Original Article

Association of Depression, Anxiety, and Musculoskeletal Symptoms with Internet Addiction Amongst Undergraduates of University

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Abstract

Objective: To find association of depression, anxiety, and musculoskeletal symptoms with internet addiction amongst undergraduates of King Edward Medical University during Covid-19 induced lockdown.

Method: This was a Cross-sectional analytical study, conducted in Biochemistry Department of KEMU, Lahore from October to December 2020. A total of 400 undergraduate students enrolled in various programs of the university, Lahore fulfilling selection criteria were included in the study. Data were recorded using Google doc. Patient Health Questionnaire-2, Generalized Anxiety Disorder-2, and Modified version of Nordic Musculoskeletal Questionnaire were used to detect clinically significant depression, anxiety, and to record musculoskeletal symptoms respectively. The participants were classified into three categories namely low, moderate, and severe level of internet addiction based on Young's Internet Addiction Test score.

Results: The mean age of study subjects was 20.5 ± 1.5 years. Most of them were females (n=253, 63.3%), and of MBBS degree program (n=268, 67%). Majority showed moderate level of internet addiction (n=287, 71.8%). Amongst those who had severe level of internet addiction, more (17%) were found to have anxiety as compared to those who did not have it (6.8%). Similarly, more number (17.7%) was observed in depression category than no depression category (5.9%). Likewise, comparing presence of musculoskeletal symptoms with level of internet addiction, significant association was established ($p<0.001$).

Conclusion: Various levels of internet addiction amongst participants showed significant association with anxiety, depression, and musculoskeletal symptoms during covid-19 induced lock down.

Keywords: internet addiction, patient health questionnaire, generalized anxiety disorder, internet usage, undergraduate, medical students, covid-19

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Introduction

The biological response of human body to psychological stress is very similar to the biological response induced by physical diseases or microbial infections. Today, we have evolved to a computationally smart lifestyle, where we utilize screens frequently in our daily lives. Screen could be a television set, a computer terminal, or a handheld electronic device, such as a tablet or a smartphone. Cognitive stimulation by these electronic devices can cause a cascade of neurophysiological interactions like stress, which can have a significant impact on the brain's information processing capacity.[1] Stress adaption is a process in which people cope with stress by using a combination of various coping strategies. The increased use of electronic media is leading towards some new media-based stress manage-

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ment strategies. Modern electronic devices are the most used items for entertainment, which can help with avoidance-coping by offering a diversion from the stressor.[1,2]

Covid-19 pandemic has led towards financial, mental, and physical health problems which are the major stressful events globally. Changes in daily routine of life (decreased physical activity and loneliness) together with imposed stress are responsible for excessive use of electronic devices during this pandemic. University students are no exception to this as lockdown had forced them to depend on internet not only for entertainment and communication but also for education purposes because they are continuing their education through e-learning.[3]

Because modern screens are interactive, they increase the risk of their excessive use to access the internet, perhaps leading to internet addiction. "Internet addiction" also known as "compulsive internet usage," and "problematic internet use," is an impulsive shift in human behavior in which a person loses control over his or her use of the internet.[4]

Internet dependency has various adverse effects on mental and physical health such as increased risk of depression, anxiety, and musculoskeletal problems.[5] Frequent use of electronic devices with incorrect posture also aggravate musculoskeletal problems resulting in pain, mobility restrictions, and decreased functional ability and most people with musculoskeletal problems suffer with back, neck, and shoulder pain.[6]

To our knowledge, limited data is available in which impact of Covid-19 induced lockdown on internet dependency and its effect on mental and physical health are explored, especially in youngsters.

Material and Methods

This cross-sectional analytical study was conducted at Biochemistry Department of KEMU, Lahore from October to December 2020 after obtaining ethical approval from Institutional Review Board of KEMU vide letter no.726/RC/KEMU dated:10/10/2020. We included both male & female undergraduate students of age 18-25 years, studying in all academic years of various ongoing programs of KEMU including MBBS, DPT, and Allied Vision and Health Sciences after getting their consent to participate in the study. Only those undergraduate students at the university, who had Wi-Fi facility or internet connection during Covid-19 induced lockdown period took part in the study. The undergraduate students studying in the university who faced long hours' power shut down and provided with poor internet signal strength were excluded from our study. Sample size of 400 students was calculated taking a confidence level of 95%, absolute precision of 5% with expected prevalence of depression amongst students as 60%.[1] Responses of study subjects were recorded using Google doc-based questionnaire. Weblink of the questionnaire was first shared with class representatives of each program through WhatsApp messenger and subsequently it was shared with other students of the respective classes. Hence, data were collected through snowball sampling technique and confidentiality of study participants was also ensured. Questionnaire used in the study consisted of 31 closed ended questions to ask about background characteristics, to assess anxiety, depression & internet addiction and to record musculoskeletal symptoms (MSS) and mode of learning as e-learning amongst study subjects. Patient Health Questionnaire-2 (PHQ-2) and Generalized Anxiety Disorder-2 (GAD-2) are valid & reliable brief screeners which were used to detect clinically significant depression and anxiety[7] respectively. Therefore, presence & severity of internet addiction was determined by using Young's IAT.[4] Modified version of Nordic Musculoskeletal Questionnaire (mNMQ) was used to record MSS including pain & discomfort in 9 body regions amongst participants of the study.[5,8] A few questions were also asked to record their responses to observe effect of confounders on anxiety, depression, and MSS. These confounding variables included Covid-19 illness of study participants or of their family members or friends, loss of loved one due to Covid-19, financial crisis, academic delay, fear of professional examination, and fear of getting covid-19 infection.

Scores obtained from questions asked using GAD-2 & PHQ-2 on a 5-point Likert type scale ranged from 0-6 with a cut-off score of ≥3 to find clinically significant anxiety and depression,[7] respectively amongst study respondents. Regarding level of internet addiction, participants were classified into three categories based on IAT score. Those who scored 0-19, 20-39, 40-69, and 70-100 were considered as having no addiction, low level, moderate level, and severe level of internet addiction respectively.[4]

Recorded data of subjects of our study included age, gender, degree program, academic year, Body Mass Index, history of Covid-19 illness, IT device used for internet, purpose of use of IT device, use of IT device with proper posture, e-learning time spent per day, opi-

nion regarding e-learning is better than traditional learning, and sources used for e-learning. Data of study participants were analyzed using SPSS version 23. Descriptive statistics of quantitative variables such as age & BMI were calculated through mean ± SD and of the remaining qualitative variables through determining their frequencies & percentages. Levels of internet addiction among study respondents were also cross tabulated with anxiety, depression, musculoskeletal pain/discomfort during internet use, duration of trouble due to musculoskeletal symptom, use of internet without taking break, and daily duration of leisure activity on internet. Chi-square test was applied to determine association among qualitative variables and p-value was considered significant if it was less than 0.05.

Results

In our study, a total of 400 undergraduate students were included as participants whose mean age was 20.5 ± 1.5 years. Most of them were females (n=253, 63.3%), and of MBBS degree programme (n=268, 67%). Among study respondents, majority were studying in second year of their respective degree programme (n=158, 39.5%) and had normal BMI (n=249, 62.3%). Moderate level of internet addiction was observed in most of the students (n=287, 71.8%) whereas anxiety, depression, and musculoskeletal symptoms were recorded in 48.5%, 49.3%, and 52.8% of the study subjects respectively. Only 55 students (13.8%) had history of Covid-19 illness. During Covid-19 induced lockdown, majority of the study subjects used smartphone (n=338, 84.5%) as IT device. IT devices were used mostly for social networking system including WhatsApp & Facebook followed by entertainment purpose (n=135, 33.8%). Many of the respondents of the study rarely (n=159, 39.8%) and never (n=128, 32%) used IT device with proper posture. On asking about musculoskeletal symptoms in body regions, participants were observed as having high frequency of these symptoms in neck (n=166,41.5%) followed by back (n=131, 32.8%) amongst other body regions. Only 52 students (13%) used IT device mostly for the sake of e-learning and majority of the students consumed only 1-2 hours (n=107,26.8%) followed by 2-3 hours (n=94, 23.5%) daily on e-learning. When asked about their opinion regarding e-learning vs traditional learning, 60% of students disagreed that e-learning is better than traditional learning whereas only 17% of them agreed to this statement. The most used e-learning sources amongst our study participants were Google Classroom and Youtube (n=280, 70%). (Table-1)

When different levels of internet addiction were compared with various degree programs of study subjects, no significant difference was observed (p-value= 0.351) as shown by percent bar graph (Fig-1)

Fig-1: *100% component bar chart showing frequencies of participants with different levels of internet addiction against various degree programs at KEMU(N=400), p-value= 0.351, χ2 =4.43, df=4.*

Similarly, no significant difference was found when our study participants' daily duration of leisure activity on internet was compared amongst various degree programs (p-value=0.213), considering degree program as confounding variable. This is shown in bar graph as (Fig-2).

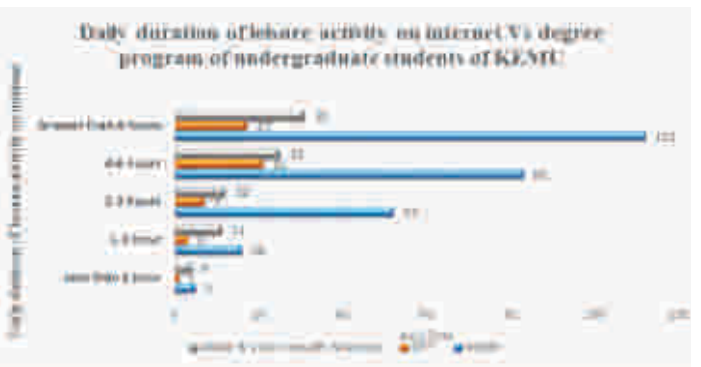

Fig-2: *Frequency of study participants of various degree programs at KEMU spending time on internet for leisure activity (N=400) p-value= 0.213, χ2 =10.8, df=8*

Fig-3: *Duration of internet usage by study subjects without taking break in different levels of internet addiction (p-value <0.001, χ2 =19.1, df=4)*

When duration of internet usage without taking break by the respondents was plotted against different levels of internet addiction, it was noted that highest percentage of respondents who used internet for >5 hours without any break were having severe level of internet addiction. Moreover, significant difference was revealed with p-

Table 1: *Background characteristics of undergraduate students of KEMU as study participants*

Variables	n (%)	Variables	n (%)
Age in years	20.5 ±1.5 (mean ± SD)	**Use smartphone/laptop with proper posture**	
		Never	128 (32%)
Gender		Rarely	159 (39.8%)
Male	147 (36.8%)	Occasionally	79 (19.8%)
Female	253 (63.3%)	Frequently	31 (7.8%)
		Always	3 (0.8%)
Degree Program		**IT devices used**	
MBBS	268 (67%)	Smartphone	338(84.5%)
DPT	49(12.3%)	TV	14 (3.5%)
Vision & Allied	83(20.8%)	Computer	4 (1%)
Health Sciences		Laptop	38 (9.5%)
		Tablet	6 (1.5%)
Academic Year		**Musculoskeletal symptoms in body regions**	Of total study participants n=400
First	117 (29.3%)	Neck	
Second	158 (39.5%)	Shoulders	166 (41.5%),
Third	39 (9.8%)	Hands/wrists	97 (24.3%)
Fourth	56 (14.0%)	Back	83 (20.8%)
Final	30 (7.5%)	Hips/thighs	131 (32.8%)
			30 (7.5%)
Body Mass Index (BMI)	22.1 ± 4.07 (mean ± SD)	**Daily duration of e-learning**	
		< 30 minutes	67 (16.8%)
BMI Categories		30-60 minutes	90 (22.5%)
Underweight	69 (17.3%)	1-2 hour	107 (26.8%)
Normal	249 (62.3%)	2-3 hours	94 (23.5%)
Overweight	67 (16.8%)	4-6 hours	29 (7.3%)
Obese	15 (3.8%)	> 6 hours	13 (3.3%)
Levels of internet addiction based on YIAT score		**Purpose of use of IT devices**	
		Social networking system (WhatsApp, Facebook)	167 (41.8 %)
low level	66 (16.5%)	Education	52 (13 %)
moderate level	287 (71.8%)	Communication (Calls, SMS)	9 (2.3 %)
severe level	47 (11.8%)	Gaming	22 (5.5 %)
Depression		Entertainment (Movie, Music)	135 (33.8 %)
Anxiety	197(49.3%)	Web surfing	12 (3%)
Complaint of Musculoskeletal	194 (48.5%)	Online shopping	3 (0.8%)
symptoms	211(52.8%)		
History of Covid 19 illness	55(13.8 %)	**e-learning sources used**	
e-learning is better than traditional learning		Google Classroom	156 (39%)
		YouTube	124 (31%)
Strongly Disagree	127 (31.8%)	Zoom	66 (16.5%)
Disagree	114 (28.5%)	Google search	22 (5.5%)
Neutral (both are same)	90 (22.5%)	Wikipedia	5 (1.3%)
Agree	47 (11.8%)	PowerPoint slides	11 (2.8%)
Strongly Agree	22 (5.5%)	Video lectures	3 (0.8%)
		E-Books	6 (1.5%)
		Netflix	5 (1.3%)
		All above mentioned sources	2 (0.5%)

value <0.001, $\chi 2$ =95.41, df=12 (Fig-3)

When responses of our participants with musculoskeletal symptoms during IT device usage were recorded on Likert scale, majority of the respondents who never & rarely (n=169/287, 59%) maintained their proper posture using IT device, were having MS symptoms and the difference was found statistically significant (p-value = 0.001).

Non-significant association was observed when confounding variables were compared with anxiety, depression, and MS symptoms (p-value > 0.05). When presence of anxiety (through GAD-2 scale)[7] amongst study subjects and their level of internet addiction was compared, a significant association was identified (p=0.007). Amongst those who had severe level of internet addiction, more respondents (17%) were found to have anxiety as compared to those who did not have it (6.8%) (Table-2)

Similarly, a significant association was seen (p= 0.001) while comparing presence of depression (through PHQ-2)[7] and level of internet addiction of participants. Those who had severe addiction were observed to have more number (17.7%) in depression category as compared to no depression category (5.9%). Likewise, presence of Musculoskeletal symptoms of our respondents were compared with level of internet addiction, and a significant association was established (p<0.001). Greater number of subjects was noticed to have MS symptoms (13.7%) amongst those who had severe level of internet addiction as compared to those who did not have such symptoms (9.5%) (Table-2)

Discussion

Our research quest in this descriptive, cross-sectional study aimed to find the association of depression, anxiety, and musculoskeletal symptoms with internet addiction amongst undergraduate students at King Edward Medical University, Lahore.

Habitual internet use is associated with several addictive characteristics that are analogous to symptoms of substance-use disorder including obsession, tolerance, inability to control craving, impairment of daily life activities, disregard to harmful consequences, and withdrawal.[7] In the present study, majority of the students were found to have moderate level of internet addiction (71.8%) which is contrary to the findings of Croatian study in which majority respondents had low level of internet addiction (39%).[4] This might be because we recorded data of our study during covid-19 induced lockdown in which students used internet too much for having greater availability of free time. However, another study conducted on 4211 Chinese college students showed same results i.e 17.4% of the participants were

Table 2: *: Association of anxiety, depression & MS symptoms with various levels of internet addiction (N=400)*

	Anxiety Disorder (GAD-2 score ⩾3)		Total	χ^2, df	p-value
Level of internet Addiction	**No Anxiety**	**Anxiety**			
Low level / average online user	36 (17.4%)	30 (15.4%)	66		
Moderate level	156 (75.7%)	131(67.5%)	287	10.05, 2	0.007
Severe level	14 (6.79%)	33 (17%)	47		
Total	206	194	400		
	Depression Disorder (PHQ-2 score ⩾3)		**Total**	**χ^2, df**	**p-value**
Level of internet Addiction	**No Depression**	**Depression**			
low level / average online user	36(17.7%)	30(15.2%)	66		
moderate level	155(76.3%)	132(67%)	287	13.55, 2	0.001
severe level	12(5.9%)	35(17.7%)	47		
Total	203	197	400		
	Musculoskeletal symptoms while using IT device		**Total**	**χ^2, df**	**p-value**
Level of internet Addiction	**No**	**Yes**			
low level / average online user	47(11.7%)	19(9%)	66		
moderate level	124(65.6%)	163(77.2%)	287	18.6, 2	<0.001
severe level	18(9.5%)	29(13.7%)	47		
Total	189	211	400		

considered as having moderate to severe level of Internet addiction.[9] Earlier studies did not investigate how much time the respondents spent on certain activities on the internet and did not distinguish the activities on the internet for educational purposes and leisure activities.[10,11] This shortcoming was controlled in our research by mentioning the duration for internet usage for different educational and leisure activities. In our participants, IT devices were most used for social networking system (n=167, 41.8 %). These findings are in line with a survey of 367 Turkish university students, individuals who primarily used their smart phones to access social networking sites had a significantly higher risk for smart phone addiction.[12] Similar connection was explored in 410 Hong Kong university undergraduates in which people who had cyber relationships and habit of online gambling had higher Internet addiction scores.[13]

Students recruited in our study who used IT device for the sake of e-learning and majority of them consumed 1-2 hours daily (n=107,26.8%). It was noted that highest percentage of respondents who used internet for >5 hours without any break were having severe level of internet addiction with significant p-value=0.000 which clearly showed that it is not related with e-learning. We assumed that internet addiction is responsible for the development of anxiety, depression and musculoskeletal symptoms and our data supported this hypothesis as shown by significant results.

Our findings resonate well with prior results from multiple studies which looked at the relationship between psychological traits (depression, anxiety, social phobia, loneliness) and smart phone/internet addiction. In a Lebanese study, depression (p=0.004) and anxiety scores (p=0.028) emerged as independent positive predictors of smart phone addiction, with depression score being a more powerful predictor compared to anxiety score.[7] In a sample of 440 Indian high school/college students, high prevalence of depression (85.7%) and anxiety (83.3%) in the participants addicted to the Internet was observed and was statistically significant.[14]

The relationship between greater internet usage and increased risk of musculoskeletal symptoms is widely accepted.[8,9] This exploration is consistent with our conclusions in which greater number of subjects had MS symptoms (77.2% and 13.7%) amongst those who had moderate/severe level of internet addiction with a p<0.001. We also studied the impact of proper posture on musculoskeletal symptom sand majority of the respondents who never & rarely (n= 169/287, 59%) maintained their proper posture while using IT device, had MS symptoms and this difference was statistically significant (p=0.001). Amro and his colleagues in their study also noted that only 12.9% of smart phone users and 15.7% of computer users considered proper posture recommendations while using social media on laptops and smart phones and this consideration was negatively associated with the severity of Musculoskeletal disorders in terms of severity of headache, neck, and back pain[3] which agrees with our study.

In the present study, participants were having high frequency of MSS in neck (n=166, 41.5%) followed by back (n = 131, 32.8%), shoulders (n=97, 24.3%) and hands/wrists (n=83, 20.8%). These findings are consistent with the findings of another study conducted on 150 computer users of aged 18 to 50 years in which 67 (44.7%) participants suffered from musculoskeletal problems, affecting at least one of the four anatomical sites (low back, neck, shoulder, wrist/hand). In another research conducted on 4211 Chinese youngsters, neck, shoulder, elbow, wrist/hand, low back, and waist pain was reported by participants and internet addiction was significantly related to an increased risk of musculoskeletal pain.[8]

Only 55 students (13.8%) had history of Covid-19 illness so we can say it is not proved to be a confounding variable in our study as far as anxiety, depression, and MS symptoms are concerned.

The COVID-19 induced lockdown has accelerated the implementation of e-learning and most medical schools used it regardless of their readiness. But in our study, only 52 students (13%) used IT device mostly for the sake of e-learning and majority of the students consumed only 1-2 hours. The most used e-learning sources amongst our study participants were Google Classroom and Youtube i.e 70%. When asked about their opinion regarding e-learning vs traditional learning, 60% of our students disagreed that e-learning is better than traditional learning. So, majority of our students agreed with Kaur et al[16] who concluded that regarding convenience, interaction level, individual learning needs, and balancing of practical and theoretical knowledge, the students found e-learning to be less effective than traditional learning. However, AlQhtani and his colleagues concluded that e-learning was more or equally effective in following parameters such as assignment submission and meeting individual needs, but less effective in including building skills and knowledge, and interaction level. So, they stressed on blended teaching.[17]

Conclusion

Various levels of internet addiction among study participants showed significant association with anxiety, depression, and musculoskeletal symptoms during covid-19 induced lock down. Moreover, greater number of students with severe level of internet addiction developed anxiety, depression, and musculoskeletal symptoms during this period.

Conflict of Interest: None

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Authors Contribution

NAW, MR: Conceptualization of Project
MR: Data Collection
NAW, MR, AI, IA, RA, KQ : Literature Search
NAW: Statistical Analysis
NAW, MR, AI, IA, RA, KQ: Drafting, Revision
NAW, MR, AI, IA, RA: Writing of Manuscript