## Original paper

# The relationship between quality of sleep, stress, depressive and anxiety symptoms and coping strategies among first-year female students of the University of Colombo, Sri Lanka

S Thakshila, C Suraweera

## Abstract

### Background

Sufficient and restorative sleep is essential for mental and physical wellbeing. The challenges of university life may be associated with detrimental effects on students' mental wellbeing, leading to stress and poor quality of sleep. Students may adopt varied strategies to cope with these difficulties.

### Aims

The aim of this study was to explore the relationship between quality of sleep, stress, depressive and anxiety symptoms, and coping strategies, among first-year female students of the University of Colombo, Sri Lanka.

### Methods

A cross-sectional study was conducted among 200 female undergraduates from five selected faculties of the University of Colombo, Sri Lanka. A self-administered questionnaire, the Pittsburg Sleep Quality Index (PSQI), Depression Stress Anxiety Scale-21 (DASS-21) and the Brief Coping Orientation to Problems Experienced Inventory (brief COPE inventory) were administered using simple random sampling.

### Results

Among the participants, 82.5% (n=165) had poor objective and subjective quality of sleep as indicated by the global PSQI. There was a strong positive correlation between sleep quality and stress, and 57.6% (n=95) of the poor sleepers were found to be stressed. The occurrence of stress was positively correlated with the use of self-blame, planning, denial, and emotional support as coping strategies, as per the brief COPE inventory. There was also a statistically significant correlation between quality of sleep, as measured by the PSQI, and coping strategies, as measured by the brief COPE inventory. The highest mean global PSQI score was observed among students from the Faculty of Law, with 95% experiencing poor quality of sleep. The highest correlation between sleep quality and stress was seen among students from the Faculty of Medicine, where the highest percentage of students (61.9%), were stressed.

### Conclusions

Most of the university undergraduates who participated in this study had poor quality of sleep and stress. There was a strong relationship between sleep quality, stress, and the type of coping strategy the undergraduates used.

**Key words:** sleep, Pittsburg Sleep Quality Index, stress, coping

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## Background

University education for new entrant students can be highly stressful, as they adapt to a new lifestyle consisting of learning, examinations, peer pressure and living in a new environment, away from home and the protective environment of their families. Students may struggle to balance their newly found freedom, social life, educational activities, and to manage their time appropriately. Students may compromise their sleep to engage in other activities such as academic work or sports, and this may result in mental health issues, mood, and behavioural changes (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 (3). Troubled sleep could be a predictive sign

and a symptom of illnesses, and an indication of possible poor quality of life (3). Quality of sleep is measured qualitatively and quantitatively (2). The quantitative component of sleep mainly comprises of duration, while the qualitative aspect includes depth of sleep and restfulness upon awakening (2). Prior work has suggested that university students have poor sleep habits and sleeping patterns such as insubstantial sleep, irregular bedtimes on weekdays and weekends as reasons for their poor sleep quality (4). Research from Finland found that frequent waking up during the night is complained of mainly by female students (5). One-fifth of the students complained about sleeping problems at least once a week during the first year, and female students experience more symptoms of stress compared to their male peers (5). They also reported poor sleep quality and higher levels of distress than male students. Higher levels of stress in females were associated with more sleep problems when compared to men. When experiencing stressful events, females were more likely to use social support as a coping strategy (10).

Coping is the way in which people handle and respond to their stressors, and this can be adaptive and maladaptive. Adaptive coping strategies includes active coping, planning, positive reframing, acceptance, humor, religion, emotional support, and instrumental support (6). A student may experience positive or negative outcomes, depending on the coping strategies adopted (6). University students are known to utilize coping strategies such as spending time with friends, sleeping, engaging in music, sports, and spending time alone (6). Female students are reported to prefer studying and sleep as their coping strategies, while the male students cope with their stressors by spending time with friends, playing, and isolating themselves from others (7). Insufficient sleep, and irregular sleep-wake patterns have been described in increasing levels among university students, and a close relationship is reported between sleep quality and physical and mental health (3, 8). When comparing university students and other average population of the same age, students are reported to experience more sleep disturbances because of their heavy academic workload (9). There is also a strong relationship between coping styles and sleep (6). A given individual's coping style mainly affects the quality of sleep (9).

Considering all the above, this study was conducted to identify the relationship between quality of sleep and stress levels among undergraduates, the presence of depressive and anxiety symptoms and the coping strategies used by them.

## Methods

We conducted an analytical cross-sectional study among female first-year undergraduates studying at five faculties of the University of Colombo, Sri Lanka. All female undergraduates in the first year were invited to participate in the study, and participants were selected by using a simple random sampling method until the sample size (n=200) was reached.

The demographic data of the participants were obtained using a self-administered questionnaire. The Pittsburg Sleep Quality Index (PSQI), the Depression, Anxiety, Stress Scale-21 (DASS-21) and the brief COPE inventory, all of which have been translated to Sinhala and locally validated, were used to determine sleep quality, depression, anxiety, and stress and coping strategies respectively (11-13).

The PSQI consists of nineteen self-related items and discriminates between good and poor sleepers (14). It includes 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 is calculated as a global PSQI score, which ranges from zero to twenty-one. Worldwide, participants with a PSQI score of five or more are considered to be poor sleepers.

The Depression, Anxiety, Stress Scale-21 (DASS-21) was used to assess the stress level of the subjects (15). The scale consists of 21 items with seven items per subscale: depression, anxiety, and stress. The levels of psychological stress were categorized as normal, mild, moderate, severe, and extremely severe.

The Brief COPE Inventory explores for a range of coping strategies individuals may adopt, when experiencing stressful events (16). The Brief COPE inventory consists of fourteen coping strategies, namely 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" (17).

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

Ethical approval to conduct the study was obtained from the Ethics Review Committee of the Faculty of Medicine, University of Colombo, Sri Lanka. Informed written consent was obtained from all participants prior to the study. The aims, methods, anticipated benefits, and

potential risks of the study were explained clearly verbally and in writing, to all participants, prior to inclusion in the study. Informed written consent was obtained from all participants included in the study.

## Results

The mean age of the participants was 21.43 ± 0.812 years. The participants were recruited in a manner so that almost equal numbers were from the faculties of Law, Management, Arts, Medicine, and Science (20%, 20%, 20.5%, 21%, and 18.5%) respectively.

In the study population, 82.5% (n=165) students scored five or more in the global PSQI score, indicating poor sleep quality. Their mean global PSQI score was 7.99 (SD=3.721). There was a statistically significant difference in the global PSQI scores of the participants between the 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. The significant values of sleep quality and its components are summarized in Table 1.

In our study, 53% (n=106) of students reported some level of stress, and the mean levels of reported stress, depression and anxiety symptoms as shown in Table 2. Of the participants, 14%, 16%, 12.5% and 10.5% reported mild, moderate, severe and extremely severe levels of stress, respectively. The coping strategies commonly used by the participants, as per the Brief COPE 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 4).

There was a statistically significant positive correlation between subjective quality of sleep and levels of stress (r = 0.384, p= 0.000) and this also correlated with the total DASS score (r= 0.437, p= 0.000). Strong correlations were observed between sleep disturbances as per the PSQI, i.e., between individuals experiencing waking up in the middle of the night or early morning, having to get up to use the bathroom, not being able to breathe comfortably, coughing or snoring loudly, feeling too cold or hot, having bad dreams, having pain or other reasons that disturbed continuous sleep (r= 0.472, p=0.000), daytime dysfunction (r=0.491, p= 0.000) and the total DASS score, which was greater than correlations seen with the stress score. Daytime dysfunction showed a significant positive correlation with the total DASS score (r=0.470, p=0.000). A statistically significant positive correlation was seen between sleep disturbances (r=0.387, p= 0.000) and the global PSQI score (r =0.474, p=0.000). There was a strong correlation between the global PSQI score and the total DASS score (r= 0.526, p=0.000).

The correlation between the DASS scores and coping is shown in Table 3. There was a positive, significant correlation between stress and self-blame. The DASS score and coping byself-blame was also positively correlated. A significant positive correlation was observed between stress and denial.

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) was statistically correlated with the 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).

| Table 1. The prevalence of quality of sleep as per the PSQI scale | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Faculty** | | | | | | | |
| | | Total (N=200) | Arts % | Law % | Management % | Medicine % | Science % |
| Subjective sleep quality | Good | 76.5 | 95.1 | 50.0 | 85.0 | 71.5 | 81.1 |
| | Bad | 23.5 | 4.9 | 50.0 | 15.0 | 28.5 | 18.9 |
| Sleep latency | >30 minutes | 86 | 73.2 | 92.5 | 90.0 | 83.3 | 91.9 |
| Sleep duration | <7 hours | 63 | 51.2 | 77.5 | 65.0 | 64.3 | 56.8 |

| Table 2. Mean levels of stress, anxiety and depression among participants, as indicated by the mean scores of the DASS-21 scale | | |
|---|---|---|
| DASS Score | Mean | SD |
| Stress | 17.56* | 10.421 |
| Anxiety | 10.11** | 8.306 |
| Depression | 14.14** | 11.078 |
| Total DASS score | 41.81 | 27.024 |

* Mild,  **Moderate symptoms

| Table 3. Correlation between the Brief COPE scale and the DASS 21 | | | | |
|---|---|---|---|---|
| Coping strategy | DASS S score | | Total DASS score | |
| | Pearson correlation | Sig. (2-tailed) | Pearson correlation | Sig. (2-tailed) |
| Self distraction | .327** | .000 | .310** | .000 |
| Active coping | .361** | .000 | .305** | .000 |
| Denial | .423** | .000 | .466** | .000 |
| Substance use | -.086 | .224 | -.073 | .301 |
| Emotional support | .420** | .000 | .407** | .000 |
| Behavioral disengagement | .320** | .000 | .341** | .000 |
| Venting | .379** | .000 | .416** | .000 |
| Instrumental support | .329** | .000 | .309** | .000 |
| Positive reframing | .202** | .004 | .190** | .007 |
| Self blame | .585** | .000 | .595** | .000 |
| Planning | .455** | .000 | .422** | .000 |
| Humor | -.104 | .143 | -.088 | .215 |
| Acceptance | .300** | .000 | .260** | .000 |
| Religion | .194** | .006 | .155* | .029 |

*Correlation is significant at the 0.05 level (2-tailed)

** Correlation is significant at the 0.01 level (2-tailed)

Table 4. The mean scores for coping strategies used by students in this study, as per the Brief COPE

| 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 |

*Individual scores of coping strategies were higher than 5 for these items, indicating that the University students commonly used those coping strategies

## Discussion

In our study, 76.5% (n=153) of the participants described their subjective sleep quality as being 'very good' or 'fairly good sleep'. However, it is interesting to note that although 76.5% of the participants reported their subjective sleep quality as 'very good' or 'fairly good sleep', 82.5% (n=165) had poor global PSQI scores indicating poor global sleep quality. Findings from other countries indicate that subjective sleep quality can be higher (87.7%) or lower (67.7%) than in our study (18, 19). In a study conducted among female medical students, 80.8% reported that their subjective sleep quality was good (8). It would be interesting to explore what other factors may contribute to this wide variation of subjective sleep quality, and if there is a difference between males and females – especially since our study focused on females only. A total of 71.5% (n=30) of participants from the Faculty of Medicine reported good sleep quality, which is satisfactory compared to studies conducted in other countries, despite the common belief that medicine is one of the most stressful undergraduate courses. The mean of total hours on bed, in this group of participants, was 6.853 hours and the mean total hours of sleep was 6.259 hours, with actual sleep duration ranging from two to nine hours. This is reflected in other studies conducted worldwide (18, 20, 21). This finding is important as this indicates that undergraduates are getting a sleep duration less than the recommended sleep of about seven to eight hours (21). Most participants (63%, n=126) experienced daytime dysfunction as a big problem. It is a significant finding specially considering that daytime dysfunction secondary to poor sleep quality implies health hazards like poor attention, concentration, and proneness to road traffic accidents. There was a significant difference between the subjective and objective measures of sleep quality in our study. The difference between subjective and objective sleep quality components may be due to a lack of understanding about symptoms of sleep issues.

The significant correlation between the PSQI and the total DASS scores in our study, indicates the important association between sleep quality and the experience of depressive and anxiety symptoms. The correlation was stronger for the total score which includes depressive and anxiety symptoms, compared to the stress score only, suggesting that participants have developed psychological symptoms – which is an important finding. Similar findings have been reported from Southern Thailand, which found a significant correlation between PQSI and depression, anxiety and stress, and from Germany (10, 22). This observation should be interpreted keeping in mind that sleep disturbances are a prominent clinical symptom of depression and anxiety. In our study, 57.6% of poor sleepers reported being stressed, and similar findings have been reported by other studies conducted globally (22, 24). The percentage of poor sleepers who were extremely stressed was 12% (n= 20) (Figure 1). These findings all highlight the positive correlation between sleep quality and stress levels.
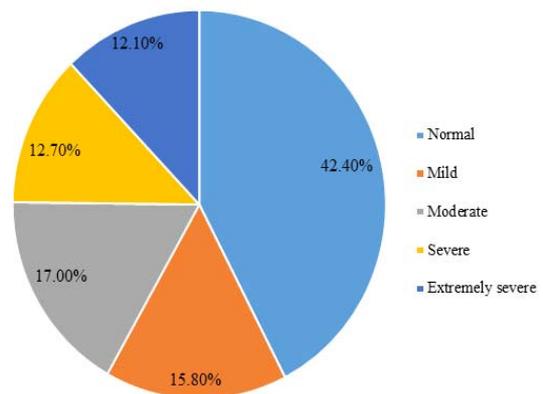


Figure 1. Levels of stress among study participants who were poor sleepers.

In our study, the positive correlations between stress and coping strategies indicates that undergraduates appear to use both adaptive and maladaptive coping strategies. Coping strategies which were correlated with higher coefficients were, self-blame, denial, emotional support, venting and planning – which are similar to research findings in other countries (27).

An important finding of our study was the statistically significant correlation between sleep quality and its components,and the subcategories of the Brief COPE scale, even when stress was not considered. The study revealed that there is a correlation between emotional support and sleep disturbances, the PSQI score and quality of sleep, indicating that emotional support is very important in the life of an undergraduate. This highlights the importance of supporting the students emotionally to cope with their issues. Self-blame correlated with daytime dysfunction, with the PSQI score indicating that maladaptive coping may have an impact on sleep. However, we could not interpret whether the correlations were positive or negative without further statistical analyses.

The findings of this study were limited by lack of laboratory measures on sleep health. Laboratory parameters on sleep quality are more accurate and may have led to a difference in the results of this study.

## Conclusions

There were strong positive relationships between sleep quality and stress, and between stress and varying coping strategies among first-year female undergraduate students. This study highlights the importance of focused interventions on quality of sleep, stress and coping among university students.We recommend that university administrators consider these factors when academic programs are formulated. Further, counselling programs for university students should also include highlighting sleep hygiene and exploring ways of strengthening coping strategies.

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## Statement of contribution

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

## Conflicts of interest

None declared.

**S Thakshila,** Department of Allied Health Sciences, Faculty of Medicine, University of Colombo, Sri Lanka

**C Suraweera,** Department of Psychiatry, Faculty of Medicine, University of Colombo, Sri Lanka

**Corresponding author:** C Suraweera

**Email:** dr.chathurie@gmail.com

http://orcid.org/0000-0002-7542-5068

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