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Internet addiction, mental health, and sleep quality in students of medical sciences, Iran: A cross-sectional study

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Abstract:

BACKGROUND: Internet addiction (IA) is a severe problem, especially in academic communities. The association between IA and unfavorable emotional conditions (e.g., anxiety, stress, and depression) can harm students' relationships and academic and career performance. The present study evaluated (a) the prevalence of IA in a sample of medical sciences university students; (b) the association between IA and depression, anxiety, stress, and sleep disorders; and (c) the association between demographic characteristics and IA, depression, anxiety, and stress.

MATERIALS AND METHODS: In this descriptive cross-sectional study, 268 students from Abadan University of Medical Sciences were selected using Morgan Table. The participants responded to the Young Internet Addiction Test, the Depression Anxiety Stress Scales-42, and the Pittsburgh Sleep Quality Index. Data were analyzed using descriptive statistics, Pearson correlation coefficient, independent sample *t*-test, one-way ANOVA, and least significant difference.

RESULTS: The mean score of IA was 45.65 ± 35.40 . IA was found to be significantly related to depression, anxiety, stress, and sleep disorders (except for sleep disturbance) ($P < 0.001$). Males were found to be more likely than females to suffer from IA, depression, anxiety, stress, and sleep disorders. Furthermore, age was inversely related to IA, depression, and stress. Finally, medical sciences students suffered from depression, anxiety, and stress more than students majoring in other fields.

CONCLUSIONS: The simultaneous occurrence of IA and depression, anxiety, stress, and sleep disorders in students indicates that IA is associated with other psychological problems. Therefore, researchers and policymakers need to identify preventive measures to help internet-addicted students.

Keywords:

Anxiety, depression, internet addiction, sleep quality, stress

Introduction

Easy access to computers, worldwide modernization, and increased smartphone use have provided people with the opportunity to use the internet easily and frequently.^[1] Despite the advantages of the internet, the recent dramatic increase in internet use has resulted in its pathological use (i.e., internet addiction [IA]).^[2]

IA is defined as an individual's disability to control their use of the internet, which

usually leads to feelings of distress and/or has considerable adverse psychological, social, and occupational effects.^[3,4] IA has not been officially accepted as a disorder in the latest edition of The Diagnostic and Statistical Manual of Mental Disorders (5th ed.)^[5] or The International Statistical Classification of Diseases and Related Health Problems 10th Revision.^[6] However, studies have revealed that IA can be described as a compulsive-impulsive spectrum disorder, which has four characteristics: excessive use; tolerance (a need for more hours of use, etc.); emotional

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withdrawal (e.g., tension, depression, and anger); and negative repercussions such as fatigue, arguments, lying, and social isolation.^[3,7]

The prevalence of IA varies from 1.6% to 18% worldwide and differs according to age, sex, ethnicity, and population.^[8] The results of one study indicated that the risk of IA in men is more than women. However, this result is not definitive and needs further study.^[9] Moreover, it has been revealed that the prevalence of IA is higher in adolescents and young adults than other age groups.^[10] Among them, university students, especially medical sciences students, are a vulnerable group due to the increasing use of technology for learning and clinical care.^[11]

There are several emotional factors that may be associated with IA in students.^[2] The results of a study in Malaysia showed that students with severe IA are likely to be affected by depression.^[12] Moreover, the results of various studies indicated that high use of the internet could be associated with anxiety,^[13] stress,^[2] poor sleep quality,^[10] suicidal thoughts,^[14] and reduced physical activity.^[15] These negative effects can influence family relationships,^[16] academic performance, and long-term professional goals,^[17,18] and they can have broad and detrimental consequences on society as a whole.^[8]

Although Iran is among the top twenty countries in the world in terms of the number of internet users^[19] and is the first country on this list from the Middle East (62.7 million users),^[20] there are few studies conducted on the prevalence of IA in Iran and those that do exist have yielded inconsistent results. Most studies have investigated the prevalence of IA among adolescents and high school students,^[21-25] while few studies have investigated the prevalence of IA among medical sciences students. Studies that have focused on this group of students have employed different sampling strategies, and most of them have focused on one major (medicine^[26,27] and nursing^[28]) or a limited number of majors^[29,30] within one university (using a similar tool [Yong's internet addiction scale]). Furthermore, an extensive literature search revealed no previous studies that have observed the relationship between IA and three psychological symptoms and sleep disorders among students from all fields of study at a university of medical sciences. Because of the limited number of empirical studies in this regard and the increasing use of the internet in Iran, especially among students,^[31] the results of this study provide useful insights to relevant authorities so that they can identify high-risk groups and understand and resolve this potential problem.

This study evaluated (1) the prevalence of IA in a sample of medical sciences university students; (2) the association

between IA and depression, anxiety, stress, and sleep disorders; and (3) the association between demographic characteristics and IA, depression, anxiety, and stress.

Materials and Methods

Study design and setting

The present study was a cross-sectional study. The statistical population consisted of all students of Abadan University of Medical Sciences in 2019.

The inclusion criteria included the students who were 18 years old and older, have passed at least one semester, and were willing to participate in the project. Exclusion criteria were questionnaires being confused.

Study participants and sampling

The sample size, according to Morgan Table, included 268 students who were selected through stratified sampling method from students of nursing, operation room, bachelor of science in anesthesia, medical laboratory sciences, medicine, public health, environmental health engineering, health information technology, medical library and information science, and emergency medical aid.

Data collection tool and technique

The tools for collecting data included four parts: demographic information form (age, sex, field of study, and marital status), Young's Internet Addiction Test (IAT), the Depression Anxiety Stress Scales (DASS) (1995), and Pittsburgh Sleep Quality Index (PSQI) (1989).

Internet addiction

The Young's IAT consists of 20 self-report items that evaluate the respondents' productivity in the workplace, school, and home (3 items), social behaviors (3 items), emotional connection, and response to the use of the internet (7 items).^[32] The respondent should answer the items based on 6-option Likert scale (does not apply = 0, rarely = 1, occasionally = 2, frequently = 3, often = 4, and always = 5). The scores range from 0 to 100; higher score indicates more dependency on the internet and more severe problems resulting from excessive use of the internet. Based on the scoring, results are interpreted as follows: 0–49 points = normal, 50–79 points = moderate, and 80–100 points = severe internet addictive behaviors. The convergent and discriminant validities of this scale were favorable. In the present study, the Cronbach's alpha was 0.993.

Depression, anxiety, and stress

The DASS consists of 42 items. This scale evaluates the degree of depression, anxiety, and stress (14 items for each). The scoring of this scale is based on the 4-option Likert scale (did not apply to me at all = 0, applied to me some degree, or some of the time = 1,

applied to me to a considerable degree, or a good part of time = 2, applied to me very much, or most of the time = 3). This scale is completed in a self-assessment form.^[33] The scores of each subscale are calculated as follows: depression: the scores between 0 and 9 indicate normal, 10–13 mild, 14–20 moderate, 21–27 severe, 28 and higher extremely severe; anxiety: 0–7 normal, 8–9 mild, 10–14 moderate, 15–19 severe, 20 and higher extremely severe; stress: 0–14 normal, 15–18 mild, 19–25 moderate, 26–33 severe, 34 and higher extremely severe.^[34] The convergent and discriminant validities of this scale were favorable. The Cronbach's alpha for the three scales of depression, anxiety, and stress in this questionnaire was obtained as 0.918, 0.935, and 0.948, respectively.

Sleep disorders

PSQI consists of 19 self-assessment items presented in 7 component scores: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. It examines the sleep pattern and quality over the past month. Each component score ranges from 0 to 3 (no difficulty = 0 and severe difficulty = 3). To total score is calculated by the sum of the scores of the seven component scores, ranging from 0 to 21. The higher score indicates poorer sleep quality. The reliability of this scale was calculated and reported by its developers (Cronbach's alpha = 0.83).^[35] The reliability of this scale in Iran was acceptable (Cronbach's alpha = 0.77). It also has adequate convergent and discriminant validities.^[36] In the present study, the Cronbach's alpha was 0.83.

Statistical analysis

Descriptive statistics were used to analyze participants' demographic characteristics and the prevalence of IA, depression, anxiety, stress, and sleep disorders. The associations between IA and depression, anxiety, stress, and sleep disorders were determined using the Pearson correlation coefficient. This measure was also used to evaluate the associations between age and IA, depression, anxiety, stress, and sleep disorders. An independent sample *t*-test was used to assess the association between sex and the variables of interest, while a one-way ANOVA was used to examine these variables' association with the field of study. The least significant difference (LSD) *post hoc* analysis was used to detect differences in the variables of interest based on the field of study. The data were analyzed by SPSS version 21 (IBM SPSS 21, Inc., USA, 2012). The significance level was set to 0.05.

Ethical consideration

The protocol of the study was approved by the ethics committee of Abadan Faculty of Medical Sciences (IR.ABADANUMS. REC.1396.236). The researcher obtained informed consent from the respondents.

Participation in the study was voluntary, and participants were assured that their information would remain confidential.

Results

Two hundred sixty-six respondents (out of 268) answered the questionnaire. 110 (41.4%) students were male and 156 (58.6%) were female. The age range of the students was 18–42 years, and the age mean was 20.91 ± 2.79 years. In addition, most of the students (95.5%) were single. The frequency distribution of the students' fields of study is presented in Table 1.

The prevalence of internet addiction

Of the respondents, 26 students (9.8%) reported having moderate IA, and 99 students (37.2%) reported having severe IA. The mean score of IA was 45.65 ± 35.40 [Table 2].

Depression, anxiety, and stress

The mean score of depression was 13.16 ± 8.13 , the mean score of anxiety was 12.36 ± 8.51 , and that of stress was 12.73 ± 8.79 . Table 2 shows the frequency distribution of depression, anxiety, and stress.

Sleep disorders

One hundred and fifteen (43.2%) students had good sleep quality and 151 (56.8%) had poor sleep quality [Table 2]. The mean score of the total disorder in the students' sleep quality was 5.21 ± 2.40 out of 21. The highest score was obtained from the dimension of subjective sleep quality (1.42 out of 3) and the lowest score was on the habitual sleep efficiency (0.03 out of 3) [Table 3].

Table 1: Participant's characteristics (n=266)

Demographic characteristics	Categories	n (%)
Gender	Male	110 (41.4)
	Female	156 (58.6)
Age (mean±SD)		20.91±2.79
Marital status	Unmarried	254 (95.5)
	Married	12 (4.5)
Cigarette smoking	Yes	5 (1.9)
	No	261 (98.1)
Field of study	Medicine	78 (29.3)
	Nursing	63 (23.7)
	Medical laboratory sciences	28 (10.5)
	Operation room	24 (9)
	Bachelor of Science in anesthesia	21 (7.9)
	Public health	14 (5.3)
	Emergency medical aid	14 (5.3)
	Health information technology	10 (3.8)
	Environmental health engineering	9 (3.4)
	Medical library and information science	5 (1.9)

SD=Standard deviation

The association between internet addiction, depression, anxiety, stress, and sleep disorders

There was a positive relation between IA and depression, anxiety, and stress in students ($P < 0.001$). In other words, increasing in the score of IA increased the scores of depression, anxiety, and stress [Table 4]. Moreover, the score of IA in the students had no significant relationship with habitual sleep deficiency ($P = 0.12$), but there could be found a positive relationship between the score of IA and the total score of sleep quality disorder and other dimensions ($P < 0.001$). In other words, an increase in the score of IA increased the score of sleep quality disorder [Table 4].

There was a significant difference in IA ($P = 0.001$), depression ($P = 0.004$), anxiety ($P < 0.001$), stress ($P = 0.002$), and sleep quality disorder ($P = 0.001$) between males and females; it was more prevalent among the males [Table 5].

The age of students had an inverse relation with the scores of IA ($P = 0.04$), depression ($P = 0.048$), and stress ($P = 0.03$) but had no significant relation with the scores of anxiety ($P = 0.21$) and sleep quality disorder ($P = 0.15$) [Table 6].

One-way ANOVA showed that there was no significant difference between the mean scores of IA ($P = 0.23$) and sleep quality disorder ($P = 0.41$) in the students of different fields of study, but the mean scores of depression, anxiety, and stress had a significant difference in the students of different fields of study ($P < 0.05$). The LSD *post hoc* analysis indicated that the mean scores of depression, anxiety, and stress were significantly higher in the students of medicine than the students of nursing and other fields of study, but there was no significant difference between the students of nursing and other fields of study ($P > 0.05$) [Table 7].

Due to the small number of married and smoking students, these variables were not considered.

Discussion

The purpose of this study was to determine the prevalence of IA among students of Abadan University of Medical Sciences and its association with depression, anxiety, stress, and sleep disorders. This study also examined the association between demographic characteristics (age, sex, and field of study) and IA, depression, anxiety, and stress.

The IA prevalence rate recorded in this study (45.65) is higher than that reported in other Iranian universities (10%–20%).^[29,30] However, similar studies conducted among students of medicine and nursing

Table 2: The frequency distributions of internet addiction, depression, anxiety, stress, and sleep quality in students

Variables	n (%)
Internet addiction	
Normal	141 (53)
Moderate	26 (9.8)
Severe	99 (37.2)
Mean score±SD	45/65±35.40
Depression	
Normal	125 (47)
Mild	14 (5.3)
Moderate	66 (24.8)
Severe	52 (19.5)
Extremely severe	9 (3.4)
Mean score±SD	13/16±8.13
Anxiety	
Normal	115 (43.2)
Mild	13 (4.9)
Moderate	23 (8.6)
Severe	46 (17.3)
Extremely severe	69 (25.9)
Mean score±SD	12.36±8.51
Stress	
Normal	150 (56.4)
Mild	21 (7.9)
Moderate	73 (27.4)
Severe	21 (7.9)
Extremely severe	1 (0.4)
Mean score±SD	12.73±8.79
Sleep quality	
Good sleepers	115 (43.2)
Poor sleepers	151 (56.8)
Mean score±SD	5.26±2.40

SD=Standard deviation

Table 3: The statistical indexes of the total score of sleep quality and its dimensions in the students

Components of sleep quality	Mean score±SD	Minimum	Maximum
PSQI total	5.26±2.40	0	12
Subjective sleep quality	1.42±0.69	0	3
Sleep latency	0.76±0.47	0	2
Sleep duration	1.35±0.77	0	3
Sleep efficiency	0.03±0.24	0	3
Sleep disturbance	0.88±0.32	0	1
Use of sleep medication	0.08±0.26	0	1
Daytime dysfunction	0.74±0.65	0	2

SD=Standard deviation, PSQI=Pittsburgh Sleep Quality Index

reported an IA prevalence of about 50%, which is consistent with the results of the present study.^[27,28] The prevalence of IA among students in other countries is diverse. For example, according to Mihajlov and Vejmelka,^[37] the rates of IA are 4%–25% in the United States, 18.3% in the United Kingdom, 17.9% in Taiwan, 17.3% in Qatar, 6.4% in China, 5% in Italy, and 0.7% in India. Despite the need for special attention regarding

differences in internet use, the high prevalence rate of IA in the present study could be due to the increasing use of the internet – especially virtual social networks – in

Table 4: Pearson correlation coefficients between the scores of internet addiction and the scores of depression, anxiety, stress, sleep quality, and its dimensions in the students

Variables	Internet addiction score*	
	r	P
Depression score	0.902	<0.001
Anxiety score	0.892	<0.001
Stress score	0.913	<0.001
Components of sleep quality		
PSQI total	0.882	<0.001
Subjective sleep quality	0.856	<0.001
Sleep latency	0.447	<0.001
Sleep duration	0.804	<0.001
Sleep efficiency	0.095	0.12
Sleep disturbance	0.355	<0.001
Use of sleep medication	0.299	<0.001
Daytime dysfunction	0.738	<0.001

*Pearson correlation coefficients. PSQI=Pittsburgh Sleep Quality Index

Table 5: The mean scores of internet addiction, depression, anxiety, stress, and sleep quality in terms of the student's sex

Score	Mean score±SD		P*
	Male	Female	
Internet addiction	54.25±33.86	39.59±35.31	0.001
Depression	14.86±8.21	11.96±7.89	0.004
Anxiety	14.77±8.82	10.65±7.88	<0.001
Stress	14.66±8.89	11.37±8.49	0.002
Sleep quality	5.86±2.41	4.84±2.31	0.001

*Independent sample t-test. SD=Standard deviation

Table 6: Pearson correlation coefficients between the students' age and the scores of internet addiction, depression, anxiety, stress, and sleep quality

Score	Age*	
	r	P
Internet addiction	-0.128	0.04
Depression	-0.117	0.048
Anxiety	-0.078	0.21
Stress	-0.129	0.03
Sleep quality	-0.088	0.15

*Pearson correlation coefficients

Table 7: The mean scores of internet addiction, depression, anxiety, stress, and sleep quality in terms of the students' field of study

Variables	Mean score±SD			P*
	Medicine (n=78)	Nursing (n=63)	Other fields (n=125)	
Internet addiction	51.06±38.38	45.67±36.17	42.26±32.85	0.23
Depression	16.87±8.95	11.84±7.44	11.50±7.17	<0.001
Anxiety	15.81±10.73	11.40±7.20	10.69±6.83	<0.001
Stress	16±10.80	11.51±7.90	11.31±7.21	<0.001
Sleep quality	5.47±2.69	4.94±2.34	5.30±2.24	0.41

*One-way ANOVA. SD=Standard deviation

Iran in recent years. Furthermore, the industrial nature of the city of Abadan and the lack of recreational facilities can promote internet use. However, there is a possibility that the prevalence of IA in Iran has increased, and that variations in IA prevalence rates among different countries might be due to differences in the assessment methods for IA, as well as cultural and social factors. Therefore, it is important for every country and province to conduct surveys to assess the prevalence of IA at regular intervals.^[38]

Moreover, IA was revealed to be directly related to anxiety, stress, and depression – students with moderate to severe IA showed higher psychological symptoms than other rest. Even though different studies have utilized different questionnaires and types of data,^[39,40] IA has been consistently found to be linked to depression,^[10,41] anxiety,^[42] and stress.^[43] For instance, a study indicated that depressed people who were internet addicted were more severely depressed than those who were not internet addicted.^[44] Moreover, IA treatment has been shown to partially alleviate depression.^[45] Nevertheless, there is no consensus regarding the causal relationship between these variables.^[10,13] Seki *et al.* believed that depression and IA operate in a continuous cycle – people use the internet to treat their stress, resulting in decreased social activity and increased stress and depression.^[46]

The results of the present study corroborate the results of a study in Taiwan,^[18] as 56.8% of the students surveyed suffered from poor sleep quality and a direct relationship was found between IA and sleep quality disorder and the other relevant dimensions (except the habitual sleep disorder). Free internet access and its excessive use stimulate the central nervous system, causing delayed sleep and short sleep duration. Moreover, the blue light emitted by screens suppresses the release of melatonin, thus reducing sleep duration.^[47] Tan and Li also indicated that problematic internet use is associated with depression and sleep disturbance, both of which can mediate sleep disturbance.^[16] However, it could be that poor sleep quality and depression lead to IA.^[48]

The present study cannot be used to make inferences about the direction of the investigated relationships. Still, the observed variables are undoubtedly related to

each other, and these relationships must be considered in diagnoses and treatment.

According to previous studies, males are more likely than females to use the internet excessively and to experience IA^[43,49,50] and sleep disturbances.^[51] The results of the present study are consistent with such findings. However, some researchers have reported that there is no difference between the sexes in terms of IA.^[21,52]

Unlike most previous studies which being female was a risk factor for depression, anxiety, and stress,^[12,53] the results of this study showed that men experience higher levels of depression, anxiety, and stress. This may be because social factors such as occupation are considered as one of the most important mental health factors among young people in Iran. Unemployed people show higher levels of anxiety, stress, and depression.^[54] Most students (especially in Abadan) are unemployed and have no entertainment other than the internet. A lack of proper career prospects has led many students to worry about their future.^[55] Men are under more pressure than women because they are expected to have a job,^[54] which leads them to use the internet to reduce their stress.^[55] However, this is a temporary and false form of relief and can exacerbate anxiety and depression. Further studies on this topic are needed, and this issue needs more general consideration in Iranian society.

Furthermore, the mean scores for depression, anxiety, and stress among medical students were significantly higher than those of students from other fields of study. This could be because medical students are likely to experience long study hours, stress related to clinical practices,^[56] and pressure from repeated academic evaluations.^[57]

Strength and limitation

This study was a cross-sectional study, and therefore, the results do not show a causal relationship. In addition, in the present study, data were collected through self-report questionnaires, which can affect the accuracy of data. However, we strongly encouraged participants to provide accurate information. Finally, since the sample consists of students from a single university, the results cannot be considered as being representative of the whole country.

To the best of the researchers' knowledge, this study was the first to investigate the relationships between IA, sleep disorder, and three psychological symptoms among students from all fields of study at the University of Medical Sciences in Iran. Furthermore, this was the first study to examine the association between demographic characteristics and the four psychosocial stressors investigated.

Conclusions

The results of the present study indicate that IA is very common among Iranian medical sciences students and is correlated with other psychological problems.

Therefore, developing an education program about the appropriate use of the internet for students would be advisable in order to increase awareness of the negative effects of excessive use of the internet and its association with psychological health and sleep quality. In addition, providing counseling sessions for students with moderate or severe IA as well as providing recreational facilities for students could be helpful. On the research side, longitudinal studies are required to further investigate the causal factors for IA, mental problems, and sleep disorder and to clarify the mechanisms of their interdependence. Furthermore, the amount of time people spend using the internet, the spaces and programs used most often, or academic procrastination resulting from internet use could be interesting research topics.

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Conflicts of interest

There are no conflicts of interest.

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