Objective: This study aimed to investigate subjective sleep quality and its association with demographics, psychological health, and sleep hygiene related behaviors in pre-clinical medical students. Methods: In this cross-sectional study, a self-administered questionnaire consisting of demographics, sleep hygiene behaviors, Pittsburgh Sleep Quality Index (PSQI), and Depression, Anxiety and Stress Scale-21 (DASS21) was handed out to all medical students of Tehran University of Medical Sciences at pre-clinical stage. Results: The questionnaire was filled out by 553 (89.7%) of 616 students approached. About 60% of our sample had a global PSQI score of more than 5 (cut off of poor sleep quality) with mean global PSQI score of 6.32 (SD=2.72). The prevalence of moderate to extremely severe depression, anxiety and stress scores were 26.1%, 29.61%, and 14.5% respectively. Poor sleep quality was associated with later year in the school, psychological distress and several lifestyle behaviors. Constructing a multivariate logistic model, depression, anxiety and some sleep hygiene behaviors were significantly associated with higher PSQI score. Discussion: Our findings suggest that poor sleep quality is a common problem among pre-clinical medical students and is associated with some psychological symptoms and sleep hygiene behaviors. This issue demonstrates necessity of interventions to improve the sleep quality in this population group. Keywords: sleep; Students; Medical; behavior.
INTRODUCTION

Pre-clinical medical students are in a critical period of acquiring the necessary knowledge and experience that would be useful for the rest of their education and career. Therefore, this period necessitates complete physical and mental health. In addition, high level of academic burden on students, exposes them to an increased risk of different sleep problems and its related consequences. In one study prevalence of daytime sleepiness is estimated to be as high as about 50% amongst students, whilst it is only 36% amongst the general population. In another study, it was shown that 40.6% of medical students suffer from poor sleep quality.

It can be hypothesized that several lifestyle behaviors, environmental and psychological factors were associated with poor sleep quality and quantity. Sleep hygiene is a set of behaviors that is believed to have a positive effect on both sleep quality and quantity. Alcohol use, caffeine and energy drinks, stimulants and frequent use of technology such as phone or computers before sleep are among common behaviors that are incompatible with sleep hygiene. Environmental conditions like living in dormitories have been associated with poor sleep quality in previous studies. Psychological problems such as depression, anxiety, and stress have been associated with sleep disorders such as insomnia.

Clinical stage of medical training starts at the fourth year in the usual curriculum of the Iranian medical schools and it’s associated with the night calls and shifts. Whilst public student communities and some special populations have been studied, to the best of our knowledge, no extensive study on the sleep condition and its associated factors among medical students at pre-clinical stages has been carried out. In this study, we aimed to focus on this distinct subgroup of students and we aimed to (1) assess sleep quality amongst different subgroups of medical students of Tehran University of Medical Sciences at the pre-clinical stage, and then to (2) identify specific lifestyle behaviors, environmental and psychological factors associated with poor sleep quality amongst them.

MATERIAL AND METHODS

Participants and procedures

This is a cross-sectional questionnaire-based study conducted from December 2013 to January 2014 and all medical students of Tehran University of Medical Sciences at first, second, and third years (616 students) were invited to participate. Medical students at this level of education are at pre-clinical stage and do not have night calls or shifts. The questionnaires were administered on paper. Time for the distribution of the self-administered questionnaires was chosen carefully paying attention to the exams schedule of the students such that they had no exam over a period of 2 weeks before and after filling out the questionnaires. The study protocol was approved by institutional review board and ethic committee of Tehran University of Medical Sciences.

MEASURES

Demographics and sleep hygiene

The survey included demographic questions assessing age, gender, and year at medical school, marital and residential status and the number of their roommates. The latter includes the number of people who shared the same living environment in the dormitory (e.g., a suite or a room). We also assessed students’ sleep hygiene and lifestyle behaviors by asking them 10 questions with responses including ‘never’, ‘sometimes’, ‘often’ and ‘almost always’ in regard to taking afternoon naps lasting at least one hour, going to bed at different times from day to day, getting out of bed at different times from day to day, using bed for activities other than sleeping, consumption of caffeinated drinks such as coffee, teas and energy drinks before bedtime, using electronic devices before bedtime, going to bed late in order to study for exams, difficulty sleeping because of different sleep schedules of roommate(s), having an uncomfortable room and sleeping on an uncomfortable bed. We customized questions based on previous similar studies. Each question was analyzed separately with no global score.

Sleep quality

Pittsburgh Sleep Quality Index (PSQI) was used to assess students’ subjective sleep quality. This is an internationally recognized tool for the evaluation of sleep quality during a preceding month and consists of 19 items which are combined to form seven subscales: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. Each item was scored on a 3 point scale (ranging from 0 for non-difficulty to 3 for severe difficulty) and the combination of seven subscales yields the global PSQI score which ranges from 0 to 21. Scores greater than 5 have been shown to be indicative of poor sleep quality.

The PSQI has a high degree of internal consistency with an overall reliability coefficient (Cronbach’s α) of 0.83 in the original article. The global cutoff score of 5 for distinguishing poor from good sleep quality has a sensitivity of 86.9% and a specificity of 86.5%. Although these figures were calculated based on a study with different sample properties (52 controls, 34 poor sleepers with major depression, 62 physician-referred poor sleepers; with mean ages of 59.9, 50.9 and 44 respectively), the PSQI has been previously used in several studies to assess medical students’ sleep quality. Reliability and validity of the Persian version of PSQI (PSQI-P) were verified in a study conducted by Farrahi Moghaddam et al. The overall reliability coefficient of the questionnaire was 0.73 in this study.

Depression, anxiety, and stress

Depression, Anxiety, and Stress Scale-21(DASS-21) was used to assess students’ mental health. Recommended cutoff points for each subscale are as follows: Depression [normal (0-9), mild (10-13), moderate (14-20), severe (21-
parametric analysis. All variables with a score was 6.32 (SD=2.72). There were 332 (60.0%) participants shown in Table 1. Among all students, the mean global PSQI the mean of 4.15 (SD=1.47) roommates. Only 4 (0.7%) stu-
dormitories, the number of roommates ranges from 1 to 9, with alone, or with a friend or other forms. From those who live in their families or in university dormitories (262 [47.4%] and 230 [41.6%] respectively), and the remaining (58 [10.5%]) either live alone, or with a friend or other forms. From those who live in dormitories, the number of roommates ranges from 1 to 9, with the mean of 4.15 (SD=1.47) roommates. Only 4 (0.7%) students in this survey were married, all others were single.

RESULTS
Demographics
The questionnaire was filled out by 553 (89.7%) of the 616 students approached (63 questionnaire were not returned or eliminated due to missing data in PSQI), including 268 (48.5%) males and 281 (50.8%) females. Of these, 177 (32%) were first-year, 84 (15.2%) second-year, and 292 (52.8%) third-year med-
imal students (our data is compatible with the total number of cal students (Sleep Foundation’s recommendation21, considering that “op-
timal” sleep duration may be even longer22. The mean global score of the different demographic subgroups is shown in Table 2. According to the data in this table, earlier class years -value=0.026).

A post hoc Tukey test showed that global PSQI score of first year and second year students differs significantly (p-value=0.02), while other pairs doesn’t have any significant difference. There was no significant difference in sleep quality based on gender and residency status. There was also no significant association between number of roommates and global PSQI score (r=−0.02, p-value=0.85). Association between sleep quality and marital status couldn’t be investigated because of the small frequency of married students.

DASS-21
Mean DASS-21 score for depression, anxiety, and stress

were 9.70 (SD=6.99), 6.93 (SD=5.96), 6.01 (SD=3.42) re-
spectively. Frequency and percentage of students with psychological distress are shown in Table 3. An overall prevalence of moderate to very severe depression, anxiety and stress was found to be 26.1%, 29.61% and 14.5%, respectively. The students with better psychological status had significantly lower global PSQI scores (p-value<0.0001).

A post hoc Tukey test showed that all pairs of psychological levels have significant difference in global PSQI score (p-value<0.05) except mild vs. moderate and moderate vs. severe levels in depression, anxiety and stress category; in addition to severe vs. extremely severe levels in depression and anxiety category; and normal vs. mild levels in anxiety category.

PSQI
The mean component scores and mean global scores are shown in Table 1. Among all students, the mean global PSQI score was 6.32 (SD=2.72). There were 332 (60.0%) participants with a global PSQI score>5 which are classified as “poor sleepers”, and 221 (40%) with a score of ≤5 which are classified as “good sleepers”. Subjective sleep quality, sleep duration and daytime dysfunction had means above 1, identifying these components as the main contributors to the global PSQI score18.

Analysis of sleep timing shows that 129 (23.32%) stu-
dents go to bed before midnight and 424 (76.68%) after mid-
night. Mean sleep duration was 6.32 (SD=1.43), and only 184 (33.3%) reported sleeping 7 hours or more as the “minimum” required sleep time in this generation according to National Sleep Foundation’s recommendation21, considering that “optimal” sleep duration may be even longer22. The mean global score of the different demographic subgroups is shown in Table 2. According to the data in this table, earlier class years reported better sleep quality compared with the later class years (p-value=0.026).

A post-hoc Tukey test showed that global PSQI score of first year and second year students differs significantly (p-value=0.02), while other pairs doesn’t have any significant difference. There was no significant difference in sleep quality based on gender and residency status. There was also no significant association between number of roommates and global PSQI score (r=−0.02, p-value=0.85). Association between sleep quality and marital status couldn’t be investigated because of the small frequency of married students.

DASS-21
Mean DASS-21 score for depression, anxiety, and stress

were 9.70 (SD=6.99), 6.93 (SD=5.96), 6.01 (SD=3.42) respec-
tively. Frequency and percentage of students with psychological distress are shown in Table 3. An overall prevalence of moderate to very severe depression, anxiety and stress was found to be 26.1%, 29.61% and 14.5%, respectively. The students with better psychological status had significantly lower global PSQI scores (p-value<0.0001).

A post hoc Tukey test showed that all pairs of psychological levels have significant difference in global PSQI score (p-value<0.05) except mild vs. moderate and moderate vs. severe levels in depression, anxiety and stress category; in addition to severe vs. extremely severe levels in depression and anxiety category; and normal vs. mild levels in anxiety category.

Table 1. PSQI global and subscale means.

| Sleep quality    | Mean | SD  |
|------------------|------|-----|
| Global PSQI      | 6.32 | 2.72|
| Subscales        |      |     |
| Subjective sleep quality | 1.08 | 0.71|
| Sleep latency    | 0.97 | 0.86|
| Sleep duration   | 1.19 | 0.84|
| Habitual sleep efficiency | 0.22 | 0.19|
| Sleep disturbances | 0.89 | 0.47|
| Use of sleep medications | 0.12 | 0.14|
| Daytime dysfunction | 1.84 | 0.90|

PSQI=Pittsburgh Sleep Quality Index.
Sleep hygiene

Frequency and percentage of responses “never or sometimes” and “often or almost always” to each question are as shown in Table 4. We grouped the responses to summarize the data, however statistical analysis without grouping the responses showed similar results. According to these results, poor sleepers tend to ‘take daytime naps lasting one hour or more’, ‘go to and out of bed at different times from day to day’, ‘drink caffeine-containing drinks within 4 hours before bedtime’, ‘use electronic devices before bedtime’, ‘go to bed late because they have to study’, ‘have a disturbed sleep due to the different sleep-wake schedules of their roommates’, and/or ‘sleep in an uncomfortable room’.

Associated factor with poor sleep quality

To evaluate factors associated with poor sleep quality, we constructed a multivariate logistic model from all variables with a p-value < 0.1 in univariate analysis plus gender. Global PSQI score > 5 was considered as the dependent variable in the logistic regression model. As presented in Table 5, depression, anxiety and some sleep hygiene behaviors were found to be significantly associated with poor sleep quality.

### DISCUSSION

Pre-clinical students go through an intensive course before entry into the clinical wards and contact with patients. It is thus useful to monitor the well-being of these students before they proceed to the next stage. There are limited researches investigating sleep habits of this subgroup which can have both health and academic implications. Our study aimed to evaluate sleep quality and its related factors amongst medical students at the pre-clinical stage.

Our results showed that over half of participant in our study revealed poor sleep quality and about 60% of our sample had a global PSQI score of more than 5 (cutoff point for poor sleep quality) with mean global PSQI score of 6.32 (SD=2.72)16,20. This can be explained by several factors that were partially investigated in this study. We observed no significant difference in sleep quality among male and female students, which is consistent with the findings of another study conducted by Cates et al.21. However, some studies have reported that female medical students have a poorer sleep quality compared with male medical students16,21. It seems likely that cultural differences between countries may play a role in the differences between these results.

The differences in sleep quality between students of different year groups observed in this study is in contrast with the

### Table 2. Association between demographics and sleep quality (mean PSQI score).

| Characteristics | Number (%) | Mean (SD) PSQI Score | p-value |
|-----------------|------------|---------------------|---------|
| Year in the curriculum | | | |
| 1 | 84 (15.2%)  | 6.93 (3.35) | 0.026a |
| 2 | 292 (52.8%) | 6.36 (2.63) | |
| Missing data | 0 (0%) | | |
| Gender | | | |
| Male | 268 (48.5%) | 6.21 (2.63) | 0.311 |
| Female | 281 (50.8%) | 6.44 (2.80) | |
| Missing data | 4 (0.7%) | | |
| Residency | | | |
| With family | 262 (47.4%) | 6.18 (2.76) | |
| Dormitory | 230 (41.6%) | 6.58 (3.07) | 0.496 |
| Other | 58 (10.5%) | 7.17 (2.63) | |
| Missing data | 2 (0.5%) | | |
| Marital status | | | |
| Single | 548 (99.1%) | 6.30 (2.70) | |
| Married | 4 (0.7%) | 8.50 (4.66) | |
| Missing data | 1 (0.2%) | | |
| Number of roommates | | | |
| 1-3 | 67 (29.1%) | 6.31 (2.45) | 0.013 |
| 4-6 | 141 (61.3%) | 6.54 (2.62) | |
| 7-9 | 22 (9.6%) | 6.32 (2.83) | |
| Missing data | 0 (0%) | | |

PSQI=Pittsburgh Sleep Quality Index
SD=Standard Deviation

### Table 3. Association between psychological disorders and sleep quality (mean global PSQI score).

| Psychological disorder | Number (%) | Mean Global PSQI score (SD) | p-value |
|------------------------|------------|----------------------------|---------|
| Depression | | | |
| Normal | 295 (53.3%) | 5.52 (2.30) | |
| Mild | 98 (17.7%) | 6.53 (2.21) | <0.0001 |
| Moderate | 101 (18.3%) | 7.40 (2.62) | |
| Severe to extremely severe | 38 (6.9%) | 9.32 (3.87) | |
| Anxiety | | | |
| Normal | 319 (57.7%) | 5.67 (2.37) | |
| Mild | 62 (11.2%) | 6.39 (2.39) | <0.0001 |
| Moderate | 101 (18.3%) | 6.98 (2.70) | |
| Severe to extremely severe | 59 (10.7%) | 8.61 (3.18) | |
| Stress | | | |
| Normal | 381 (68.9%) | 5.22 (2.84) | <0.0001 |
| Mild | 72 (13%) | 5.82 (2.35) | |
| Moderate | 53 (9.6%) | 7.10 (2.48) | |
| Severe to extremely severe | 24 (4.3%) | 7.85 (2.47) | |
| Missing data | 23 (4.2%) | | |

PSQI=Pittsburgh Sleep Quality Index
SD=Standard Deviation

* Post-hoc test showed that the difference is significant in all levels (p-value<0.05) except mild vs. moderate, moderate vs. severe and severe vs. extremely severe levels.

** Including alone, with friend or other undetermined forms.

*** Because of low number of married students, p-value was not calculated.
Table 4. Association between sleep hygiene and sleep quality.

| Question                                                                 | Never & Sometimes (%) | Often & Almost Always (%) | Missing data | p-value a |
|--------------------------------------------------------------------------|------------------------|----------------------------|--------------|-----------|
| I take daytime naps lasting one hour or more                             | 334                    | 217                        | 2            |           |
| Poor sleepers b                                                         | 179 (53.9%)            | 151 (45.5%)                | 2 (0.6%)     | <0.0001   |
| Good sleepers c                                                          | 155 (70.1%)            | 66 (29.9%)                 | 0            |           |
| I go to bed at different times from day to day                           | 428                    | 120                        | 5            |           |
| Poor sleepers                                                            | 257 (71.4%)            | 91 (27.7%)                 | 4 (1.2%)     | <0.0001   |
| Good sleepers                                                            | 191 (86.4%)            | 29 (13.2%)                 | 1 (0.5%)     |           |
| I go out of bed at different times from day to day                       | 447                    | 79                         | 27           |           |
| Poor sleepers                                                            | 248 (74.7%)            | 63 (19%)                   | 21 (6.3%)    | <0.0001   |
| Good sleepers                                                            | 199 (90%)              | 16 (7.2%)                  | 6 (2.7%)     |           |
| I use bed for activities other than sleeping                             | 335                    | 216                        | 2            |           |
| Poor sleepers                                                            | 193 (58.1%)            | 138 (41.6%)                | 1 (0.3%)     | 0.084     |
| Good sleepers                                                            | 142 (64.3%)            | 78 (35.3%)                 | 1 (0.5%)     |           |
| I drink caffeine containing drinks such as tea, coffee or energy drinks within 4 hours before bedtime | 401                    | 151                        | 1            |           |
| Poor sleepers                                                            | 221 (66.6%)            | 110 (33.1%)                | 1 (0.3%)     | <0.0001   |
| Good sleepers                                                            | 180 (81.4%)            | 41 (18.6%)                 | 0            |           |
| I use electronic devices such as TV, computer or cell phone before bedtime | 105                    | 446                        | 2            |           |
| Poor sleepers                                                            | 47 (14.2%)             | 283 (85.2%)                | 2 (0.6%)     | <0.0001   |
| Good sleepers                                                            | 58 (26.2%)             | 163 (73.8%)                | 0            |           |
| I go to bed late because I have to study my lessons                      | 375                    | 171                        | 7            |           |
| Poor sleepers                                                            | 216 (65.1%)            | 112 (33.7%)                | 4 (1.2%)     | 0.049     |
| Good sleepers                                                            | 159 (71.9%)            | 59 (26.7%)                 | 3 (1.4%)     |           |
| My roommates prevented me from sleeping because of their different sleep-wake schedule | 433                    | 53                         | 67           |           |
| Poor sleepers                                                            | 248 (74.7%)            | 43 (43%)                   | 41 (12.3%)   | 0.001     |
| Good sleepers                                                            | 185 (83.7%)            | 10 (4.5%)                  | 26 (11.8%)   |           |
| I sleep on an uncomfortable bed                                          | 512                    | 35                         | 6            |           |
| Poor sleepers                                                            | 303 (91.3%)            | 26 (7.8%)                  | 3 (0.9%)     | 0.071     |
| Good sleepers                                                            | 209 (94.6%)            | 9 (4.1%)                   | 3 (1.4%)     |           |
| I sleep in an uncomfortable room                                         | 517                    | 33                         | 3            |           |
| Poor sleepers                                                            | 302 (91%)              | 28 (8.4%)                  | 2 (0.6%)     | 0.003     |
| Good sleepers                                                            | 215 (97.7%)            | 5 (2.3%)                   | 1 (0.5%)     |           |

a p-value is referred to categories of subjects (poor sleepers vs. good sleepers)
b defined as PSQI global score > 5c defined as PSQI global score > 5
c defined as PSQI global score ≤ 5

The results of previous studies. Later years reported worse sleep quality compared with the former class years. One explanation for this phenomenon can be that later year students face a relatively heavier educational burden and this issue may affect the psychological distress among them. Another hypothesis is that as students get older, they take more time with their friends instead of their families in the university and dormitories, so this fact can adversely affect sleep hygiene.

High prevalence of psychological distress and its strong association with poor sleep quality amongst medical students were also observed in the present study. Similar results have been reported by previous studies using DASS-21. A depression prevalence of 37.2%, an anxiety prevalence of 63%, and a stress prevalence of 23.7% among Malaysian medical students have been reported. According to a study in Saudi Arabia, the prevalence of moderate to extremely severe level of depression, anxiety, and stress among Saudi Arabian medical students were 52.4%, 46%, and 56% respectively.

It seems that high academic burden on medical students plays a major role in the prevalence of psychological distress. Although sleep disturbance can be either a cause or a symptom of psychological distress or simply be a comorbidity, there is some evidence that shows psychological distress can be caused by insomnia. In view of these, prompt attempt should be made to better understand the nature of relation between sleep status and psychological distress. Studies are needed to find out the most important causes and consequences of psychological distress.

Sleep hygiene has a considerable role in the quality of sleep among medical students. Poor sleep hygiene have been
Table 5. Multiple regression model of factors associated with poor sleep quality.

| Characteristics                           | Crude OR (95% CI) | Adjusted OR (95% CI) | p-value(For Adjusted OR) |
|-------------------------------------------|-------------------|----------------------|--------------------------|
| Year in the curriculum                    |                   |                      |                          |
| 1                                         | 1                 |                      |                          |
| 2                                         | 0.68 (0.54-1.48)  | 0.91 (0.52-1.61)     | 0.76                     |
| 3                                         | 1.13 (0.77-1.65)  | 0.98 (0.64-1.51)     | 0.94                     |
| Gender                                    |                   |                      |                          |
| Female a                                  | 0.78 (0.55-1.10)  | 1.34 (0.93-1.97)     | 0.12                     |
| Psychological disorder                    |                   |                      |                          |
| Depression b                              | 2.22 (1.28-3.24)  | 1.86 (1.17-2.82)     | 0.007                    |
| Anxiety                                   | 2.63 (1.75-3.82)  | 1.93 (1.15-2.69)     | 0.009                    |
| Stress                                    | 1.20 (0.69-2.11)  | 1.48 (0.90-2.44)     | 0.12                     |
| Sleep hygiene behaviors                   |                   |                      |                          |
| I go to bed at different times from day to day c | 2.10 (1.60-2.77)  | 1.87 (1.07-3.26)     | 0.03                     |
| I go out of bed at different times from day to day | 2.03 (1.53-2.71)  | 1.27 (0.77-2.08)     | 0.35                     |
| I drink caffeine containing drinks such as tea, coffee or energy drinks within 4 hours before bedtime | 1.76 (1.43-2.18)  | 2.20 (1.46-3.32)     | <0.0001                  |
| I use electronic devices such as TV, computer or cell phone before bedtime | 1.64 (1.33-2.01)  | 1.87 (1.07-4.69)     | 0.18                     |
| I go to bed late because I have to study my lessons | 1.27 (1.02-1.58)  | 1.11 (0.63-1.95)     | 0.73                     |
| My roommates prevented me from sleeping because of their different sleep-wake schedule | 1.55 (1.20-2.02)  | 1.25 (0.84-1.88)     | 0.27                     |
| I sleep on an uncomfortable bed           | 1.44 (1.06-1.94)  | 1.07 (0.62-1.85)     | 0.80                     |
| I sleep on an uncomfortable room          | 1.79 (1.32-2.46)  | 1.14 (0.69-1.88)     | 0.61                     |

PSQI=Pittsburgh Sleep Quality Index
CI=Confidence Interval
a Male is considered as reference
b Normal is considered as reference
c Response never is considered as reference
Global PSQI score > 5 is considered as the dependent variable in the logistic regression model.

previously reported to associate poor sleep quality by several studies3,27. However, after controlling for confounders, besides depression and anxiety, only irregularity of the time to go to bed, and caffeine use were the significant explanatory variables. In other words, our results show that some of the sleep hygiene behaviors are not so important when the psychological symptoms, irregularity sleep schedule, and caffeine intake were controlled and there is confounding between sleep hygiene and psychological symptoms.

To the best of our knowledge, there is no extensive study investigating association between psychological symptoms and sleep hygiene behaviors, and their relationship with sleep quality. As next steps, studies with longitudinal designs (that allow for cross-lagged analysis) are proposed to better understand the most important and effective components of sleep hygiene behaviors and their potential confounders.

This is a cross sectional study with a high response rate of 89.7%, and it’s the first study that focuses on pre-clinical students’ sleep quality in an Iranian population. The use of a standardized measure for sleep quality and psychological distress is another advantage of the present study. To the best of our knowledge, no previous study has examined the relationship between psychological distress and sleep quality using both DASS-21 and PSQI standard measures. However, there are several limitations in our study. First of all, the cross-sectional methodology limits our ability to measure sleep quality changes as the students go through the different levels of the preclinical stage, and also prevents us from finding causality relationship between the different factors.

It is still unclear that factors associated with poor sleep quality are a cause or consequence or simply a comorbidity, so determining the most appropriate intervention needs further investigations. The use of objective measure of sleep pattern such as polysomnography could also lead to additional data, however, it seems that there is a strong relation between subjective and objective measurements28. Further longitudinal and interventional studies are needed to overcome these limitations.

CONCLUSION

To summarize, this study investigated the sleep quality and its related factors amongst pre-clinical medical students of Tehran University of Medical Sciences. We showed that poor sleep quality is a common problem in the population of students, and it’s associated with later year in the school, psychological distress and poor sleep hygiene. This study provides a better vision of factors associated with poor sleep quality and points to the need for further evaluation of sleep problems.

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Sleep quality and related factors

Conflict of interest: The authors declare that they have no conflict of interest.

Compliance with ethical standards: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional the study was approved by the institutional ethic committee (IR.TUMS.REC.1394.967).

Informed consent: Informed consent was obtained from all individual participants included in the study verbally.

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