International Journal of Community Medicine and Public Health
*Rehman M et al. Int J Community Med Public Health. 2022 Apr;9(4):1626-1631*
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: https://dx.doi.org/10.18203/2394-6040.ijcmph20220830

**Original Research Article**

# The effects of the COVID-19 lockdown on physical activity and sleep quality among university students: cross sectional study

**Mehroze Rehman[1], Areeba Shaikh[1]*, Maryam Maheen[1], Duaa Nini[1], Bushra Zulfiqar[2], Bina Fawad[3]**

[1]Ziauddin University Hospital, Ziauddin Medical College, Karachi, Sindh, Pakistan
[2]Department of Obstetrics and Gynaecology, Al-Tibri Medical College and Hospital Isra University, Karachi, Sindh, Pakistan
[3]Department of Community Health Sciences, Ziauddin University, Karachi, Sindh, Pakistan

**Received:** 27 January 2022
**Accepted:** 08 March 2022

***Correspondence:**
Dr. Areeba Shaikh,
E-mail: shaikhareeba5@gmail.com



## ABSTRACT

**Background:** Since the commencement of the lockdown, universities shifted their teaching online as an all-out effort to prevent transmission of the infection. This confinement has resulted in poor sleep quality (SQ) and low physical activity (PA) levels. The aim of this study is to determine the effects of the lockdown on SQ and PA levels and investigate their association amongst university students.
**Methods:** 404 students filled out an online questionnaire, the International physical activity questionnaire (IPAQ) and the Pittsburgh sleep quality questionnaire (PSQI), which were used to assess both the parameters.
**Results:** The pandemic resulted in participants indulging in reduced PA and poor global PSQI scores. It was found that females had worse global PSQI scores than males. Furthermore, a significant association was analyzed between SQ and PA where it was seen that participants with worse SQ were involved in low PA during lockdown.
**Conclusions:** The lockdown has been an unfamiliar period in which many lifestyle changes were noted. This study bridges the gap existing in the health education sector and increases awareness among young adults regarding healthy lifestyle choices during this pandemic and forthcoming events.

**Keywords:** COVID-19, Sleep quality, Physical activity, University students, Sedentary behavior

## INTRODUCTION

Coronavirus is a family of viruses known to cause respiratory infections ranging from the common cold to severe diseases such as Middle East respiratory syndrome (MERS) and severe acute respiratory syndrome (SARS). A newly identified strain, SARS coronavirus-2 (SARS-CoV-2), has caused a pandemic of respiratory illness, called COVID-19.[1]

COVID-19 was first reported as pneumonia of unknown etiology in Wuhan, China, to the World Health Organization (WHO) Country office in China on 31 December 2019.[2] Since then, the disease has spread globally with 8,586,396 confirmed cases.[3] Whereas in Pakistan 148,921 confirmed cases have been reported as of 16 June 2020. Lockdown has been imposed globally, and citizens are advised to practice social distancing to prevent the further spread of the infection.[4]

In 2003, SARS was eventually eradicated through community containment measures. While these measures prevent human-to-human transmission, they can induce unhealthy behaviors as people's daily activities are disrupted.[5]

Like previous pandemics, the COVID-19 pandemic has become a stressful situation increasing anxiety and

depression in the general population. These factors influence physical activity (PA), sleep quality (SQ), and overall lifestyle. Staying indoors during the pandemic may harm physical health. An Italian study stated that quarantine impacted the habits of its population, which included alteration of daily PA.[5] Another study in Hong Kong observed that 37% of participants had poorer SQ during the pandemic.[6] SQ is a key indicator of health and it can improve immunity against viral infections, which can be beneficial in the current situation.[7]

Numerous studies have stated that decreased levels of PA, sedentary behavior (SB), and long sleep durations were found in young adults during the pandemic.[7] Limited research has been conducted in Pakistan regarding the impact of the pandemic on the physical health of university students; hence this study bridges this gap and increases health education awareness among the population during pandemics.[7]

## METHODS

A descriptive cross-sectional study was conducted, and the participants were surveyed online. The objectives of the study are to determine the effects of the lockdown on SQ and PA levels and their association amongst university students.

The inclusion criteria were: adults aged 18-28 years old and students from all public and private universities in Karachi, Pakistan. All individuals who were diagnosed with a dysfunctional sleep pattern and any disability to perform PA were excluded.

The sample size was 400 at a 95% confidence level by using the OpenEpi calculator. Consent was acquired from all participants. A self-designed and self-explanatory questionnaire was prepared and disseminated using Google forms which included three components: general information (e.g. age, sex, and marital status), SQ, and physical activity. The online survey was conducted between 25 June 2020, and 25 September 2020, with 404 respondents.

This research was conducted in accordance with the Helsinki declaration as revised 1989 and was approved by the ethical review board of Ziauddin University and Al-Tibri Medical College and Hospital Isra University.

The Pittsburgh sleep quality index (PSQI) was used to assess SQ and sleep duration in participants. It consists of 24 questions, 19 of which are self-reported, and 5 require secondary feedback from a room or bed partner. Only the self-reported questions are used to assess SQ and generate categorical scores representing the PSQI's seven components. The seven component scores are then added to yield one "global" score with a range of 0-21 points. Scores of 5 or less are then further classified as having "good SQ," and a score of more than five is classified as "poor SQ". The sleep duration was calculated from participants' reported bedtimes and waking up times.[8]

Furthermore, because it was not possible to attain data before the onset of COVID-19, one additional question was asked, "How has your sleep been since the onset of the COVID-19 pandemic? (e.g. same as usual, better than usual, and worse than usual)".

The International physical activity questionnaires (IPAQ) was used to analyze the PA level in participants. Three items were taken from the questionnaire to obtain information on participants' involvement in vigorous PA, moderate PA, and walking. All the responses in hours were converted to minutes, and incomplete data were excluded from the analysis.

The MET-minutes per week were calculated using the following formula.

$$MET\ minutes/week = Intensity\ (MET) \times duration \times frequency$$

Three levels of PA were proposed based on categorical scores that are low, moderate, and high.

Statistical package for social sciences (SPSS) version 20 was used to analyze the data. Our study assessed the variables both qualitatively and quantitatively. Furthermore, qualitative variables were compared using Chi-square tests. A p value of <0.05 was considered significant throughout the study.

## RESULTS

### *Descriptive statistics of participants and COVID-19 related issues*

A total of 404 participants (mean age 21.8±2.05 years) were included in the study based on the inclusion criteria. Our sample consisted of 272 (67.3%) females and 132 (32.7%) males.

The Pearson's Chi-square test was used on global PSQI scores and gender to determine the SQ in males (good versus poor, 31.1% versus 68.9%) and females (27.2% versus 72.8%).

### *Sleep and pandemic*

We evaluated the following components; sleep duration, sleep latency, sleep efficiency, and sleep quality from the PSQI questionnaire using the Chi-square test and associated the effect of lockdown on sleep with global PSQI score. For sleep duration, 265 participants slept for >7 hours, 104 participants had a good score and 161 participants had a poor score (39.2% versus 60.8%, p<0.00). As for sleep efficiency, 146 participants had a poor score while 106 participants had a good score (42.1%

versus 57.9%, p<0.00). Similarly, for sleep latency 103 participants (78.6%) had a poor global PSQI score with a significance value of (p<0.00).

The qualitative analysis of the sleep quality during the pandemic is represented in Figure 1. After the outbreak of COVID-19 majority of the population's sleep had worsened.

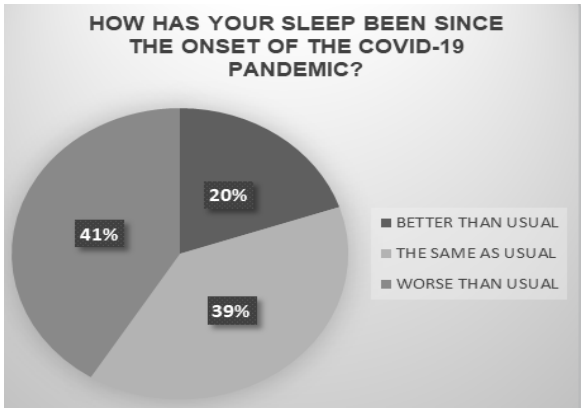


**Figure 1: COVID-19 effect on sleep quality.**

***Physical activity and pandemic***

During the lockdown, only 28.5% of the participants were reported to have a high PA. The inferential analysis in Table 1 depicts the overall PA levels from "before" compared to "during" the COVID-19 lockdown period. Using the Chi-square test, it revealed that the majority of the population adapted to a sedentary lifestyle during the lockdown, including low PA (before versus during COVID-19, 88 versus 177), moderate PA (131 versus vs.109) and high PA (181 versus 67).

***Association of SQ and PA during pandemic***

In Table 2 the chi-square test was applied to find an association between the qualitative data of SQ and PA during the lockdown. Participants with SQ 'better than usual' were indulged in high PA (25.5%). Whilst those with SQ 'worse than usual' had low PA (50.6%). Whereas, (42.2%) individuals had moderate PA with their SQ to be 'same as usual'. Interestingly, the participants who had a 'worse than usual' SQ had an increase of high PA by 3.2% than those with 'better than usual' SQ (28.7% versus 25.5%).

**Table 1: Comparison of physical activity before and during COVID-19 pandemic.**

| Physical activity before | Physical activity during | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Low | | Moderate | | High | | Total | |
| | N | % | N | % | N | % | N | % |
| Low | 67 | 37.9 | 12 | 11 | 9 | 7.9 | 88 | 22 |
| Moderate | 55 | 31.1 | 47 | 43.1 | 29 | 25.4 | 131 | 32.8 |
| High | 55 | 31.1 | 50 | 45.9 | 76 | 66.7 | 181 | 45.3 |
| Total | 177 | 100 | 109 | 100 | 114 | 100 | 400 | 100 |

**Table 2: Comparison of sleep quality and physical activity during COVID-19 pandemic.**

| How has your sleep been since the onset of the COVID-19 pandemic | Physical activity during | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Low | | Moderate | | High | | Total | |
| | N | % | N | % | N | % | N | % |
| Better than usual | 30 | 16.7 | 21 | 19.3 | 29 | 25.2 | 80 | 19.8 |
| Same as usual | 59 | 32.8 | 46 | 42.2 | 53 | 46.1 | 158 | 39.1 |
| Worse than usual | 91 | 50.6 | 42 | 38.5 | 33 | 28.7 | 166 | 41.1 |
| Total | 180 | 100 | 109 | 100 | 115 | 100 | 404 | 100 |

## DISCUSSION

This cross-sectional study investigated lockdown effects on PA and SQ in young adults. Our findings provide evidence of an association between genders and SQ; most females were evident to have poor sleep, a comparison of PA scores (before and during a pandemic), and SQ correlation with PA during the lockdown. As far as we know, this is the first study that assesses the PA and SQ of young adults in Pakistan during the COVID-19 lockdown.

Our results confirmed the association of gender against global PSQI and reported (72.8%) females having poorer SQ than males (68.9%) during the lockdown. A study in Pakistan reported a similar finding of poor SQ in females.[9] The research conducted in China during the COVID-19 pandemic states analog findings; 23.2% of the sample experienced insomnia leading to worsened SQ.[10]

It was observed that females tend to have a higher sleep latency period than males, which leads to poorer SQ in females. This means that males take fewer minutes to fall asleep hence their scores are better.[11] It has been described that mental health contributes as a consequential risk factor for poor SQ in females. This could be elucidated by the release of sex steroid hormones responsible for depressive

symptoms, irritability, premenstrual anxiety, and menstrual pain.[12]

However, we also investigated that insufficient sleep duration (60.8%), sleep efficiency (42.1%), and sleep latency (78.6%) are associated with higher global PSQI scores. An Italian study reported that 57% of the population revealed poor SQ during the lockdown, which is considerably worse than pre-pandemic SQ.[13] Similarly, other studies also stated that participants' SQ had been negatively affected relative to pre-lockdown.[14,15] This may be possible due to the unprecedented situation caused during the lockdown; several factors could affect sleep habits (i.e. less physical activity, psychological distress, increased feeling of time expansion, and reduced sun exposure).[14] Additionally, the dramatic increase of sleep latency in students is the most prevalent factor in poor SQ before and during the lockdown (39% versus 55%). These altering behaviors could be explained due to social restrictions and moderation of work schedules and daily activities.[15]

Our study evaluated that most participants thought of their SQ as worse than before the onset of lockdown. The pandemic has been a distressing period for most of the population, especially university students. Stress has a marked impact on SQ which could be due to lockdown-induced stress.[16] From our study 50.6% of our population were reported to have "worse than usual" SQ during the lockdown. Interestingly, a study conducted stated an increased rate of moderate insomnia during the pandemic which may affect the sleep pattern of individuals.[17]

Correspondingly, positive results for altered sleep patterns during pandemic were collected from another study; 69.4% of participants had a disturbed sleep pattern.[18] A study that also used the PSQI scoring, found worsening of SQ and insomnia symptoms during the lockdown.[15]

The present study has shown that the students had disturbed sleep during the pandemic, which depicted that PA's level directly influenced the SQ. Participants with deteriorating SQ had lower PA levels, whereas those with better SQ had a higher PA level during the lockdown. These findings agree with various studies that have estimated a positive correlation between sleep with PA. Evidence has shown that exercise can act as a non-photic synchronizer that can alter the circadian rhythm of the human body; hence PA can interact with the circadian typology or chronotype.[19]

Ever since the commencement of the lockdown, universities have shifted to online teaching. Gyms and workout facilities were closed as an all-out effort to prevent infection transmission. Due to this confinement, prolonged sitting and increased screen time have decreased PA, leading to SQ impairment.[20] Therefore, strategies originally thought for promoting an active lifestyle (through social media and user-friendly online exercising applications) at home or surroundings may impact sleep, which may benefit the changing behavior during the lockdown. Moreover, options for lenient outdoor recreational activities should be implied while preserving both safety and social distancing.

This study also states the trends of PA before and during the pandemic. We found out that many students have decreased their physical activity and opted for sedentary behavior during the lockdown. A study carried out in Spain similarly reported a dramatic decrease in vigorous and walking activities while sedentary time was increased. However, the moderate activities barely changed, whereas, in our study, there was a decrease by 16.8% in moderate activity.[21] Likewise, a significant reduction (57.1%) was found in a study in the number of time people spent on physical activities. The total MET minutes/week were decreased in all participants during the lockdown compared to the time before.[22]

Additionally, a global study also reported an altered pattern of PA. During the lockdown, the time and days people spent on physical activities decreased by 33.5% and 24%, respectively. In correspondence to that sitting, time increased significantly by 28.6%.[23]

Conversely, a study reported an increase in the number of days of vigorous and moderate PA with a subsequent rise in minutes/week of physical activity. The sitting time was found to be increased. The reason for this unexpected increase in PA during the lockdown was not apparent.[24] Although, it could be due to encouragement from social media that reminds its users to stay active.[25]

Keeping the given situation in mind, we suggest some measures to promote an active lifestyle among the general population and its positive impact on their health and sleep. Awareness campaigns should be held so that each individual can be informed about the current situation, its direct impact on their health, and its relationship with other factors that indirectly influence their lifestyle. The government should be actively involved by sending notifications through SMS.

Despite the efforts of objectively proving our hypothesis, this study includes several limitations. The first limitation is that it is difficult to make causal inferences as the study conducted is the cross-sectional design. Second, the participants' recruitment was completed online (due to the outbreak of the COVID-19 pandemic). As the sampling was voluntary and processed through an online system, selection and response bias could be possible. Third, the PA data before the pandemic was collected by participants recalling their past routine; therefore, there is a chance of recall bias.

## CONCLUSION

The COVID-19 outbreak has been a stressful and unfamiliar period for the general population. Many lifestyle changes were noted during the lockdown. We

assessed the impact of these changes on variables of health like PA and SQ. Our study found out university students have decreased their daily PA during the COVID-19 lockdown and are opting for a sedentary lifestyle. Stress from the pandemic and having to stay. Indoors succumbs to being idle. We also found a more significant number of women in our sample population had low SQ than men because of a tremendous increase in the sleep latency period.

*Funding: No funding sources*
*Conflict of interest: None declared*
*Ethical approval: The study was approved by the Institutional Ethics Committee*

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**Cite this article as:** Rehman M, Shaikh A, Maheen M, Nini D, Zulfiqar B, Fawad B. The effects of the COVID-19 lockdown on physical activity and sleep quality among university students: cross sectional study. Int J Community Med Public Health 2022;9:1626-31.