

## Sleep Quality and Its Correlation with General Health in Pre-university Students of Karaj, Iran

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**Objective:** Sleep quality affects on physical and psychological well being and even academic functions of students. Indeed, sleep quality has been suggested as an individual index of general health. Among adolescents and young adults, poor sleep quality is common. The aim of this survey was to determine the sleep quality and its correlation with general health in 18-year-old Iranian students.

**Methods:** Simple random sampling was used to select 1000 students from all of the Karaj non-private pre-university schools for this cross sectional study. These students were asked to complete two self-report questionnaires; Pittsburgh Sleep Quality Index and General Health Questionnaire-28. Nine hundred and forty three students were entered into the final analysis.

**Results:** Poor sleep quality and poor general health were observed in 56% and 42% of participants, respectively. In both of them the difference between boys and girls was significant ( $P < 0.05$ ). Poor general health was noticed in 55% of students with poor sleep quality. Also, there were a positive correlation between sleep quality and general health.

**Conclusion:** The prevalence of poor sleep quality in Iranian pre-university students is higher than that of many other countries. Further researches are required for finding the etiology.

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**Keywords:** General Health • General Health Questionnaire • Pittsburgh Sleep Quality Index • Student • Sleep Quality

### Introduction

Research on the prevalence of poor sleep quality and its determinants, are important for at least three major reasons. First, depending on the country and the age group, prevalence of sleep disturbances has been reported to be as high as 5% to 71% (1-6). Second, poor sleep quality can be regarded as an important symptom of many medical and psychiatric disorders. Third, there is also a strong correlation between sleep health and indices like occupational activities, physical and psychological well being, and even death (1). Complaining about distress, depression, anxiety and general health problems are more common among those who have poor sleep quality (7-9). Also, they experience more interpersonal conflicts (10) and have a higher risk of drug

and substance abuse (11). Because of the great impact of these factors on human life and function, some investigators have suggested using sleep quality as an index for evaluating the individual general health (12).

Particularly, a direct relationship between sleep quality and academic functions has been observed in high school students, e.g. sufficient sleep and shorter sleep latency lead to higher academic function and insufficient sleep lead to fatigue, concentration and attention disturbances, school absenteeism, and suppression of other cognitive functions like abstraction and problem solving (2). In Iran, the prevalence of sleep disturbances in 7- to 11-year-old children is 46.1% (13). As adolescence affects on different aspects of life (e.g. psychological, social, occupational, etc.), healthy transition from that is so important. So assessment of some factors like sleep quality which have direct relation to adolescent health should be a mission of the health systems. The investigation of these factors may lead to appropriate interventions by early diagnosis of even latent problems.

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The aim of this study was to evaluate the prevalence and correlation of two factors relating to school functioning among a large group of Iranian pre-university students; sleep quality and general health.

### Materials and Methods

The study was approved by the research council of Iran University of Medical Sciences. A representative sample of 1000 students was selected by stratified random sampling from all non-private pre-university schools of Karaj (A multi-million city in the west of Tehran and the fourth-largest city of Iran) in autumn 2006. Just 18 years old students were included in the survey and no exclusion criteria were considered. The resulting sample consisted of 496 girls and 504 boys. The Pittsburgh Sleep Quality Index (PSQI) and General Health Questionnaire-28 (GHQ-28) were used in this survey.

PSQI which is appropriate for 18-year-old or older individuals is a self-rated questionnaire that assesses sleep quality over a time interval of 1 month. It consists of 19 self-rated questions and 5 other questions which are rated by bed partner or roommate. We neglected the last 5 questions because all of the participants were single. This shouldn't cause any problems because the 5 question set is used for clinical information only and is not tabulated in scoring of the PSQI. The 19 self-rated questions evaluate a wide variety of factors related to sleep quality. In PSQI, these are grouped into 7 component scores, all of which are weighted equally on a 0-3 scale. These components are: sleep quality, sleep latency (time from "light off" to falling asleep), habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. The 7 component scores are then added to yield a global PSQI score in the range of 0 to 21; the higher the score, the worse the sleep quality. A global score equal or greater than 5 would indicate poor sleep quality in the past month (12,14). PSQI has been translated and validated in Iran by another study (15). The entire questionnaire requires 5 to 10 minutes to complete and 5 minutes to score.

GHQ-28 consists of 28 questions designed for evaluating the general health in the past month. The questions are divided into four 7-

question groups that lead to the assessment of the following 4 indices: somatic symptoms, anxiety symptoms, social functions, and depressive symptoms. All of the questions are equally weighted on a scale of 0 to 3 and the final score would be from 0 to 84. A global score equal or greater than 23 signals poor general health in the past month. GHQ-28 has also been translated and validated in Iran (16). It takes about 8 minutes to fill the questionnaire and 3 additional minutes to score it.

In the schools after explaining the study aim, the students were asked to fill consent form and then PSQI and GHQ-28. A limited time equal to 20 minutes was given to them. As 57 questionnaires were incomplete, only 943 students out of all participants entered into the final analysis. The number of girls was 462 and 481 were boys.

### Statistical analysis

SPSS software was used for statistical analysis. Analysis was applied for general description of the questionnaires results, comparison of the score of girls and boys groups with 95% confidence interval and 0.05 level of significance and correlation evaluation between instruments' results. Associations were assessed using chi-square test, regression model and Pearson correlation coefficient.

### Results

Among all of the participants, 56% were grouped as poor sleepers. Although sleep disturbance symptoms were very common but, most of the students described their sleep quality as very good or fairly good (Table 1). Regarding the sex differences, poor sleep quality in girls was significantly more than boys. Girls went to bed sooner, fell asleep later, had shorter sleep duration, less habitual sleep efficiency, more sleep disturbances, and more daytime dysfunction (Table 1). The difference in these items between girls and boys was significant.

According to the results of GHQ-28, 42% of all students had poor general health. The distribution between boys and girls was 33% and 52%, respectively, with significant difference ( $p < 0.05$ ).

Among poor sleepers, poor general health and among good sleepers, good general health were more common (Table 2). Also there was

a significant relationship between the quality of sleep and the general health. In addition, Pearson correlation coefficient was positive and equal to 0.506 ( $p < 0.05$ ) (Figure 1).

Among poor sleepers, girls' scores in somatic and anxiety components of GHQ-28 were significantly higher than boys, but in social function and depressive components there were no significant difference between girls and boys (Table 3). In comparison to students with good general health, those with poor general health had more sleep latency, shorter sleep duration, less habitual sleep efficiency, more frequent sleep disturbances, and more frequent daytime dysfunction (Table 4).

## Discussion

The high prevalence of poor sleep quality (56%) was the most important finding of this survey. In the United States, 16.3% of adolescents (17), 25.9% of adults older than 18 (7) and 71% of college students (18) suffer from at least one type of sleep problems. Also in France 40% (4), in China 16.9% (10), in Italy 37% (19), and in Taiwan 40% (20) of adolescents suffer from sleep disturbances. A longitudinal study that followed up the adolescents up to young adulthood found that the proportion of subjects that reported not attaining sufficient sleep ranged between 54% and 75% in the period from early adolescent to young

**Table 1 :** Results of PSQI in All Students and According Gender

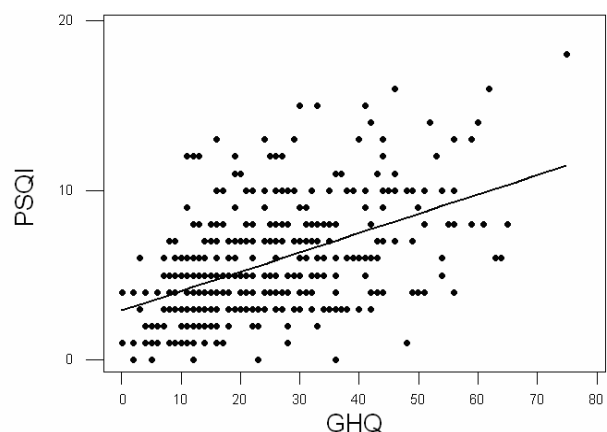
PSQI items	Statistical Characters	Total	Boys	Girls	P-value
Time of going to bed (hr PM)	mean( $\pm$ SD)	11.5 ( $\pm$ 0.5)	11.85 ( $\pm$ 0.26)	10.75 ( $\pm$ 0.4)	<0.05
Time of getting up (hr AM)	mean( $\pm$ SD)	6.5 ( $\pm$ 0.3)	6.7 ( $\pm$ 0.25)	6.3 ( $\pm$ 0.3)	>0.05
Subjective sleep quality (%)	Frequency of very and fairly good state	84%	86%	83%	>0.05
Sleep latency (min)	mean( $\pm$ SD)	30 ( $\pm$ 3.0)	22 ( $\pm$ 5.0)	37 ( $\pm$ 4.0)	<0.05
Sleep duration (hr)	mean( $\pm$ SD)	6.5 ( $\pm$ 0.5)	6.8 ( $\pm$ 0.4)	6 ( $\pm$ 0.3)	<0.05
Habitual sleep efficiency	mean( $\pm$ SD)	86% ( $\pm$ 6.0)	95% ( $\pm$ 3.0)	84% ( $\pm$ 4.0)	<0.05
Sleep disturbances (%)	Frequency of at least once a week	88%	82%	94%	<0.05
Use of sleep medications (%)	Frequency of at least once a week	7%	6%	8%	>0.05
Daytime dysfunction (%)	Frequency of at least once a week	74%	66%	83%	<0.05
Poor sleep quality (%)	Frequency of $\geq$ 5 global score	56%	43%	70%	<0.05

**Table 2.** Frequency of Good and Poor General Health in Good and Poor Sleepers

	GHQ<23	GHQ $\geq$ 23	P-value
PSQI<5	55%	45%	<0.05
PSQI $\geq$ 5	45%	55%	<0.05

**Table 3.** The differences between Boys and Girls in GHQ-28 Subscale Scoring among Poor Sleepers.

GHQ-28 subscales	Boys (mean $\pm$ SD)	Girls (mean $\pm$ SD)	p-value
Somatic symptoms	5.41 ( $\pm$ 3.06)	8.04 ( $\pm$ 4.14)	<0.05
Anxiety symptoms	5.92 ( $\pm$ 3.84)	8.03 ( $\pm$ 4.32)	<0.05
Social function	7.68 ( $\pm$ 4.05)	7.77 ( $\pm$ 4.24)	>0.05
Depressive symptoms	5.2 ( $\pm$ 5.23)	6.54 ( $\pm$ 5.93)	>0.05



**Figure 1.** Correlation between PSQI and GHQ-28 Scores

**Table 4.** The Differences between Students with Good and Poor General Health Expressed in Terms of PSQI Components.

PSQI components	Statistical Characters	GHQ<23 ( $\pm$ SD)	GHQ $\geq$ 23( $\pm$ SD)	P-value
Subjective sleep quality	Frequency of very and fairly good state	75% ( $\pm$ 7.0)	70% ( $\pm$ 6.0)	>0.05
Sleep latency	Minutes mean	30 ( $\pm$ 5.0)	45 ( $\pm$ 7.0)	<0.05
Sleep duration	Hours mean	6.5 ( $\pm$ 0.5)	5.9 ( $\pm$ 0.4)	<0.05
Habitual sleep efficiency	Mean	85% ( $\pm$ 5.0)	73% ( $\pm$ 6.0)	<0.05
Sleep disturbances	Frequency of at least once a week	75% ( $\pm$ 4.0)	85% ( $\pm$ 6.0)	<0.05
Use of sleep medications	Frequency of at least once a week	8% ( $\pm$ 2.0)	10% ( $\pm$ 3.0)	>0.05
Daytime dysfunction	Frequency of at least once a week	64% ( $\pm$ 5.0)	80% ( $\pm$ 6.0)	<0.05

adulthood (21). So, sleep disturbances are common among adolescents. Physical and social developments (22), emotional and behavioral problems (23), substance use and misuse (24), and stress (12) experienced by this age group have been suggested as probable causes. In Iranian adolescents, national entrance exams of universities and living in a developing country may have an exaggerating role in increase of the prevalence of poor sleep quality in this age group. Additionally, organic or psychiatric disorders (that we didn't screen them) and high prevalence of poor general health among participants (that need cause and effect study) can be suggested as the other important factors that can potentially contribute to high prevalence of poor sleep quality. Further etiological studies are required to clarify the reasons of high observed prevalence of poor sleep quality. From the practical point of view, because poor sleep quality has a great impact on school functioning (2) screening of sleep problems in students by education system is very important, especially in students who have school problems.

Another interesting finding of this study is the significant difference between the subjective and the objective measures of the sleep quality. From the objective aspect, the results of PSQI showed that 56% of all participants had poor sleep quality, 88% of them had sleep disturbances and 74% had daytime dysfunction. At the same time, 84% of the participants reported their subjective sleep quality as very good or fairly good and only 7% used sleep medications. In explanation of this discrepancy, there are some possibilities: firstly, participants didn't know that their symptoms (e.g. snoring or difficulty to keep up enthusiasm to get things done) relate to a kind of sleep problem, so reported their subjective sleep quality well or very well. Secondly, in assessing poor sleep quality both subjective and objective assessments of sleep quality should be considered because the two are only moderately correlated (25,26) and that subjective sleep reports may partly reflect an individual's perspective or state of mind in addition to some component of their objective sleep patterns (27); and finally it may be due to unreliable answers of participants. To exact

clarification of reason, further research should be done. This finding suggests that the health system should try to increase the general public's knowledge about sleep health (e.g. by medias), and also the physicians should assess sleep problems in detail and more carefully. Poor experience of medical practitioners and lack of systematic approach to sleep problems may lead to late detection and even not detection of sleep problems (7). There are a few sleep centers and no fellowship courses of sleep in Iran. Our findings together with these points highlight the need to educate physicians more about the sleep. This also suggests the need for training sleep specialists.

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This study showed that poor sleep quality and its determinants are more common among the girls. There are dozens of studies that support this finding (1,12,28,29). This may be due to neurotic disorders that are more common in the girls (28,29). Also more attention of the females to their somatic symptoms can cause more reports about the sleep difficulties in this group (1).

Our study revealed a close correlation between self assessed quality of sleep and self assessed general health. This finding replicates the idea that the sleep quality can be used as an indicator of the general health (12) and is consistent with the studies that suggest a bidirectional relationship between the sleep and general health statuses of adolescents in which either can be the cause or result of the other (10,22,30). We should emphasize that it is necessary for the physicians to evaluate the sleep systematically, rather than by asking a general question about it. This last point is because of the difference between the subjective and objective measures of the sleep quality as pointed above.

Our study has also some limitations. We did not investigate possible causes of poor sleep quality and poor general health. Also, the consequences of poor sleep quality should be studied. As both PSQI and GHQ-28 assess participants during the past month, so we could not differentiate acute and chronic problems, or short term and long term consequences of poor sleep quality. Finally, although there are reports showing correlation between the results of PSQI and that of sleep lab studies (31), but such lab study was not applied in the present study.

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