Foundation University Journal of Psychology
Vol 7, No.1 (January, 2023)

FUJP Open Access Journal

Research Article DOI 10.33897/fujp.v7i1.577

Screen Time and Attention Deficit Hyperactive Symptoms Among Young Adults in Bangladesh: An Online Cross-Sectional Study During The COVID-19 Pandemic

Abeer Hasan Olive[1], Sumon Ghosh[2], Asmia Iqbal[1], Ahmed Mostafiz Rufsun Zani[1], Delower Hossain[3], Rubayet Ferdous[4], Sukanta Chowdhury[2]

1. East West University, Dhaka, Bangladesh
2. International Centre for Diarrheal Disease Research, Dhaka, Bangladesh
3. Department of Medicine and Public Health, Sher-e-Bangla Agricultural University, Dhaka, Bangladesh
4. North South University, Dhaka, Bangladesh

For Correspondence: Dr. Sukanta Chowdhury. Email: sukanta@icddrb.org

Abstract

Objective. Mobile or computer device screening time contributes to developing attention deficit hyperactivity disorder (ADHD). This study assessed the role of screening time in developing ADHD symptoms in adults according to the World Health Organization (WHO) Adult ADHD Self-Report Scale (ASRS).

Method. This research is an internet-based self-reported study on young adult people aged over 18 years amid Covid-19 to collect information on ADHD symptoms and mobile/computer device screening time using a web-based structured questionnaire.

Results. Among the 310 respondents, 124 (40%) had ADHD symptoms. Males with ADHD symptoms (45%) were more than females (35%). Histories of using digital devices with screening time of more than 4 hours a day were seven times more likely to develop ADHD symptoms compared to the respondents who had a history of using digital devices with screening time less than 3 hours (*aOR* 7.5, 95% *CI*: 3.62-24.92).

Conclusion. The occurrence of ADHD symptoms was not uncommon in young adults amid the COVID-19 pandemic. More awareness regarding the negative impact of longer screening time in progressing ADHD among young adults needs to be improved to reduce the risk of developing ADHD.

Keywords. *ADHD, screening time, young adult, prevalence, Bangladesh.*

Introduction

ADHD is a neurodevelopmental disorder that shows a combination of persistent mental problems, including trouble in sustaining attention, hyperactivity, and impulsivity (Dos Santos Assef et al., 2007). Although attention deficit hyperactivity disorder (ADHD) causes significant problems in children and adolescents, it can cause behavioral and social interaction problems in adults (Perrin et al., 2001). The overall prevalence of ADHD was 5% globally (Lissak, 2018; Yen et al., 2009).

The COVID-19 pandemic poses a potential threat to public health worldwide. As of January 31, 2022, 376,186,897 cases were reported, with 5,684,323 deaths globally. Individual countries took several measures, including vaccination, lockdown, temporary and long-term closure of public areas, closure of educational institutions, quarantine, physical distancing, and isolation to control the spread (WHO, 2022). Globally, many people, including jobholders, students, and workers, were forced to stay at home for a short to a long period (Sultana et al., 2021). The prevalence of ADHD is increased significantly during the COVID-19 pandemic (Mackolil & Mackolil, 2020; Smith, 2017). Covid-19 has negative impact on mental health (Schäfer et al., 2020). Many studies reported increased anxiety, depressive disorders, distress, poor sleep quality, and suicide during COVID-19 (Panchal et al., 2020; Rajkumar, 2020; Vindegaard & Benros, 2020). During the COVID-19 pandemic, people's daily activities are changed (Vargo et al., 2021). People of all age groups were inclined to use internet-based digital technologies, including computers, smartphones, and video-based communication platforms. People spent more time on computer/mobile devices screens particularly on online social media platforms, to maintain social connectedness during the pandemic. Globally, the majority of the students were encouraged to stay at home and forced to study remotely using video-based online applications (Sun et al., 2020).

Digital media and the internet use are most popular amongst the young generation (Diomidous et al., 2016). With the emergence of the internet and digital gadgets, people become addicted to the screen which can pose to their mental health (Al Tawil et al., 2020). As of January 2021, more than 5 billion people used a mobile phone, and 4.66 billion people had internet access to their devices (Kemp, 2021). The current pandemic exaggerates the use of digital technologies that negatively influenced the behavioral and cognitive development (Small et al., 2020).

In Bangladesh, many people suffered from mental disorders during the pandemic (Ripon et al., 2020; Sifat, 2020). To contain COVID -19 outbreak, the Government of Bangladesh took several measures from the beginning of the outbreak. The countrywide strict lockdown was implemented several times that restricted public movement outside the home. All the schools, colleges, universities, and other educational institutions were completely shut down. Students from all the educational institutes went to the online platform (Shahriar et al., 2021). Institutions were partially reopened (Humayun et al., 2021). From 20 January 2022, all the educational institutes were closed again due to the emergence of a new SARS-CoV-2 (Omicron) variant. All age groups were inclined to internet-based communication amid the Covid-19 pandemic (Araf et al., 2022). COVID-19 pandemic-related behavior changes can affect the development of ADHD symptoms in young adults due to excessive use of digital devices. In Bangladesh, ADHD status among young adults has not been well explored. We aimed to conduct an online-based cross-sectional survey to estimate ADHD occurrence and to assess the role of screening time in developing ADHD symptoms in young adults.

Method

An internet-based self-reported cross-sectional study was conducted to collect information about demographics, digital media, internet use, and screening time using Google Forms. Data collection took place between November and December 2020 in English language. A group of researchers prepared a semi-structured questionnaire and shared it unanimously with the people through social media (Facebook) and email. Those interested in participating in this study were invited to respond. Male and female participants aged over 18 years and having internet connection in their digital devices were included.

The questionnaire included open and close-ended questions to collect demographics (age, gender, and occupation), internet usage, types of digital devices (desktop, smart phone and laptop) screening time (strata: 2-3 hours, 4-6 hours and more than 6 hours), and symptoms of ADHD. According to the World Health Organization (WHO) Adult ADHD Self-Report Scale (ASRS), six specific questions (annex 1) were included in the questionnaire (Kessler et al., 2005).

The score for an individual participant in this survey using the WHO Composite International Diagnostic Interview (CIDI) were calculated (Kessler et al., 2005). It is considered that a person scoring 4 or more is clinically positive for ADHD symptoms according to the ASRS guideline.

A descriptive analysis performed to estimate the proportion, mean, median, standard deviation, 95% confidence interval, and p-value for categorical data. Univariate and multivariate analyses conducted to identify the association between ADHD score and screening time.

Odds ratios (aORs) and adjusted odds ratios were calculated to measure the association. STATA 13 version for data analysis was used.

The research protocol was reviewed and approved by the Research Review Committee (RRC) of the Department of Pharmacy, East West University, Bangladesh. This study complied with the most recent revision of the Helsinki Declaration and followed the Checklist for Reporting Results of Internet E-Surveys (CHERRIES) guidelines. Informed consent was obtained at the beginning of the online survey.

Results

Table 1

Demographic Characteristics of Study Participants (N = 310*).*

Characteristics	Number of participants (%)
Sex	
Female	156 (50)
Male	154 (50)
Age	
18-25 years	200 (65)
26-33 years	110 (35)
Occupation	
Student	256 (83)
Job	52 (17)
Housewife	1 (1)
Business	1 (1)

A total of 310 respondents took part in this online survey. The majority of the respondents were students (83%), followed by job holders (Table 1). Among the respondents, males and females were equal in numbers, and the majority of them were below 26 years of age.

Table 2

Proportion of ADHD symptoms among respondents (N=310*).*

Characteristics	Number of participants scored 4 or more for ADHD symptoms (%)		*p*
	Yes	No	
Sex			
Female	55 (35)	101 (65)	0.08
Male	69 (45)	85 (55)	
Age			
18-25 years	90 (45)	110 (55)	0.01
26-33 years	34 (31)	76 (69)	
Occupation			
Student	109 (43)	147 (57)	
Job	15 (29)	37 (71)	0.19
Housewife	-	1 (1)	
Business	-	1 (1)	

Of the 310 respondents, 124 (40%) scored four or more for ADHD according to the World Health Organization (WHO) Adult ADHD Self-Report Scale (ASRS). Male respondents with ADHD symptoms were more than females. Respondents between 26-33 years with ADHD symptoms were more than 18-25 years of age. ADHD symptoms were more frequently reported among students than in other groups (Table 2).

Table 3

History of Using Internet, Digital Devices, and Screening Time (N = 310).

Activities	Number of participants (%)
Using digital devices	
Yes	310 (100)
No	-
Types of digital devices	
Smart phone	214 (69)
Laptop	47 (15)
Desktop computer	49 (16)
Daily screening time with digital devices	
Less than 2 hours	1 (1)
2-3 hours	73 (24)
4-6 hours	96 (31)
More than 6 hours	140 (45)
Using internet	
Yes	310 (100)
No	-
Daily screening time with internet	
2-3 hours	74 (24)
4-6 hours	100 (32)
More than 6 hours	136 (44)
Knowledge about ADHD	
Heard about ADHD	141 (45)
Did not hear about ADHD	169 (55)
Ability to diagnose ADHD using ASRS scale	
Aware	255 (82)
No aware	55 (18)

All respondents had a history of using digital devices. The majority of the respondents used smartphones (69%), followed by laptops and desktop computers. Around half of the respondents spent their time with digital devices more than six hours. All respondents had access to the internet, and the screening time for 44% of participants was more than six hours a day. According to their self-reported response, 55% of respondents had no prior knowledge about ADHD disease. More than 80% of the respondents reported that they could diagnose ADHD themselves using ASRS (Table 3).

Table 4

Relationship between Screening Time and ADHD Symptoms in Adult (N=310).

Factors	Number of participants with ADHD (%)	OR	*95% CI*		aOR	*95% CI*	
			LL	*UL*		*LL*	*UL*
Sex							
Female	55 (18%)	Ref.			Ref.		
Male	69 (22%)	1.49	0.94-2.35		1.09	0.66-1.79	
Age							
26-33 years	34 (11%)	Ref			Ref.		
18-25 years	90 (29%)	1.82	1.11-2.98		1.11	0.62-1.99	
Occupation							
Job	15 (5%)	Ref.			Ref.		
Student	109 (35%)	1.82	0.95-3.5		1.31	0.57-2.97	
Housewife	-	-	-				
Business	-	-	-				
Types of digital devices							
Desktop computer	13 (4%)	Ref.			Ref.		
Smart phone	90 (29%)	2	1-4		1.21	0.55-2.66	
Laptop	21 (7%)	2.2	0.95-5.26		1.26	0.49-2.23	
Daily screening time with digital devices							
Less than 2 hours	-						
2-3 hours	7 (2%)	Ref.			Ref.		
4-6 hours	49 (16%)	9.82	4.09-23.6		7.5	3.62-24.92	
More than 6 hours	68 (22%)	8.9	3.81-20.76		7.11	2.75-18.39	
Daily screening time with internet							
2-3 hours	62 (20%)	Ref.			Ref.		
4-6 hours	49 (16%)	4.51	2.2-9.22		2.21	0.96-5.02	
More than 6 hours	13 (4%)	3.93	1.98-7.82		1.68	0.74-3.79	

Note. OR: Odds Ratio, aOR: Adjusted Odds ratio

In univariate analysis, male respondents, aged between 18 to 24 years, students, who had a history of using mobile/computer device more than six hours, screening time of more than six hours a day were more likely to develop ADHD symptoms compared to respondents who had not these characteristics. In the final multivariate logistic regression analysis, respondents having a history of using mobile/computer device with screening time more than four hours a day were seven times more likely to develop ADHD compared to the respondents who had a history of using mobile/computer device with screening time less than 3 hours (aOR 7.5, 95% CI: 3.62-24.92) (Table 4).

Discussion

This online-based study explored the association between ADHD symptoms and the usage of digital media and the internet with screening time among adults during the COVID-19 pandemic. We found that around 40% of the adult respondents had ADHD symptoms, which is higher than other countries' reports. The prevalence of ADHD was lower in low-income countries (1.9%) compared with high-income countries (4.2%). ADHD prevalence was reported in France (5.6%), Australia (1.1%), and Riyadh (11%) (Alrahili et al., 2019; Ebejer et al., 2012).

Though ADHD is solely considered a childhood disorder (Spencer et al., 1998), our study findings suggest that adult people with ADHD symptoms were not uncommon. The majority of ADHD was identified in aged 18-24 years (3.6%) and 25-34 years (3.6%) which is in agreement with our study findings (Fayyad et al., 2007). However, another study identified that adult ADHD had a significant negative association with age which suggests ADHD is a persistent problem in childhood (Simon et al., 2009). During the COVID-19 pandemic, people of all age groups were forced to restrict their movement and activities which may be attributed to spending more screening time in virtual media (Aguilar-Farias et al., 2021). Nevertheless, other social and cultural factors, including employment and financial difficulties, interpersonal problems, and emotional and educational outcomes, could play an essential role in developing ADHD in adults (Ginsberg et al., 2014; Volkow & Swanson, 2013).

The proportion of ADHD symptoms found in this study was higher in males than female. Similar findings have also been documented in a study in Bangladesh, where the prevalence of ADHD is higher in young adult males (75%) (Hasan et al., 2016). Other countries also reported a comparatively higher prevalence in males (4.1%) than in females (2.7%) regarding young adults. However, the difference was not significant (Fayyad et al., 2007). Another study in Canada where more men (n = 287, 58.8%) are diagnosed with ADHD than women (n = 201, 41.2%) (Hesson & Fowler, 2018). Bangladeshi men who have access to digital media are more likely to experience ADHD symptoms than Bangladeshi women, who may not have access to digital media or may be restricted in their screen time due to household duties.

This study identified that students (83%) were more likely to develop ADHD symptoms than other professional groups.

However, a multi-country study reported that ADHD prevalence was higher in the employed group (3.5%) than in the student (2.2%). In Turkey, the ADHD prevalence was 6.1% among university students (Kavakci et al., 2012). The higher prevalence in students could be due he easy access to the internet, addiction to video games, and social media, and prolonged internet-based education platforms during the COVID-19 lockdown in Bangladesh. So, the run time of the digital screen increased in the case of students. Excessive digital device use and lack of physical activity make this age group more vulnerable to ADHD.

Prolonged screening time because of internet use can play a vital role in developing ADHD symptoms. One possible reason is that the blue light of smartphones or other digital media imbalances the melatonin, which impacts emotional behavior, the sleep cycle which directly impacts reduced attention and hyperactivity (Lissak, 2018). The faster social media and tremendous data info in front of the eyes triggered the overstimulation and bombardment of their neurotransmitters and hormones (Lissak, 2018). Moreover, digital media can be attributed to repetitive attentional shifts and multitasking, impairing executive functioning and leading to ADHD symptoms (Lissak, 2018). Our study found that one-half of the respondents used digital devices and the internet for more than 6 hours a day, and most of them had smartphones. A previous study in Bangladesh found that 35.2% of respondents liked to stay on the internet for more than 3 hours a day, and 66.5% used the internet on their mobile phones (Hassan et al., 2020). In Bangladesh, the overall number of internet subscribers reached 113.73 Million at the end of December 2021 which is around 65% of the overall population; among them, 123. 82 million were mobile internet subscribers (BTRC, 2021).

This study found that male students aged between 18 to 24 years and who have a history of using smartphones with the internet for more than six hours were more likely to develop ADHD than respondents who did not have these characteristics. However, a study in Taiwan showed the opposite results where the odds ratio of ADHD for internet addiction was significantly higher in females (OR = 1.39, 95% CI =1.28–1.52) than in males (OR = 1.23, 95% CI =1.13–1.34) (Yen et al., 2009). A study in USA showed that odds of ADHD diagnosis were lower among all older age groups compared with patients aged 18 to 24 years (patients aged 55-64 years: OR, 0.375; 95% CI, 0.36-0.38; P < .001; patients aged >65 years: OR, 0.09; 95% CI, 0.08-0.10; P < .001) (Chung et al., 2019).

A study found that college students screening positive for adult ADHD had a higher odds ratio (OR = 2.84, 95% CI =2.09–3.88) of having internet addiction (Yen et al., 2009). One systemic review study suggests that patients with internet addiction were 2.51 times more likely to have ADHD than the non-internet addiction groups was (OR 2.51, 95%CI 2.09, 3.02) (Wang et al., 2017). Another study of 304 high school students in Turkey found that 11% of the population had internet addiction and scored high in ADHD diagnosis evaluation, Evaluation Inventory, and Beck Depression Inventory (Gundogar et al., 2012).

The study revealed that respondents with a history of using digital devices with prolonged screening time posed a risk of developing ADHD symptoms. A similar result has also been documented in a study where a statistically significant but modest association was found between a higher frequency of digital media use and subsequent symptoms of ADHD (Ra et al., 2018). Another study found that overtiredness from digital media use is likely to exacerbate ADHD symptoms as poor sleep can lead to hyperactivity and sensation seeking (Steinfeld et al., 2015). A comprehensive cross-sectional study in Norway surveyed 9,846 adolescents, ages 16 to 19 years, on the type and frequency of electronic device use at bedtime and hours of screen time during leisure time; a higher frequency of screen-time at bedtime was associated with increased risk of short sleep duration (Hysing et al., 2015). This eventually leads to suppression of melatonin production due to the bright and blue light exposure, which can ultimately disrupt the individual's circadian cycle and causes sleep disturbance which is connected to internalizing and externalizing behaviors that are the profound stage of ADHD symptoms predisposition (Falbe et al., 2015; Grover et al., 2016).

Limitations

This study has some limitations; among them, one is self-reporting data. This study doesn't reflect the representation of all the young adults in Bangladesh, because of selection bias and sort of convenient and snow-ball sampling method. Clinical assessment to confirm ADHD was not performed. The survey findings may not be generalized for the pre-post Covid-19 pandemic as this survey was conducted during the COVID-19 pandemic.

Conclusions

The occurrence of ADHD was considerably higher in adults amid the COVID-19 pandemic. Using digital devices with screening time for more than four hours was identified as a risky practice to develop ADHD symptoms. Further medical and psychiatry assessments are needed to understand the burden of ADHD more accurately in adults or young adults. Awareness about the negative impact of excessive digital media use and prolonged screening time in developing ADHD symptoms should be increased through mass campaigns. Further studies with larger sample size are necessary to assess the effect of screening time on ADHD in young adults.

Declaration

Acknowledgement. We are grateful to all study participants for providing their valuable time and information.

Conflict of interest. The authors declare no conflict of interest.

Author contribution. AHO, SG, and SC involved in conceptualization and methodology. AHO, SG, AI, AMRZ, MRF, and SC involved in data acquisition, investigation, original draft preparation, visualization, and validation. AHO, SG, and SC involved in data analysis and interpretation. SA AHO, SG, AI, AMRZ, MRF, and SC involved in reviewing, revising, and editing the manuscript. SC involved in supervision.

Funding. No funding required.

Data availability statement. The data presented in this survey are available on reasonable request from the corresponding author.

References

Aguilar-Farias, N., Toledo-Vargas, M., Miranda-Marquez, S., Cortinez-O'Ryan, A., Cristi-Montero, C., Rodriguez-Rodriguez, F., Martino-Fuentealba, P., Okely, Anthony, D., & del Pozo Cruz, B. (2021). Sociodemographic predictors of changes in physical activity, screen time, and sleep among toddlers and preschoolers in Chile during the COVID-19 pandemic. *International Journal of Environmental Research and Public Health, 18*(1), 176.

Al Tawil, L., Aldokhayel, S., Zeitouni, L., Qadoumi, T., Hussein, S., & Ahamed, S. S. (2020). Prevalence of self-reported computer vision syndrome symptoms and its associated factors among university students. *European Journal of Ophthalmology, 30*(1), 189-195.

Alrahili, N., Aldakheel, A. A., AlUbied, A., Almalki, A., AlBarrak, A., Al-Dosari, B., Alhemaidi, W., Alamro, A. S., & Alageel, A. A. (2019). Prevalence of adult attention deficit hyperactivity disorder among medical students in Riyadh City. *Int J Med Dev Ctries, 3*, 246-251.

Araf, Y., Akter, F., Tang, Y. d., Fatemi, R., Parvez, S. A., Zheng, C., & Hossain, G. (2022). Omicron variant of SARS-CoV-2: Genomics, transmissibility, and responses to current COVID-19 vaccines. *Journal of Medical Virology. 94*(5),1825-1832.

BTRC. (2021). Bangladesh Telecommunication Regulatory Commission. Available from: *http://www.btrc.gov.bd* (Accessed February 10, 2022).

Chung, W., Jiang, S.-F., Paksarian, D., Nikolaidis, A., Castellanos, F. X., Merikangas, K. R., & Milham, M. P. (2019). Trends in the prevalence and incidence of attention-deficit/hyperactivity disorder among adults and children of different racial and ethnic groups. *JAMA network open, 2*(11), e1914344-e1914344.

Diomidous, M., Chardalias, K., Magita, A., Koutonias, P., Panagiotopoulou, P., & Mantas, J. (2016). Social and psychological effects of the internet use. *Acta informatica medica, 24*(1), 66.

Dos Santos Assef, E. C., Capovilla, A. G. S., & Capovilla, F. C. (2007). Computerized Stroop test to assess selective attention in children with attention deficit hyperactivity disorder. *The Spanish Journal of Psychology, 10*(1), 33-40.

Ebejer, J. L., Medland, S. E., Van Der Werf, J., Gondro, C., Henders, A. K., Lynskey, M., Martin, Nicholas, G., & Duffy, D. L. (2012). Attention deficit hyperactivity disorder in Australian adults: prevalence, persistence, conduct problems and disadvantage. *PLoS One. 2012; 7*(10), e47404.

Falbe, J., Davison, K. K., Franckle, R. L., Ganter, C., Gortmaker, S. L., Smith, L., Land, T., & Taveras, E. M. (2015). Sleep duration, restfulness, and screens in the sleep environment. *Pediatrics, 135*(2), e367-e375.

Fayyad, J., De Graaf, R., Kessler, R., Alonso, J., Angermeyer, M., Demyttenaere, K., De Girolamo, G., Haro, J. M., Karam, Elie, G., & Lara, C. (2007). Cross-national prevalence and correlates of adult attention-deficit hyperactivity disorder. *The British Journal of Psychiatry, 190*(5), 402-409.

Ginsberg, Y., Quintero, J., Anand, E., Casillas, M., & Upadhyaya, H. P. (2014). Underdiagnosis of attention-deficit/hyperactivity disorder in adult patients: a review of the literature. *The Primary Care Companion for CNS Disorders, 16*(3), 23591.

Grover, K., Pecor, K., Malkowski, M., Kang, L., Machado, S., Lulla, R., Heisey, D., & Ming, X. (2016). Effects of instant messaging on school performance in adolescents. *Journal of Child Neurology, 31*(7), 850-857.

Gundogar, A., Bakim, B., Ozer, O., & Karamustafalioglu, O. (2012). P-32-The association between internet addiction, depression and ADHD among high school students. *European Psychiatry, 27*(S1), 1-1.

Hasan, C. M. M., Islam, M. M., Mahib, M. M. R., & Arju, M. A. C. (2016). Prevalence and assessment of biochemical parameters of attention-deficit hyperactivity disorder children in Bangladesh. *Journal of Basic and Clinical Pharmacy, 7*(3), 70.

Hassan, T., Alam, M. M., Wahab, A., & Hawlader, M. D. (2020). Prevalence and associated factors of internet addiction among young adults in Bangladesh. *Journal of the Egyptian Public Health Association, 95*(1), 1-8.

Hesson, J., & Fowler, K. (2018). Prevalence and correlates of self-reported ADD/ADHD in a large national sample of Canadian adults. *Journal of Attention Disorders, 22*(2), 191-200.

Humayun Kabir, M., Hasan, K., & Bhuya, M. T. R. (2021). Recommendations for school-going students post CoVid-19 in Bangladesh. *Bioinformation, 17*(4), 500.

Hysing, M., Pallesen, S., Stormark, K. M., Jakobsen, R., Lundervold, A. J., & Sivertsen, B. (2015). Sleep and use of electronic devices in adolescence: results from a large population-based study. *BMJ Open, 5*(1), e006748.

Kavakci, O., Kugu, N., Semiz, M., Meydan, F., Karsikaya, S., & Dogan, O. (2012). Prevalence of attention-deficit/hyperactivity disorder and co-morbid disorders among students of Cumhuriyet University. *The European Journal of Psychiatry, 26*(2), 107-117.

Kemp, S. (2021). Digital 2021: Global overview report. Available from: *https://datareportal.com/reports/digital-2021-global-overview-report* (Accessed February 4, 2022).

Kessler, R. C., Adler, L., Ames, M., Demler, O., Faraone, S., Hiripi, E. V. A., Howes, M. J., Jin, R., Secnik, K., & Spencer, T. (2005). The World Health Organization Adult ADHD Self-Report Scale (ASRS): a short screening scale for use in the general population. *Psychological Medicine, 35*(2)*,* 245-256.

Lissak, G. (2018). Adverse physiological and psychological effects of screen time on children and adolescents: Literature review and case study. *Environmental Research, 164,* 149-157.

Mackolil, J., & Mackolil, J. (2020). Addressing psychosocial problems associated with the COVID-19 lockdown. *Asian Journal of Psychiatry, 51,* 102156.

Panchal, N., Kamal, R., Orgera, K., Cox, C., Garfield, R., Hamel, L., & Chidambaram, P. (2020). The implications of COVID-19 for mental health and substance use. *Kaiser family Foundation,* 21.

Perrin, J. M., Stein, M. T., Amler, R. W., Blondis, T. A., Feldman, H., Meyer, B., Shaywitz, BA, & Wolraich, M. L (2001). Clinical practice guideline: treatment of the school-aged child with attention-deficit/hyperactivity disorder. *Pediatrics, 108*(4)*,* 1033-1044.

Ra, C. K., Cho, J., Stone, M. D., De La Cerda, J., Goldenson, N. I., Moroney, E., Tung, I., Lee, S. S., & Leventhal, A. M. (2018). Association of digital media use with subsequent symptoms of attention-deficit/hyperactivity disorder among adolescents. *JAMA, 320*(3), 255-263.

Rajkumar, R. P. (2020). COVID-19 and mental health: A review of the existing literature. *Asian Journal of Psychiatry, 52,* 102066.

Ripon, R. K., Mim, S. S., Puente, A. E., Hossain, S., Babor, M. M. H., Sohan, S. A., & Islam, N. (2020). COVID-19: psychological effects on a COVID-19 quarantined population in Bangladesh. *Heliyon, 6*(11), e05481.

Schäfer, S. K., Sopp, M. R., Schanz, C. G., Staginnus, M., Göritz, A. S., & Michael, T. (2020). Impact of COVID-19 on public mental health and the buffering effect of a sense of coherence. *Psychotherapy and Psychosomatics, 89*(6), 386-392.

Shahriar, S. H. B., Arafat, S., Sultana, N., Akter, S., Khan, M. M. R., Nur, J. E. H., & Khan, S. I. (2021). The transformation of education during the corona pandemic: exploring the perspective of the private university students in Bangladesh. *Asian Association of Open Universities Journal. 16(2),* 161-176.

Sifat, R. I. (2020). COVID-19 pandemic: Mental stress, depression, anxiety among the university students in Bangladesh. *Soc Psychiatry,* 1(2).

Simon, V., Czobor, P., Bálint, S., Mészáros, A., & Bitter, I. (2009). Prevalence and correlates of adult attention-deficit hyperactivity disorder: meta-analysis. *The British Journal of Psychiatry, 194*(3), 204-211.

Small, G. W., Lee, J., Kaufman, A., Jalil, J., Siddarth, P., Gaddipati, H., Moody, T. D., & Bookheimer, S. Y. (2020). Brain health consequences of digital technology use. *Dialogues in Clinical Neuroscience, 22*(2), 179.

Smith, M. (2017). Hyperactive around the world? The history of ADHD in global perspective. *Social History of Medicine, 30*(4), 767-787.

Spencer, T., Biederman, J., Wilens, T. E., & Faraone, S. V. (1998). Adults with attention-deficit/hyperactivity disorder: a controversial diagnosis. *Journal of Clinical Psychiatry, 59*(7), 59-68.

Steinfeld, B., Scott, J., Vilander, G., Marx, L., Quirk, M., Lindberg, J., & Koerner, K. (2015). The role of lean process improvement in implementation of evidence-based practices in behavioral health care. *The Journal of Behavioral Health Services & Research, 42*(4), 504-518.

Sultana, A., Tasnim, S., Hossain, M. M., Bhattacharya, S., & Purohit, N. (2021). Digital screen time during the COVID-19 pandemic: a public health concern. *F1000Research, 10*(81), 81.

Sun, L., Tang, Y., & Zuo, W. (2020). Coronavirus pushes education online. *Nature Materials, 19(6),* 687-687.

Vargo, D., Zhu, L., Benwell, B., & Yan, Z. (2021). Digital technology use during COVID-19 pandemic: A rapid review. *Human Behavior and Emerging Technologies, 3*(1), 13-24.

Vindegaard, N., & Benros, M. E. (2020). COVID-19 pandemic and mental health consequences: Systematic review of the current evidence. *Brain, Behavior, and Immunity, 89,* 531-542.

Volkow, N. D., & Swanson, J. M. (2013). Adult attention deficit–hyperactivity disorder. *New England Journal of Medicine, 369*(20), 1935-1944.

Wang, B., Yao, N., Zhou, X., Liu, J., & Lv, Z. T. (2017). The association between attention deficit/hyperactivity disorder and internet addiction: a systematic review and meta-analysis. *BMC Psychiatry, 17*(1), 1-12.

WHO. (2022). WHO Coronavirus (COVID-19). *https://covid19.who.int/.* (Accessed February 4, 2022).

Yen, J. Y., Yen, C. F., Chen, C. S., Tang, T. C., & Ko, C. H. (2009). The association between adult ADHD symptoms and internet addiction among college students: the gender difference. *Cyberpsychology & Behavior, 12*(2), 187-191.