS scores ($ESS \geq 10$), 8 students didn't have excessive daytime sleepiness ($ESS < 10$). When the GPA of students with RLS were compared in terms of the of the ESS scores, the median GPA of the students who had excessive daytime sleepiness was significantly lower ($p=0.038$) (Figure 2).

When the most common sleep problems of the patients with RLS were questioned, 5 patients stated that they had difficulty in waking up, 4 patients had difficulty in falling asleep, 3 patients complained of excessive daytime sleepiness, 3 patients had changes in sleep-wake hours, 1 patient had breathing problems in sleep and 1 patient had other sleep problems.

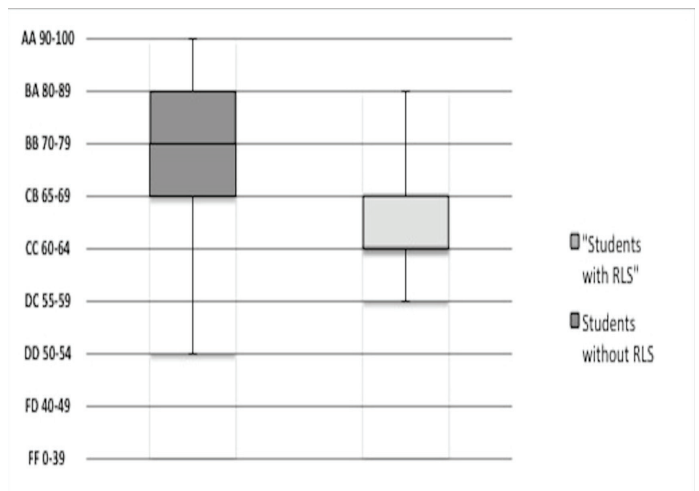


Figure 1. Distribution of grade point averages of students with and without RLS

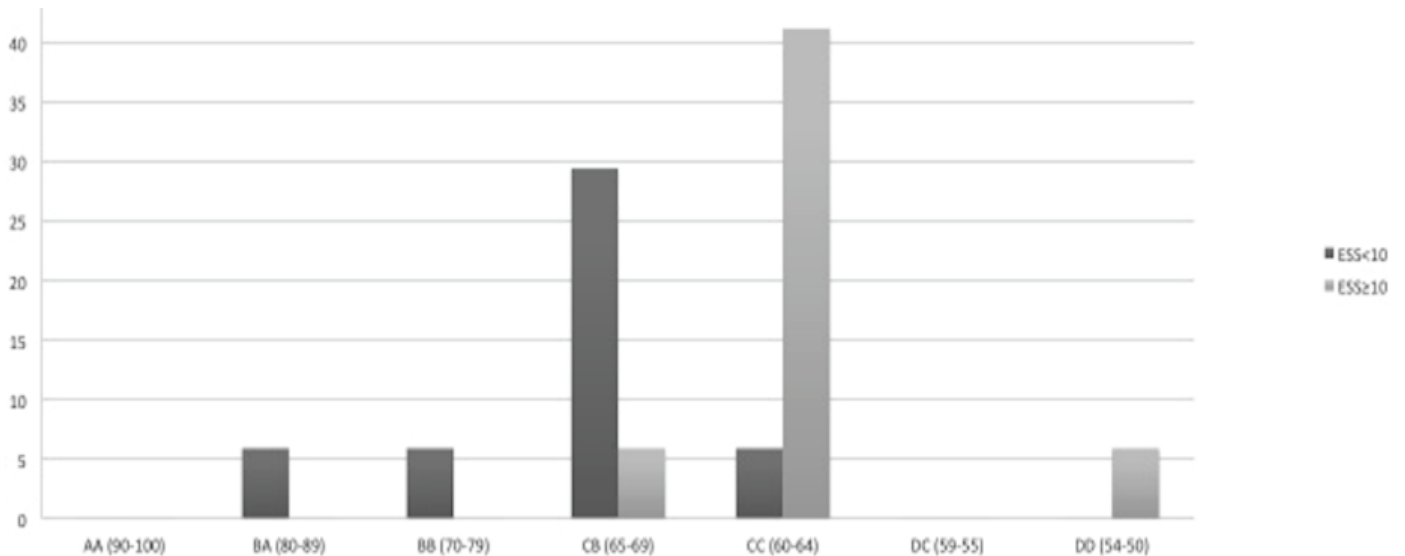


Figure 2. Epworth Sleepiness Scale scores of the students with RLS according to grade point averages

DISCUSSION

The RLS prevalence rate of 9.9%, found in the cross-sectional study between the 2nd and 3rd grade students of the medical faculty was consistent with the literature (19-22). Although RLS is known to show regional variation, its highest prevalence is reported to be 8-12% in studies conducted in Europe. A lesser prevalence rate of 1-8% in Asian studies reported (23). The prevalence of RLS is also known to increase with age (3). Mean age of a specific cohort consisting of university students will be lower than average. When we looked at the specific RLS prevalence in this age group, we see that a wider range and a higher rate of prevalence reported in studies conducted in Turkey (24, 25). The prevalence of RLS among medical students was reported as 7.6% in the study conducted by Demirci

et al. (24), and 18.4% in the study conducted by Özcan et al (25). Our RLS ratio was between the range of RLS ratios, which were reported previously in Turkey among university students. RLS rate was found to be 3 times higher in female students than in male students. The prevalence of RLS in women is expected to be higher than in men due to an increase in the number of previous pregnancies. In nulliparous women, the RLS rate was reported to be similar to that of men (22). In our study, we thought that the high RLS ratio in nulliparous women with a mean age of 20 years, was due to the higher prevalence of iron deficiency, the most important etiological factor in RLS, in nulliparous women than in men, which is caused by excessive menstrual loss.

In our study, we found that the GPAs of the students in the

Faculty of Medicine with RLS were significantly lower than the other students. We thought that the GPA might be an indirect finding showing cognitive functions in students. According to the results of our study, we concluded that students with RLS are cognitively affected compared to healthy controls. Cognitive dysfunction in RLS patients has been previously shown in several studies (7-11). However, it is controversial whether cognitive effect is caused by a direct disorder caused by RLS or by chronic insomnia associated with RLS. Van Dongen et al. showed that chronic mild sleep deprivation affects cognitive performance in healthy volunteers (26). Pearson et al. concluded that cognitive impairment in patients with RLS was similar to that reported for one-night sleeplessness (10). Allen et al. concluded that cognitive impairment in RLS patients arises from chronic sleep disruption rather than the direct effect of RLS pathology (1). When we compared the GPA of the RLS patients with ESS scores, a commonly used subjective test to evaluate daytime sleepiness, which is one of the most common results of sleep disorders, we found significantly lower GPA in patients with excessive daytime sleepiness. Also nearly 25% of the students with RLS reported to suffer from insomnia. In the light of these findings, we concluded that low school success in RLS students is related to cognitive impairment due to chronic sleep deprivation caused by RLS.

This study has some limitations. This cross-sectional study included a small, group of medical school students in design. Therefore, it does not provide information about the general population. However, since no such study has been conducted among university students before, our study has provided important data on this subject. Depression and anxiety are also important factors affecting cognitive functions and academic performance. By giving questionnaires to students about depression and anxiety and evaluating the results between students with and without RLS could have been more useful in evaluating the effect of RLS on academic performance. Also in suspected cases or in case of overlapping other sleep disturbances it would be better if we performed polysomnography for diagnosis of RLS. Another important limitation was the lack of cognitive tests given to the university students included in the study. A study including cognitive tests could provide more objective data to assess whether there is cognitive impairment in RLS students.

CONCLUSION

As a result, the prevalence of RLS found in university students is consistent with the overall prevalence of RLS. The cognitive impairment beneath the worse academic performance of the students with RLS was more related with frequency of RLS symptoms rather than the severity of symptoms. Finally the cognitive impairment was probably due to insomnia-related chronic sleep deprivation secondary to RLS and it indirectly decreased the academic performance.

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