

Original Article



Prevalence of internet addiction and its association with anxiety, depression, and stress in high school students during the COVID-19 pandemic

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Abstract

Background and aims: The COVID-19 pandemic threatened human health from March 2020 to June 2021. The need to maintain social distancing, school closures, online education, and spending a lot of time on the internet made students addicted to the Internet, which endangered their mental health. The present study aimed to determine the prevalence of internet addiction and its relationship with anxiety, stress, and depression in high school students in Shahrekord.

Methods: The present cross-sectional study examined 420 female and male students who were selected from high schools in Shahrekord city from 2020 to 2021. This study used a two-part questionnaire, including demographic information, and the Yang Internet Addiction Test (YIAT) to investigate internet addiction status. The 21-item Depression, Anxiety, and Stress Scale (DASS-21) was utilized to investigate depression, anxiety, and stress in students during the COVID-19 pandemic.

Results: In terms of the prevalence of internet addiction among students during the COVID-19 pandemic, 76% did not have an internet addiction, 22.3% were prone to internet addiction, and 1.7% had severe internet addiction. The mean anxiety, stress, and depression scores in students addicted to the internet were significantly higher than normal users ($P < 0.001$). There was no significant relationship between internet addiction and gender, education level, job, and parents' education ($P > 0.05$).

Conclusion: Considering the COVID-19 pandemic and the provision of time for excessive use of the internet by students, interventional measures and teaching the correct and planned use of the internet seem essential to maintain the students' health.

Keywords: Internet addiction, COVID-19, Anxiety, Stress, Depression

Received: January 13, 2023, Accepted: May 13, 2023, ePublished: December 30, 2024

Introduction

Internet use has significantly increased in the last two decades. As of March 2020, approximately 4.57 billion people worldwide were using the internet, with the number of new users reaching 1 million per day (1,2). Over the past two years, the COVID-19 pandemic has caused many adverse changes in individuals' lives, particularly affecting adolescents in over 130 countries (3). Due to control measures during the pandemic, students were isolated at home, leading to increased internet use and adversely affecting their physical and mental health (2,4). Studies have indicated that the stressful factors caused by the pandemic have influenced addictive behaviors, resulting in excessive internet use (5).

Distance learning and the transfer of various activities to the online world have made adolescents spend more time using computers, smartphones, and virtual space, leading to internet addiction and psychological problems (6-8). According to Yang, internet addiction is considered a social problem with symptoms such as being too preoccupied with the internet, feeling the need to use the internet for longer periods, not paying attention to the

time spent on the internet, and spending unplanned and a significant amount of time in virtual space (9).

During the COVID-19 crisis, adolescents used the internet for various purposes, such as communicating with friends, playing computer games, doing assignments, and searching. As a result, the mean time spent on the internet per day during the COVID-19 pandemic increased substantially, intensifying the risk of internet addiction in adolescents (10,11). In a meta-analysis study conducted before the COVID-19 pandemic, 13.6% of adolescents were addicted to the internet (12). This figure increased to 24.4% throughout the COVID-19 pandemic (13). A study conducted in China also indicated that the frequency and duration of recreational use of the internet among adolescents increased during the COVID-19 pandemic (10). Furthermore, a study of 11 European countries during the COVID-19 pandemic, involving 11356 adolescents, showed that internet addiction increased with increasing behavioral problems, suicide, destruction of peer relationships, depression, and anxiety (14).

According to reports from parents during the quarantine period, 30% of children and adolescents

showed symptoms of post-traumatic stress disorder (15,16). A study conducted in Poland revealed that the long-term effects of the COVID-19 pandemic led to stress disorder and depression syndromes (17). Studies have shown that, in addition to student isolation and excessive internet use, the closure of parks and sports halls forced adolescents to change their lifestyles, reduce physical activity, and become more isolated, leading them to spend more time in cyberspace (18). Due to the COVID-19 pandemic, adolescents have become more predisposed to problems caused by excessive internet use (19). Therefore, it is essential to protect adolescents from the harmful effects of the internet to improve their physical, mental, and social health and enable them to become valuable members of the community (20).

The aim of this study was to investigate the prevalence of internet addiction among students during the COVID-19 crisis and examine the relationship between internet addiction and psychological factors such as anxiety, stress, and depression. The ultimate goal was to use the results of the study to plan precise interventions to prevent internet addiction and address the psychological and social problems of students during the COVID-19 pandemic or any similar crisis.

Materials and Methods

The study population for this descriptive-analytical cross-sectional study consisted of 420 students from public high schools in Shahrekord in 2021. The sample size required for this study was calculated to be 384, but due to potential dropouts, a sample size of 420 was chosen (21).

The sample size was calculated using the following formula:

$$n = z^2 \cdot p(1-p) / d^2$$

Where:

- z is the 95% confidence coefficient (1.96).
- p is an estimate of the prevalence of internet addiction in students, which was considered to be 0.5 due to the unavailability of a larger sample size (21).
- d is the accuracy level, which was set at 0.05.

The samples were selected from two educational districts of Shahrekord. Four out of 16 schools (two boys' schools and two girls' schools) were selected from District 1, and 2 out of 8 high schools (one boys' school and one girls' school) were selected from District 2 using convenience random sampling. A total of 70 students were selected from each school, and they were enrolled in the study based on attendance lists using systematic random sampling. In total, 420 students completed the questionnaires. The students who provided informed consent and volunteered to complete the questionnaire were included in the study.

Data were collected using a two-part questionnaire, which included a demographic characteristics checklist and the Yang Internet Addiction Test (YIAT) consisting

of 20 items rated on a 5-point Likert scale (rarely, sometimes, usually, often, and always scored as 1, 2, 3, 4, and 5, respectively). A score of 20-40 indicated a normal user, 50-79 indicated mild internet addiction, and 80-100 indicated severe internet addiction (22).

The 21-item Depression, Anxiety, and Stress Scale (DASS-21) is a short version of the scale. It consists of 21 items divided into three subscales: depression, anxiety, and stress, each investigated using seven items. The original version was introduced by Lovibond and Lovibond in 1995 (23). The items are rated on a 4-point Likert scale (never, low, moderate, and high) with scores ranging from 0-3. As the questionnaire used in this study was the short version and the original version consists of 42 items, the final score of each subscale should be doubled. We used the score interpretation table after doubling the scores.

In a study conducted by Yang et al, the internal consistency of the questionnaire was estimated to be 0.92, and the test-retest reliability was also satisfactory. The Cronbach's alpha coefficient of the questionnaire administered in Sweden was higher than 0.90. The validity of the questionnaire has also been confirmed in a study conducted by Alavi et al in Iran, where the internal consistency (α) of the scale was determined to be 0.88 (24).

The psychometric properties of the DASS-21 have been investigated in several studies. In the study by Asghari Moghaddam et al, the internal consistency coefficients of the depression, anxiety, and stress scales were 0.93, 0.93, and 0.92, respectively, and their test-retest coefficients (with an interval of three weeks) were 0.84, 0.89, and 0.90, respectively (25). In a large sample ($n=1794$) by Henry and Crawford, Cronbach's alpha coefficients for the three sub-scales of depression, anxiety, and stress were reported to be 0.93, 0.82, and 0.90, respectively (26).

The public high schools in Shahrekord were visited, and 70 students were selected from each school using systematic random sampling before data collection. Prior to administering the questionnaires, the school staff and students were given an explanation of the research objectives and the importance of maintaining confidentiality. Then, selected students completed the questionnaires, while the researchers were present in the schools to answer any questions the students may have had about the items.

Data from the completed questionnaires were entered into SPSS version 20.0, and the Spearman correlation coefficient test was used to investigate the relationship between internet addiction in students and their parents' education levels and occupations. Pearson's correlation coefficient was used to investigate the relationship between internet addiction and anxiety, stress, and depression. Additionally, the results of the independent t test indicated that there is no significant relationship between internet addiction and gender.

Results

A total of 212 (50.6%) out of 420 students in this study

were female. The mean age of the students was 13.8±1 years. The use of internet for social networking, entertainment, and partially scientific purposes were the most common uses of the internet by both genders. The results indicated that high school diplomas and bachelor's degrees were the most frequent education levels among parents. Furthermore, 50.9% of fathers had official jobs, and 41% of mothers were housewives (Tables 1 and 2). The majority of the students used the internet for 3 to 5 hours daily (more than 110 hours per month).

The results of data analysis indicated that among female students, 163 (38.7%) were not addicted to the internet, 47 (11.2%) were predisposed to internet addiction, and 3 (0.7%) exhibited severe internet addiction. Among male students, 157 (37.3%) were not addicted to the internet, 47 (11.2%) were predisposed to internet addiction, and 4 (1%) had severe internet addiction (Table 3).

Pearson's correlation coefficient ($r=0.541$) also showed a significant relationship between internet addiction and stress ($P<0.001$). The results of the *t*-test revealed no significant difference in the mean scores of internet addiction between boys and girls ($t=1.12$) ($P=0.261$) (Table 4). The data also showed that internet addiction had a significant relationship with depression, stress, and anxiety in both male and female students. Pearson's correlation coefficient ($r=0.544$) indicated a significant relationship between internet addiction and depression ($P<0.001$) (Table 5).

Additionally, Pearson's correlation coefficient ($r=0.474$) showed a significant relationship between internet addiction and anxiety in both genders ($P<0.001$).

No significant difference was observed in students' internet addiction scores considering the fathers' education level ($P=0.947$) or mothers' education level ($P=0.221$). However, the internet addiction score was significantly associated with the father's job ($P=0.19$) and the mother's job ($P=0.467$). Therefore, there was no significant difference between students' internet addiction scores considering the parental employment and education levels ($t=1.12$) ($P=0.261$).

Discussion

The present study examined the prevalence of internet addiction among high school students in Shahrekord and its relationship with anxiety, depression, and stress during the COVID-19 pandemic. Our results indicated that 22.3% of students had moderate internet addiction and 1.7% of students exhibited severe internet addiction. These results are in agreement with those of the study

by Kato et al, who reported a prevalence of 1.8% for internet addiction among adolescents before and after the COVID-19 pandemic (27).

The COVID-19 pandemic has led to excessive internet use among students and adolescents due to isolation, social distancing, and the closure of schools (28). Lifestyle changes, distance from friends, isolation, and stress caused by the disease are the reasons for the increase in internet addiction during the pandemic. Therefore, students turned to the excessive use of the internet because their lessons were presented virtually, and adolescents spent a great deal of time on the internet communicating with their friends online to participate in online classes (29).

We found no significant relationship between gender and internet addiction in this study, which is consistent with the study conducted by Özgün Öztürk et al (30).

We also found no significant relationship between internet addiction and family income, father's education level, and job, which is inconsistent with the study by Chung et al. Adolescents whose fathers had high income and education levels exhibited a higher risk of internet addiction because most of their fathers' time was spent at work. In such families, the mandatory quarantine during the COVID-19 pandemic led to excessive internet use in children to escape loneliness (31).

In our study, internet addiction was not associated with mothers' education levels and jobs. This result was inconsistent with a study by Chung et al, in which the mother's high education level was not a protective factor for adolescents' internet addiction. It seems that employed women with academic degrees do not have

Table 2. Parents' jobs and education levels

		Fathers, n (%)	Mothers, n (%)
Parents' jobs	Freelance	101 (34)	60 (14.3)
	Unemployed	35 (8.3)	-
	Employee	130 (30.9)	89 (21.1)
	Educator	90 (21.6)	75 (17.8)
	Housewife	-	173 (41.1)
	Others	64 (15.2)	23 (5.7)
Education level	Under diploma	21 (5)	90 (21.3)
	Diploma	100 (23.8)	154 (36.8)
	Associate degree	27 (6.7)	45 (10.6)
	Bachelor's degree	198 (47)	90 (21.3)
	Master's degree	70 (16.6)	38 (9)
	Doctorate and higher	4 (1)	3 (0.7)
	Total	420 (100%)	420 (100%)

Table 1. Gender, age, and educational level of participants

Gender	n (%)	Age (y) (%)					Education level (%)		
		12	13	14	15	16	Seventh grade	Eighth grade	Ninth grade
Female, n (%)	213 (50.6)	8 (1.9)	13 (3)	50 (11.9)	111 (26.4)	26 (6.2)	69 (16.4)	51 (12.1)	75 (17.8)
Male, n (%)	207 (49.4)	9 (2.1)	12 (2.9)	50 (11.9)	114 (27.2)	27 (6.4)	70 (16.6)	66 (15.7)	89 (21.1)
Total	420 (100)	17 (4)	25 (5.9)	100 (23.8)	225 (53.7)	53 (12.6)	139 (33)	117 (28)	164 (39)

Table 3. Internet Addiction among Participants

		Girls, n (%)	Boys, n (%)	Total, n (%)
Level of internet addiction	No Internet addiction (20-40)	162(38.7)	157(37.3)	319 (76)
	Prone to Internet addiction (50-79)	47(11.1)	47(11.1)	94(22.3)
	Internet addiction (80-100)	3(0.7)	4(1)	7 (1.7)

Table 4. Comparison of internet addiction among students by gender

Groups	Number	Average	Standard deviation	t	Degree of freedom	Level of significance
Female students	212	39.42	14.9	1.12	419	0.261
Male students	208	41.14	16.4			

Table 5. Correlation between the score of internet addiction and scores of depression, anxiety, and stress in the students

	The score of internet addiction	
	P value	r
Depression	<0.001	0.544
Anxiety	<0.001	0.474
Stress	<0.001	0.541

enough time to communicate with their children due to working outside the home, taking care of children, and doing housework, resulting in children being more exposed to internet addiction (31).

The association between internet addiction and anxiety is consistent with the study by Ravens-Sieberer et al, who observed an increase in internet use during the COVID-19 pandemic, which was associated with mental problems, including anxiety (32). However, Campbell et al (33) reported no association.

Our results showed a significant relationship between internet addiction and stress, which is in agreement with the study by Ravens-Sieberer et al. They concluded that the COVID-19 epidemic increased the risk of mental problems and stress due to excessive use of the internet (32). This result is similar to that of Guessoum et al, who showed that the decrease in interactions with peers, the loneliness of adolescents, the COVID-19 pandemic, and stress due to the disease and home quarantine increased internet addiction in students (34).

Consistent with the study conducted by Wang et al in China, our results revealed a significant relationship between internet addiction and depression. Over 23% of our study participants had mild depression, and 8% of them had major depression during the COVID-19 pandemic (35).

Conclusion

Holding training sessions for school staff and students is necessary to prepare basic plans and schedule the use of the internet with regard to research results. This is especially important considering the relatively high prevalence of internet addiction among high school students in Shahrekord and its relationship with mental health issues such as anxiety, stress, and depression during the COVID-19 crisis. In addition, it is important to hold

training sessions for parents to improve their children's physical and mental health.

Given the physical and psychological side effects of excessive internet use among students, who are the active force of society, there is a need for comprehensive qualitative and intervention studies in this area. Based on the results of such studies, it is recommended that educational sessions should be held for both students and education officials on the proper and scheduled use of the internet, with parental supervision.

Acknowledgments

This article was derived from a research project approved by Shahrekord University of Medical Science (approval No. 5839). Hereby, the researchers gratefully thank the people who participated in this study.

Authors' Contribution

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Competing Interests

The authors declare that there is no conflict of interests.

Ethical Approval

This article was approved by the Ethics Committee of Shahrekord University of Medical Sciences (IR.SKUMS.REC.1400.224).

Funding

This study was supported by the Research and Technology Deputy of Shahrekord University of Medical Sciences (Grant No. 5839).

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