

# Prevalence, associated factors and adverse effects of internet addiction among medical students at Usmanu Danfodiyo University, Sokoto, Nigeria

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## ABSTRACT

**Background:** Internet addiction has become a serious social problem among youths, particularly undergraduate university students in developing countries, including Nigeria. **Aim:** This study aimed to determine the prevalence, associated factors and adverse effects of internet addiction among medical students at Usmanu Danfodiyo University, Sokoto, Nigeria. **Materials and Methods:** A cross-sectional study was conducted among 200 randomly selected medical students at Usmanu Danfodiyo University Sokoto, Nigeria. A structured self-administered questionnaire was used to obtain information on the research variables. Data were analyzed using IBM SPSS version 25 statistical computer software package. **Results:** Close to two-thirds, 119 (59.5%) of the 200 respondents had internet addiction, with 91 (45.4%) having mild addiction, and 28 (14.0%) having moderate addiction. Internet addiction was associated with the use of both mobile data/personal hotspots and College Wi-Fi for internet access and spending  $\geq 6$  hours on the internet per day. The adverse effects experienced by the respondents include excessive internet use with a waste of time and money (22.5%), loss of self-control (19.6%), neglect of social life (11.0%), and neglect of academic work (7.0%). **Conclusion:** This study showed a high prevalence of internet addiction among medical students at Usmanu Danfodiyo University, Sokoto, Nigeria. Internet addiction was majorly associated with internet use practices, and about a fifth or less of the respondents experienced some adverse effects. The university management should periodically organize sensitization programs on the hazards of excessive internet use for their students, and also screen them for internet addiction and its adverse effects to facilitate timely interventions.

**Keywords:** Internet addiction, prevalence, associated factors, adverse effects, medical students

## INTRODUCTION

The use of the internet and smartphones has grown significantly over the past few years and has now become essential to modern life with the majority of the over three billion individuals that use it every day worldwide being young people.<sup>1,2</sup> According to statistics, about 4.6 billion people worldwide used the internet as of January 2021.<sup>3</sup> Current estimates show that Nigeria has the highest number of internet users in Africa with more than 109 million internet users, followed by Egypt with 75.66 million users, and South Africa with 41.19 million users.<sup>4</sup>

The country also ranked 6<sup>th</sup> among the top 20 countries with the highest number of internet users across the world beating even developed countries like Japan and Russia to the 7<sup>th</sup> and 8<sup>th</sup> position respectively.<sup>5</sup> In Nigeria, the majority of users (82.0%) access the internet

through smartphones while only 16% do so via desktop PC because mobile connections are much cheaper and do not require the infrastructure that is needed for traditional desktop PCs with a fixed-line internet connection.<sup>4</sup>

The use of the internet responsibly has many advantages, including improved communication, research, socialization, and enjoyment.<sup>6</sup> The use of the internet is very common among medical trainees and health professionals because it supports the use of evidence-based medicine, learning and research, access to online medical resources, managing patients in remote locations, and academic and recreational purposes in the medical and healthcare areas.<sup>7-9</sup> However, there are drawbacks to using the internet, and excessive use has been linked to addiction and mental health problems.<sup>6</sup>

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Evidence from the literature showed that similar to the situation in the developed countries, internet addiction has now become a serious social problem among youths in developing countries with very high internet addiction prevalence rates being reported in studies conducted among medical and health sciences students in many of these countries including Nigeria (94.7%),<sup>10</sup> Ethiopia (79%),<sup>11</sup> and India (58.9%).<sup>12</sup>

Internet addiction is a complex issue that affects a variety of online behaviors, including social networking, online gaming, and online shopping.<sup>13</sup> Internet addiction is characterized by unrestrained and excessive internet use that interferes with daily life, and it is primarily linked to other mental illnesses like depression and attention deficit hyperactivity disorder.<sup>14,15</sup> It is believed that teenagers are the main risk group for developing an online addiction because their age groups are more susceptible to addictive behaviors due to changes in the brain that occur during adolescence, particularly in cognition, stress, and motivation.<sup>16,17</sup>

The literature demonstrates that a variety of factors are associated with internet addiction; these include urban residence, internet access at home, gender, spending more time online, using the internet for entertainment, pornography, online gaming, and substance use.<sup>18-21</sup> A study conducted among medical and allied health sciences students in northern Tanzania reported a significantly higher prevalence of internet addiction among those who spent  $\geq 5$  hours per day on the internet (40.2%) than those who spent  $< 5$  hours per day (19.6%).<sup>22</sup> It was also significantly higher among those who use the internet for social networking (44.5%) than those who use it for internet surfing (30.2%), and those who use it for academic purposes (23.8%).<sup>22</sup> A study among medical students in India reported a significantly higher prevalence of internet addiction among males (72.95%) than females (48.13%).<sup>12</sup> Similarly, a systematic review and meta-analysis on internet addiction and its associated factors among African high school and university students by Zewde et al.,<sup>23</sup> reported that male sex, urban residence, and using the internet for more than 4 hours a day were significantly associated with internet addiction among the study participants.

Adolescent internet addiction can have a variety of detrimental effects, such as cognitive issues, loneliness, and issues with one's family and relationships with

others.<sup>24-26</sup> Other adverse effects of internet addiction include low self-esteem, a lack of self-care, poor academic performance, poor self-performance in school, depression, anxiety stress, and obesity.<sup>27-30</sup> A study conducted among students of a medical university in Iran reported a significant adverse relationship between internet addiction and self-esteem scores, and also life-satisfaction scores.<sup>31</sup> A study by Okwaraji et al.,<sup>32</sup> in a sample of Nigerian university undergraduates, reported a high prevalence of internet addiction and depression.

Whereas, several studies have examined the burden of internet addiction among medical and allied health sciences students across the world including Nigeria, little is known about the burden of the phenomenon among medical students in Sokoto, Nigeria. This study was conducted to determine the prevalence, associated factors, and adverse effects of internet addiction among medical students at Usmanu Danfodiyo University, Sokoto, Nigeria.

## **MATERIALS AND METHODS**

### **Study Design, Population and Area**

A cross-sectional study was conducted among medical students at the College of Health Sciences of Usmanu Danfodiyo University, Sokoto, Nigeria, in May and June 2021. Medical students at all levels of training who gave consent to participate in the study were considered eligible and enrolled in the study.

### **Sample Size Estimation and Sampling Technique**

The sample size was estimated at 200 using the formula for calculating the sample size for proportion in cross-sectional studies,<sup>33</sup> a 14.1% prevalence of severe internet addiction among university students from a previous study,<sup>10</sup> a 5% margin of error, and an anticipated 95% response rate. The eligible participants were selected by systematic sampling technique after a proportionate allocation of the number of participants to be selected from each of the six classes/levels of training was done.

### **Data Collection**

A structured self-administered questionnaire was used to obtain information on the sociodemographic characteristics of the study participants, their internet use practices, and the prevalence and adverse effects of internet addiction among them. The questions on internet use practices were adapted from the instrument

used in previous studies,<sup>2,5,8</sup> while the questions on the prevalence and severity of internet addiction were adapted from Young's Internet Addiction Test.<sup>14</sup> The questionnaire was pretested on 20 students in the Faculty of Nursing and Allied Health Sciences of the Institution. The necessary adjustments were made based on the observations made during the pretesting.

### Data Analysis

Data were analyzed using IBM SPSS version 25 computer statistical software package. The Young's Internet Addiction Test is a 20-item questionnaire rated on a 5-point scale ranging from 0 to 5, with a minimum total score of 0, and a maximum total score of 100. Total scores of 0 to 30 were graded as normal internet usage, total scores of 31 to 49 were graded as a mild level of internet addiction, total scores of 50 to 79 indicate a moderate level of internet addiction, while total scores of 80 to 100 indicate a severe dependence on the internet.<sup>34</sup> Quantitative variables were summarized using mean and standard deviation, while qualitative variables were summarized using frequencies and percentages. Chi-square analysis was used to determine the factors that were associated with internet addiction. All levels of significance were set at  $p < 0.05$

### Ethical Consideration

Institutional ethical clearance was obtained from the Ethical Committee of Usmanu Danfodiyo University Teaching Hospital (UDUTH), Sokoto, Nigeria. Also, informed consent was obtained from the participants before commencing questionnaire administration.

## RESULTS

### Sociodemographic characteristics of respondents

All the 200 questionnaires administered were filled and used for analysis, giving a response rate of 100%. The ages of the respondents ranged from 16 to 36 years (mean =  $23.18 \pm 3.25$ ). Close to half, 93 (46.5%) of the 200 respondents were aged 16-22 years, followed by those in the 23-27 years category (44.5%). Most of the respondents were males (78.5%), single (97.5%), and practised Islam as a religion (83.5%). The majority of respondents belong to the Hausa ethnic group (51.5%) and were in the 100-300 levels of study (59.5%). The majority of respondents (56.5%) reside in the school's hostel, and most of them (70.5%) were from urban communities (Table 1).

**Table 1: Sociodemographic characteristics of respondents**

Variables	Frequency(%) n = 200
Age group (years)	
16-22	93 (46.5)
23-27	89 (44.5)
28-32	16 (8.0)
33-36	2 (1.0)
Mean $\pm$ SD	23.18 $\pm$ 3.25
Sex	
Male	157 (78.5)
Female	43 (21.5)
Marital status	
Single	195 (97.5)
Married	5 (2.5)
Religion	
Islam	167 (83.5)
Christianity	33 (16.5)
Tribe	
Hausa	103 (51.5)
Fulani	9 (4.5)
Yoruba	24 (12.0)
Ibo	11 (5.5)
Others	53 (26.5)
Level of study	
100	46 (23.0)
200	42 (21.0)
300	31 (15.5)
400	21 (10.5)
500	19 (9.5)
600	41 (20.5)
Place of residence	
School's hostel	113 (56.5)
Off-campus with parents	25 (12.5)
Off-campus with friends or colleagues	43 (21.5)
Off-campus alone	19 (9.5)
Home town	
Urban	141 (70.5)
Rural	59 (29.5)

### Respondents' internet use practices

The majority of respondents (74.0%) used their mobile phones/data to access the internet, first used the internet from ages 7-17 years (76.0%), and spent 1-5 hours on the internet per day (65.0%). Most of the respondents (95.0%) spent N100 to N5000 on the internet every month. The majority of them (71.0%) use the internet both at home/hostel and in the school, and also pay for the services both at home (74.0%) and school (59.5%). The majority of respondents (79.0%) used the internet for multiple purposes (Table 2).

### Prevalence of internet addiction among respondents

About two-thirds, 119 (59.5%) of the 200 respondents had internet addiction, with 91 (45.5%) having mild addiction, and 28 (14.0%) having moderate addiction (Figure 1).

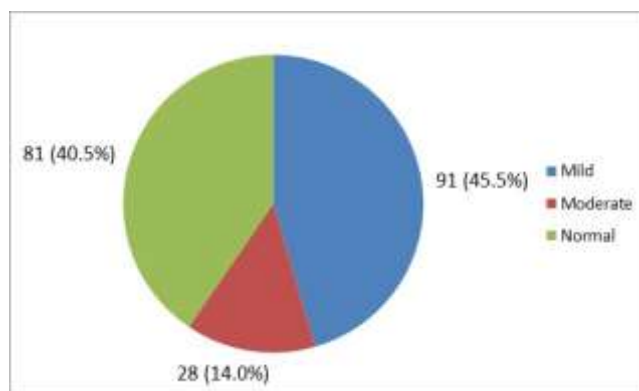
**Table 2: Respondents' internet use practices**

Variables	Frequency(%) n = 200
<b>Gadgets used for internet</b>	
Mobile phone	148 (74.0)
Computer (laptop or desktop)	1 (0.5)
Both	51 (25.5)
<b>Method of internet access</b>	
Mobile data / personal hotspot	148 (74.0)
College Wi-Fi	3 (1.5)
Both	49 (24.5)
<b>Age at first use of the internet (years)</b>	
7-17	152 (76.0)
18-27	48 (24.0)
<b>Amount spent on mobile data per month (Naira)</b>	
100-5,000	190 (95.0)
6,000-10,000	9 (4.5)
11,000-15,000	1 (0.5)
<b>Time spent on the internet per day (hours)</b>	
1-5	130 (65.0)
6-10	51 (25.5)
11-16	19 (9.5)
<b>Regular places of internet use</b>	
Hostel/home	53 (26.5)
School	5 (2.5)
Both	142 (71.0)
<b>Type of internet access at hostel/home</b>	
None	16 (8.0)
Free	6 (3.0)
Paid	148 (74.0)
Both free and paid	30 (15.0)
<b>Type of internet access at school</b>	
None	23 (11.5)
Free	14 (7.0)
Paid	119 (59.5)
Both free and paid	44 (22.0)
<b>The primary purpose of internet use</b>	
Education	20 (10.0)
Social networking	18 (9.0)
Internet surfing	4 (2.0)
Mixed	158 (79.0)

**Factors associated with internet addiction among respondents**

There was no association between internet addiction and any of the respondents' sociodemographic variables. On the other hand, the internet use practices that were associated with internet addiction were the use of both mobile data / personal hotspots and College Wi-Fi for internet access, and spending  $\geq 6$  hours on the internet per day (Table 3). Internet addiction was significantly ( $p < 0.05$ ) more prevalent among those who use both mobile data / personal hotspots and College Wi-Fi (69.4%) as compared to those who use only mobile data/personal hotspots (57.4%) or College Wi-Fi (0%).

It was also significantly more prevalent among those who spent 11-16 hours on the internet per day (89.5%), and those who spent 6-10 hours (78.4%) as compared to those who spent 1-5 hours (47.7%)



**Figure 1: Prevalence of internet addiction among respondents**

**Adverse effects of internet addiction among respondents**

The most common adverse effects of internet use among the respondents were excessive use with a waste of time and money (22.5%), loss of self-control (19.6%), and neglect of social life (11.0%). A few of them (7.0%) also admitted to neglecting their academic work (Table 4).

**DISCUSSION**

This study assessed the prevalence, associated factors and adverse effects of internet addiction among medical students at Usmanu Danfodiyo University, Sokoto, Nigeria. The prevalence of internet addiction was high (59.5%) among the respondents in this study with close to half of them (45.5%) having mild addiction, while the remaining 14.0% had moderate addiction. The high prevalence of internet addiction among the respondents in this study agrees with the high use of the internet among them with the majority of them using their mobile phones to access the internet (74.0%), spending 1-5 hours on the internet every day (65.0%), using it majorly for educational purposes (45.0%), and accessing the internet both at home/hostel and in the school (71.0%).

**Table 3: Factors associated with internet addiction among respondents**

Variables	Internet use status		Test of significance
	Normal Frequency (%)	Internet addiction Frequency (%)	
Gadgets used for internet			
Mobile phone	61 (41.2)	87 (58.8)	$\chi^2 = 0.747$ , p = 0.688
Computer (laptop or desktop)	0 (0)	1 (100)	
Both	20 (39.2)	31 (60.8)	
Method of internet access			
Mobile data / personal hotspot	63 (42.6)	85 (57.4)	$\chi^2 = 6.658$ , p = 0.036*
College Wi-Fi	3 (100)	0 (0)	
Both	15 (30.6)	43 (69.4)	
Age at first use of the internet (years)			
7-17	62 (40.8)	90 (59.2)	$\chi^2 = 0.220$ , p = 0.882
18-27	19 (39.6)	29 (60.4)	
Amount spent on mobile data per month (Naira)			
100-5,000	80 (42.1)	110 (57.9)	$\chi^2 = 4.110$ , p = 0.128
6,000-10,000	1 (11.1)	8 (88.9)	
11,000-15,000	0 (0)	1 (100)	
Time spent on the internet per day (hours)			
1-5	68 (52.3)	62 (47.7)	$\chi^2 = 22.190$ , p = 0.001*
6-10	11 (21.6)	40 (78.4)	
11-16	2 (10.5)	17 (89.5)	
Regular places of internet use			
Hostel / home	27 (50.9)	26 (49.1)	$\chi^2 = 3.865$ , p = 0.145
School	1 (20.0)	4 (80.0)	
Both	53 (37.3)	89 (62.7)	
Type of internet access at hostel/home			
None	8 (50.0)	8 (50.0)	$\chi^2 = 2.772$ , p = 0.428
Free	1 (16.7)	5 (83.3)	
Paid	62 (41.9)	86 (58.1)	
Both free and paid	10 (33.3)	20 (66.7)	
Type of internet access at school			
None	10 (43.5)	13 (56.5)	$\chi^2 = 0.304$ , p = 0.959
Free	5 (35.7)	9 (64.3)	
Paid	49 (41.2)	70 (58.8)	
Both free and paid	17 (38.6)	27 (61.4)	
The primary purpose of internet use			
Education	9 (45.0)	11 (55.0)	$\chi^2 = 7.678$ , p = 0.053
Social networking	2 (11.1)	16 (88.9)	
Internet surfing	1 (25.0)	3 (75.0)	
Mixed	69 (43.7)	89 (56.3)	

\*Statistically significant (p &lt; 0.05)

However, the high internet use among the respondents in this study is not surprising because the use of the internet is known to be popular among medical trainees as it offers them easy access to online medical resources.<sup>7,8</sup>

Similar to the findings in this study, high internet addiction prevalence rates were reported in studies conducted among adolescents and undergraduate

medical students across Nigeria including Enugu (59.2%),<sup>32</sup> Jos (46.0%),<sup>35</sup> and Ibadan (44.9%).<sup>36</sup> Also, high internet addiction prevalence rates were reported in studies conducted among undergraduate medical students in other places including Ethiopia (79.0%),<sup>11</sup> and India (58.9%).<sup>12</sup>

**Table 4: Adverse effects of internet addiction among respondents**

Variables	Frequency(%), n = 200
Excessive use (waste of time and resources)	
Yes	45 (22.5)
No	155 (77.5)
Neglect academic work	
Yes	14 (7.0)
No	186 (93.0)
Lack of control	
Yes	36 (19.6)
No	148 (80.4)
Neglect social life	
Yes	22 (11.0)
No	178 (89.0)

In this study, internet addiction was associated with some of the respondents' internet use practices including the use of both mobile data / personal hotspots and College Wi-Fi for internet access and spending  $\geq 6$  hours on the internet every day. This finding is in agreement with the finding in a study conducted among undergraduate students of a public university in Ile-Ife, Nigeria, in which there was an association between internet addiction and the respondents' internet use practices, particularly, using mobile phones for surfing, and living in the school hostel (which probably offers a higher likelihood of access to free internet services by students, either from the institutional internet services or from their colleagues).<sup>10</sup>

A study conducted among medical and allied health sciences students in northern Tanzania also established an association between internet addiction and the respondents' internet use practices including spending  $\geq 5$  hours on the internet per day, using the internet for social networking, and using the internet at both hostel/home and college.<sup>22</sup> In a study among undergraduate medicine and health sciences students at Ambo University, Ethiopia, the internet use practices that were associated with internet addiction include having one's computer, having internet access at home, having an email account, and using the internet for news.<sup>11</sup>

Contrary to the findings in other studies, there was no association between internet addiction and any socio-demographic variable among the respondents in this study. A study among undergraduate university students by Omoyemiju and Popoola<sup>10</sup> reported a

significantly ( $p < 0.05$ ) higher prevalence of internet addiction among males (57.4%) than females (42.6%). A study among medical students by Chaudhari et al., (2015) also reported a significantly higher prevalence of internet addiction among males (72.95%) than females (48.13%). Similarly, studies that examined gender differences in internet addiction among university students in the Slovak Republic,<sup>37</sup> and among Korean adolescents<sup>38</sup> reported higher rates of internet addiction in males. The absence of gender disparity in the prevalence of internet addiction among the respondents in this study could be due to the generally high use of the internet by the students, and the fact they use it majorly for educational purposes.

The adverse effects of internet addiction experienced by the respondents in this study include excessive internet use with a waste of time and money (22.5%), loss of self-control (19.6%), neglect of social life (11.0%), and neglect of academic work (7.0%). These findings provide additional information on the consequences of internet addiction as documented in previous studies. A study among medical students by Salarvand et al.,<sup>31</sup> reported a significant adverse relation between internet addiction score and self-esteem score, and life satisfaction score. A study among university students by Chen and Peng<sup>39</sup> reported better interpersonal relationships, academic grades and learning satisfaction among non-heavy internet users than among heavy users. Also, heavy internet users were more likely than non-heavy users to be depressed, physically ill, lonely and introverted. A study among Egyptian adolescents reported that those with problematic use of the internet were more prone to psychiatric disorders (social phobia, specific phobia, oppositional defiant disorders, generalized anxiety disorders, and attention deficit hyperactive disorder).<sup>40</sup> A study among urban adolescents of Kamrup District, Assam, India, reported a significant association between internet addiction and stress (OR = 12), depression (OR = 14), and anxiety (OR = 3.3).<sup>37</sup> The findings of this study and the latter studies bring to the fore the high burden of internet addiction among undergraduate university students, and the need for the university management to periodically sensitize their students on the hazards of excessive internet use, and also screen them for internet addiction and its adverse effects to facilitate timely interventions.

## CONCLUSION

This study showed a high prevalence of internet addiction among medical students at Usmanu Danfodiyo University, Sokoto, Nigeria. Internet addiction was majorly associated with internet use practices, and about a fifth or less of the respondents experienced some adverse effects. The university management should periodically organize sensitization programs on the hazards of excessive internet use for their students, and also screen them for internet addiction and its adverse effects to facilitate timely interventions.

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## Conflict of interest

None declared.

## REFERENCES

- World Health Organization. Public health implications of excessive use of the internet, computers, smartphones and similar electronic devices: meeting report, Main Meeting Hall, Foundation for Promotion of Cancer Research, National Cancer Research Centre, Tokyo, Japan, 27-29 August 2014. World Health Organization. Available at: <https://apps.who.int/iris/handle/10665/184264> [Last accessed on 2022, May 25].
- Bremer J. The internet and children: advantages and disadvantages. *Child Adolesc Psychiatric Clin N Am* 2005; 14(3): 405-28.
- Kemp S. Digital 2021, Global Overview Report. Available at: <https://datareportal.com/reports/digital-2021-global-overview-report> [Last accessed on 2022, May 25].
- Statista.com. Number of internet users in African countries. Available at: <https://www.statista.com/statistics/505883/number-of-internet-users-in-african-countries/> [Last accessed on 2022, May 11].
- Internet World Stat. Top 20 countries with the highest number of internet users. Available at: <https://www.internetworldstats.com/top20.htm> [Last accessed on 2022, May 25].
- Chao CM, Kao KY, Yu TK. Reactions to problematic internet use among adolescents: inappropriate physical and mental health perspectives. *Front. Psychol* 2020; 11, Article 1782.
- Gedam SR, Ghosh S, Modi L, Goyal A, Mansharamani H. Study of internet addiction: prevalence, pattern, and psychopathology among health professional undergraduates. *Indian J Soc Psychiat*. 2017;33(4): 305-311.
- Salehi M, Khalili MN, Hojjat SK, Salehi M, Danesh A. Prevalence of internet addiction and associated factors among medical students from Mashhad, Iran in 2013. *Iran Red Crescent Med J* 2014; 16: e17256.
- Buneviciene I, Bunevicius A. Prevalence of internet addiction in healthcare professionals: systematic review and meta-analysis. *Int J Soc Psychiatry* 2021; 67(5); 483-491.
- Omoyemiju MA, Popoola BI. Prevalence of internet addiction among students of Obafemi Awolowo University, Ile-Ife, Nigeria. *British J Guidance and Counselling* 2020; 1729339.
- Umeta GT, Regasa SD, Taye GM, Ayeno HD, Tefera GM. Prevalence of internet addiction and its correlates among regular undergraduate medical and health science students at Ambo University: a cross-sectional study. *Substance Abuse Res Treatment* 2022; 16: 1-10.
- Chaudri B, Menon P, Saldanha D, Tewari A, Battacharya L. Internet addiction and its determinants among medical students. *Ind Psychiatry J* 2015; 24: 158-62.
- Nissen JB. Treating and preventing adolescent mental health disorders: what we know and what we don't know. *Acta Psychiatr Scand* 2006; 113: 518-518.
- Young KS. Internet addiction: The emergence of a new clinical disorder. *CyberPsych Behav* 1998; 1(3), 237-244.
- Kratzer S, Hegerl U. Is internet addiction a disorder of its own? – a study on subjects with excessive internet use. *Psychiatr Prax* 2008; 35(2): 80-3.
- Casey BJ, Tottenham N, Liston C, Durston S. Imaging the developing brain: what have we learned about cognitive development? *Trends Cogn Sci* 2005; 9(3): 104-110.
- Hammond CJ, Mayes LC, Potenza MN. Neurobiology of adolescent substance use and addictive behaviors: prevention and treatment implications. *Adolesc Med State Art Rev* 2014; 25(1): 15-32.
- Effat SM, Azab HM, Aly HY, Mahmoud OAA. The relationship between anxiety, depression and problematic internet use among a sample of

- university students in Egypt. *Sohag Med J* 2019; 23(1): 154-165.
19. Akpunne BC, Akinnawo EO, Alakija OA, Kumuyi DO. Psychometric properties of young's internet addiction test in Nigeria. *Int J High Risk Behav Addict* 2020; 9(4): e91968.
  20. Kapus K, Nyulas R, Nemeskeri Z, Zadori I, Muity G, Kiss J et al. Prevalence and risk factors of internet addiction among Hungarian high school students. *Int J Environ Res Public Health* 2021; 18(3): 6989.
  21. Seo M, Kang HS, Yom YH. Internet addiction and interpersonal problems in Korean Adolescents. *Comput Inform Nurs* 2009; 27(4): 226-33.
  22. Mboya IB, Leyaro BJ, Kongo A, Mkombe C, Kyando E, George J. Internet addiction and associated factors among medical and allied health sciences students in northern Tanzania: a cross-sectional study. *BMC Psychology* 2022; 8: 73.
  23. Zewde EA, Tolossa T, Tiruneh SA, Azanaw MM, Yitbarek GY, Admasu FT et al. Internet addiction and its associated factors among African high school and university students: systematic review and meta-analysis. *Frontiers in Psychology* 2022; 13: 847274.
  24. Park MH, Park EJ, Choi J, Chai S, Lee JH, Lee C et al. Preliminary study of internet addiction and cognitive function in adolescents based on IQ tests. *Psychiatr Res* 2011; 19(2-3): 275-281.
  25. Hasmujaj E. Internet addiction and loneliness among students of University of Shkodra. *European Sci J* 2016; 12(29): 397.
  26. Hou J, Jiang Y, Chen S, Hou Y, Wu J, Fan N, Fang X. Cognitive mechanism of intimate interpersonal relationships and loneliness in internet addicts: An ERP study. *Addict Behav Rep.* 2019; 10: 100209.
  27. Yedemie YY. Internet use patterns, internet addiction and its association with psychological self-esteem among Bahir Dar University Students, Ethiopia. *Qual Prim Care* 2021; 29(3): 27-35.
  28. Javaeed A, Jeelani R, Gulab S, Ghauri SK. Relationship between internet addiction and academic performance of undergraduate medical students of Azad Kashmir. *Pak J Med Sci* 2020; 36(2): 229-233.
  29. Akin A, İskender M. Internet addiction and depression, anxiety and stress. *Int Online J Educ Sciences* 2011; 3(1): 138-148.
  30. Bozkurt H, Özer S, Şahin S, Sönmezgöz E. Internet use patterns and internet addiction in children and adolescents with obesity. *Pediatr Obes.* 2018; 13(5): 301-306.
  31. Salarvand S, Bagheri Z, Keshvari M, Dalvand P, Ghanei GR, Keshvari M. The prevalence of internet addiction and its relations to the self-esteem and life satisfaction in students of a medical university. *Acta Med Iran* 2018; 56(6): 392-397.
  32. Okwaraji FE, Aguwa EN, Onyebueke GC, Shiweobi-Eze C. Assessment of internet addiction and depression in a sample of Nigerian university undergraduates. *Int Neuropsychiatric Dis J* 2015; 4: 114-122.
  33. Ibrahim T. *Research Methodology and Dissertation Writing for Health and Allied Health Professionals.* Abuja: Cress Global Link Limited; 2009.
  34. Young K. Internet addiction: a new clinical phenomenon and its consequences. *American Behav Sci* 2004; 48: 402-415.
  35. Ihekaike MM, Shehu MY, Makama M. Prevalence and associated factors of internet addiction among clinical medical students of a Nigerian private university. *Int Neuropsychiatric Dis J* 2021; 16(3): 41-51.
  36. Afolabi AA, Ilesanmi OS, Adebayo AM. Prevalence and pattern of internet addiction among adolescents in Ibadan, Nigeria. *Cureus* 2022; 14(2): e22293.
  37. Rigelsky M, Megyesiova S, Ivankova V, Al Khouri I, Sejvl J. Gender differences in internet addiction among university students in the Slovak Republic. *Adiktologie* 2021; 21(1): 35-42.
  38. Ha YM, Hwang WJ. Gender differences in internet addiction associated with psychological health indicators among adolescents using a national web-based survey. *Int J Mental Health Addiction* 2014; 12(5): 660-669.
  39. Chen YF, Peng SS. University students' internet use and its relationship with academic performance, interpersonal relationships, psychosocial adjustments and self-evaluation. *Cyberpsychol Behav* 2008; 11(4): 467-9.
  40. Redal M, Rabie M, Mohsen N, Hassan A. Problematic internet use and psychiatric morbidity in a sample of Egyptian adolescents. *Psychology* 2012; 3(8): 626-631.

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