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# Influence of Covid 19 Conditions on Sleep Alterations of Georgian and Foreign Students at the University of Georgia- A Cross Sectional Study

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*Article*

# Influence of COVID-19 Conditions on Sleep Alterations of Georgian and Foreign Students at the University of Georgia—A Cross Sectional Study

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**Abstract:** The alterations in sleep among undergraduate students have been a burden to their mental health and academic studies. We used the Pittsburgh Sleep Quality Index scale in this study conducted among Georgian and International students. The respondents participated in this study through the University intranet as their responses remained anonymous. The survey comprised the demographic characteristics and sleep health deteriorating wake patterns such as subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. A total of 500 students completed this study, 72% were Georgian students, and 28% were international students. 50.8% of Georgian students were under the age of 20 years, and 74.3% of international students were between 21 and 30 years of age. Most Georgian students reported poor subjective sleep quality, short sleep duration, fewer sleep disturbances, and daytime dysfunction. However, sleep latency was higher among international students. Both categories of students reported using sleeping pills as the statistical significance was observed between global score and gender, subjective sleep quality, and age grade of Georgian students ($p<0.05$). This study aimed to evaluate the sleep-wake health quality among international and Georgian undergraduate students at the University of Georgia.

**Keywords:** sleep cycle; sleep pills; sleep habits; COVID-19; students; PSQI

## 1. Introduction

Generally, students usually have trouble falling asleep, which led to investigations regarding sleep patterns among international students [1]. It has been suggested that during the COVID-19 pandemic, sleep disorders would deepen among international students would be stronger [2,3]. The essence of sleep crosses over the affairs of every creature for the proper physiology of the body mechanisms [4]. It is crucial for mental health [5,6] and healthy living [7]. It has a wide range of effects, and deprivation can result in fatigue and dysfunction of neurocognitive functions [8]. It has been recommended that students should have 7 -9 hours of sleep per night [9] but most students do not value the upshot of sleep owing to their studies and time constraints [10]. Compared to studies, most foreign students find it difficult to adapt to the change in environment, new peer groups, and social life [11]. The effect of body pain or physical injury can affect the students' sleep, especially after strenuous sporting activity [7]. This study aimed to evaluate the sleep-wake health quality among international and Georgian undergraduate students at the University of Georgia (UG).

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## 2. Materials and Methods

This descriptive study was designed to examine the sleep health quality among international students and Georgian Students during COVID-19, using the Pittsburgh Sleep Quality Index scale (PSQI). The data was collected by an online survey which was created using Google forms from the 22nd of March until the 23rd of June 2022. The link was shared among the students after receiving approval from the University's ethical board. During this period, the University was following an online regime of education, and the responses were voluntary and anonymous.

*Assessment*

Demographic variables: included gender, age group (<20, 21-30, >31), and nationality (country of origin). The countries were specified by the students and six countries. The specified countries were Egypt, India, Iran, Nigeria, Georgia, and Israel.

**PSQI:** We used the Pittsburgh Sleep Quality Index scale (PSQI) which contained 19 self-rated questions. The subcomponents included subjective sleep quality (SSQ) - Poor (Very poor and poor), Good (Very good and pretty good), sleep latency (SL) High (31–60 minutes and > 60 minutes), Low (<15 minutes and 16–30 minutes), sleep duration (SD), habitual sleep efficiency (HSE), sleep disturbances (SDs), use of medications (USM)- <1 time/week (Not during the last month and less than once a week) and > 1 time/week (once or twice a week and three or more times a week) and daytime sleep dysfunction (DDS). The seven subcomponents were added to get one global score (GS) which ranged from 0 to 21 points and above 7 indicated poor sleep quality.

*Statistical Analysis*

The descriptive analysis was performed using the Statistical Package for the Social Sciences (SPSS) version 23.0 software (SPSS Inc., Chicago, IL, USA). The Chi-square test was used to determine the relationship between age and sleep quality, as well as gender and poor sleep quality. The P-values were two-sided and significant at $P < 0.05$.

## 3. Results

Out of the 500 undergraduate university students who participated in this study, 360 (72%) students were Georgian students while 140 (28%) students were international students from Egypt, India, Iran, Nigeria, and Israel. 76.1% of Georgian students, were females and 23.9% were males, while 68.6% females and 31.4% of males were international students. In the age category, 50.8% of Georgian students were < 20 years, and 48.1% were between the ages of 21–30 years (Table 1). Among international students, 74.3% of students aged between 21–30 years, were higher than < 20 years and > 31 years age categories, 22.1% and, 3.6% respectively (Table 2).

**Table 1.** The Frequency of demographic characteristics and PSQI components among UG Students.

| | Variables | Georgian students (N=360) | International Students (N= 140) |
|---|---|---|---|
| **Sex** | Male | 86(23.9%) | 44(31.4%) |
| | Female | 274(76.1%) | 96(68.6%) |
| **Age** | < 20 | 183(50.8%) | 31(22.1%) |
| | 21-30 | 173(48.1%) | 104(74.3%) |
| | > 31 | 4(1.1%) | 5(3.6%) |
| **PSQI** | | | |
| **SSQ** | Good | 158(51.4%) | 96(68.6) |
| | Poor | 175(48.6%) | 44(31.4) |
| **SL** | High | 201(55.8%) | 75(53.6%) |
| | Low | 159(44.2%) | 65(46.4) |
| **SD** | < 7 hrs | 123(34.2%) | 71(50.7%) |

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| | | | |
|---|---|---|---|
| | > 7 hrs | 237(65.8%) | 69(49.3%) |
| **HSE** | < 75% | 139(38.6%) | 102(72.9%) |
| | > 75% | 221(61.4%) | 38(27.1%) |
| **SDs** | High | 99(27.2%) | 89(63.6%) |
| | Low | 261(72.5%) | 51(36.4%) |
| **USM** | < 1 Time/Week | 331(91.9%) | 131(93.6%) |
| | > 1 Time/Week | 29(8.1%) | 9(6.4%) |
| **DSD** | High | 161(44.7%) | 106(75.7%) |
| | low | 199(55.3%) | 34(24.3) |
| **GS** | <7 | 173(48.1%) | 83(59.3%) |
| | >7 | 187(51.9%) | 57(40.7%) |

In PSQI subcomponents, **SL**- High (31–60 minutes and > 60 minutes), Low (<15 minutes and 16–30 minutes); **SD**- < 7hrs and > 7hrs; **HSE-** <75% and > 75% scores; **USM-** <1 time/week (Not during the last month and less than once a week) and > 1 time/week (once or twice a week and three or more times a week).

**Table 2.** Frequency distribution of the represented countries for the international students by demographic characteristics and selected variables.

| | | International students | | | | |
|---|---|---|---|---|---|---|
| | **Variable** | **Egypt N(%)** | **India N(%)** | **Iran N(%)** | **Nigeria N(%)** | **Israel N(%)** |
| **Sex** | Male | 5(3.6%) | 14(10.0%) | 6(4.3%) | 12(8.9%) | 7(5.0%) |
| | Female | 18(12.9%) | 24(17.1%) | 22(15.7%) | 18(12.9%) | 14(10.0%) |
| **Age** | < 20 | 8(5.7%) | 9(6.4%) | 5(3.6%) | 4(2.9%) | 5(3.6%) |
| | 21-30 | 15(10.7%) | 27(19.3%) | 23(16.4%) | 23(16.4%) | 16(11.4%) |
| | > 31 | 0 | 2(1.4%) | 0 | 3(2.1%) | 0 |
| | **PSQI** | | | | | |
| **SSQ** | Good | 17(12.1%) | 25(17.9%) | 21(15.0%) | 23(16.4%) | 10(7.1%) |
| | Poor | 6(4.3%) | 13(9.3%) | 7(5.0%) | 7(5.0%) | 11(7.9%) |
| **SL** | High | 14(10.0%) | 20(14.3%) | 15(10.7%) | 15(10.7%) | 11(7.9%) |
| | Low | 9(6.4%) | 18(12.9%) | 13(9.3%) | 15(10.7%) | 10(7.1%) |
| **SD** | < 7 hrs | 12(8.6%) | 20(14.3%) | 17(12.1%) | 12(8.6%) | 10(7.1%) |
| | > 7 hrs | 11(7.9%) | 18(12.9%) | 11(7.9%) | 18(12.9%) | 11(7.9%) |
| **HSE** | < 75% | 13(9.3%) | 28(20.0%) | 23(16.4%) | 22(15.7%) | 16(11.4%) |
| | > 75% | 10(7.1%) | 10(7.1%) | 5(3.6%) | 8(5.7%) | 5(3.6%) |
| **SDs** | High | 13(9.3%) | 28(20.0%) | 16(11.4%) | 19(13.6%) | 13(9.3%) |
| | Low | 10(7.1%) | 10(7.1%) | 12(8.6%) | 11(7.9%) | 8(5.7%) |
| **USM** | < 1 Time/Week | 22(15.7%) | 36(25.7%) | 27(19.3%) | 29(20.7%) | 17(12.1%) |
| | > 1 Time/Week | 1(0.7%) | 2(1.4%) | 1(0.7%) | 1(0.7%) | 4(2.9%) |
| **DSD** | High | 19(13.6%) | 29(20.7%) | 21(15.0%) | 24(17.1%) | 13(9.3%) |
| | low | 4(2.9%) | 9(6.4%) | 7(5.0%) | 6(4.3%) | 8(5.7%) |
| **GS** | < 7 | 11(7.9%) | 23(16.4%) | 19(13.6%) | 18(12.9%) | 12(8.6%) |
| | > 7 | 12(8.6%) | 15(10.7%) | 9(6.4%) | 12(8.6%) | 9(6.4%) |

Tables 3–6 present the components of the Pittsburgh Sleep Quality Index (PSQI) and the prevalence of poor sleep quality during the COVID-19 among Georgian students and international students by their age and gender. The result shows that the prevalence of poor subjective sleep quality (SSQ) was significantly higher among students < 20 years (Table 3, $P < 0.05$). However, there was statistical significance between poor sleep quality and gender among Georgian students (Table 5, $P < 0.05$).

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**Table 3.** Comparison of the PSQI component scores and the Georgian students' age grade.

| | | Georgian students | | | | | |
|---|---|---|---|---|---|---|---|
| **PSQI** | | **< 20** | **21– 30** | **>30** | **Total** | **X²** | **P-value** |
| **SSQ** | Good | 21.7% | 28.6% | 1.1% | 51.4% | 14.011 | < 0.05 |
| | Poor | 29.2% | 19.4% | 0.0% | 48.6% | | |
| **SL** | Low | 21.9% | 21.4% | 0.8% | 44.2% | 1.624 | > 0.05 |
| | High | 28.9% | 26.7% | 0.3% | 55.8% | | |
| **SD** | > 7 hrs | 30.3% | 34.7% | 0.8% | 65.8% | 6.519 | > 0.05 |
| | < 7 hrs | 20.6% | 13.3% | 0.3% | 34.2% | | |
| **HSE** | > 75% | 30.0% | 30.6% | 0.8% | 61.4% | 1.099 | > 0.05 |
| | < 75% | 20.8% | 17.5% | 0.3% | 38.6% | | |
| **SDs** | Low | 37.5% | 33.9% | 1.1% | 72.5% | 2.005 | > 0.05 |
| | High | 13.3% | 14.2% | 0.0% | 27.5% | | |
| **USM** | < 1 Time/Week | 46.9% | 43.9% | 1.1% | 91.9% | 0.479 | > 0.05 |
| | > 1 Time/Week | 3.9% | 4.2% | 0.0% | 8.1% | | |
| **DSD** | Low | 25.8% | 28.3% | 1.1% | 55.3% | 5.656 | > 0.05 |
| | High | 25.0% | 19.7% | 0.0% | 44.7% | | |
| **GS** | < 7 | 21.4% | 25.6% | 1.1% | 48.1% | 8.764 | > 0.05 |
| | > 7 | 29.4% | 22.5% | 0.0% | 51.9% | | |

**Table 4.** Comparison of the PSQI component scores and the international students age grade.

| | | International students | | | | | |
|---|---|---|---|---|---|---|---|
| | **PSQI** | **< 20** | **21–30** | **>30** | **Total** | **X²** | **P-value** |
| SSQ | Good | 14.3% | 50.7% | 3.6% | 68.6% | 2.533 | > 0.05 |
| | Poor | 7.9% | 23.6% | 0.0% | 31.4% | | |
| SL | Low | 12.1% | 39.3% | 2.1% | 53.6% | 0.123 | > 0.05 |
| | High | 10.0% | 35.0% | 1.4% | 46.4% | | |
| SD | > 7 hrs | 10.7% | 37.9% | 2.1% | 50.7% | 0.242 | > 0.05 |
| | < 7 hrs | 11.4% | 36.4% | 1.4% | 49.3% | | |
| HSE | > 75% | 16.4% | 53.6% | 2.9% | 72.9% | 0.186 | > 0.05 |
| | < 75% | 5.7% | 20.7% | 0.7% | 27.1% | | |
| SDs | Low | 13.6% | 46.4% | 3.6% | 63.6% | 2.986 | > 0.05 |
| | High | 8.6% | 27.9% | 0.0% | 36.4% | | |
| USM | < 1 Time/Week | 22.1% | 67.9% | 3.6% | 93.6% | 3.329 | > 0.05 |
| | > 1 Time/Week | 0.0% | 6.4% | 0.0% | 6.4% | | |
| DSD | Low | 19.3% | 52.9% | 3.6% | 75.7% | 4.964 | > 0.05 |
| | High | 2.9% | 21.4% | 0.0% | 24.3% | | |
| GS | < 7 | 12.9% | 42.9% | 3.6% | 59.3% | 3.562 | > 0.05 |
| | > 7 | 9.3% | 31.4% | 0.0% | 40.7% | | |

**Table 5.** Comparison of the PSQI component scores and the gender of the Georgian Students' age grade.

| | | Georgian students | | | | |
|---|---|---|---|---|---|---|
| | | **Male** | **Female** | | | |
| SSQ | Good | 14.2% | 37.2% | 51.4% | 2.833 | > 0.05 |
| | Poor | 9.7% | 38.9% | 48.6% | | |
| SL | Low | 12.5% | 31.7% | 44.2% | 3.050 | > 0.05 |
| | High | 11.4% | 44.4% | 55.8% | | |
| SD | > 7 hrs | 16.7% | 49.2% | 65.8% | 0.777 | > 0.05 |
| | < 7 hrs | 7.2% | 26.9% | 34.2% | | |
| HSE | > 75% | 16.4% | 45.0% | 61.4% | 2.482 | > 0.05 |

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| | | | | | | |
|---|---|---|---|---|---|---|
| SDs | < 75% | 7.5% | 31.1% | 38.6% | 7.136 | > 0.05 |
| | Low | 20.0% | 52.5% | 72.5% | | |
| | High | 3.9% | 23.6% | 27.5% | | |
| USM | < 1 Time/Week | 23.1% | 68.9% | 91.9% | 3.182 | > 0.05 |
| | > 1 Time/Week | 0.8% | 7.2% | 8.1% | | |
| DSD | Low | 14.4% | 40.8% | 55.3% | 1.230 | > 0.05 |
| | High | 9.4% | 35.3% | 44.7% | | |
| GS | < 7 | 15.3% | 32.8% | 48.1% | 11.441 | < 0.05 |
| | > 7 | 8.6% | 43.3% | 51.9% | | |

**Table 6.** Comparison of the PSQI component scores and the international students from respective countries by Gender.

| | | Egypt | | India | | Iran | | Nigeria | | Israel | | Total | $X^2$ | P-value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PSQI** | | **Male** | **Female** | **Male** | **Female** | **Male** | **Female** | **Male** | **Female** | **Male** | **Female** | | | |
| **SSQ** | **Good** | 2.9% | 9.3% | 7.1% | 10.7% | 3.6% | 11.4% | 7.9% | 8.6% | 2.1% | 5.0% | 68.6% | 1.230 | >0.05 |
| | **Poor** | 0.7% | 3.6% | 2.9% | 6.4% | 0.7% | 4.3% | 0.7% | 4.3% | 2.9% | 5.0% | 31.4% | | |
| **SL** | **Low** | 0.7% | 9.3% | 5.7% | 8.6% | 2.1% | 8.6% | 6.4% | 4.3% | 4.3% | 3.6% | 53.6% | 1.566 | >0.05 |
| | **High** | 2.9% | 3.6% | 4.3% | 8.6% | 2.1% | 7.1% | 2.1% | 8.6% | 0.7% | 6.4% | 46.4% | | |
| **SD** | **> 7 hrs** | 0.0% | 8.6% | 5.7% | 8.6% | 3.6% | 8.6% | 4.3% | 4.3% | 3.6% | 3.6% | 50.7% | 0.377 | >0.05 |
| | **< 7 hrs** | 3.6% | 4.3% | 4.3% | 8.6% | 0.7% | 7.1% | 4.3% | 8.6% | 1.4% | 6.4% | 49.3% | | |
| **HSE** | **> 75%** | 0.7% | 8.6% | 7.1% | 12.9% | 4.3% | 12.1% | 7.1% | 8.6% | 5.0% | 6.4% | 72.9% | 0.633 | >0.05 |
| | **< 75%** | 2.9% | 4.3% | 2.9% | 4.3% | 0.0% | 3.6% | 1.4% | 4.3% | 0.0% | 3.6% | 27.1% | | |
| **SDs** | **Low** | 2.1% | 7.1% | 8.6% | 11.4% | 1.4% | 10.0% | 5.0% | 8.6% | 4.3% | 5.0% | 63.6% | 0.589 | >0.05 |
| | **High** | 1.4% | 5.7% | 1.4% | 5.7% | 2.9% | 5.7% | 3.6% | 4.3% | 0.7% | 5.0% | 36.4% | | |
| **USM** | **< 1 Time/ Wk.** | 2.9% | 12.9% | 10.0% | 15.7% | 4.3% | 15.0% | 8.6% | 12.1% | 3.6% | 8.6% | 93.6% | 0.016 | >0.05 |
| | **> 1 Time/ Wk.** | 0.7% | 0.0% | 0.0% | 1.4% | 0.0% | 0.7% | 0.0% | 0.7% | 1.4% | 1.4% | 6.4% | | |
| **DSD** | **low** | 3.6% | 10.0% | 9.3% | 11.4% | 3.6% | 11.4% | 7.1% | 10.0% | 3.6% | 5.7% | 75.7% | 3.958 | >0.05 |
| | **High** | 0.0% | 2.9% | 0.7% | 5.7% | 0.7% | 4.3% | 1.4% | 2.9% | 1.4% | 4.3% | 24.3% | | |
| **GS** | **< 7** | 0.0% | 11 7.9% | 8.6% | 7.9% | 3.6% | 10.0% | 6.4% | 6.4% | 4.3% | 4.3% | 59.3% | 4.803 | >0.05 |
| | **> 7** | 3.6% | 5.0% | 1.4% | 9.3% | 0.7% | 5.7% | 2.1% | 6.4% | 0.7% | 5.7% | 40.7% | | |

## 4. Discussion

Our study presented that the prevalence of poor sleep quality among Georgian students and international students by age was 51.9% and 40.7% respectively. This was probably because local students were more involved in social activities before the pandemic period and the pandemic limited this activity in comparison to foreign students, as it is well known that good/active wakefulness is necessary for sufficient night sleep. There was a significant relation between sleep quality and Georgian students' age grades. The age prevalence corresponded with the age grades published in Kim's study among international students in South Korea during the COVID-19 pandemic [12] and remained consistent with Browning's studies [13]. The females, with respect to gender, had poor sleep quality during the pandemic as observed in other studies. It is very interesting evidence, that females seemed more and significantly vulnerable in terms of sleep and mood disorders, [14] it was revealed in our investigation as well in the works of other researchers [15–17].

However, students who had poor sleep quality reported difficulty in falling asleep after their daily activities and some sleep less than 7 hours in other to achieve the plans for the next day. Studies reported that the sleep duration of the students during the pandemic increased [18–21] which was not the same among the students who had less than 7 hours of sleep in this study. Some of the students spent more time in bed trying to sleep as their habitual sleep efficiency was less than 75% which can be attributed to insomnia, psychological stress, and the use of sleeping tablets [22–25].

Meanwhile, some studies have shown that students who have low sleep duration at night are likely to have daytime dysfunction [26–28] which was observed among the participants of this study.

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There are multivariate factors that can affect the sleep quality of students such as the course of study [29], time management [30,31], academic performance [32,33] and we assumed that the impact of COVID-19 affected the sleep quality of some students. Compared to studies, most foreign students find it difficult to adapt to social life [34,35]. The condition in reference to hygiene, tidiness, and spaciousness of the room could affect the quality of sleep such as the room being exposed to air pollutants such as tobacco smoke and bad odor [36].

The effect of life situations on the mental state of students which triggered nightmares, aggressive behavior, and depression eventually resulted in sleep deprivation [37–40]. This descriptive study suggested that both international and local students still have difficulty with their sleep quality and essence of sleep consultations are required. Since poor sleep quality has been a global problem, especially among students [41,42], university authorities should help the students through publicity and consultations for raising awareness. Further investigative studies regarding healthy sleep quality are recommended.

**Author Contributions:** M.E.N: Conceptualization, Methodology, Formal analysis, Data curation, Writing—review & editing. L.N.: Investigation, Formal analysis, Visualization, Writing—review & editing. O.I. and A.F: Methodology, Investigation, Data curation, Writing—review and editing. G.M.: Conceptualization, Methodology, Formal analysis, Data curation, Writing—original draft, Writing—review and editing. All authors have read and agreed to the published version of the manuscript.

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**Institutional Review Board Statement:** The study was conducted in accordance with the Declaration of Helsinki and approved by the Institutional Review Board of the School of Health Sciences, the University of Georgia (UGREC-01-22).

**Informed Consent Statement:** Online Informed consent was obtained from all subjects involved in the study.

**Data Availability Statement:** The data that support the findings of this study are available from the corresponding author upon reasonable request.

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