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ORIGINAL ARTICLE

Association Between Internet Use, Sleep, Cognition and Physical Activity Levels During COVID-19 Lockdown

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Abstract

Purpose The purpose of this study was to compare internet usage, sleep, cognition and physical activity in college professors and collegiate students during COVID-19 lockdown and to study the association of internet overuse with sleep quality, cognition and physical activity during the COVID-19 lockdown.

Methods A sample of 125 participants {professors ($n=52$) and collegiate students ($n=73$)} was recruited from Jamia Hamdard, New Delhi, India. Criteria for inclusion were college professors and collegiate students who uses internet. Both the groups were assessed for internet usage (Internet Addiction Test), sleep quality (Pittsburgh Sleep Quality Index), cognition (Cognitive Failure Questionnaire) and physical activity (Global Physical Activity Questionnaire) via google forms.

Results There was a significant difference for internet usage ($p<0.05$), sleep quality ($p=0.032$), cognition (distractibility, $p=0.019$) and physical activity in college professors and collegiate students. It has been also reported that there was a significant association of internet usage with sleep quality and cognition and sleep quality with cognition.

Conclusion Students have more problematic internet usage, bad sleep quality, more cognitive failures and less physical activity than college professors during pandemic lockdown. It has been also observed that problematic internet usage has correlation with sleep quality, cognition and physical activity.

Keywords COVID-19 pandemic · Internet addiction · Mental ability · Intellectual functions · Sleep · Physical functions

1 Introduction

The coronavirus disease 2019 (COVID-19) outbreak is currently a challenge that is affecting people globally and can lead to severe problems. The WHO acted very quickly by organizing diagnostics advancement; providing guidelines on patient examination, laboratory testing, and treatment; and giving day-to-day information regarding disease. The preventive measures have also been given to people by WHO which includes often washing hands, avoid touching eyes, nose and mouth, maintain social distance and wear masks [1]. In order to stop the spread of disease, many countries have taken many steps, out of which lockdown was widely seen all over the world [2]. There are many impacts of this lockdown on humans which affects their lives such as health, economy and their lifestyles. COVID-19 causes drastic changes in world economy that is noticed by the people globally [3]. Yet some of the impact of coronavirus needs immediate attention.

Internet have undoubtedly changed our lives in the last few years and modified our way of communicating, socializing, entertaining ourselves, working, studying, and even thinking. For people who born in this era, the internet becomes that part of life which is perfectly blended in daily experience [4]. While many have focused on the incredible benefits that result from new technology, there are also some disadvantages [5]. Although 'Internet gaming disorder' is recognized and included in the Diagnostic and Statistical Manual of Mental Disorder V (DSM-V), given by the American Psychiatric Association [6], internet addiction disorder consists of a range of addiction disorders which includes

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internet gaming disorder and social networking using smartphones in particular, which has been emerging as a cause of psychosocial issues in adults [7].

Problematic internet use is characterized by an excessive or poorly control urges, or behaviors of internet use that results into harmful effects on daily living activities [8]. Cognition is a neural process that includes thinking, judgment, problem solving and other higher mental functions such as execution of complex behavior, memory, attention and concentration [9]. Internet addicts have shown cognitive problems such as reduced decision-making ability, poor decision making and impaired executive functioning [10]. Problematic internet use also affects sleep and results into various sleep problems such as reduced sleep time, insomnia, sleep apnea, nightmares and extended day sleep time [11]. Internet addiction also reduces the amount of physical activity and leads to adverse health consequences [12]. As people were advised to self-isolate and stay at home during lockdown, these actions negatively affect people's lives and leads to more screen time which in turn affects the sleep quality, physical activity [13] and mental health [14]. Some studies suggest that prevalence of psychological issues such as internet addiction has been increased during pandemic [15]. In order to reduce the negative impact, there is a need to highlight these issues [16].

Although there are high chances that college students get addicted to internet as compared to others as internet is more attainable to students and students have more spare hours to use it but nowadays teachers are also having risk to develop internet addiction due to increased demand to use internet for academic purposes due to ongoing pandemic. To the best of our knowledge, there have been no studies which have studied the impact of COVID-19 lockdown on internet usage, cognition, sleep and physical activity in professors and students. Therefore, the present study was aim to determine the impact of COVID-19 lockdown on internet usage, cognition, sleep and physical activity and determine the difference between these variables in professors and students. It also provides information how this problematic internet use affects sleep quality, cognitive functions and physical activity in college professors and students.

2 Methods

2.1 Study Design and Sample

It was an observational study. A sample of 125 participants was recruited from New Delhi, India via convenience sampling. A google form was created consisting of all the questionnaires, the link for which was shared with known eligible people who were requested to further share the link of the google form with their known to people who can be suspected to be eligible for the present study. The study was done from December 2020 to August 2021. Criteria for inclusion were college professors and collegiate student who use internet. Subjects who can understand and read English were included in the study. Subjects with the history of any neurological, psychological, psychiatric disorders and who consume alcohol, drug (drug abuse) and centrally active medications were excluded from the study. The study was approved and carried out in accordance with the Institutional Ethics Committee, Jamia Hamdard. The privacy rights of subjects were observed and informed consent was obtained for participating in the study (Fig. 1).

2.2 Measures

2.2.1 Internet Usage

Internet usage was assessed using Internet Addiction Test (IAT). The Internet Addiction Test is the first validated and reliable measure of addictive use of the internet developed by Young [17]. The IAT is a 20-item questionnaire that measures normal, mild, moderate, and severe levels of internet addiction. The 20-item questionnaire measures characteristics and behaviors associated with compulsive

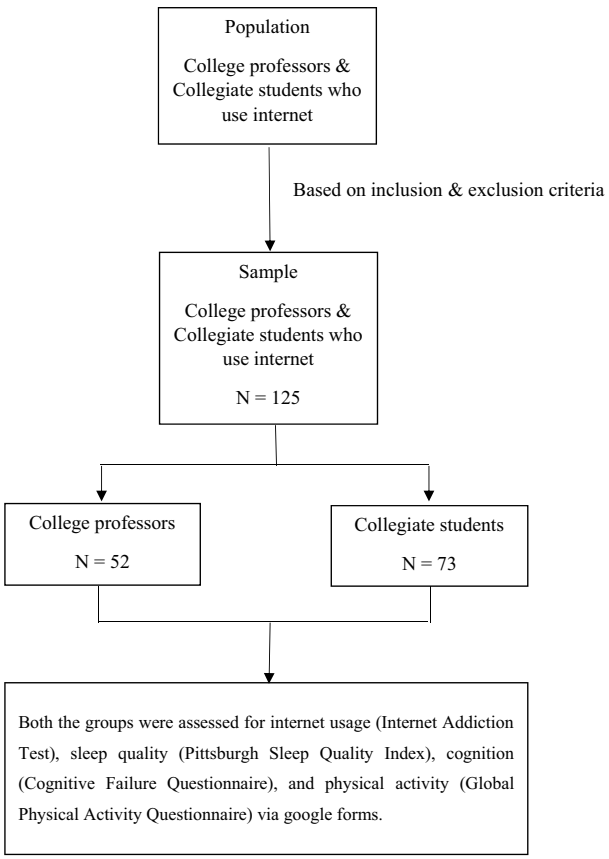

Fig. 1 Flowchart

use of the internet that include compulsivity, escapism, and dependency. The higher the score, the worse the participants are said to be in terms of internet usage [18].

2.2.2 Sleep Quality

Sleep quality was assessed by Pittsburgh Sleep Quality Index given by Buysse et al. [19]. The PSQI is a 19-item self-rated questionnaire having 7 components for evaluating subjective sleep quality over the previous month. Each question is weighted on a 0–3 interval scale. The global PSQI score is calculated by totaling the seven component scores, where lower scores denote a healthier sleep quality [20].

2.2.3 Cognition

Cognition was measured using Cognitive Failure Questionnaire (CFQ) which was developed by Broadbent et al. [21]. The CFQ is used to assess the frequency with which persons experienced cognitive failures in everyday life. In order to score the scale, add up the scores of the 25 separate items, providing a score ranging from 0 to 100. The higher the score, the worse the participants are said to be in terms of cognition. The following domains of CFQ were used in this study which was given by Rast et al. [22].

2.2.3.1 Forgetfulness Forgetfulness is a tendency to let go from one's mind something known or planned, for example, names, intentions, appointments, and words.

2.2.3.2 Distractibility Distractibility is defined as being absentminded or easily disturbed in one's focused attention.

2.2.3.3 False Triggering False triggering is the breakage in the cognitive and motor actions.

2.2.4 Physical Activity

The Global Physical Activity Questionnaire was developed by WHO for assessment of physical activity in 2002 [23]. It collects information on physical activity participation in three different settings as well as sedentary behavior, comprising 16 questions [24]. The lower the score, the worse the participants are said to be in terms of physical activity.

The domains are:

- Activity at work
- Travel to and from places
- Recreational activities

3 Data Analysis

Data analysis was done using SPSS version 23. The data were tested for normality using Shapiro–Wilk Test. Following which the data of 125 participants were tested using Mann–Whitney *U* Test for all the variables. A p value of ≤ 0.05 was considered as significant. Spearman correlation tests were applied to determine associations between different test measures. Both the groups were assessed for internet usage, sleep quality, cognition and physical activity.

In this study, the subjects were divided into two groups: college professors ($n=52$) and collegiate students ($n=73$). The measures for internet addiction (Internet Addiction Test), sleep quality (PSQI), cognition (Cognitive Failure Questionnaire) and physical activity (Global Physical Activity Questionnaire) were measured between two groups.

4 Results

The results are described and represented under different tables mentioned accordingly in appropriate sections. The demographic data are presented in Table 1.

Table 1 Demographic data of college professors ($n=52$) and collegiate students ($n=73$)

	Mean age (years)	SD (years)	Min age (years)	Max age (years)
College professors (52)	38.36	13.17	22.0	58.0
Male (10)	31.30	9.34	22.0	52.0
Female (42)	40.04	13.47	22.0	58.0
Collegiate students (73)	20.77	1.97	18.0	26.0
Male (26)	20.65	2.15	18.0	26.0
Female (47)	20.83	1.89	18.0	26.0

Abbreviations: *SD* standard deviation, *Min.* minimum, *Max.* maximum

Table 2 Comparison of different variables between college professors ($n=52$) and collegiate students ($n=73$)

Variables	College professors (Mean rank)	Collegiate students (Mean rank)	*p* value
1. Internet usage	40.42	79.08	0.000*
2. Sleep quality	54.84	68.82	0.032*
a. Subjective sleep	58.82	65.98	0.220
b. Sleep latency	57.95	66.60	0.171
c. Sleep duration	67.77	59.60	0.194
d. Sleep efficiency	57.73	66.75	0.131
e. Sleep disturbances	55.24	68.53	0.023*
f. Sleep medication	64.62	61.85	0.391
g. Daytime function	51.03	71.53	0.001*
3. Cognition	56.28	67.79	0.080
a. Forgetfulness	57.59	66.86	0.158
b. Distractibility	54.03	69.39	0.019*
c. False triggering	58.50	66.21	0.240
4. Physical activity			
a. Vigorous PA during work	60.87	64.52	0.529
b. Moderate PA during work	61.34	64.18	0.629
c. Walk during work	65.38	61.31	0.491
d. MV use for traveling	69.71	58.22	0.067
e. Bicycle use for traveling	57.87	66.66	0.018*
f. Walk for traveling	57.12	67.19	0.109
g. Vigorous PA at garden/yard	53.54	69.74	0.004*
h. Moderate PA at garden/yard	62.09	63.65	0.804
i. Moderate PA inside house	62.37	63.45	0.866
j. Vigorous PA during leisure time	61.79	63.86	0.707
k. Moderate PA during leisure time	60.49	64.79	0.418
l. Walking during leisure time	61.79	62.82	0.946

Data are presented as Mean rank

Abbreviations: *IAT* Internet Addiction Test, *PSQI* Pittsburgh Sleep Quality Index, *CFQ* Cognitive Failure Questionnaire, *IPAQ* International Physical Activity Questionnaire, *PA* physical activity, *MV* motor vehicle

*Significant difference $p \leq 0.05$

Table 3 Categorical comparison of internet usage between college professors ($n=52$) and collegiate students ($n=73$)

IAT categories	College professors (%)	Collegiate students (%)
Normal internet users (IAT ≤ 30)	71.15%	27.40%
Mild addiction (IAT 31–49)	21.15%	43.84%
Moderate addiction (IAT 50–79)	7.69%	23.29%
Severe addiction (IAT 80–100)	0%	5.48%

Data are presented as percentage

Abbreviation: *IAT* Internet Addiction Test

4.1 Internet Usage

There is a significant difference in Internet Addiction Test score in professors and students (Table 2). Internet Addiction Test scores of both the groups showed that students are more addicted to internet than professors. Professors (71.15%) have more percentage of normal internet users as compared to students (27.40%) (Table 3). Table 3 shows the categorical comparison of internet addiction [25].

4.2 Sleep Quality

There is a significant difference in sleep quality in college professors and collegiate students (Table 2). The mean score for global PSQI score suggests that professors have good sleep quality as compared to students (Table 2). Table 4 shows comparison of sleep quality patterns in professors and students. PSQI score of less than or equal to 5 considered as good sleep quality and a score greater than 5 is considered as poor sleep quality [10]. Subjects having sleep duration less than 5 h were more in student (15.07%) group as compared to professors (7.69%) (Table 4).

Table 4 Comparison of sleep quality patterns in college professors ($n=52$) and collegiate students ($n=73$)

Categories	College professors Mean rank (%age)	Collegiate students Mean rank (%age)	*p* value
Subjective sleep quality (Mean rank)	58.82	65.98	0.220
Very good	25.00%	15.07%	
Fairly good	55.77%	60.27%	
Fairly bad	13.46%	20.55%	
Very bad	5.77%	4.11%	
Sleep duration (mean rank) (h)	67.77	59.60	0.194
> 7		26.92%	41.10%
6–7	32.69%	30.14%	
5–6	32.69%	13.70%	
< 5	7.69%	15.07%	
Sleep efficiency (mean rank) (%)	57.73	66.75	0.131
> 85	32.69%	13.70%	
75–84	42.31%	60.27%	
65–74	23.08%	26.03%	
< 65	1.92%	0%	
Use of sleep medication (mean rank)	64.62	61.85	0.391
Not during past month	88.46%	93.15%	
< 1 time/week	0%	0%	
2–3 times/week	3.85%	0%	
3 or more times/week	7.69%	6.85%	
PSQI (Mean rank)	54.84	68.82	0.032*
PSQI ≤ 5	44.23%	17.81%	
PSQI > 5	55.77%	82.19%	

Data are presented as percentage and mean rank

Abbreviations: *PSQI* Pittsburgh Sleep Quality Index

Table 5 Cognitive states comparison of college professors ($n=52$) and collegiate students ($n=73$)

CFQ categories	College professors	Collegiate students
CFQ < 43	57.69%	52.05%
CFQ ≥ 43	42.31%	47.95%

Data are presented as percentage

Abbreviations: *CFQ* Cognitive Failure Questionnaire

4.3 Cognition

There is no significant difference in cognition between professors and students (Table 2). The students have more cognitive failures than professors as professors (56.28) have less mean CFQ score than students (67.79) (Table 2). Data have been showed that students were more distractable and have more false triggering and forgetfulness as compared to professors. Table 5 shows cognitive states comparison of students and professors [26].

4.4 Physical Activity

4.4.1 Physical Activity During Work

There is no significant difference between professors and students in physical activity during work (Table 2). However, results showed that more vigorous and moderate physical activities are done by students as compared to professors while professors walked more as compared to students during work.

4.4.2 Physical Activity During Travel

There is a significant difference in both the groups when they use bicycle for traveling (Table 2). The time for traveling by motor vehicle is more in professors. Bicycles are used by students more than professors for traveling. The mean rank showed that students walk more as compared to professors for traveling.

4.4.3 Physical Activity at Garden/Yard

There is a significant difference in vigorous physical activity at garden or yard in both the groups (Table 2). Students have done more vigorous and moderate physical activities at garden/yard as compared to professors.

4.4.4 Physical Activity During Leisure Time

There is no significant difference between professors and students in physical activity during leisure time (Table 2). The mean score data have been showed that students did more vigorous (63.86) and moderate (64.79) physical activity during leisure time when compared with professors mean rank scores for vigorous (61.79) and moderate (60.49) physical activities. Professors (63.25) walked more during leisure time as compared to students (62.82).

4.5 Correlation Between Internet Usage and Sleep Quality

There is a significant correlation of internet usage with sleep in both the groups. Subjective sleep, sleep latency, use of sleep medications, daytime dysfunctions and global PSQI scores significantly correlate with internet usage in professors and subjective sleep, use of sleep medications, daytime dysfunctions and global PSQI score in students (Table 6). There is a significant association between sleep quality and cognition in professors and students (Table 7).

4.6 Correlation Between Internet Usage and Cognition

There is a significant association of internet addiction with cognition in professors (Table 6). There is a significant association between cognition and sleep quality in professors and students (Table 7). There is no significant correlation

Table 6 Correlation of internet usage with sleep parameters, cognition and physical activity measures

	College professors internet usage (IAT)	Collegiate students internet usage (IAT)
Sleep quality (PSQI)	0.388* (0.004)	0.266* (0.023)
Subjective sleep	0.296* (0.033)	0.236* (0.044)
Sleep latency	0.314* (0.023)	0.076 (0.524)
Sleep duration	0.240 (0.087)	0.106 (0.374)
Sleep efficiency	0.239 (0.088)	0.100 (0.399)
Sleep disturbances	0.097 (0.495)	0.173 (0.144)
Sleep medications	0.325* (0.019)	0.300* (0.010)
Daytime dysfunction	0.515* (0.000)	0.206 (0.08)
Cognition (CFQ)	0.394* (0.004)	0.192 (0.104)
Forgetfulness	0.393* (0.004)	0.263* (0.025)
Distractibility	0.359* (0.009)	0.074 (0.534)
False triggering	0.390* (0.004)	0.266* (0.023)
Physical activity (IPAQ)		
Vigorous PA during work	0.086 (0.546)	−0.148 (0.212)
Moderate PA during work	0.099 (0.483)	−0.115 (0.334)
Walk during work	0.036 (0.800)	−0.095 (0.422)
MV use for traveling	0.038 (0.788)	−0.113 (0.339)
Bicycle use for traveling	−0.080 (0.575)	−0.043 (0.719)
Walk for traveling	0.118 (0.406)	−0.067 (0.575)
Vigorous PA at garden/yard	0.051 (0.719)	−0.216 (0.066)
Moderate PA at garden/yard	0.038 (0.790)	−0.161 (0.174)
Moderate PA inside house	−0.171 (0.226)	−0.144 (0.338)
Vigorous PA during leisure time	0.055 (0.701)	−0.160 (0.177)
Moderate PA during leisure time	−0.031 (0.827)	−0.179 (0.130)
Walking during leisure time	−0.310* (0.025)	0.045 (0.707)

Data are presented as correlation coefficient (*p* value)

Abbreviations- *IAT* Internet Addiction Test, *PSQI* Pittsburgh Sleep Quality Index, *CFQ* Cognitive Failure Questionnaire, *IPAQ* International Physical Activity Questionnaire, *PA* physical activity, *MV* motor vehicle

*Correlation is significant at the 0.05 level

Table 7 Correlation between sleep parameters and cognition

College professors	Cognition (CFQ)	Forgetfulness	Distractibility	False triggering
Sleep quality (PSQI)	0.445* (0.001)	0.426* (0.002)	0.459* (0.001)	0.425* (0.002)
Subjective sleep	0.443* (0.001)	0.408* (0.003)	0.478* (0.000)	0.401* (0.003)
Sleep latency	0.431* (0.001)	0.433* (0.001)	0.422* (0.002)	0.449* (0.001)
Sleep duration	0.148 (0.294)	0.162 (0.252)	0.140 (0.322)	0.180 (0.201)
Sleep efficiency	0.253 (0.070)	0.193 (0.169)	0.293* (0.035)	0.235 (0.093)
Sleep disturbances	0.219 (0.118)	0.167 (0.236)	0.248 (0.076)	0.173 (0.220)
Sleep medications	0.442* (0.001)	0.445* (0.001)	0.414* (0.002)	0.446* (0.001)
Daytime dysfunction	0.422* (0.002)	0.447* (0.001)	0.426* (0.002)	0.407* (0.003)
Collegiate students				
Sleep quality (PSQI)	0.301* (0.010)	0.278* (0.017)	0.404* (0.000)	0.161 (0.173)
Subjective sleep	0.214 (0.070)	0.169 (0.152)	0.304* (0.009)	0.119 (0.316)
Sleep latency	− 0.069 (0.563)	− 0.027 (0.820)	− 0.075 (0.528)	− 0.070 (0.557)
Sleep duration	0.186 (0.116)	0.192 (0.103)	0.203 (0.085)	0.124 (0.297)
Sleep efficiency	0.173 (0.144)	0.133 (0.263)	0.265* (0.024)	0.066 (0.579)
Sleep disturbances	0.289* (0.013)	0.286* (0.014)	0.322* (0.005)	0.238* (0.043)
Sleep medications	0.178 (0.133)	0.184 (0.119)	0.188 (0.111)	0.116 (0.329)
Daytime dysfunction	0.318* (0.006)	0.280* (0.017)	0.445* (0.000)	0.161 (0.173)

Data are presented as correlation coefficient (*p* value)

Abbreviations: *PSQI* Pittsburgh Sleep Quality Index, *CFQ* Cognitive Failure Questionnaire

*Correlation is significant at the 0.05 level

Table 8 Correlation between cognition and physical activity

Physical activity (IPAQ)	College professors cognition (CFQ)	Collegiate students cognition (CFQ)
Vigorous PA during work	0.107 (0.450)	0.0.068 (0.569)
Moderate PA during work	0.158 (0.264)	0.057 (0.629)
Walk during work	0.055 (0.700)	0.010 (0.935)
MV use for traveling	0.104 (0.463)	− 0.042 (0.722)
Bicycle use for traveling	− 0.303*(0.029)	0.106 (0.372)
Walk for traveling	− 0.091 (0.520)	− 0.159 (0.178)
Vigorous PA at garden/yard	− 0.084 (0.554)	− 0.020 (0.870)
Moderate PA at garden/yard	0.117 (0.408)	− 0.007 (0.850)
Moderate PA inside house	0.028 (0.843)	− 0.001 (0.994)
Vigorous PA during leisure time	− 0.042 (0.767)	− 0.222 (0.060)
Moderate PA during leisure time	− 0.171 (0.225)	− 0.100 (0.402)
Walking during leisure time	− 0.234 (0.095)	− 0.187 (0.113)

Data are presented as correlation coefficient (*p* value)

Abbreviations- *CFQ* Cognitive Failure Questionnaire, *IPAQ* International Physical Activity Questionnaire, *PA* physical activity, *MV* motor vehicle

*Correlation is significant at the 0.05 level

between cognition and physical activity except for bicycle use for traveling in professors (Table 8).

Table 9 Correlation between sleep and physical activity

Physical activity (IPAQ)	College professors sleep quality (PSQI)	Collegiate students sleep quality (PSQI)
Vigorous PA during work	0.210 (0.135)	−0.230*(0.050)
Moderate PA during work	0.204 (0.147)	−0.180 (0.127)
Walk during work	0.069 (0.628)	−0.064 (0.592)
MV use for traveling	0.284*(0.041)	−0.259*(0.027)
Bicycle use for traveling	−0.032 (0.823)	−0.281 (0.016)
Walk for traveling	0.232 (0.097)	−0.417*(0.000)
Vigorous PA at garden/yard	−0.033 (0.814)	−0.209 (0.076)
Moderate PA at garden/yard	0.036 (0.800)	−0.012 (0.919)
Moderate PA inside house	0.110 (0.439)	0.159 (0.180)
Vigorous PA during leisure time	0.108 (0.445)	−0.175 (0.138)
Moderate PA during leisure time	0.093 (0.511)	−0.264*(0.024)
Walking during leisure time	−0.140 (0.445)	−0.142 (0.232)

Data are presented as correlation coefficient (p value)

Abbreviations: *IPAQ* International Physical Activity Questionnaire, *PA* physical activity, *MV* motor vehicle

*Correlation is significant at the 0.05 level

4.7 Correlation Between Internet Usage and Physical Activity

There is no significant association observed between internet addiction and physical activity level in both the groups except for walking during leisure time in professors (Table 6). There is a significant association of sleep quality with motor vehicle use for traveling in both professors and students. Comparative data also showed that there is a significant negative correlation of sleep quality with vigorous activity during work, walk, motor vehicle and bicycle use for traveling and moderate physical activity in students (Table 9).

5 Discussion

To the best of our knowledge, this is the first study that investigates the comparison of internet usage, sleep quality, cognition and physical activity in college professors and collegiate students during COVID-19 lockdown and also determines the association of problematic internet overuse with sleep quality, cognition and physical activity level during pandemic. Main findings suggested that there is a significant difference in the internet usage, sleep quality and physical activity in college professors and collegiate students. The findings also suggested that there is a significant association of internet usage with sleep quality and cognition and sleep quality with cognition. The results of this study highlighted the need of comprehensive management of pandemic, it is necessary to not only focusing on the physical aspects and infected patients, but also on mental health and sleep problems that can occur as result of problematic internet usage during pandemic. In addition, universities should prioritize the need for coping strategies to help students as well as professors to manage mental health issues and improve sleep quality as the pandemic continues.

In this study, it has been proven that students are more addicted to internet as compared to professors ($p < 0.05$). Previous studies have also reported that prevalence of internet addiction was high in students and this type of addiction may increase during pandemic [27]. A study done by Siste et al. [28] suggests that the high prevalence of internet overuse during the COVID-19 pandemic occur due to several psychological measures such as internalization, externalization, prosocial, and sleep problems. The present study reports that sleep quality in collegiate students is significantly poor as compared to college professors ($p = 0.032$). Sleep problems have been increased during pandemic in young adults [16]. The poor sleep quality has been observed in both college professors [29] and collegiate students [30] in previous studies. The high levels of stress, anxiety, and poor sleep were found among US university students during pandemic [31]. During pandemic, poor sleep quality and sleep disorders were found in university professors also [32]. In the present study, it has been also reported that there is a significant positive correlation of internet usage with sleep quality in both professors ($\rho = 0.388$; $p = 0.004$) and students ($\rho = 0.266$; $p = 0.023$). A positive correlation between internet addiction and sleep quality has also been observed in previous studies [33]. A study done by Kim et al. [34] reported that poor sleep quality and less sleep time are associated with internet over usage. Some possible explanations for poor sleep quality in the individuals with internet addiction have been reported by many studies. Kim et al. [35] proposed that sleep deprivation due to excessive internet usage

occurs because of displacing sleep time. Another possible explanation is that the external factors like exposure to light from the device causes reduced melatonin secretion which affects the circadian rhythm [11].

In this study, it has been found that there is a significant difference in distractibility between college professors and collegiate students ($p = 0.019$) and students have more cognitive failure (mean rank = 67.79) than professors (mean rank = 56.28). A study done by Riaz et al. [36] showed that participants experience psychological issue during COVID-19 and cognitive emotion regulation significantly predicts depression, anxiety and stress. In addition, there is a significant positive correlation found between internet usage and cognition in students ($\rho = 0.394$; $p = 0.004$). The possible explanation for effect of internet usage on cognition is that individuals with internet addiction had white matter integrity abnormalities in brain regions that were related to executive functioning, attention, decision-making and cognitive functions [37]. In another study, it has been observed that individuals with internet addiction had decreased dopamine transporters [38].

There is a significant correlation observed between sleep quality and cognition in both professors ($\rho = 0.445$; $p = 0.001$) and students ($\rho = 0.301$; $p = 0.010$) in this study. A study done by Zavecz et al. found that individuals with poor sleep quality have poor working memory, executive functions, and decision-making performance [39]. There is a significant difference in vigorous physical activity between college professors and students ($p = 0.004$) and also there is a significant difference in usage of bicycle for traveling ($p = 0.018$). There is a negative correlation of sleep quality with vigorous ($\rho = -0.230$; $p = 0.050$) and moderate physical activity ($\rho = 0.264$; $p = 0.24$) in students. A study by Abid et al. reported that low physical activity leads to poor sleep quality during pandemic confinement which has also be found in this study [13].

Although present study is the first study which investigates the effect of lockdown on internet usage, sleep quality, cognition and physical activity in college professors and collegiate students, there are some limitations. The sample size was small, and more studies should be done with larger sample size to evaluate and confirm the present findings. In the current study, it has been found that pandemic leads to more internet addiction which in turn leads to poor sleep quality and more cognitive failures and also, this poor sleep quality can impact cognitive functions and physical activity levels. Therefore, it is recommended that less time would be spent on internet during pandemic lockdown and encourage efficient sleep time and more physical activity to lead a healthy lifestyle.

6 Conclusion

In this study, it has been observed that students have more problematic internet usage, bad sleep quality, more cognitive failures and less physical activity than college professors during pandemic lockdown. It has been also observed that problematic internet usage has correlation with sleep quality, cognition and physical activity.

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Data Availability The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Conflict of Interest The authors have no competing interests to disclose.

Research Involving Human Participants The study was approved and carried out in accordance with the Institutional Ethics Committee, Jamia Hamdard.

Informed Consent The privacy rights of subjects were observed and informed consent was obtained for participating in the study.

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