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The Impact of Social Media as a Tool of E-learning during the COVID-19 Lockdown on the Mental Health of Medical Students: A Gender-based Study

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ABSTRACT

This study aimed to identify the impact of both social media as a tool of E-learning, and the stressful situations due to COVID-19 as a disease or as a result of lockdown on the psychometric parameters and cognitive function of the medical students. This study was carried out on the students of the College of Medicine; the University of Diyala in Iraq during June-October 2021 A self-reported Google Form submitted questionnaire to the students. The questionnaire included items related to demographic characteristics, COVID-19 illness and psychometric assessments of sleep, anxiety, depression and cognitive function. Most of the participants (92.3%) used smartphones in E-learning indoors, poor sleep quality was observed in 40%, and males significantly complained from changes in the sleep pattern compared with females. The mean ± SD of total scores related to depression was significantly ($p=0.03$) higher in females (10.7±7.1) than the corresponding value in males (8.4±5.9). Females reported. Females showed a significantly higher score of cognitive function impairment compared with males. COVID-19 as a disease or as a result of lockdown using social media as a tool of E-learning due to lockdown, are the precipitating factors for abnormal sleep behavior in males, and depressive symptoms with impairment of cognitive function in males.

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1. INTRODUCTION

The COVID-19 pandemic forced governments to establish E-learning as an alternative strategy due to nationwide closures. At that time, different E-learning platforms were being challenged, including Zoom, Moodle, Blackboard, Skype, Skype, Zoom, FaceTime, and Cisco WebEx. Both students and teachers were not familiar with these learning tools, which placed them in stressful situations. These stressful conditions lead to significantly higher scores of anxieties and depression in undergraduate university students living in Lebanon, tested with the DASS-21 (Depression, Anxiety and Stress Scale-21) [1]. Stress-related symptoms were significantly reported among people who experienced longstanding exposure to the screens of computers and smartphones [2]. Therefore, those people are vulnerable to the impairment of skeletomuscular, cognitive, and daily function [3]. There is evidence that exposure duration, intensity, and the modality of smart devices played a role in the impairment of mental health [4,5,6]. Therefore, E-learning is chronic workplace stress termed Burnout syndrome leading to mental health problems that are difficult to manage [7]. In addition to the mental health problems associated with E-learning, practical sessions of teaching, particularly in health-related colleges, will not be perfectly performed. In one study carried out on 315 dental students, 85% of responders suffered from stress and anxiety, and 67% of them suggested using alternative methods for practical sessions

[8]. Moreover, anxiety-related COVID-19 is another important factor that negatively influences E-learning among nursing students and intensifies the level of anxiety and stress [9].

Demographic characteristics of the students also played a role in intensifying the intensity of anxiety, as Hoque et al reported that 14.1% of the students complained of extreme anxiety, which is related to the demographic characteristics [10]. This study aimed to assess the relationship between E-learning and mental health in medical students, taking into consideration the demographic characteristics and the impact of COVID-19 illness among the relative medical students.

2. MATERIALS AND METHODS

2.1 Setting and Design

This study was conducted in the Department of Physiology and Medical Physics of the College of Medicine at the University of Diyala in Iraq from 1st June to 31st October 2021. The Institutional Scientific and Ethical Committees approved this online self-reported survey study.

2.2 Instruments

The self-reported questionnaire was distributed to the students of the college of medicine using Google form. The questionnaire included items related to the demographic characteristics, COVID-19 illness in the family and close friends, and the type of social media users in the E-learning. The mental health of the students was assessed using the following psychometric tools:

a. Sleep quality and disorder using sleep disorder inventory (SDI) [11].
b. General-anxiety disorder (GAD)-7 (composed of 7 items with 4-point scale: not at all, several days, more than half the days, and nearly every day) [12]. Anxiety was categorized according to the total score, as 0-4) minimal), 5-9 (mild), 10-14 (moderate), and 15-21 (severe).
c. Cognitive function self-assessment scale (CFSS) (composed of 18 items with a 5-point scale: never, several rarely, more often, many times, and always [13].
d. Depression using the patient health questionnaire (PHQ-9) [14], which is composed of 9 questions with 4-point scale: not at all, several days, more than half the days, and nearly every day was categorized according to the total depression score, as 0-4 (minimal or no depression), 5-9 (mild) 10-14 (moderate), 15-19 (moderately severe), 20-27 (severe).

2.3 Participants

A total participated of 155 students (56 males and 99 females) with a median age of 20 years in this study.

2.4 Statistical analysis

The results are expressed as numbers, percentages, median, and mean ± SD. The data was analyzed using the Chi-square test for categorized data and independent two-sample t-test (two-tailed) for continuous data using the Excel 10 program software. The p-value at ≤0.05 is a significant level.

3. Results

Table 1 shows the characteristics of the participants. The male to female ratio is 1:1.8 with a mean age value of 21.1 years. A small percentage of participants are (7.7%) living in the camps of the university, while the majority of them live inside the province of the university. Most of the participants were non-smokers, and about one-third of them had no history of COVID-19 infection in their families and/or close friends. Most of the participants used smartphones in E-learning at their houses. Only 7.1% of the participants indulge in E-learning outside their houses. Table 2 shows that 40% of the participants complained of very poor night sleep, while 22.6% of the participants had a good quality of night sleep, and 37.4% complained of a variety of poor night sleep. Table 3 shows the results of responders to the sleep disorder inventory questionnaire, which showed a significantly higher percentage among males compared with females in two items of sleep disorders.

There is no significant difference in the mean± SD of the total sleep disorder score between males and females. A higher percentage of sleeping excessively during the daytime was observed in both females and males, which accounted for 57.8% and 48.2%, respectively. Table 4 shows the scoring of items that are related to depression-associated E-learning. The scores of three of nine items related to depression were significantly higher in females compared with the corresponding scores among males. A total score of 20-27, which indicated severe depression was reported in 16.2% of females and 5.4% of males (p=0.050). The mean ± SD of total scores was significantly (p=0.03) higher in females (10.7±7.1) than the corresponding value in males (8.4±5.9) (Table 4). The cognitive function of the participants was assessed by using a self-assessment scale consisting of 18-items. The mean score of the item "lack of concentration" is significantly higher in males than females, while the mean score of the items "Difficulty in performing two tasks simultaneously; Absent-mindedness during intellectual/cognitive activities; Difficulty in organizing extra-routine activities; and Forgetfulness" are significantly higher in females than males (Table 5). A total score of >50 was significantly (p=0.014) reported in 10 out of 99 females, while none of the males scored >50.

Table 6 shows that there are non-significant differences between participants with and those without a history of COVID-19 in their families or close friends in the scores of depressions and impairment of the cognitive functions associated with E-learning.

Table 1. Characteristics of the participants

Characteristic		Number (%)
Age (years)	Mean ± SD (Median)	21.1±3.8 (20.0)
Sex	Male: Female	56: 99
Residency	Inside province	143 (92.3)
	Outside province	12 (7.7)
Ethnicity	Arab	147 (94.8)
	Kurd	8 (5.2)
Smoking	None smoker	144 (92.9)
	Current smokers	7 (4.5)
	Ex-smoker	4 (2.6)
	History of death from COVID-19	11 (7.1)
History of COVID-19 infection in:	Family members	21 (13.5)
	Close participants	32 (20.6)
	Both	49 (31.6)
Social media	Tablet	5 (3.2)
	Lap Top	5 (3.2)
	Desk Top	2 (1.3)
E-learning	In-House	144 (92.9)
	Out House	11 (7.1)

Table 2. Distribution of the participants according to the sleep quality

Sleep quality items	Female (n=99)	Male (n=56)	Total (n=155)	$\chi 2$	p-value
Very poor night with little or no sleep	41 (41.4)	21 (37.5)	62 (40.0)	0.225	0.635
Difficult night with several awakenings or a long period without sleep	3 (3.0)	9 (16.1)	12 (7.7)	8.547	0.004
Fair night with only few, brief (<30 min) awakenings	13 (13.1)	8 (14.3)	21 (13.5)	0.044	0.834
Good night with only one, brief (<30 min) awakening	17 (17.2)	8 (14.3)	25 (16.1)	0.221	0.639
Outstanding night with no awakenings.	25 (25.3)	10 (17.9)	35 (22.6)	1.112	0.292

The results are expressed as number (%). P-value was calculated using Chi-square test for categorized data

Table 3. Evidence of sleep disorder assessed by sleep disorder inventory.

Item	Female (n=99)	Male (n=56)	Total (n=155)	$\chi 2$	p-value
Difficulty falling asleep	34 (34.3)	25 (44.6)	59 (38.1)	1.600	0.206
Getting up during the night (do not count if the subject gets up once or twice per night to go to the bathroom and quickly falls back to sleep)	30 (30.3)	22 (39.3)	52 (33.5)	1.291	0.256
Wandering, pacing or getting involved in inappropriate activities at night	13 (13.1)	16 (28.6)	29 (18.7)	5.616	0.018
Awakening you during the night	19 (19.2)	19 (33.9)	38 (24.5)	4.150	0.042
Awakening at night, dressing, and planning to go out, thinking that it is morning and time to start the day	19 (19.2)	13 (23.2)	32 (20.6)	0.347	0.556
Awakening too early in the morning (earlier than is his/her habit)	41 (41.4)	29 (51.8)	70 (45.2)	1.552	0.213
Sleeping excessively during the day	57 (57.8)	27 (48.2)	84 (54.2)	1.320	0.251
Other night-time behaviors that bother you	35 (35.4)	20 (35.7)	55 (35.5)	0.001	0.970
Total score	2.505±2.082	3.071±2.514	2.710±2.256		0.156
0	13 (13.1)	11 (19.6)	24 (15.5)		0.284
1	28 (28.3)	6 (10.7)	34 (21.9)		0.011
2	16 (16.2)	12 (21.4)	28 (18.1)		0.421
3	17 (17.2)	6 (10.7)	23 (14.8)		0.276
4	7 (7.1)	4 (7.1)	11 (7.1)		1.000
5	10 (10.1)	4 (7.1)	14 (9.0)		0.532
6	1 (1.0)	6 (10.7)	7 (4.5)		0.005
7	3 (3.0)	4 (7.1)	7 (4.5)		0.238
8	4 (4.0)	3 (5.4)	7 (4.5)		0.687

The results are presented as number (%) and mean ± SD. p-value was calculated using independent two-sample t-test for continuous data and Chi-square test for categorized data.

Table 4. Assessment of depression-associated E-learning.

Items	Female (n=99)	Male (n=56)	Total (n=155)	p-value
Little interest or pleasure in doing things?	1.202±1.169	1.143±1.119	1.181±1.148 (1)	0.756
Feeling down, depressed, or hopeless?	1.444±1.197	1.179±1.146	1.348±1.182 (1)	0.174
Trouble falling or staying asleep, or sleeping too much?	1.232±1.114	0.875±0.974	1.103±1.076 (1)	0.039
Feeling tired or having little energy?	1.636±1.083	1.036±1.095	1.419±1.122 (1)	0.001
Poor appetite or overeating?	1.434±1.188	0.839±0.968	1.219±1.147(1)	0.001
Feeling bad about yourself — or that you are a failure or have let yourself or your family down?	1.070±1.154	0.964±1.095	1.032±1.131 (1)	0.570
Moving or speaking so slowly that other people could have noticed? Or so fidgety or restless that you have been moving a lot more than usual?	1.020±1.069	0.839±1.041	0.954±1.059 (1)	0.305
Thoughts that you would be better off dead, or thoughts of hurting yourself in some way?	0.758±1.507	0.679±1.046	0.729±1.046(0)	0.653
Trouble concentrating on things, such as reading the newspaper or watching television?	0.909±1.070	0.821±0.936	0.877±1.021(1)	0.596
Score				
0-4 (minimal or no depression)	16 (16.2)	15 (26.8)	31 (20.0)	0.114
5-9 (mild depression)	37 (37.4)	18 (32.1)	55 (35.5)	0.509
10-14 (moderate depression)	20 (20.2)	12 (21.4)	32 (20.6)	0.860
15-19 (moderately severe depression)	10 (10.1)	8 (14.3)	18 (11.6)	0.435
20-27 (severe depression)	16 (16.2)	3 (5.4)	19 (12.3)	0.050
Mean ± SD (Median)	10.707±7.106	8.375±5.873	9.865±6.761 (9)	0.03

The results are presented as numbers (%) and mean ± SD. p-value was calculated using an independent two-sample t-test for continuous data and a Chi-square test for categorized data.

Table 5. Scoring of ‘cognitive functioning self-assessment scale’’ (CFSS) of 18 statements.

Item	Female (n=99)	Male (n=56)	Total (n=155)	p-value
Lack of concentration	1.889±1.203	1.196±0.999	1.639±1.178 (1)	<0.001
Absent-mindedness	1.535±1.312	1.232±0.972	1.426±1.206 (1)	0.104
Difficulty in performing two tasks simultaneously	1.687±1.314	1.232±1.175	1.523±1.281 (1)	0.029
Difficulty in performing mental calculation	1.252±1.240	1.107±0.947	1.200±1.142 (1)	0.415
Tip of the tongue phenomenon	1.131±1.259	0.946±1.069	1.065±1.193 (1)	0.334
Absent-mindedness during intellectual/cognitive activities	1.515±1.296	0.964±0.934	1.316±1.205 (1)	0.003
Difficulty in organizing extra-routine activities	1.616±1.307	1.025±1.010	1.439±1.228 (1)	0.010
Difficulty in recalling recent information	1.545±1.296	1.500±1.206	1.529±1.260 (1)	0.827
Difficulty in recalling old information	1.485±1.044	1.375±1.088	1.445±1.058 (1)	0.541
Difficulty in recalling autobiographical events	1.182±1.224	1.125±1.096	1.161±1.176 (1)	0.767
Forgetfulness	1.828±1.333	1.214±1.171	1.606±1.397 (1)	0.003
Lack of concentration while reading	1.788±1.256	1.679±1.146	1.748±1.215 (2)	0.583
Lack of motor coordination	1.192±1.158	1.089±1.149	1.155±1.512 (1)	0.595
Slowness in the execution of movements	1.162±1.201	1.143±1.197	1.155±1.196 (1)	0.926
Difficulty in finding the appropriate words	1.394±1.105	1.607±1.344	1.471±1.197 (1)	0.315
Use of periphrases or generic terms instead of specific words	1.667±1.195	1.411±1.218	1.574±1.206 (1)	0.208
Difficulty in spatial orientation	1.202±1.195	1.268±1.183	1.226±1.187 (1)	0.741
Difficulty in temporal orientation	1.263±1.192	1.071±1.173	1.194±1.185 (1)	0.335
0-9	15 (15.2)	8 (14.3)	23 (14.8)	0.880
10-19	27 (27.3)	20 (35.7)	47 (30.3)	0.276
20-29	23 (23.2)	8 (14.3)	31 (20.0)	0.185
30-39	17 (17.2)	15 (26.8)	32 (20.6)	0.158
40-49	7 (7.0)	5 (9.0)	12 (7.7)	0.655
≥50	10 (10.1)	0 (0.0)	10 (6.5)	0.014
Mean ± SD	26.33±10.81	22.29±13.14	28.87±15.66 (22)	0.099

The results are presented as numbers (%) and mean ± SD. p-value was calculated using an independent two-sample t-test for continuous data and a Chi-square test for categorical data.

Table 6. The mean ± SD of the scores of depression and cognitive functions according to the existence of COVID-19 in the family members or close friends.

Participants	Scoring of Depression	Scoring of cognitive function
Without COVID-19 infection	9.566±6.905	22.945±14.892
Family member infected	5.095±5.195 (p=0.004)	16.238±11.811 (p=0.047)
Close friends infected	11.344±7.555 (p=0.282)	28.469±17.520 (p=0.142)
Both family members and close friends infected	11.265±5.780 (p=0.180)	28.306±15.259 (p=0.076)

The results are expressed as mean ± SD. P-value was calculated by using an independent two-sample Student's test, and the comparison with participants without a history of COVID-19 infection.

4. Discussion

The results of this study showed that both E-learning facilitated by social media COVID-19 lock-down as well as the COVID-19 illness itself significantly impact the mental health of medical students. The majority of students used Smartphones for E-learning. A recent study reported the close association between mental health represented by anxiety and depression with smartphones usage by students' college during the COVID-19 pandemic [15]. Approximately two-thirds of our students had a history of COVID-19 in their families or close friends, and without any doubt that COVID-19 illness per se influences negatively on mental health presenting with anxiety and depressive symptoms [16]. A higher percentage of students used social media indoors because of the lockdown policy to prevent the dissemination of the viral infections. Poor sleep quality in different terms was reported in this study. Difficult nights with several awakenings were reported significantly in males compared with the corresponding percentage of females. Our results confirmed a previous study that demonstrated poor sleep quality among people aged > 35 years during COVID illness [17].

A narrative review pointed out the impact of COVID-19 on changes in the sleep habits in young people during the pandemic and lockdown policy [18]. The possibility of E-learning to induce changes in the sleep pattern should be considered because smartphone use is a cause of changes in the sleep pattern [2]. The application of the sleep disorder inventory questionnaire disclose the presence of a significant sleep disorder among males compared with females in options number 3 and 4 in Table 3, while females are significantly complained from factors that bothered her (option-9, Table 3) compared with males. This finding could be related to COVID-19, as there is one study that showed a non-significant relation between the score of smartphone addiction and sleep disorder between males and females [19, 20]. Depressive symptoms were significantly reported in females compared with males as shown in Table 4. In this study, the percentage of students who had a score of ≥ 10 is 46% for females and 41.1% for males, which is higher than the corresponding percentage of 19% reported in the general population during the COVID-19 pandemic [12,21]. Moreover, cognitive function assessed by CFSS showed females were significantly prone to impairment of cognitive function during the lockdown due to COVID-19. This observation is important as the study was carried out on medical students, and future doctors will be at an educational state below the standard level. Some authors believe that COVID-19 itself may be impacted negatively on patients infected with virus, and not uninfected persons [21]. Therefore, the use of smartphones in E-learning may be the cause of the impairment in cognitive function as a recent study demonstrates impairment of cognitive function is associated with increased daily usage of mobile phones in people aged 32.43 ± 12.8 years [22]. Our results that are shown in Table 6 clearly point out that both smartphone usage and COVID-19 illness as a disease or as the outcome of lockdown are precipitating factors of cognitive impairment and depression. The strength of the study is related to the assessment of different psychometric parameters at the same time in students who used smartphone as a tool of E-learning, and they had a history of COVID-19 in their families or close friends. One of the limitations of the study is a small sample size, which is related to the responders on the online-survey study.

We conclude that COVID-19 as a disease or as a result of lockdown, with the use of social media as a tool of e-learning due to lockdown, are precipitating factors for significant psychometric parameters related to anxiety, sleep disorder, depression, and cognitive function in medical college students. Females are significantly susceptible to impairment of mental function, and depressive symptoms, while males are significantly susceptible to changes in the sleep pattern.

5. Conclusions

The findings of this study indicate that the COVID-19 pandemic, whether through the direct impact of illness or the consequences of lockdown, combined with the intensive use of social media platforms for E-learning, has significantly influenced the psychological well-being of medical students. The results demonstrate apparent gender-based differences: males were more susceptible to abnormal sleep behaviors. At the same time, females exhibited higher levels of depressive symptoms and greater impairment in several aspects of cognitive functioning. These outcomes highlight the multifactorial nature of psychological stress during the pandemic, in which academic pressure, prolonged screen exposure, and anxiety related to COVID-19 collectively contributed to measurable disturbances in sleep quality, mood, and cognitive abilities. Furthermore, although the presence of COVID-19 among family members or close contacts did not show a uniformly significant effect, students with such exposure tended to report higher depression scores and more cognitive difficulties, indicating an added emotional burden. Overall, this study underscores the need for universities to reconsider the structure of E-learning, integrate mental health support programs, and adopt strategies to minimize excessive digital load. Future research with larger populations and objective psychometric tools is recommended to understand better the long-term consequences of digital learning environments on mental health.

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