

The Relationship Between Quality of Sleep, Stress And Coping Among First Year Female Students of University of Colombo

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Research Article

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Abstract

Background: Sufficient and restorative sleep is important to mental and physical wellbeing. The university education as an undergraduate is stressful and can have detrimental effects on the mental state of the students leading to poor sleep quality and stress, requiring use of coping strategies. This study is aimed to identify the prevalence and the correlation between sleep quality, stress and coping among university students.

Methods: A cross sectional study was conducted in a University in Sri Lanka among 200 participants from five selected faculties. A self-administered questionnaire, Pittsburg Sleep Quality Index (PSQI), Depression Stress Anxiety Scale-21(DASS 21) and brief COPE inventory was administered using consecutive random sampling to the participants. The results were analyzed using SPSS 20.0 with one-way ANOVA and Pearson correlations.

Results: 82.5% (n= 165) of subjects reported poor sleep quality. There was a positive strong correlation between sleep quality and stress ($r=0.526$, $p=0.000$). Among the poor sleepers, 57.6% (n= 95) were stressed. The stress was positively correlated with self-blame, planning, denial and emotional support in the COPE inventory. The correlation with quality of sleep with coping strategies was statistically significant. The highest mean of global PSQI score (10.33 ± 4.202) was observed among students from Law faculty with 95% experienced poor sleep quality. The highest correlation between sleep quality and stress among students from medical faculty ($r= 0.614^{**}$, $p= 0.000$) while the highest percentage of students, 61.9% were stressed.

Conclusions: The majority of university undergraduates were affected with poor quality of sleep and stress. The students use various coping strategies to cope with stress. There was a strong relationship between sleep quality, stress and coping. The sleep quality depended on stress as well coping strategies effected on sleep quality. This study highlights the importance of focused interventions on quality of sleep, stress and coping among university students.

Background

University education as a fresher is considered highly stressful and therefore can have adverse effects on the psychological state of the students. The students have to adapt to a new lifestyle consisting of learning, examinations, peer pressure and living in a whole new environment, away from home and protective environment of the family. Additionally, significant psychological distress can be caused by the sudden switch of teaching and learning methods from school education to undergraduate education, leading to changes in academic performance. Therefore, most students struggle to balance newly found freedom, social life, educational activities and time management. Most of the students compromise their sleep to engage in their activities, especially studies.[1]

Sleep is one of the essential components of optimal health.[2] A night of sufficient and restorative sleep is necessary to maintain optimal mental and physical wellbeing. Troubled sleep is a predictive sign and a

symptom of illnesses and therefore decline of quality of life.[3] Sleep quality is measured qualitatively and quantitatively. The quantitative component of sleep mainly comprises duration, while the qualitative components include depth of sleep and restfulness upon awakening.[2] Commonly stated causes the students with poor sleep quality have described the reasons for their poor sleep quality as poor sleep habits and patterns like insubstantial sleep, irregular bedtimes on weekdays and weekends.[4]. A research carried out in Finland revealed that more frequent waking up during the night is complained mainly by female students. One-fifth of the students complained about sleeping problems at least weekly during the first year. It can be detectable at the point of somatic and emotional symptoms are apparent. Academic stress is common among first-year University students.[5]

There is a strong relationship between coping style and sleep, because sleep changes according to the coping style. Coping is a necessary action and a cognitive process that makes people handle their stressors. Depending on the selection of coping strategies, it gives positive or negative direction [6]. University students have coping strategies like spending time with friends, sleeping, engaging in music and sports and spending time alone. When female students are concerned, they prefer to study and sleep.

Nevertheless, the male students cope with their stressors by spending time with friends, playing, and isolating themselves from others.[7] The coping strategies are described as adaptive and maladaptive coping strategies. Adaptive coping strategies included active coping, planning, positive reframing, acceptance, humor, religion, emotional support, and instrumental support. The maladaptive coping strategies were self-distraction, denial, venting negative emotion, substance use, behavioral disengagement, and self-blame. [6]

According to previous studies, insufficient sleep, and irregular sleep–wake patterns, which have been seen in younger adolescents, are also present at alarming levels in university students. There was a close relationship between sleep quality and physical and mental health [3,8]. When comparing the University students and average population of the same age, the University students experience sleep disturbances more because of their heavy academic workload. It may be a significant reason that decreases the students' performance as well as well-being. The individual's coping mainly affects the quality of sleep. [9]

Female students reported poor sleep quality and a higher level of distress than male students. Higher stress of women was associated with more sleep problems when compared to men. In experiencing stressful events, the females used more social support as a coping strategy. [10]

Method

An analytical cross-sectional study was conducted among the female first-year undergraduates of five faculties of a University in Sri Lanka. All female undergraduates in the first year were invited to the study, and the sample was selected using consecutive random sampling. The participants were requested to complete a self-administrative questionnaire following informed written consent. The demographic data of the participants were obtained using a self-administered questionnaire. Pittsburg Sleep Quality Index

(PSQI), Depression, Anxiety, Stress Scale-21 (DASS 21) and brief COPE inventory were used to determine sleep quality, depression, anxiety, and stress and coping strategies.

PSQI consists of nineteen self-related items and discriminates good and poor sleepers. There are seven components to assess sleep quality: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. The total sum of all seven components in the PSQI calculates as a global PSQI score which ranges from zero to twenty-one. The participants with a worldwide PSQI score of five or more was taken as a poor sleeper. [11]

Depression, Anxiety, Stress Scale- 21 (DASS 21) was used to assess the stress level of the subjects. The scale consists of 21 items with seven items per subscale: depression, anxiety, and stress. The psychological stress was categorized as normal, mild, moderate, severe, and extremely severe. [12].

The COPE Inventory assesses the coping strategies by getting the user to indicate what they generally do and feel when experiencing stressful events.[13] The brief COPE inventory consists of fourteen coping strategies as active coping, planning, positive reframing, acceptance, humor, religion, using emotional support, using instrumental support, self-distraction, denial, venting negative emotion, substance use, behavioral disengagement, and self-blame. [6] The scale consists of a four-point Likert type scale from 1 to 4, with one indicating "I usually don't do this at all" and four indicating "I usually do this a lot".[14]

The data were analyzed using the Statistical Package for the Social Sciences (SPSS), version 20. One-way ANOVA analysis was used to calculate significance in components of sleep quality, depression, anxiety, stress and coping scores according to the faculties. Pearson's correlation was used to calculate the relationship between sleep quality components, depression, anxiety, stress scores and coping scores of subcategories of brief COPE inventory.

Ethical approval was obtained from the Ethics Review Committee of the Faculty of Medicine, University of Colombo, Sri Lanka.

Results

The mean age of the participants was 21.43 ± 0.812 years. The participants were recruited so that 20%, 20%, 20.5%, 21%, and 18.5% of the participants were from the faculties of law, management, arts, medical, and science. In the selected population, 82.5% ($n= 165$) students scored five or more in the global PSQI score indicating poor sleep quality. The mean global PSQI score was 7.99 ($SD = 3.721$). There was a statistically significant difference in global PSQI scores of the participants between five faculties, $F(4,195) = 6.097, p= 0.000$. The highest mean global PSQI score was observed among the undergraduates of the law faculty, which was 10.33 ($SD= 4.202$). The lowest mean global PSQI score was 6.90 ($SD= 3.754$), which was observed among the undergraduates of the Faculty of Arts.

In our study, 53% ($n= 106$) of students reported as stressed. The mean stress score for the selected population was 17.56 ($SD = 10.421$), indicating mild stress levels. The mean anxiety score was 10.11

(SD= 8.306), indicating moderate levels of anxiety. The mean depression score was 14.14 (SD= 11.078), indicating moderate levels of depression in the population. The mean total DASS score was 41.81 (SD = 27.024) for the whole sample demonstrating the students were troubled with stress, depressive or anxiety symptoms.

The coping strategies in COPE inventory commonly used by the participants were self-distraction 5.11 (SD= 1.711), active coping 5.10 (SD= 1.681), positive reframing 5.01(SD= 1.716), planning 5.18 (SD= 1.643) and acceptance 5.07 (SD= 1.737).

Table 1. The mean scores of coping strategies

Brief COPE item (N= 200)	Mean	SD
Self distraction	5.11	1.711
Active coping	5.10	1.681
Denial	4.00	1.679
Substance use	2.14	.634
Emotional support	4.31	1.583
Behavioral disengagement	3.52	1.414
Venting	4.33	1.701
Instrumental support	4.63	1.749
Positive reframing	5.01	1.716
Self blame	4.44	1.673
Planning	5.18	1.643
Humor	3.59	1.586
Acceptance	5.07	1.737
Religion	4.84	1.844

There was a positive correlation between subjective sleep quality and stress level, which was statistically significant ($r = 0.384^{**}$, $p= 0.000$) and it correlated with total DASS score. ($r= 0.437^{**}$, $p= 0.000$). Strong correlations were observed with sleep disturbances ($r= 0.472^{**}$, $p= 0.000$) and daytime dysfunction ($r= 0.491^{**}$, $p= 0.000$) and total DASS score than with stress score. Daytime dysfunction showed significant positive correlation with total DASS score. ($r= 0.470^{**}$, $p= 0.000$). A statically significant positive correlation was seen between sleep disturbances ($r = 0.387^{**}$, $p= 0.000$) and global PSQI score ($r =0.474^{**}$, $p= 0.000$), indicating sleep disturbances mainly affected the stress level and global PSQI score. There was a stronger correlation between global PSQI score and total DASS score. ($r= 0.526^{**}$, $p= 0.000$)

The stress score highly correlated with coping score. There was a positive, significant correlation between stress and self-blame ($r= 0.585^{**}$, $p= 0.000$). The DASS score and self-blame was also observed to be positively correlated ($r= 0.595^{**}$, $p= 0.000$). A significant positive correlation was observed with stress and denial ($r= 0.423^{**}$, $p= 0.000$) while total DASS score too correlated with it. ($r= 0.466^{**}$, $p= 0.000$) Emotional support ($r= 0.420^{**}$, $p= 0.000$), venting ($r= 0.379^{**}$, $p= 0.000$) and planning ($r = 0.455^{**}$, $p= 0.000$) positively correlated with the stress scores. Venting correlated more with total DASS score ($r= 0.416^{**}$, $p= 0.000$) than stress score.

The stress level is covariates with sleep quality and stress. The relationship between sleep quality and coping was assessed using Pearson correlation coefficients between the sleep quality and items of brief COPE scale. There was a significant positive correlation between sleep disturbances and self distraction, ($r=0.223^{**}$, $p= 0.001$) emotional support ($r= 0.237^{**}$, $p= 0.001$) and venting ($r= 0.232^{**}$, $p= 0.001$).

Daytime dysfunction was positively correlated with self-blame ($r= 0.217^{**}$, $p= 0.002$) and planning ($r= 0.224^{**}$, $p= 0.001$). Emotional support ($r= 0.242^{**}$, $p= 0.001$) and self-blame ($r= 0.228^{**}$, $p= 0.001$) statistically correlated with global PSQI score. The sleep quality correlated significantly with emotional support ($r= 0.207^{**}$, $p= 0.003$) and venting ($r= 0.205^{**}$, $p = 0.004$).

Discussion

The sleep quality can be assessed subjectively and objectively. In the study, 76.5% ($n= 153$) of the participants described their sleep quality as 'very good and 'fairly good sleep'. In a study done by Lemma et al. (2012), among university students, the subjective sleep quality was reported as very good by 33.4% and fairly good by 54.3% of students, which is more than reported in our study. [15]. In another study, 67.7% of medical students have reported their subjective sleep quality as very good and fairly good [16]. In a study conducted on female medical students, 80.76% have reported their subjective sleep quality as very good and fairly good [8]. In our study, 71.5% ($n=30$) of participants from the Faculty of Medicine reported very good and fairly good sleep quality, which is higher than similar studies. 58% of subjects reported that they take less than 30 minutes on the bed to fall asleep. Mean sleep latency was 2.22 (SD = 1.453), indicating that these subjects usually take less than 60 minutes to fall asleep. In the study conducted by Lemma et al. (2012), 52.4% of subjects have taken less than 30 minutes to fall asleep. [15] Another study by Supartini et al. observed these phenomena in 76.6% of students indicating a higher sleep latency [17]. 57.2% medical students in this study reported sleep latency as less than 30 minutes. In the study conducted by Almojali mentioned as 74.5% of medical students reported their sleep latency to be less than 30 minutes, sleep latency was lower in the sample of medical students in the current study. [16]

The mean of total hours on bed was 6.853 (SD= 1.513) and the mean of total hours slept was 6.259 (SD= 1.457), indicating the actual sleep duration was less than seven hours. 63% ($n= 126$) of students had a sleep duration of less than seven hours per night and actual sleep was ranged from 2.45hours to 9.42hours. This finding is important as this indicates that the undergraduates are getting a sleep duration less than the recommended sleep, about 7-8 hours. [18] In the study conducted by Lemma et al. (2012),

62.4% of the students had an actual sleep duration of less than 7 hours [15] while in the other study by Williams (2016), 76% of participants reported sleep duration less than 7 hours. According to Williams et al., the mean sleep duration was 6.64 ± 1.40 which was more than the index study population [19]. The participants' sleep duration in our study was less than seven hours, which is compatible with the studies conducted by Williams and Lemma. The mean sleep duration reported by medical students was 6.197 (SD= 1.800) in our study and 64.3% of them reported sleep duration less than seven hours. (Figure 1) In the study conducted by Almojali et al. (2017), 73.4% of medical students reported a sleep duration less than seven hours which was replicated in our study. (mean = 5.8h, SD= 1.3h) [16]. This further describes students taken less amount of sleep rather than they should be taken.

67.5% (n= 135) of undergraduates experienced sleep disturbances once or twice a week which was statically significant ($p = 0.312$) with a mean of 1.29 (SD = 0.579). Lemma et al. (2012), in their study, reported that 67.4% of students experienced sleep disturbances once or twice a week, which was the same as our study.[15] The current study found that 71.4% of medical students have experienced sleep disturbances at least once or twice a week. In the study by Lohitashwa et al. (2015) among medical students, sleep disturbances were experienced by 34.16% participants at least once a week. [8] It explains that participants from the medical Faculty of this study have experienced sleep disturbances more than the same population from other countries.

The mean of daytime dysfunction is 2.38 (SD = 1.542), indicating that most participants (63%, n= 126) experienced daytime dysfunction as a big problem more than once per week. 53.84% of medical students have experienced daytime dysfunction at least once a week, according to Lohitashwa et al. (2015), while 49.7% of University students have experienced daytime dysfunction in the study conducted by Lemma et al. (2012). [8,14]

The mean global PSQI score of the study population in our study was 7.99 (SD = 3.721), indicating poor sleep quality. In the study, 82.5% (n= 165) of all students had poor sleep quality. Out of the faculties, 95% (n= 38) of the participants from the Faculty of law experienced poor sleep quality. Among medical undergraduates, 78.6% (n= 33) had poor sleep quality, while 85% (n= 34) of the participants from the Management faculty reported poor sleep quality. (Figure 2) The study done by Lemma et al. (2012) observed poor sleep quality in 55.8% of (mean =6.23, SD =2.89) University students [15]. Williams et al. classified 42.4% of participants as poor sleepers. (mean= 5.50, SD= 2.46, range 0 - 18) [19]. Therefore, 82.5% of participants reporting poor sleep quality in our study sample is high compared to the other studies. In studies conducted among medical undergraduates by Lohitashwa et al. (2015) and Almojali et al. (2017), 57.89% and 76% (mean =7.1, SD = 3.84) experienced poor sleep quality, respectively. [8,16] In our study, 78.6% of medical undergraduates and 83.8% of undergraduates from the Science faculty reported poor sleep quality.

There was a significant difference between the subjective and objective measures of sleep quality in our study. 76.5% (n= 153) of students reported that their sleep was very good and fairly good subjectively. Interestingly 9% (n= 18) of them were on sleep medications less than once a week or once or twice a

week. In the objective component, depending on the global PSQI score, 82.5% (n= 165) of all the students had poor sleep quality, and 63.0% (n= 126) students had daytime dysfunction more than once or twice, three or more times in a week. The difference between subjective and objective sleep quality components may be due to a lack of understanding about symptoms of sleep issues.

Stress levels among undergraduates were rated as mild (14%), moderate (16%), severe (12.5%) and extremely severe (10.5%). (Figure 3) In a study done in Sri Lanka among undergraduate nursing students, the stress score was 18.91 ± 10.017 indicating that the stress scores of university students were less. In a study done by Rathnayake and Ekanayake found that there were correlations between depression, anxiety, and stress among subjects. (Depression and stress (0.785**), anxiety and stress (0.763**)) [20] Stress among undergraduates was 12.4 (SD= 8.0), and it comprised of mild (15.7%), moderate (11.6%), severe (5.1%) and extremely severe (1.5%) levels. [15] In a study done using Kessler Psychological Distress Scale (K10) among medical students, stress was reported as mild, moderate and severe by 23.2%, 13.3% and 16.7% of students, respectively. [16] The stress level of medical undergraduates in the current study was mild (16.7%), moderate (9.5%), severe (19%) and extremely severe (16.7%), giving an overall high stress level of the study participants. A study among female undergraduates in Indonesia revealed that 72.7% of undergraduates in Health Sciences and 73.30% in Science Technology had moderate to severe degrees of stress. [21] Therefore, the stress levels of our study participants are higher than in similar studies indicating that the selected population is more stressed.

The means of individual scores of coping strategies in this study were higher than 5, indicating that the University students commonly used those coping strategies. The individual scores for self-distraction was 5.11 (SD= 1.711), active coping 5.10 (SD= 1.681), positive reframing 5.01 (SD= 1.716), planning 5.18 (SD= 1.643) and acceptance 5.07 (SD= 1.737). Similar results were observed by Średniawa (2019) et al. with planning 2.06 (SD= 0.68), acceptance 1.87 (SD= 0.64), active coping 2.13 (SD= 0.62), positive reframing 1.57 (SD= 0.76) and self-distraction 1.68 (SD= 0.68) being the coping strategies commonly used by the participants.[22] A previous study on coping strategies among female medical students revealed higher means indicating that 46.3% of students have some stress. They used coping strategies such as self-distraction 6.1 (SD= 1.4), religious coping 6.3 (SD= 1.6), emotional support 6.0 (SD= 1.4), instrumental support 5.9 (SD= 1.4), and planning 6.2 (SD= 1.3) commonly which is similar to the findings of our study. [23]

The students in the present study, coping strategies reported as "have been doing it a lot" were self-distraction (23%), active coping (20%), positive reframing (20.5%), planning (24.5%), acceptance (21.5%), religion (20%) and instrumental support (16%). Similar results were observed in a study done by Shakthivel et al. (2017,) indicating that most first-year female medical students in India used religion and self-blaming as coping strategies while boys used humor. 19.4% of them used self-distraction and instrumental support, and 21.5% used positive reframing. Planning was used by 15.1%, while 30.1% used religion. [24]

Strong correlations ($r > 0.5$) with sleep quality were seen with stress score and DASS total score. The PSQI scores correlated positively with the total DASS score ($r=0.526^{**}$, $p= 0.000$) in a statistically significant manner. The correlation was stronger for the total score than for the stress score ($r= 0.474$, $p=0.000$). In a study conducted among undergraduate students in Southern Thailand, PSQI score highly correlated with depression ($r=0.34$; $p < 0.001$), anxiety ($r=0.35$; $p < 0.001$) and stress scores ($r=0.38$; $p < 0.001$). [19](17) A previous study done among German students observed a strong positive correlation between sleep quality and chronic stress. ($r= 0.416^{**}$, $p < 0.001$)10 In our study, there is a statistically positive correlation between global PSQI and stress. ($r= 0.474^{**}$, $p= 0.000$)

In our study, 57.6% poor sleepers reported stressed. (Figure 4) The percentage of poor sleepers who were extremely stressed was 12% ($n= 20$). A similar study done among female students yielded that 41.8% of poor sleepers were stressed. [19] Another study described that 84% of students with poor sleep as stressed to a moderate to a severe degree. Students with poor sleep were reported as having higher 4.7 times stress levels than students with good sleep quality. [21] These findings describe that there was a positive correlation between sleep quality and stress level.

The stress score highly correlated with coping. In our study, the positive correlations between stress and coping strategies indicated that undergraduates commonly use both adaptive and maladaptive coping strategies. The correlations with higher coefficients were self-blame ($r= 0.585^{**}$, $p= 0.000$), denial ($r= 0.423^{**}$, $p= 0.000$), emotional support ($r= 0.420^{**}$, $p= 0.000$), venting ($r= 0.379^{**}$, $p= 0.000$) and planning ($r = 0.455^{**}$, $p= 0.000$). In a previous research done using Perceived Stress Scale and brief COPE scale, significant correlations were observed between self distraction, ($r=0.225$, $p <0.0001$), denial ($r=0.232$, $p <0.0001$), behavioral disengagement ($r= 0.355$, $p <0.0001$), venting ($r=0.258$, $p <0.0001$) and self-blame ($r= 0.258$, $p <0.0001$) which was similar our study. [24] There were significant associations between perceived stress and coping strategies by using Perceived Stress Scale and brief COPE scale. Students who felt stressed used venting ($r= 5.0$, $p = 0.001$), denial ($r= 4.5$, $p = 0.032$), self-blame ($r= 5.0$, $p < 0.001$), and disengagement ($r= 4.4$, $p = 0.004$) more than the students who were not stressed ($r= 4.5$, 4.1 , 4.3 , and 3.9 , respectively). Students who were not stressed used emotional support ($r= 5.9$, $p = 0.032$) more than stressed students ($r= 5.6$). The study findings are similar to the studies done in other countries and had similar statistical correlation with stress and coping. Our study found that correlations between coping strategies and stress were statistically significant and similar with findings of studies done elsewhere.

This study revealed a statistically significant correlation between sleep quality and its components with subcategories of brief COPE scale even when stress was not considered. Positive correlations were seen with emotional support and sleep disturbances ($r= 0.237^{**}$, $p= 0.001$), PSQI score ($r= 0.242^{**}$, $p= 0.001$) and quality of sleep ($r= 0.207^{**}$, $p= 0.003$). Self-blame correlated with daytime dysfunction ($r= 0.217^{**}$, $p= 0.002$) and PSQI score ($r= 0.228^{**}$, $p= 0.001$).

The findings of this study were limited by the lack of laboratory measures on sleep health. The Depression Anxiety Stress Scale (DASS) was used to reduce bias when stress interfered with depression and anxiety. The individual's behavior during stressful events varies for everyone. Therefore, we were

unable to calculate the total coping score and compare it with others. The stressful events are also different from individual to individual. In future studies, we recommend using laboratory measures to explore the relationship between sleep quality, stress and coping.

Conclusion

There were strong positive relationships between sleep quality and stress and stress and coping among first-year female undergraduate students. In further analysis, there was an indirect relationship between sleep quality and coping.

The study highlights the importance of focused interventions on quality of sleep, stress and coping among university students. It is important to be aware of the association between sleep hygiene, stress and coping. We recommend that administrators consider these factors when academic programs are formulated. Indirectly, it also suggests that coping with stress will be better if the sleep quality is good. Further, the counselling programs for university students should be focused on sleep hygiene and ways of strengthening coping strategies. Health promotion and educational activities on health should focus more on promoting the mental health of undergraduates and physical health.

List Of Abbreviations

ANOVA	Analyze of Covariance
DASS 21	Depression Anxiety Stress Scale 21
PSQI	Pittsburg Sleep Quality Index
SD	Standard Deviation
SPSS	Stastical Package for Social Sciences

Declarations

Ethical approval and consent to participate

Ethical approval was obtained from the Ethic Review Committee of Faculty of Medicine, University of Colombo, Sri Lanka (Reference UCP-AL-15-333) which under the guidelines with the declaration of Helsinki and by the Council for International Organizations of Medical Sciences (CIOMS) in collaboration with the World Health Organization. Therefore, the all methods were carried out in accordance with guidelines and regulations by the Ethics Review Committee ensuring autonomy, beneficence, non-maleficence and justice. Aims, methods, anticipated benefits and potential risks of the study were

explained clearly in verbally and written. Details relating to an individual person was not included in this manuscript. Informed consent was taken from all the participants in written prior to the study.

Consent for publication

Not applicable

Availability of data and materials

The data set used during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors have no competing interests.

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Authors' contributions

ST and CS were responsible for the design of the study and writing of the paper. ST collected the data. CS supervised the procedure. All authors read and approved the final manuscript.

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Figures

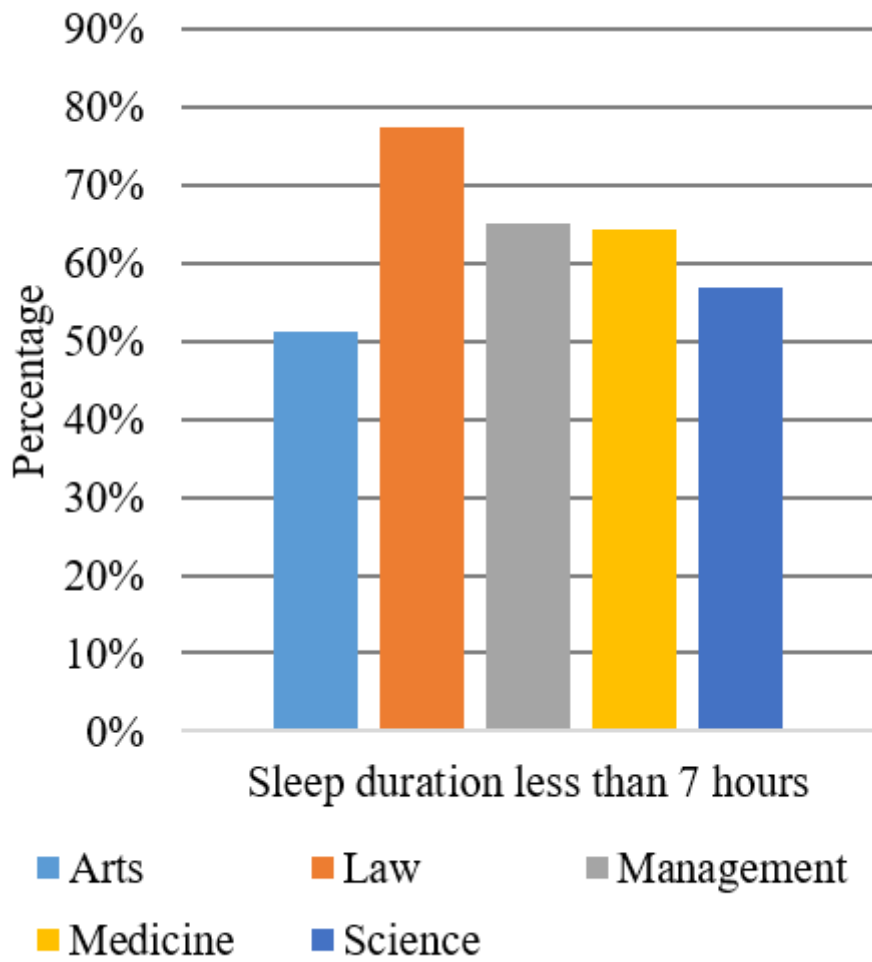


Figure 1

The percentage of students with sleep duration less than seven hours per night

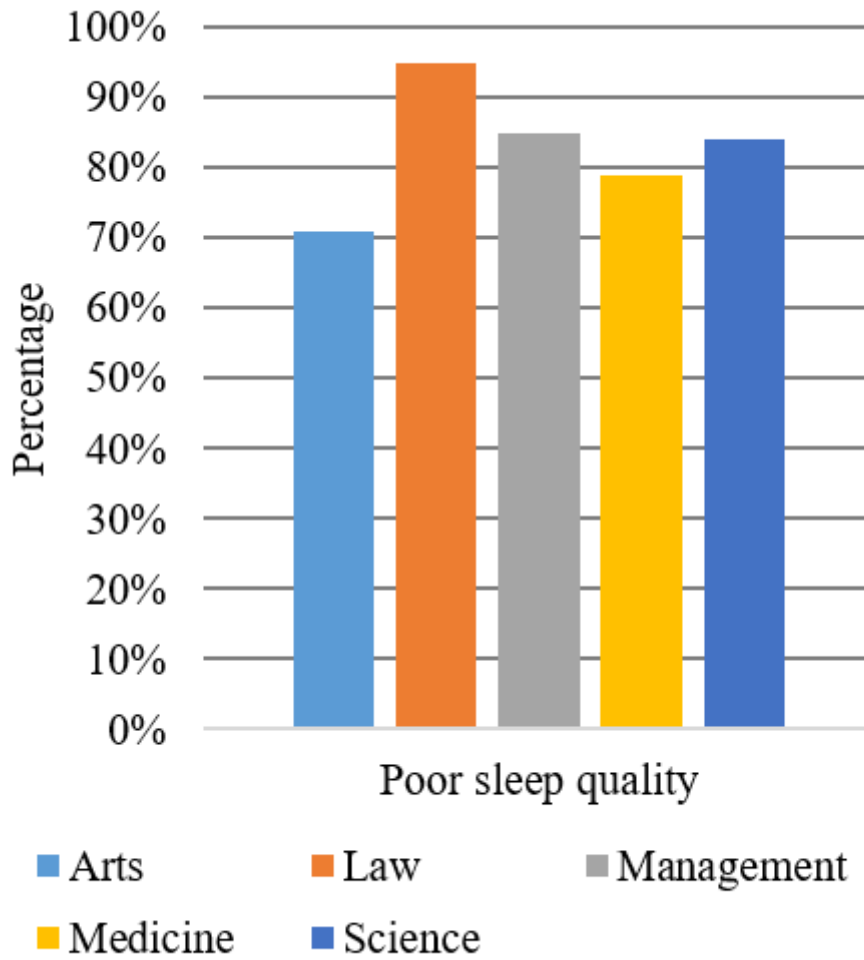


Figure 2

The percentage of students with poor sleep quality by faculty in University

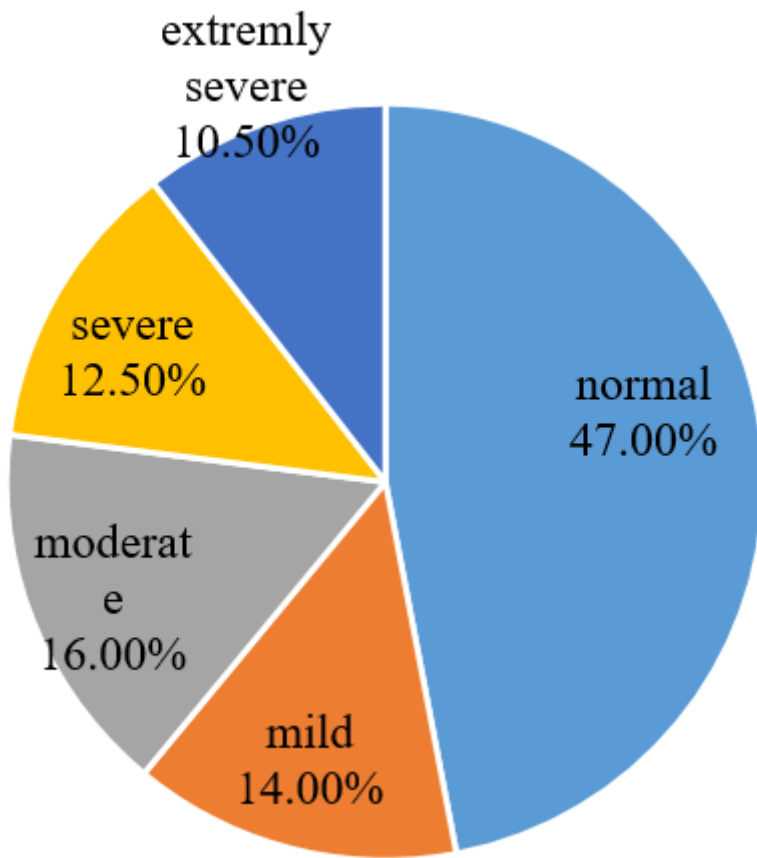


Figure 3

Stress level among participants

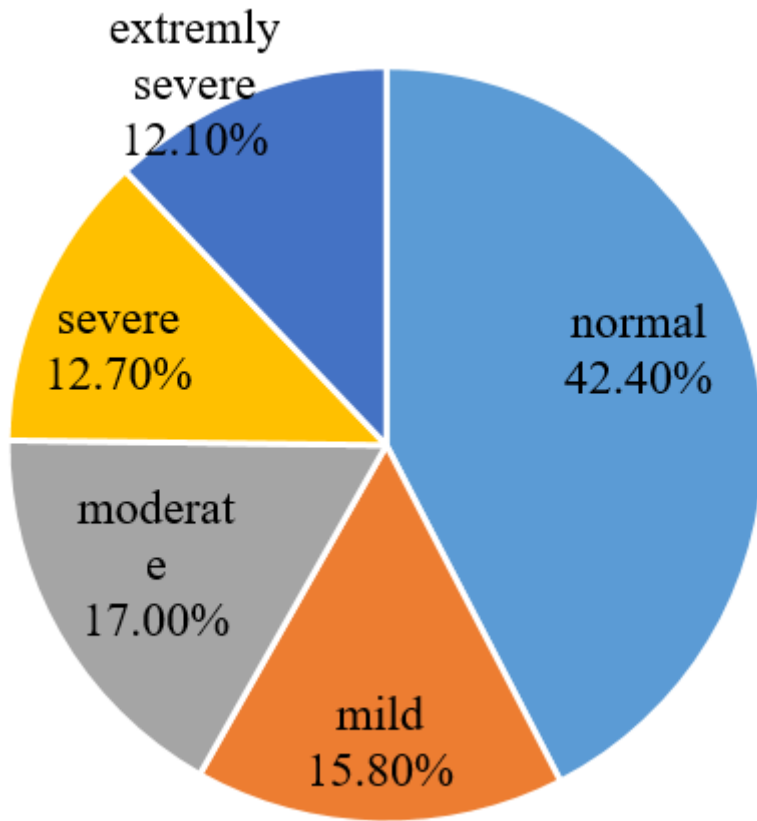


Figure 4

Stress level among poor sleepers