

# CONFOUNDING FACTORS AFFECTING THE SLEEP QUALITY AMONG INTERNATIONAL STUDENTS DURING THE LOCKDOWN

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## Abstract:

The coronavirus disease 2019 (COVID-19) pandemic has had a negative impact on students' sleep quality, and it's an issue that's been understudied. This study aimed to determine which variables from the demographic data most affect the sleep quality among international students in Jordan during the COVID-19 outbreak and the lockdown. A cross-sectional study design was used to measure SQS. The tool was completed online by the international students using Google Forms. All of the findings were received online and then analysed accordingly. The general linear regressions analysis of independent variables on sleep quality score showed that using the social media for more than six hours daily is the most confounding factor that impaired the sleep quality ( $p=0.008$ ). therefore, among international university students, sleep quality deteriorated during the confinement. Keeping occupied with social media for many hours daily during the lockdown has a negative impact on sleep quality.

**Keywords:** International students; Lockdown; Sleep; Sleep quality; Sleep assessment; COVID-19.

## Introduction

Sleep is a natural, reversible and recurring condition of decreased reactivity to external stimuli accompanied by complex and predictable physiological changes. Examples of these alterations include coordinated, spontaneous and internally produced brain activities, as well as hormone variations and muscle relaxation (Dang-Vu et al., 2021).

Sleep serves a variety of purposes (Worley, 2018). In particular, it is essential for waking cognition or the abilities to think clearly, stay aware and vigilant and maintain focus. Furthermore, sleep consolidates memories and plays an important function in emotional regulation (Chiang et al., 2014). Given that sleep, especially well-structured sleep, is crucial for health maintenance, the incidence of disturbed sleep is worrying. Several bodily

functions are affected by sleep, or the lack of it, including endocrine networks and physiological systems' homeostatic control to coordinate basic biological activities, such as growth and reproduction, whole-body metabolic control (including catabolism and anabolism), as well as stress, infection and other environmental shocks (Carroll & Liu, 2021). The unknowns and worries surrounding COVID-19, as well as the societal ramifications of mass lockdown, may cause sleep disruption and psychological stress for a large number of people, including COVID-19 sufferers and the broader population. COVID-19-related societal reactions such as home confinement, school suspension, and social isolation enhance the incidence of sleep disruption in the general population (Lin et al., 2021).

Meanwhile, many nations, including Jordan, have adopted precautionary steps, such as contact restrictions, self-isolation and the closure of schools and colleges/universities, to minimise the spread of the coronavirus (Bedford et al., 2020). Therefore, the pandemic may have had a bigger psychological impact on university students as in other population groups (Wang et al., 2020). As a result of the spread of COVID-19, Jordan universities have been compelled to shift from face-to-face to online learning (e-learning) (Al-Salman & Haider, 2021; Alsoud & Harasis, 2021).

In recent years, Internet use has quickly grown across the world, and it has become a vital tool for social interaction and communication. Therefore, it has been associated with poor sleep quality and sleep disturbance (Nguyen et al., 2021). With the convenience of taking online classes from home, this type of teaching mode has been linked to extended exposure to mobile, tablet or computer screens, and students are also required to remain sedentary (Mheidly et al., 2020). Unfortunately, it has been reported that long-term exposure to artificial light from electronic appliances can be harmful to one's health. For example, Karki et al. (2021) reported that adolescents who use the Internet go to bed later, take longer to fall asleep and have more frequent night-time awakenings. Additionally, Franceschini et al. (2020) found that over half of the 6,519 students they examined experienced poor sleep quality and sleep habits due to increased psychological discomfort brought about by the COVID-19 lockdown containment measures. Bird et al. (2021) stressed that such experience significantly influences students' growth, quality of life and learning.

Like many countries around the globe, Jordan hosts numerous international students specialising in different areas of science and literature. Based on Alnuaimat, (2021) more than 44 thousands of international students studying in Jordan, around two thirds of them studying in private universities. Those students have been affected directly by the decision to shift the mode of education to distance and online learning. Therefore, international students' virtual classroom experiences could be severely hampered by the time difference, as a results several students reported that they had to adjust their sleep schedules either by going to bed too early or too late in order to keep up with

their academic schedule (Byer, 2020). Being in a different time zone may negatively affect sleep quality and has other concerns (Byer, 2020). Therefore, the present study aimed to assess the effect of screen time and naps on the sleep patterns of international students enrolled in Jordanian universities. In particular, we aimed to examine sleep problems amongst international students and assess their perceptions regarding online classes during lockdown. Moreover, this study identified the confounding factors that influenced sleep quality amongst these international students in Jordan. Therefore, the study hypothesis is that there is no significant relationship between the socio-demographic profiles and sleep quality among international students in Jordanian universities.

## Method and Materials

From July through September 2020, a cross-sectional study design was applied at Jordan's public and private universities. The study inclusion criteria were as follows: The authors obtained a list of convenient sample from international students studying in a Jordanian university regardless of the academic year, should currently be registered and actively enrolled in their academic study and should be living in their home countries during their online (distance) education. If students had a severe medical condition or stayed in Jordan during the lockdown, they were excluded.

## Procedure

An online survey was created using the Google Forms web survey platform, and the target participants were required to complete the form. Through the official channels of the participating colleges and universities, a personal invitation e-mail with a link to the web survey was issued. In addition, the survey link was shared via social media (Facebook and WhatsApp) as well as amongst the researchers' personal connections.

All the participants provided information regarding their gender, age, marital status, smoking status, alcohol usage, use of social media for more than six hours daily (Nowell & Thompson, 2020), methods of online learning, average daily time spent online learning, place

of residence and living status during the confinement.

The validated English version of the Sleep Quality Scale (SQS) was used to assess the participants' sleep quality for the past month. The SQS consists of 28 items and evaluates six domains of sleep quality: daytime symptoms, restoration after sleep, problems initiating and maintaining sleep, difficulty waking and sleep satisfaction. Using a four-point Likert-type scale, the respondents indicated how frequently they exhibited certain sleep behaviours (0 = "few," 1 = "sometimes," 2 = "often," and 3 = "almost always"). Scores on items belong to factors 2 and 5 (restoration after sleep and satisfaction with sleep) and are reversed before being summed. Total scores can range from 0 to 84, with higher scores denoting more acute sleep problems, and lower sleep quality (Shin & Shin, 2006). The data from this current study indicate that the SQS is a reliable instrument for the assessment of the sleep quality of international students. Reliability analysis was applied to the questionnaire. An alpha value of 0.85 indicated good reliability

### **Ethical Approval**

The institutional review board of Al-Balqa Applied University examined and authorised all research involving human subjects, and this particular study received ethical approval number(26/3/2//1279). The participants gave their informed consent electronically rather than in writing. The justification for not providing written informed consent is that the researchers indicated clearly at the beginning of the survey that the participants' acceptance to take the survey constituted their written informed consent. This meant that they freely and willingly agreed to participate in the study. No physical or face-to-face interviews were conducted, and as mentioned previously, the survey was generated using Google Forms.

### **Data Analysis**

The completed forms were encoded and analysed using SPSS version 27 (SPSS@IBM). Data were double-checked for accuracy. Any missing information was not allowed as the online questionnaire was programmed to move

to next item only if the participant completed the previous one. The participants' demographic characteristics were specified in terms of frequencies and percentages for categorical variables. To determine which demographic factors had the greatest impact on SQS, a general linear model (GLM) was applied. The significance level was set at a p value of 0.05.

### **Results**

A total of 247 international students served as the respondents for this survey after meeting the inclusion criteria. Their socio-demographic profiles are described in the following information. The socio-demographic characteristics were analysed using descriptive analysis (Table 1). There were more female respondents (N=130) than males, and the mean age was 23.66 years. Most of the surveyed students were single (76.5%), and more than two-thirds of the respondents were living with their respective families (78.9%).

As for smoking habits, most of the students were not active smokers (76.9%). Regarding the country of origin, many students came from Far East countries, such as Malaysia, China and the Philippines (49.4%). More than half of the students used their smartphones as a tool for online learning.

Next general linear regression was used to examine the predictability of the selected socio-demographic characteristics and the SQS score to determine correlation and identify the primary predictors that impact the sleep quality amongst international students in Jordan, as shown in Table 1, gender, marital status, living status, smoking status, alcohol use, type of gazettes used for online learning, using of social media more than six hours daily, age, and country of origin. Initially, any significant relationships between the covariates and socio-demographic characteristics found during the preliminary analysis were entered into the GLM. As shown in Table 2, using social media for more than six hours daily was the most significant variable that impacted the quality of sleep during the COVID-19 lockdown amongst the respondents. Furthermore, results showed that an increase of one hour of daily usage of social media will significantly decrease the total SQS score.

Table 1. Demographic data analysis

| Variable                     | Frequency (%) |
|------------------------------|---------------|
| <b>Gender</b>                |               |
| Male                         | 116 (47)      |
| Female                       | 131 (53)      |
| <b>Marital Status</b>        |               |
| Single                       | 189 (76.5)    |
| Married                      | 58 (23.5)     |
| <b>Living Status</b>         |               |
| Alone                        | 21 (8.5)      |
| With Family                  | 195 (78.9)    |
| With Colleagues              | 31 (12.6)     |
| <b>Smoking Status</b>        |               |
| Yes                          | 57 (23.1)     |
| No                           | 190 (76.9)    |
| <b>Alcohol Use</b>           |               |
| Yes                          | 16 (6.5)      |
| No                           | 231 (93.5)    |
| <b>Type of used Gazettes</b> |               |
| Smart Phone                  | 125 (50.6)    |
| Tablet                       | 39 (15.8)     |
| Laptop                       | 83 (33.6)     |

Table 2. General linear regressions analysis of independent variables on SQS

| Variable   | Adjusted b (95% CI)    | t statistic | P Value |
|--|------------------------|-------------|---------|
|  |                        |             |         |
| Using social media for more than six hours daily | -4.362 (-7.590,-1.134) | -2.661      | .008    |
|  |                        |             |         |
| Gender   | 2.819(-.270,5.909)     | 1.797       | .074    |
|  |                        |             |         |
|  |                        |             |         |

## Discussion

The current study aimed to fill several important gaps in the research on international students. In general, it sought to identify and evaluate the impacts of online learning on sleep quality. In this work, sleep quality was assessed mainly from the perspective of the students. The socio-demographic factors contributing to sleep quality were also identified, and the impacts were measured by evaluating the SQS scores across all domains.

This current study used a cross-sectional design, and it was conducted from May 2021 to July 2021 in Jordan amongst international students who were all above the age of 18 years. According to the Department of Statistics of the Ministry of Higher Education, Jordan has a high number of international students during the last year of around forty four thousands (Alnuaimat, 2021).

The results of this study contribute to the growing body of knowledge regarding quality of sleep amongst international students, specifically in Jordan.

The Jordanian government has announced the closure of schools and institutions on March 15, 2020, as the number of virus transmissions grew. Furthermore, the government proclaimed a state of emergency and imposed a lockdown throughout the country (UNESCO, 2020). As a result, face-to-face teaching and training were prohibited, and all educational institutions were required to transition from traditional to online learning via digital platforms (Mpungose, 2020). As a result, many international students were forced to study online in their home countries instead (Lane, 2021).

Meanwhile, sleep deprivation amongst teenagers is a serious public health problem, and social media use may have a significant impact in altering their sleep patterns, which in turn, may lead to mental health issues. Whilst previous research on sleep and mental health have largely focused on the frequency and length of social media usage, teenagers' emotional experiences with social media have been understudied (Nesi et al., 2021). The entire study sample consisted mainly of single students (76.5%), with mean age of 24 years old. The literature has indicated that medical students are prone to sleep difficulties (Yassin et al., 2020). However, there is a lack of studies related to

international students in Jordan. Thus, these international students, who are studying whilst staying at their home countries, may develop negative attitudes towards their normal daily routines and may feel detached from the purpose of their study. This, in turn, causes deterioration in their sleep patterns and could increase the sense of anxiety, especially considering that many students travel to study abroad, not only to get their academic degrees, but also to have better experiences and meet new people.

In the current study, we found that a greater level of exposure to social media amongst international students was negatively correlated with sleep quality. Several reasons would support such a result amongst international students in Jordan, including the basic responsibilities involved and the possibility of not getting enough quality sleep at night due to the time difference between Jordan and countries in the Far East, such as Malaysia, China and the Philippines as (49.4%) respondents from such countries. This finding is consistent with previous studies (e.g. Perez et al., 2021; Alonzo et al., 2021), which reported a similar negative correlation between sleep quality and social media use. Moreover, the widespread use of electronic devices has been drastically altered human circadian rhythms and has blurred the line between day and night (Cain et al., 2020). A reduction in circadian rhythm amplitude has been regularly documented in depressive illnesses, which are characterized by symptoms such as poor mood, exhaustion, and sleep difficulties (Al Kazhali et al., 2021; Burns et al., 2021). In addition, when those international students confronted with the COVID-19 outbreak, they might displayed high levels of psychological stress reflected as anxiety symptoms and sleeplessness as supported by (Elhadi et al., 2021).

The negative correlation between sleep quality and social media usage can be explained in several ways. First, international students may have larger social networks and, therefore, greater possibilities of getting assistance in seeking services during study time. Second, they often have a better outlook and understanding of their role as international students. This is in contrast to Combertaldi et al. (2021), who reported that the use of social media at night had a far less impact on bedtime arousal and sleep quality than previously thought.

Year 2021 is over, and 2022 has started. Yet, there are still concerns of new waves of mutated COVID-19 viruses, paving the way for possible fresh lockdowns and limited traveling in the future. Therefore, there is a need to ensure that the concerns of the international students can be adequately addressed using research findings, such as those of the present study, to improve services and ensure that better safety measures are employed.

### Limitations

There are certain limitations to the current study. Firstly, the used tool was self-report which might have a recall bias. Secondly, the questionnaire did not include questions about time of day when social media were used. This might have an effect on the responses regarding quality of sleep among respondents.

Finally, the study respondents were not asked directly about time zone. Rather, they were asked about country of residence during study time.

### Conclusion

In conclusion, social media use for more than six hours daily is considered the most significant variable that impacts the quality of sleep during the COVID-19 lockdown amongst international students in Jordan. Furthermore, an increase by one hour of daily usage of social media will significantly decrease the total SQS score. Regardless of gender and other demographic variables, it has been well-established that the higher the frequency of social media use amongst students, the more adverse effects this may have on their sleep quality. One of the reasons for this finding is that the use of different electronic devices, such as smartphones, tablets and laptops, can increase alertness and make it more difficult for them to fall asleep, thus leading to bad sleeping habits with worse consequences.

Thus, the researchers recommend that students reduce their use of electronic devices, especially before going to bed. Doing so will have a positive effect on their sleep quality and ultimately improve their effectiveness the following day.

### Conflicts of interest

The authors declare no conflicts of interest.

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