



# Association between Sleep Quality and Gastroesophageal Reflux in Medical Students

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## ABSTRACT

### BACKGROUND

Due to stressful occupational conditions, irregular dietary and sleep schedules, medical students are at increased risk of developing gastrointestinal disorders, gastroesophageal reflux (GERD) in particular, as well as sleep disturbances. Therefore, for the first time, we aimed to assess the correlation between GERD and sleep disturbances among medical students.

### METHODS

The current cross-sectional study was done on 290 medical students at different study periods in Iran during 2018-2019. Age, sex, stage of studying, residence, and body mass index were gathered. The frequency scale for the symptoms of gastroesophageal reflux (FSSG) was utilized to assess gastrointestinal symptoms among them and the Pittsburgh Sleep Quality Index (PSQI) to assess sleep quality. Eventually, the association of sleep disturbances with demographic factors and gastrointestinal symptoms was evaluated.

### RESULTS

Living in the dormitory ( $p = 0.048$ ; OR: 1.73; 95%CI: 1.01-2.99) and being overweight ( $p < 0.001$ ; OR: 3.09; 95%CI: 1.58-6.06) were independently correlated with impaired sleep quality. GERD presented either by heartburn ( $p < 0.001$ ) or regurgitation ( $p < 0.001$ ) was associated with a lower quality of life.

### CONCLUSION

GERD was correlated with poor sleep quality among medical students. In addition, residence in dormitory and being overweight were correlated with poor sleep quality.

### KEYWORDS:

Gastroesophageal reflux, Sleep, Medical students, Cross-sectional study.

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## INTRODUCTION

Digestive disorders are among the most common causes of illness worldwide that based on the American Nutrition Association estimated to affect over 70 million people per day all over the world.<sup>1</sup> Gastroesophageal reflux (GERD)

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is a prevalent gastrointestinal disorder affecting 10-40% of individuals in Western countries. The prevalence of GERD seemed to be less in the Eastern countries; however, it has remarkably increased from 5% to 8.5% during the past decade.<sup>2,3</sup>

The critical role of sleep for maintenance of well-being, and physical and mental health has been previously investigated.<sup>4,5</sup> Sleep disturbances, including difficulties in sleep initiation, maintaining sleep, and complaints of non-refreshing sleep, are an issue that has gained remarkable attention because of its role in mental and physical health.<sup>6,7</sup> Evidence has shown a two-sided association between sleep disturbances, sleep quality in particular, and functional gastrointestinal complications, to the extent that it has been even named as an independent predictor for GERD.<sup>8</sup>

Medical students are a group of university students with significantly high levels of stress, emotional exhaustion and occupation-related burnout that altogether lead to sleep disturbances, including sleep deprivation, inappropriate sleep quality and, daytime drowsiness.<sup>9</sup> On the other hand, gastrointestinal disorders such as dyspepsia, irritable bowel syndrome, heartburn, and regurgitation are among the prevalent bothering symptoms in medical students.<sup>10,11</sup> Nevertheless, the studies in the literature have focused on either gastrointestinal complications<sup>11,12</sup> or sleep disturbances,<sup>9,13</sup> among the medical students and studies assessing the correlation of these two complaints, have been done on the general population.<sup>14-16</sup>

Meanwhile, improved sleep quality can lead to improved levels of performance for everyone, particularly for this critical group of people responsible for healthcare. On the other hand, promoting of a dietary habit-related lifestyle, GERD can be controlled and its negative impact on sleep quality can be prevented. To the best of our knowledge, this report is the first one assessing the relationship between GERD and sleep disturbances in medical students. The results of this study can lead to the proposal of theories about the ways to promote sleep quality of medical students by correct management of gastrointestinal-associated symptoms, GERD in particular.

## MATERIALS AND METHODS

### Study population:

This was a cross-sectional study conducted on 290 medical students of Isfahan University of Medical Sciences from January 2018 to March 2019. The Ethics Committee of the University approved the study protocol. After that, the study was entirely explained for the medical students of all grades; they were reassured that their information would remain confidential and gave their written informed consent.

Medical students studying at any grade of medicine (basic science, physiopathology, stagership, and internship) in the Isfahan University of Medical Sciences were included. The student's reluctance to participate and presence of alarm signs (including dysphagia, odynophagia, anorexia, weight loss, and gastrointestinal bleeding), university dropout, and family history of gastric cancer were considered as the exclusion criteria. We also excluded questionnaires that were incomplete (over 20%).

The study population was selected using block sampling in a way that each grade was considered as a block, and the included students of each block were selected through convenience sampling.

### Means of assessment

The participants' demographic information, including age, sex, studying grade (basic sciences course, physiopathology course, stagership, and internship), residence (dormitory or private house), and body mass index (BMI) (19.5-25 kg/m<sup>2</sup> as normal, 25.1-30 kg/m<sup>2</sup> as overweight and > 30 kg/m<sup>2</sup> as obese) were recorded in a checklist.

The frequency scale for the symptoms of gastroesophageal reflux (FSSG):

This questionnaire consists 50 items in which 12 ones are related to gastrointestinal reflux disease. These 12 questions were about the typical symptoms related to GERD scored on a five-point Likert scale from zero to four (never, occasionally, sometimes, often, and always). The sensation of heartburn and regurgitation were determined as reflux. A total score over ten was considered positive for GERD. This cut-off has been validated with a sensitivity, specificity, and accuracy of 55%, 69%, and 63%, respectively.<sup>17</sup>

### The Pittsburgh Sleep Quality Index (PSQI)

The Pittsburgh Sleep Quality Index is a valuable tool for assessing sleep quality in seven domains, including

**Table 1: The association of sleep quality impairment with demographic factors**

Variables	Sleep quality impairment, n (%)				p value	
	No	Moderately impaired	Severely impaired	Very severely impaired		
Sex	Male	35 (30.43)	41 (35.65%)	34 (29.57%)	5 (4.35%)	0.146
	Female	48 (27.75)	73 (42.20)	36 (20.81)	16 (9.25)	
Residence	Private house	36 (35.29)	30 (29.41)	28 (27.45)	8 (7.84)	0.068
	Dormitory	47 (25.27)	84 (45.16)	42 (22.58)	13 (6.99)	
Body mass index	Normal	67 (35.64)	87 (46.28)	30 (15.96)	4 (2.13)	< 0.001
	Overweight	14 (17.07)	24 (29.27)	31 (37.80)	13 (15.85)	
	Obese	2 (11.11)	3 (16.67)	9 (50)	4 (22.22)	
Grade	Basic sciences course	23 (31.94)	29 (40.28)	12 (18.06)	7 (9.72)	0.176
	Physiopathology course	23 (31.94)	27 (37.50)	17 (23.61)	5 (6.94)	
	Stagership	21 (28.38)	29 (39.19)	24 (32.43)	0 (0)	
	Internship	16 (23.19)	29 (42.03)	16 (23.19)	8 (11.59)	

subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. This questionnaire contains 19 items score based on a four-point Likert scale from zero to three. Questions number 1 and 3 are not scored in the same pattern to the others, but their score should be added to the other questions. In question number 2, the alternatives are scored as zero (less than 15 minutes), one (16-30 minutes), two (31-60 minutes), and three (more than 60 minutes). Question number 4 is scored as zero (more than 7 hours), one (6-7 hours), two (5-6 hours), and three (less than 5 hours). The remaining questions are scored from zero to three interpreted as never, once a week, twice a week, and three times or more per week. Eventually, the scores attributed to each of the seven entities are measured, and the score of each entity is interpreted as zero (no sleep problem), one (moderate), two (severe), and three (very severe). A total score higher than 5 for the questionnaire indicates poor sleep quality. The questionnaire was primarily developed by Buysse and colleagues in 1989.<sup>18</sup> The Persian version of this questionnaire has been validated by Ebrahimi and colleagues in 2008.<sup>19</sup>

### Statistical analysis

Eventually, the obtained data were analyzed by SPSS software (version 18, IBM Corporation, Armonk, NY, USA). Descriptive information was shown as mean, standard deviation, absolute numbers, and percentages. Chi-square, Fisher's exact, t, and logistic regression tests

**Table 2: Univariate logistic regression assessment of factors associated with sleep quality in medical students**

Impaired sleep quality	Odds ratio	95% Confidence interval	p value
<b>Sex</b>			
Male	1		0.313
Female	1.32	0.77-2.30	
<b>Residence</b>			
Private house	1		0.048
Dormitory	1.73	1.01-2.99	
<b>Body mass index</b>			
Normal	1		<0.001
Overweight	3.09	1.58-6.06	
Obese	3.65	0.79-16.88	
<b>Grade</b>			
Basic sciences course	1		0.119
Physiopathology course	1.05	0.51-2.19	
Stagership	1.38	0.65-2.90	
Internship	1.90	0.85-4.26	

were used as appropriated.  $p < 0.05$  was considered as statistically significant.

### RESULTS

In this study, 290 university students, including 116 (40%) men and 174 (60%) women, completed the study protocol.

As shown in table 1, the intensity of sleep quality impairment was only affected by the students' BMI ( $p < 0.001$ ), but other demographic factors, including sex ( $p = 0.146$ ), residence ( $p = 0.68$ ) or grade of study ( $p = 0.176$ ).

**Table 3: The association between sleep quality impairment and gastroesophageal reflux disease**

Variables	Sleep quality impairment, n (%)				p value
	No	Moderately impaired	Severely impaired	Very severely impaired	
Heartburn	4 (3.67)	37 (33.94)	50 (45.87)	18 (16.51)	< 0.001
Regurgitation	5 (6.10)	24 (29.27)	38 (46.34)	15 (18.29)	< 0.001

Further assessments based on univariate logistic regression model revealed the significant independent role of being overweight ( $p < 0.001$ ; 95%CI: 1.58-6.06) and dormitory residence ( $p = 0.048$ ; 95%CI: 1.01-2.99), while other demographic factors were not significantly related ( $p > 0.05$ ) (Table 2).

As shown in table 3, we found a statistically significant association between impaired sleep quality and GERD ( $p < 0.05$ ).

## DISCUSSION

To the best of our knowledge, our study is one of the limited ones assessing the co-incidence of GERD and sleep disorders among the medical students. As the primary outcome of our study, we found that the impairment in the quality of sleep was remarkably affected by symptomatic GERD, regardless of the type of symptoms (heartburn or regurgitation). Further evaluation showed that sleep disturbance was affected by BMI only. In order to assess the causative role of diverse factors for sleep disturbances, a logistic regression test was performed that revealed being overweight and living in the dormitory were predictive factors for sleep disturbances among the medical students.

Consistent with the other studies conducted on the general population, the impaired quality of sleep was directly associated with symptomatic GERD in medical students, regardless of the symptom type for either heartburn or regurgitation. This result has been previously confirmed by another study evaluating approximately 5000 persons in a community-based study that showed acid regurgitation as an independent factor for sleep disturbances.<sup>15</sup> The emphasis on a target population, medical students, was because of the high rate of GERD in this group (up to 25%),<sup>12</sup> as well as the high rate of sleep disturbances.<sup>9</sup> On the other hand, we believe a mutual association between these two conditions. Stressful clinical conditions can lead to poor sleep quality<sup>20</sup> as well as GERD that, in turn, deteriorate sleep quality.<sup>13</sup>

Moreover, poor sleep habits such as sleeping late at night, daytime drowsiness, and late morning awakening may lead to change in the times of food intake and fast food consumption which worsens GERD.<sup>21</sup> It should be noted that being overweight is an independent factor associated with poor sleep quality. Not only being overweight has a direct correlation with GERD, it also affects the sleep quality directly.<sup>2</sup>

One of the novel results of our report is the correlation of poor sleep quality to living in a dormitory. As logistic regression assessments revealed the independent predictive role of this issue in poor sleep quality, we want to raise the hypothesis about internet surfing and recreational gatherings late at night in dormitories, inadequate night sleeping, and consequently, daytime sleepiness are responsible for this association. Besides, regardless of this independent correlation and considering the direct association between GERD in medical students and poor sleep quality, we think that the low quality of food, the tendency of students to eat fast food to avoid eating dormitory food, and bad dietary habits, including consumption of fat-rich low-quality snacks, inappropriate food chewing and fast food eating may have led to gastrointestinal symptoms as a causative factor for poor sleep quality.

Surfing the literature has revealed similar outcomes regarding sleep disturbances among medical students, as Alsaggaf and colleagues found impaired sleep quality, excessive daytime sleepiness, latency in the sleep initiation and sleep maintenance among the studied medical students.<sup>13</sup> Nihayah and co-workers found results similar to our study about sleep deprivation, latency in sleep initiation, and sleep quality.<sup>22</sup> A comparative study by Corrêa and colleagues showed a significantly higher rate of sleep disturbances among medical students than the other university students.<sup>9</sup> In general, high stress levels, staying awake at night, and the remarkable burden of the courses are the factors attributed to the poor sleep quality among this group, facts that may affect their

personal quality of life and occupational performance negatively.<sup>20, 23</sup>

The correlation of demographic characteristics with sleep quality in those studying medicine is a point of controversy. For instance, there are studies in agreement with ours regarding the independency of sleep disturbances from sex,<sup>24</sup> while Akhlaghi and co-workers represented worse conditions in girls in Iran<sup>25</sup> that was consistent with the results of another study in Pakistan,<sup>26</sup> a fact that probably may have occurred because of the boys better ability to adapt to hard studying and stressful medical conditions.

The grade of study's role on sleep quality is another favored issue assessed by numerous authors. The findings of our report insisted on the absence of any correlation between sleep quality and the students' study grade, while the latter studies showed the opposite. While most of the studies showed poor sleep quality among the clinical students because of burnout, stressful shifts, and long night time awareness,<sup>20,26</sup> Corrêa and colleagues found a higher rate of sleep disturbances in earlier grades.<sup>9</sup>

This study was the first to assess the role of GERD in sleep quality among medical students who numerously suffer from both conditions. Besides, the role of diverse demographic factors in this correlation was considered, as well.

### Limitations

One of the limitations of this questionnaire was that it did not assess sleep apnea or night oximetry as the underlying etiology of poor sleep quality in the studied population. On the other hand, night shifts in internship are one of the most prominent etiologies of poor sleep quality that, not only affects the quality of sleeping, but also may be associated with gastrointestinal symptoms. Thus, it seems that night shifts and numbers of night shifts in internship can have a confounding role which has not been considered in this study. Therefore, further studies that control the confounding factors related to the sleep quality as well as gastrointestinal symptoms are strongly recommended.

### CONCLUSION

GERD is associated with poor sleep quality in medical

students. Moreover, living in the dormitory and being overweight are also risk factors.

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### ETHICAL APPROVAL

There is nothing to be declared.

### CONFLICT OF INTEREST

The authors declare no conflict of interest related to this work.

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