

## Effects of COVID-19 lockdown on sleep duration, sleep quality and burnout in faculty members of higher education in Mexico

Efeitos do *lockdown* da COVID-19 na duração e qualidade do sono e sintomas de *burnout* no corpo docente do ensino superior no México

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**Abstract** *This paper aims to assess the differences and associations of the effect of COVID-19 on sleep habits, sleep quality, and burnout symptoms among faculty members of higher education in Mexico. This was a cross-sectional study with a total sample of 214 faculty members of higher education from Mexico between May 18<sup>th</sup> and June 10<sup>th</sup> of 2020. We applied questionnaires containing sociodemographic and specific questions regarding sleep habits, sleep quality, and burnout symptoms. The results show that during COVID-19 faculty members delayed their bedtime and rise time. No change was found with weekdays time in bed, however, during weekends, time in bed was more than an hour shorter. Social jetlag decreased significantly during COVID-19. Furthermore, during COVID-19, those who reported low sleep quality were more likely to report higher symptoms of emotional exhaustion and those who slept less on weekends were more likely to report higher symptoms of depersonalization. These results suggest that the COVID-19 pandemic may have an effect on sleep and sleep quality and burnout symptoms of faculty members from higher education in Mexico.*

**Key words** COVID-19, Sleep, Sleep quality, Burnout, Higher education

**Resumo** *Este trabalho visa avaliar as diferenças e associações do impacto da COVID-19 sobre hábitos de sono, qualidade do sono e sintomas de burnout entre os docentes de ensino superior no México. Trata-se de um estudo transversal, com amostra total de 214 docentes, realizado entre 18 de maio e 10 de junho de 2020. Foram aplicados questionários contendo questões sociodemográficas e específicas sobre hábitos de sono, qualidade do sono e sintomas de burnout. Os resultados mostram que durante a pandemia os docentes atrasaram a hora de dormir e acordar. Nenhuma alteração foi observada com relação ao tempo de semana na cama, porém nos finais de semana o tempo na cama era mais de uma hora menor. O jetlag social diminuiu significativamente durante a COVID-19. Além disso, durante a pandemia, aqueles que relataram baixa qualidade do sono eram mais propensos a relatar sintomas mais fortes de exaustão emocional, e aqueles que dormiam menos nos fins de semana eram mais propensos a relatar sintomas mais fortes de despersonalização. Esses resultados sugerem que a pandemia de COVID-19 pode ter um efeito sobre a qualidade do sono e causar sintomas de burnout nos integrantes do corpo docente do ensino superior no México.*

**Palavras-chave** COVID-19, Dormir, Esgotamento, Ensino superior

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## Introduction

In December 2019, an outbreak of SARS-CoV-2 (COVID-19) was reported in Wuhan, China<sup>1</sup>. By March 11, 2020, it quickly spread worldwide and was classified as a pandemic by the World Health Organization (WHO)<sup>2</sup>. Since then, the global pandemic has had a great impact on public health, economy, and social life of individuals across the world. Public policymakers and governments around the world have implemented several policies to prevent further contagion. While these policies differ in each country based on the circumstances, the full or partial lockdown (i.e., home confinement) has become a common practice in most countries. The lockdown is a measure to mitigate disease outbreaks and to protect the physical well-being of the individuals. However, recent research has shown that life in isolation has had a profound impact on the mental well-being of people under confinement<sup>3,4</sup>. Furthermore, social isolation prevented regular contact with family members, friends, and other social circles including schools or work environments. This situation introduced consequences to mental health including feeling loneliness, anxiety, and depression<sup>5</sup>. Because most of the labor work is now carried out at home, the new work scheme generates greater computer-screen exposure which, in turn, may alter and compromise sleep patterns, physical activity, and mental well-being<sup>6</sup>.

Among different sectors across the globe, the educational system is one of the affected sectors by the worldwide lockdown. The pandemic circumstances have led 862 million children and young people around the world outside their routines, which marks roughly half the global student population<sup>7</sup>. This was estimated based on the data collected on safety measures that were taken to interrupt the transmission of influenza virus<sup>8</sup>. School closure due to the COVID-19 pandemic modified the educational system overnight. Teachers across educational spectra had to change the way they taught their classes and delivered the content of their courses. Moving from face-to-face to a completely online model has become a new reality for millions of educators around the world. This situation created a new set of challenges for university professors and high school teachers while increasing the risk of mental health consequences due to the lockdown<sup>9</sup>. Even in the pre-COVID-19 period, faculty members of higher education had multiple academic challenges to deal with including ex-

tensive workload, excess activities are undertaken in and outside working hours, student misbehavior, interactions with colleagues, and pressures to increase productivity and performance which are known as the existing contributing factors to a sharp increase in stress levels<sup>10</sup>. As a result, many faculty members experience burnout symptoms, leading to emotional exhaustion, reduced teaching efficacy, and decreased job satisfaction<sup>11</sup>. In specific, the quality of sleep was affected by these stressors which had led to sleep disturbances<sup>12,13</sup>.

Burnout is defined as a psychological syndrome caused by a prolonged response to interpersonal stressors, mainly in relation to the work environment<sup>14</sup>. It includes three main dimensions: emotional exhaustion (i.e., wearing out, debilitation and fatigue), depersonalization (i.e., negative attitudes towards clients, irritability, and loss of idealism), and inefficiency characterized by reduced personal accomplishment (i.e., decreased productivity, poor morale, and inability to cope with stressors)<sup>14</sup>. In the literature, burnout has been associated with a wide range of mental health, and well-being alterations such as increased anxiety, depression, sleep problems, alcohol consumption, impaired memory, and neck and back pain<sup>15</sup>. It is also associated to lower motivation and productivity<sup>16</sup>, job dissatisfaction<sup>17</sup>, sick leave, and mental and behavioral disorders<sup>18</sup>. Recent studies on burnout in relation to COVID-19, chiefly conducted on healthcare professionals, suggest that due to the nature of the pandemic, medical doctors and nurses experience higher numbers of mental health problems and burnout<sup>19,20</sup>.

Sleep, in particular, plays an important biological function in the recovery of physical and mental fatigue. In addition, with the lockdown imposed during the COVID-19 pandemic, the importance of a good night's sleep (consisting of sleep duration, quality, and timing) has become more relevant. Current studies related to the COVID-19 pandemic suggest a radical change in behavioral sleep habits<sup>21-24</sup>. Certain individuals benefited from this change as their sleep health has improved due to the relaxation of work/school schedules and early morning commitments. For others, however, these changes have detrimentally impacted their sleep health, especially their sleep quality<sup>21-24</sup>. To date, however, no study has focused on the effect of the COVID-19 pandemic on sleep habits, sleep quality, and burnout symptoms among faculty members of higher education. Therefore, the main objective of this work was to assess the differences and

associations of the effect of COVID-19 on sleep habits, sleep quality, and burnout symptoms among faculty members of higher education in Mexico. We hypothesized that the change in the sleep patterns of faculty members is in line with their biological needs and health. Furthermore, our second hypothesis was that due to the positive nature of these changes in their sleep patterns, faculty members will perceive no emotional exhaustion, depersonalization, and professional accomplishment.

## Methods

### Participants and procedure

This was a cross-sectional study and participants from different universities in Mexico were encouraged to voluntarily participate in the research via a web-based platform called *Qualtrics* and distributed using social media sources (Facebook, Twitter, and LinkedIn), and via institutional sources including email and public marketing of an institutional newsletter called: Observatorio de Innovación Educativa powered by Tecnológico de Monterrey. Then each participant could distribute the link of the study among their contacts in what is known as the snowball procedure, which is a non-probabilistic method. The survey was active between May 18<sup>th</sup> and June 10<sup>th</sup> of 2020. A brief presentation informed the participants about the aims of the study, and an electronic informed consent was signed before starting the survey. The survey took approximately 30 min to be completed (Please see the full version of the survey in the Supplementary section). The research project was approved by the Institutional Research and Ethics Review Committee from the Office of the Vice President of Research and Technology Transfer from Tecnológico de Monterrey, and it complied with the principles of the Declaration of Helsinki for research on human subjects.

### Measurements

The questionnaires contained sociodemographic questions and specific questions regarding sleep habits, sleep quality, and burnout symptoms. The sleep habits questions were the following: *What time do you usually go to bed on school days?*, *What time do you usually go to bed on weekends?*, *What time do you usually get out of bed on school days?*, and *What time do you usually get out of bed on weekends?*

Several sleep parameters were calculated based on rising time and bedtime. From these, we calculated time in bed on school days and weekends.

Social jet lag (SJL) was calculated according to the formula indicated by Wittmann et al.<sup>25</sup> considering the absolute difference between mid-sleep on weekdays (MSW) and mid-sleep on free days/weekends (MSF):  $MS = |MSF - MSW|$ . First, to calculate mid-sleep, we calculated the duration of the sleep episode on weekends and weekdays. Next, we calculated mid-sleep time on weekends and weekdays: bedtime + 1/2 of sleep duration. We used mid-sleep of self-reported time in bed, which is a proxy for mid-sleep (midpoint between sleep onset and waking), as used by Wittmann et al.<sup>25</sup>. In addition, sleep quality was measured based on a single question: *In general, how do you consider your sleep quality?*, with an answer of very bad, bad, regular, good, and very good.

For the assessment of burnout symptoms, the Spanish version of the Maslach Burnout Inventory for Educators (MBI-Ed)<sup>26,27</sup> was used. The questionnaire consisted of 22 items, distributed in three dimensions/subscales: (i) Emotional exhaustion, which refers to excessive psychological and emotional demands (9 items, scores  $\geq 27$  indicate high symptoms of burnout); (ii) Depersonalization, which refers to a tendency to view others in an excessively detached manner (5 items, scores  $\geq 13$  indicate high symptoms of burnout); and (iii) Professional accomplishment, which refers to a sense of competence and accomplishment (8 items, scores  $\geq 37$  indicate fewer symptoms of burnout). The internal consistency (Cronbach's alpha) for this study was = 0.77, 0.77 and 0.76, respectively. All the questionnaires were asked for an assessment of the pre-COVID-19 period and during the COVID-19 pandemic.

### Statistical analysis

Descriptive analysis was conducted to generate mean values and standard deviations (mean  $\pm$  SD) of each variable. The significance of multivariate mean comparisons on sleep variables, sleep quality, and burnout symptoms pre/during COVID-19 was tested by computing a paired *t*-test. Furthermore, three binary logistic regressions were applied to evaluate the association between the burnout dimensions (emotional exhaustion:  $\geq 27$  high symptoms; depersonalization:  $\geq 13$  high symptoms; professional accom-

plishment:  $\geq 37$  low symptoms), sleep duration, and sleep quality pre/during COVID-19.

## Results

The final sample consisted of 214 faculty members of higher education from Mexico (121 male and 93 female professors). The average age of the samples was  $42.66 \pm 9.17$  (mean  $\pm$  SD), and the age range was between 25-64 years of age. Table 1 shows the sociodemographic characteristics of the study sample. Considering the participant's pre-COVID-19 sleep habits as a baseline, the paired *t*-tests found significant differences during the COVID-19 pandemic. Bedtime was delayed on both weekdays and weekends ( $t_{213} = 11.34$ ,  $p < 0.001$ ;  $t_{213} = 5.39$ ,  $p < 0.001$ ), and rise time was also delayed on both weekdays and weekends ( $t_{213} = 16.30$ ,  $p < 0.001$ ;  $t_{213} = 3.44$ ,  $p < 0.01$ ). The amount of time spent in bed on weekdays did not change during the COVID-19 pandemic. However, the amount of time spent in bed on weekends was more than an hour shorter ( $t_{213} = 4.34$ ,  $p < 0.001$ ) during the pandemic, mainly due to bedtimes that averaged 1:24 h later and rise times that averaged only 0:16 h later (Figure 1).

Moreover, average time in bed ( $t_{213} = 2.32$ ,  $p < 0.05$ ), social jetlag ( $t_{213} = 4.65$ ,  $p < 0.001$ ) and sleep quality ( $t_{213} = 7.96$ ,  $p < 0.001$ ) decreased significantly during the COVID-19 pandemic. When considering the burnout dimensions, we observed a hike in emotional exhaustion ( $t_{213} = 10.30$ ,  $p < 0.001$ ) and depersonalization ( $t_{213} = 7.77$ ,  $p < 0.001$ ) during the COVID-19 pandemic which was accompanied by a decline in professional accomplishment ( $t_{213} = 10.25$ ,  $p < 0.001$ ) (Table 2).

Lastly, three binary logistic regression was used to test the association of the burnout dimensions pre/during the COVID-19 pandemic with weekday sleep duration, weekend sleep duration, and sleep quality. The results showed no significant difference between emotional exhaustion and depersonalization before COVID-19. However, during COVID-19, those who reported low sleep quality were more likely to report higher symptoms of emotional exhaustion (Table 3). Moreover, those who slept less on weekends were more likely to report higher symptoms of depersonalization (Table 4), and those who slept more during weekdays and weekends before COVID-19 were more likely to report fewer symptoms of burnout related to professional accomplishment. No significant difference was

found in professional accomplishment during COVID-19 (Table 5).

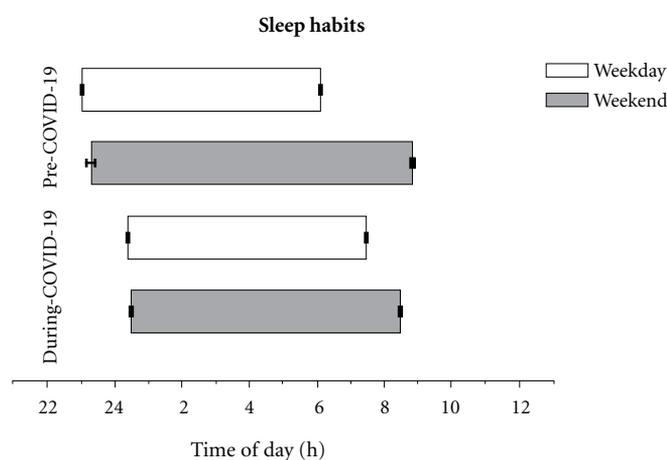
## Discussion

Our study shows that the pandemic lockdown has an effect on sleep, sleep quality, and burnout symptoms of faculty members in Mexican higher education. Overall, studies conducted on the

**Table 1.** Demographic characteristics of faculty members from higher education. Mexico, May/June, 2020.

	Participants, No. (%) (n = 214)
Gender	
Males	93 (43.5)
Females	121 (56.5)
Teaching appointment	
Hours	84 (39.3)
Non-tenure	13 (6.1)
Tenure	117 (54.7)
Degree	
Bachelor	21 (9.8)
Specialty	3 (1.4)
Masters	72 (33.6)
Doctorate	118 (55.1)
Institution	
Public	90 (42.1)
Private	124 (57.9)
Teaching experience	
Less than 1 year	4 (1.9)
1-3 years	19 (8.9)
4-6 years	40 (18.7)
7-9 years	32 (15)
10 or more	119 (55.6)
Working hours per day	
2-4	13 (6.1)
5-7	69 (32.2)
8 or more	132 (61.7)
Sleep quality (before COVID-19)	
Very bad	1 (.5)
Bad	10 (4.7)
Regular	81 (37.9)
Good	95 (44.4)
Very good	27 (12.6)
Sleep quality (during COVID-19)	
Very bad	7 (3.3)
Bad	61 (28.5)
Regular	89 (41.6)
Good	36 (16.8)
Very good	21 (9.8)

Source: Authors.



**Figure 1.** Sleep habits pre-COVID-19 and during-COVID-19, during weekdays (white bars) and weekends (grey bars) of faculty members from higher education. Mexico, May/June, 2020.

Source: Authors.

**Table 2.** Comparison between pre-health emergency and during health emergency of faculty members from higher education. Mexico, May/June, 2020.

		Pre-COVID-19 (mean ± SD)	During- COVID-19 (mean ± SD)	t	p value
Weekdays	Bedtime	23:06 ± 00:51	00:38 ± 01:54	11.34	< 0.001
	Rise time	06:10 ± 00:52	07:44 ± 01:24	16.30	< 0.001
	Time in bed	7:03 ± 01:02	7:05 ± 02:12	.18	.85
Weekends	Bedtime	23:29 ± 03:17	00:53 ± 02:04	5.39	< 0.001
	Rise time	08:30 ± 01:16	08:46 ± 01:28	3.44	< 0.01
	Time in bed	9:01 ± 03:24	7:52 ± 02:15	4.34	< 0.001
	Average sleep length	7:37 ± 01:10	7:18 ± 01:42	2.32	< 0.05
	Social jetlag	01:21 ± 01:49	00:38 ± 01:33	4.65	< 0.001
	Sleep quality	3.64 ± 0.77	3.01 ± 0.99	7.96	< 0.001
	Burnout	64.00 ± 13.54	71.14 ± 14.93	6.98	< 0.001
	Emotional exhaustion	19.39 ± 10.40	29.31 ± 13.48	10.30	< 0.001
	Depersonalization	3.92 ± 4.75	7.36 ± 6.49	7.77	< 0.001
	Professional accomplishment	40.69 ± 6.65	34.44 ± 8.79	10.25	< 0.001

Source: Authors.

general population assessing the impact of the COVID-19 lockdown on sleep have reported later bedtimes and waking times and a lengthening of sleep duration<sup>21,22,28,29</sup>, suggesting that individuals may have adjusted their sleep habits to their biological needs. While our findings are in line with those reports in the literature that found later sleep times, we did not find any changes in sleep duration on weekdays. Additionally, we

found that weekend sleep duration shortened significantly during the lockdown, by more than an hour. To our knowledge, no other study has reported such a decrease in sleep duration during the weekends. It is known that faculty members in higher education use their time (i.e., weekends) to fulfill their work demands such as evaluating students, marking exams, writing articles, writing grants, and preparing courses, in addition

to attending to their commitments<sup>30</sup>. However, regardless of their workload, on weekends, faculty members tend to sleep longer than the week-days<sup>31,32</sup>. This decrease in weekend sleep duration that we observed may be in part due to the complexities that the COVID-19 pandemic has im-

**Table 3.** The odds ratio of sleep duration and sleep quality model predicting high levels of burnout ( $\geq 27$ ) pre/during COVID-19, according to the emotional exhaustion subscale of faculty members from higher education. Mexico, May/June, 2020.

	Pre-COVID-19				During-COVID-19			
	Emotional exhaustion				Emotional exhaustion			
	B	SE	Wald	OR (95%CI)	B	SE	Wald	OR (95%CI)
Weekdays time in bed	-.002	.002	.687	.998 (.993-1.003)	-.002	.001	2.435	.998 (.995-1.001)
Weekends time in bed	-.001	.001	1.358	.999 (.996-1.001)	-.003	.002	3.189	.997 (.994-1.000)
Sleep quality	.050	.310	.026	1.051 (.572-1.929)	-1.440	.336	18.316	.237 (.123-.458)*

OR = odds ratio; SE = standard error; CI = confidence interval. \*  $p < 0.001$

Source: Authors.

**Table 4.** The odds ratio of sleep duration and sleep quality model predicting high levels of burnout ( $\geq 13$ ) pre/during COVID-19, according to the depersonalization subscale of faculty members from higher education. Mexico, May/June, 2020.

	Pre-COVID-19				During-COVID-19			
	Depersonalization				Depersonalization			
	B	SE	Wald	OR (95%CI)	B	SE	Wald	OR (95%CI)
Weekdays time in bed	.008	.005	2.461	1.008 (.998-1.019)	.001	.001	.075	1.000 (.997-1.002)
Weekends time in bed	.001	.002	.037	1.000 (.997-1.004)	-.002	.001	3.564	.998 (.995-1.000)*
Sleep quality	.724	.688	1.107	2.063 (.535-7.951)	-.866	.461	3.535	.421 (.171-1.037)

OR = odds ratio; SE = standard error; CI = confidence interval. \*  $p < 0.05$

Source: Authors.

**Table 5.** The odds ratio of sleep duration and sleep quality model predicting low levels of burnout ( $\geq 37$ ) pre/during COVID-19, according to the professional accomplishment subscale of faculty members from higher education. Mexico, May/June, 2020.

	Pre-COVID-19				During-COVID-19			
	Professional accomplishment				Professional accomplishment			
	B	SE	Wald	OR (95%CI)	B	SE	Wald	OR (95%CI)
Weekdays time in bed	.016	.006	6.325	.984 (.972-.996)**	.001	.002	.049	1.000 (.996-1.003)
Weekends time in bed	.002	.001	5.411	.998 (.996-1.000)*	.002	.001	2.892	1.002 (1.000-1.004)
Sleep quality	.734	.719	1.041	2.084 (.509-8.535)	1.089	.583	3.489	2.971 (.948-9.317)

OR = odds ratio; SE = standard error; CI = confidence interval. \*  $p < 0.05$ , \*\*  $p < 0.01$ .

Source: Authors.

posed on social behavior, which is consequently changing health behavior. Additionally, the academic workload may have increased under the remote teaching scheme which, in turn, requires training on using technological tools and adjustment of teaching materials to conducting classes via video, while leaving less time for personal commitments or rest. These new challenges may be linked to the report of low sleep quality and the appearance of symptoms of emotional exhaustion, depersonalization, and the lack of professional accomplishment during the COVID-19 pandemic that we observed in this study.

An alternative explanation for the shortening of weekend sleep during the current pandemic is that the decrease in social jetlag during the COVID-19 lockdown<sup>22,28</sup>, indicating decreased variability between the timing of weekday and weekend sleep, may better meet the participants' overall sleep needs.

The present study is the first to evaluate the association of sleep duration, sleep quality, and burnout symptoms in faculty members in higher education during the COVID-19 pandemic, thus comparable data are lacking. Existing pre-COVID-19 studies related to this topic are few. In the study of Wu et al.<sup>33</sup> the authors reported that faculty members' poor sleep quality affected the emotional exhaustion and depersonalization dimensions of burnout. Moreover, in the study of Huyghebaert et al.<sup>34</sup> it was indicated that high-level workloads for faculty members had a positive effect on emotional exhaustion, and these were partially mediated by sleep problems. Both reports indicated that sleep quality affects the emotional exhaustion and depersonalization dimensions, contrary to what our results indicated in the pre-COVID-19 period. However, our results suggest that during the COVID-19 pandemic, reports of poor sleep quality of the faculty members were associated with the presence of emotional exhaustion, and weekend short sleep

duration increased the depersonalization, which may accentuate the impact that the pandemic has had on mental and sleep health.

In summary, our study suggests that the COVID-19 pandemic has a negative effect on professors' sleep habits and sleep quality and has enhanced interpersonal stressors. However, this study has several restrictions. First, the explorative nature of this study is one of its major limitations. While the data on sleep habits and burnout symptoms during the COVID-19 lockdown were collected simultaneously, the data concerning the prior period (pre-COVID-19) were collected in retrospect. Second, our sample was restricted to faculty members in higher education. For that reason, it is not possible to project our findings to the general educator's population. Third, we used a web-based survey that may have led to a selection bias. The surveys were composed only of self-reported questionnaires; however, the selected tools were validated and commonly used prior to this study<sup>27,35</sup>. Future research should explore if the level of technical knowledge of apps and computer systems can affect the productivity of faculty members and if it has an impact on their sleep habits, anxiety, stress, and fatigue levels.

## Conclusion

The results of our study provide evidence on the sleep changes that faculty members of higher education have experienced due to the COVID-19 pandemic. It is recommended that higher education institutions should offer psychological support, and psycho-educational interventions on sleep to their faculty members so that they understand the importance of maintaining a regular and sufficient sleep duration, their sleep schedules, and daily routines while working remotely.

## Collaborations

Conceptualization: A Arrona-Palacios and S Hosseini; methodology: A Arrona-Palacios, G Rebolledo-Mendez, and J Duffy; validation: A Arrona-Palacios, and G Rebolledo-Mendez; formal analysis: A Arrona-Palacios, and G Rebolledo-Mendez; investigation: A Arrona-Palacios; resources: J Escamilla, and S Hosseini; data curation: A Arrona-Palacios; writing – original draft preparation: A Arrona-Palacios, and G Rebolledo-Mendez; writing – review and editing, J Escamilla, S Hosseini, and J Duffy; visualization, A Arrona-Palacios, J Escamilla and S Hosseini. All authors have read and agreed to the published version of the manuscript.

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