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ARTICLE

Depression, Anxiety, Stress and Their Association with the Use of Electronic Devices among Adolescents during the COVID-19 Pandemic

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ABSTRACT

Background: Adolescence is a critical, multifactorial developmental phase. With the current pandemic of COVID-19, excessive using of electronic devices is a public health concern. The aim of this study is to investigate the relationship between depression and the use of electronic devices among secondary school children in Jazan, Saudi Arabia during the COVID-19 pandemic. **Materials and Methods:** The study is an observational, cross-sectional study. Data was collected using an anonymous online survey instrument. including the Depression Anxiety Stress Scale. **Results:** A total of 427 participants were included in the study. The prevalence of depression, anxiety, and stress in our study was 14.55%, 12.01%, and 15.55%, respectively. For the hours spent on electronic devices, 13.6% of participants spent 1–4 h, 43.6% spent 5–9 h, and 42.9% spent 10 h or more. 86.7% reported an increase in their use of electronic devices during COVID-19. The regression analysis revealed that the increase of Videogame Addiction Scale for Children is significantly associated with an increase in Depression, Anxiety, and Stress scores (p-value < 0.05 for all). **Conclusion:** Electronic device use is a challenging issue among Saudi adolescents, and it has been associated with a negative impact on participants' mental well-being. The study found a positive correlation between electronic device use and increased prevalence of mental health issues. We also found significantly increased use of electronic device during the COVID-19 lockdown; hence, more mental issues were reported. It is obvious that electronic device use needs to be more controlled among adolescents. This can be achieved by involving those who are in this age group in other activities, like sports, which can reduce the time they spend on electronic device.

KEYWORDS

COVID-19; depression; electronic devices; adolescents; public health; environmental health

Nomenclature

DASS	Depression Anxiety Stress Scale
VASC	Videogame Addiction Scale for Children
ED	Electronic device
WHO	World Health Organization
SPSS	Statistical Package for Social Sciences
VGA	Videogame addiction

1 Introduction

Adolescence is a crucial phase of life in which children undergo the transition from childhood into adulthood. It is a critical, multifactorial developmental phase that involves the development of social, emotional, physiological, and psychological changes [1]. Adolescents at this stage are prone to the development of psychological disorders such as depression. Such disorders, if present, can lead to deteriorated school performance and lack of commination with others, affecting the quality of life of the individual. In addition, adolescents are more likely to develop risky behaviors, such as substance abuse; the risk of potential suicidal thoughts increases for these individuals if depression continues into adulthood [2,3].

The prevalence and incidence of depression among adolescents is increasing worldwide [4]. Depression is considered a significant public health concern as it affects 264 million people worldwide and accounts for being a significant contributor to the global burden of disease among adolescents [5,6]. In 2020, the World Health Organization (WHO) predicted that depression would be the second-ranked cause of disability-adjusted life for years [7]. In addition, a prevalence of 10%–36% of children and adolescents had mental problems in the Eastern Mediterranean region, which was higher than the estimates in developed areas [8]. Mental health is an economic burden on the health systems, whereas, in England, 13.8% of the health budget goes towards mental health treatment [9].

Many studies documented an association between screen time use and mental illness, mainly depression among adolescents [10,11]. The current trend of young people is towards spending more time on electronic devices and social media than the previous generation did. The percentage of the electronic device (ED) use increased from 24.9% to 31.1% between the years 2009 and 2011 [12]. This is in addition to the current struggle the world is going through in dealing with the COVID-19 pandemic. Adolescents can no longer engage in healthy activities in the same way as the older generation, such as playing outdoors and interacting with others. Moreover, government precautions, social isolation, and distance learning all raise the likelihood of children's loneliness and increased electronic device use, hence increasing the risk of depression [13,14]. There is insufficient information regarding the association between electronic device use and mental illness in the Jazan region southwest, Saudi Arabia. This study aims to determine the prevalence of depression and show the pattern of electronic device use and investigate any relationship between depression and the use of electronic devices among secondary school children in Jazan, Saudi Arabia.

2 Methodology

2.1 Study Design and Setting

An observational, cross-sectional study was conducted in the public schools of the Jazan region. Jazan region is located in the southwest part of Saudi Arabia and has a population of 1,603,659, according to the 2018 National population census. Administratively Jazan is divided into two educational sectors: Jazan and Sabya. According to the General Authority for Statistics, both sectors have 71 sary schools—35 for male students and 36 for female students, while the total number of students in the Jazan region is 17,988.

2.2 Study Population and Sampling

The study targeted school-age adolescents living in the Jazan region, aged 15 to 18 years old and registered for the academic year 2020/2021. We excluded any participant who did not complete the questionnaire or did not agree to participate in the study. Using the statistical formula for cross-sectional study design with a single proportion; $n = (Z\hat{}2P(1-P))/d\hat{}2$, we determined an initial sample size of 400 participants. The parameters used for sample size calculation were (P), the proportion of 50% prevalence of depression (no previous study available), and a confidence interval of 95%. Also, we assumed an error (d) not more than 5%. Finally, we added 10% to compensate for possible non-response rates, increasing our sample to 440 students. Due to the pandemic of COVID-19 situations, we combined both random and non-random sampling design to recruit the sample for this study. Four schools were

selected randomly from the two educational sectors of the Jazan region (Jazan and Sabya). Second, a convenience sample was used to select the study participants from each selected school.

2.3 Data Collection and Study Tools

The study questionnaire was distributed to the participants, and data were collected using an anonymous online survey instrument (Google Form). The link was distributed through school teaching staff via online teaching groups. The questionnaire is prepared in Arabic to assess participants' use of electronic devices, addiction to video games, and depression. The first part of the questionnaire covers the sociodemographic details of the participants (e.g., age, gender, nationality, residence, education level). The second part of the questionnaire aims to collect information about the use of electronic devices and addiction to video games in the past six months through questions like "Do you think about playing video games all day?" Students answer with a number (1 = never, 2 = rarely, 3 = sometimes, 4 = often, 5 = always). This part of the questionnaire was adapted and modified from a study conducted to translate the Videogame Addiction Scale for Children (VASC) into the Arabic language and evaluate its validity and reliability [15]. The total score was range from 21 to 105; participants who score above 90 are candidates for video game addiction [16].

The third part of the questionnaire was adapted from a study conducted to translate and evaluate the psychometric properties of an Arabic version of the Depression Anxiety Stress Scale (DASS) [17]. DASS is a 42-item instrument that measures current (''over the past week'') depression, anxiety, and stress symptoms. Each of the three scales contains 14 items. Participants are asked to use a 4-point combined severity/frequency scale to rate the extent to which they have experienced each item over the past week. The scale ranges from 0 (did not apply to me at all) to 3 (applied to me very much, or most of the time). Scores for depression, anxiety, and stress are calculated by adding the scores for the relevant items.

2.4 Statistical Analysis

The Statistical Package for Social Sciences (SPSS) software program was used for data analysis. Frequency distributions were obtained, and descriptive statistics were calculated. Another level of data analysis, based on the Chi-Square test, was used to evaluate some associations. Linear Regression Analysis evaluated the factors associated with mental health disorder symptoms among the studied children. The dependent variable was set as the depression, anxiety, and stress scores in the three models. Independent variables were VASC Score, and time spent in ED, age gender, Grade Level, residence, and increased use of ED during COVID-19. Also, Pearson linear correlation coeffect was computed. A p-value of less than 0.05 was used to indicate the statistical significance.

2.5 Ethical Considerations

Ethical approval was obtained from Jazan Health Ethics Committee (approval# 2130). The survey was conducted only after approval. Consent was requested from all participants in the study. Privacy, as well as confidentiality, was respected for all study participants. Data was kept and only used for scientific purposes. Students were told that they have the right to withdraw at any time.

3 Results

Of the 440 adolescents who planned to participate in this study, 427 completed the questionnaires, with a response rate of 97.0%. Table 1 displays the participants' background characteristics and their association with VASC and DASS scores. One hundred eighty participants (42.2%) were males, and 247 (57.8%) were females. As for age groups, 144 (33.7%) were 15–16 years old, while 283 (66.3%) were 17–18 years old. As for grade levels, 42 (9.8%) were in Grade 9, 85 (19.9%) were in Grade 10, 156 (36.5%) were in Grade 11, and 144 (33.7%) were in Grade 12. As for the mode of living, 196 (45.9%) lived in a rural area, and 231 (54.1%) were from urban areas. As for nationality, 401 (93.9%) were Saudi, and 26 (6.1%) were non-Saudi. As for hours spent on electronic devices, 58 (13.6%) spent 1–4 h, 186 (43.6%)

spent 5–9 h, and 183 (42.9%) spent 10 h or more on electronic devices. Regarding increased use of electronic devices during COVID-19, 370 (86.7%) reported an increase, while 57 (13.3%) did not. As for the association between the Videogame Addiction Scale for Children and their background information, a significant association was found between VASC and hours spent on electronic devices ($p < 0.05$), where it was observed that the higher the hours spent on electronic devices, the higher the VASC score.

Table 1: Background characteristics and summary statistics of the VASC and DASS scores

Characteristic		N	%	VASC mean (SD)	Depression mean (SD)	Anxiety mean (SD)	Stress mean (SD)
Gender	Male	180	42.2	49.27 (18.12)	10.73 (10.26)*	8.77 (8.32)*	11.95 (10.08)*
	Female	247	57.8	47.81 (20.69)	17.28 (12.15)	14.32 (10.42)	18.21 (11.97)
Age groups	15–16 years	144	33.7	48.45 (20.79)	16.64 (12.53)	13.54 (11.36)	18 (12.45)
	17–18 years	283	66.3	48.41 (19.6)	13.50 (11.36)	11.25 (9.60)	14.33 (10.99)
Grades	Grade 9	42	9.8	48.45 (22.91)	16.82 (11.74)#	13.97 (11.32)#	17.64 (12.21)#
	Grade 10	85	19.9	49.84 (21.16)	18.20 (13.29)	15.92 (10.75)	19.65 (13.03)
	Grade 11	156	36.5	47.53 (18.07)	12.45 (10.63)	10.19 (8.68)	13.97 (10.43)
	Grade 12	144	33.7	48.55 (19.47)	14.04 (11.72)	11.13 (9.80)	14.27 (11.23)
Mode of living	Rural	196	45.9	46.98 (19.84)	13.13 (11.99)*	11.01 (10.12)	14.51 (11.29)
	Urban	231	54.1	49.65 (19.60)	15.74 (11.88)	12.84 (10.35)	16.42 (11.83)
Nationality	Saudi	401	93.9	48.25 (19.84)	14.69 (11.99)	12.11 (10.12)	15.75 (11.67)
	Non-Saudi	26	6.1	51.08 (16.29)	12.38 (9.19)	10.42 (7.48)	12.58 (10.53)
Hours spent on electronic devices	1–4 h	58	13.6	40.95 (18.01)#	11.03 (11.38)#	10.17 (9.85)#	11.67 (10.84)#
	5–9 h	186	43.6	45.63 (17.98)	13.18 (11.23)	11.08 (9.52)	14.10 (11.04)
	10 years and above	183	42.9	53.63 (20.47)	17.03 (12.13)	13.51 (10.30)	18.22 (11.86)
Increased use of EDs during COVID-19	Yes	370	86.7	49.60 (19.69)	14.84 (11.87)	12.02 (9.78)	15.93 (11.56)
	No	57	13.3	40.79 (17.63)	12.72 (11.57)	11.95 (11.22)	13.14 (11.77)
All participants		427	100	48.42 (19.63)*	14.55 (11.84)	12.01 (9.98)	15.55 (11.61)

Note: * Significant at the 0.05 level, based on independent samples *t* test.
# Significant at the 0.05 level, based on ONE WAY ANOVA test.
VASC = Videogame Addiction Scale for Children, DASS = Depression Anxiety Stress Scale, ED = Electronic Devices.

As for the association between depression and background information, a significant association was found between depression score and gender ($p < 0.05$); females had significantly higher depression scores compared to males (17.28 + 12.15, compared to 10.73 + 10.26). A significant association was also found between grades and depression scores ($p < 0.05$); the highest depression scores were in Grade 10, and the lowest scores were in Grade 11. A significant association was also found between depression scores and living area ($p < 0.05$); those living in an urban area had significantly higher depression scores compared to those living in rural areas (15.74 + 11.88, compared to 13.13 + 11.99). A significant association was also found between depression scores and the hours spent on electronic devices ($p < 0.05$). It was observed that the higher the hours spent on electronic devices, the higher the scores on depression.

As for the association between anxiety and background information, a significant association was found between anxiety scores and gender ($p < 0.05$), where females had significantly higher anxiety scores compared to males (14.32 + 10.42, compared to 8.77 + 8.32). A significant association was also found between grades and anxiety scores ($p < 0.05$); the highest anxiety scores were in Grade 10, and the lowest anxiety scores were in Grade 11. A significant association was also found between anxiety scores and the

hours spent on electronic devices ($p < 0.05$). It was observed that the higher the hours spent on electronic devices, the higher the scores on anxiety.

As for the association between stress and background information, a significant association was found between stress scores and gender ($p < 0.05$), where females had significantly higher stress scores compared to males (18.21 + 11.97, compared to 11.95 + 10.08). A significant association was also found between grades and stress scores ($p < 0.05$); the highest stress scores were in Grade 10, and the lowest was in Grade 11. A significant association was also found between stress scores and the hours spent on electronic devices ($p < 0.05$). It was observed that the higher the hours spent on electronic devices, the higher the scores on stress.

Table 2 shows the association between the presence and the severity of DASS with addiction symptoms. A significant association was found between the presence of addiction symptoms and the following: depression ($p < 0.001$), anxiety ($p < 0.001$), and stress ($p < 0.001$). It was observed that, within all these associations, the higher the severity of DASS symptoms, the higher the rate of participants with addiction symptoms.

Table 2: Association between Videogame Addiction Scale for Children (VASC) and DASS symptoms among the children

DASS symptoms		Normal	Symptoms of addiction	*p* value*
Depression	Normal	180 (100.0%)	0 (0%)	**<0.001**
	Mild	53 (100.0%)	0 (0%)	
	Moderate	66 (98.5%)	1 (1.5%)	
	Severe	47 (95.9%)	2 (4.1%)	
	Extremely severe	60 (81.1%)	14 (18.9%)	
Anxiety	Normal	171 (99.4%)	1 (0.6%)	**<0.001**
	Mild	349 (100.0%)	0 (0.0%)	
	Moderate	74 (98.7%)	1 (1.3%)	
	Severe	54 (98.2%)	1 (1.8%)	
	Extremely severe	73 (83.9%)	14 (16.1%)	
Stress	Normal	218 (99.5%)	1 (0.5%)	**<0.001**
	Mild	48 (100.0%)	0 (0.0%)	
	Moderate	68 (95.8%)	3 (4.2%)	
	Severe	409 (90.9%)	4 (9.1%)	
	Extremely severe	32 (78.0%)	9 (22.0%)	
All children		**406 (96.0%)**	**17 (4.0%)**	

* Note: *p* value is based on fisher exact test.
VASC = Videogame Addiction Scale for Children, DASS = Depression Anxiety Stress Scale.

Fig. 1 demonstrates the prevalence of video game addiction based on VASC according to gender. The overall prevalence of video game addiction was 4%. The rate of video game addiction in males was 5%, while it was 3.2% in females.

Table 3 illustrates the correlations between the Videogame Addiction Scale for Children (VASC) and the DASS. When correlation was tested among all participants, a significant correlation was found between all pairs of comparison (hours spent on electronic devices, VASC score, depression score, anxiety score, and stress score). Similarly, when correlation was tested with participants who had an increase in their

electronic device use time during the COVID-19 pandemic, a significant correlation was found between all pairs. However, when correlation was tested with participants who did not have an increase in their electronic device use time during the COVID-19 pandemic, no significant correlation was found between hours spent on electronic devices and either stress score or anxiety score. However, a significant correlation was found between other pairs of correlation.

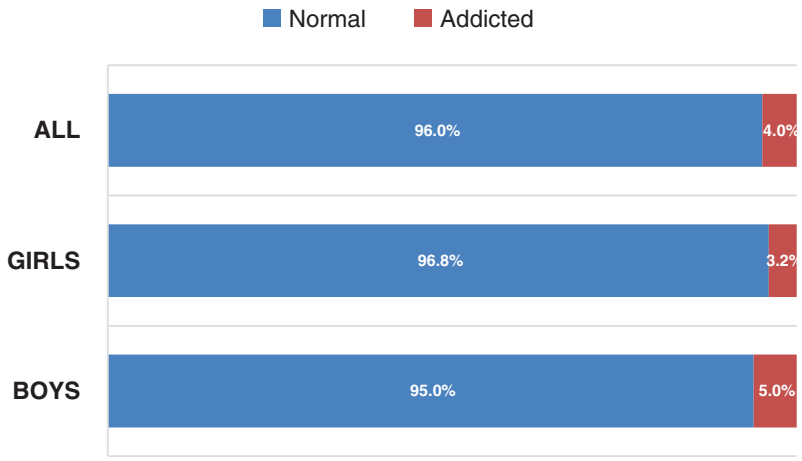

Figure 1: Prevalence of videogame addiction based on (VASC) according to gender

Table 3: Correlations[#] between the Videogame Addiction Scale for Children (VASC) and the DASS

	Variables	Hours spent in ED	VASC score	Depression score	Anxiety score	Stress score
Increased use of ED during COVID-19	Hours spent on ED	1	0.264**	0.211**	0.165**	0.228**
	VASC score		1	0.424**	0.434**	0.436**
	Depression score			1	0.799**	0.887**
	Anxiety score				1	0.840**
	Stress score					1
No increase in use of ED during COVID-19	Hours spent on ED	1	0.278*	0.244	0.240	0.255
	VASC score		1	0.615**	0.427**	0.566**
	Depression score			1	0.853**	0.905**
	Anxiety score				1	0.869**
	Stress score					1

(Continued)

Table 3 (continued)

	Variables	Hours spent in ED	VASC score	Depression score	Anxiety score	Stress score
All participants	Hours spent on ED	1	0.283**	0.222**	0.173**	0.241**
	VASC score		1	0.450**	0.427**	0.457**
	Depression score			1	0.805**	0.889**
	Anxiety score				1	0.841**
	Stress score					1

Note: #Correlation coefficient is based on pearson correlation coefficient.
**Correlation is significant at the 0.01 level (2-tailed).
*Correlation is significant at the 0.05 level (2-tailed).
VASC = Videogame Addiction Scale for Children, DASS = Depression Anxiety Stress Scale, ED = Electronic Devices.

Table 4 shows the linear regression analysis of factors associated with mental health disorders among the studied children. Three regression models were developed to predict the score of depression, anxiety, and stress, respectively. The following factors were enrolled in the model: (VASC score, time spent on EDs, age, gender, grade level, residence, and increase in the use of EDs during the COVID-19 pandemic.

Table 4: Linear regression analysis of factors associated with symptoms of mental health disorder among the studied children

Variable	Depression score			Anxiety score			Stress score		
	Coef	SE coef	*p*-value	Coef	SE coef	*p*-value	Coef	SE coef	*p*-value
VASC score	0.258	0.026	<0.001	0.2136	0.0221	<0.001	0.255	0.0255	<0.001
Time spent on EDs	0.164	0.116	0.161	0.0442	0.0987	0.654	0.210	0.114	0.066
Age	−0.03	0.154	0.864	0.152	0.130	0.245	0.009	0.150	0.951
Gender									
Male (Ref)									
Female	5.85	1.02	<0.001	4.780	0.868	<0.001	5.54	1.00	<0.001
Grade level									
9th (Ref)									
10th	−1.04	2.01	0.606	−0.01	1.70	0.997	−0.26	1.96	0.895
11th	−4.35	1.98	0.029	−4.05	1.68	0.017	−3.40	1.94	0.081
12th	−3.43	2.04	0.093	−3.95	1.73	0.023	−3.94	2.00	0.049
Residence									
Rural (Ref)									
Urban	2.26	1.01	0.026	1.674	0.857	0.051	1.269	0.989	0.200

(Continued)

Table 4 (continued)

Variable	Depression score			Anxiety score			Stress score		
	Coef	SE coef	*p*-value	Coef	SE coef	*p*-value	Coef	SE coef	*p*-value
Increased use of EDs during COVID-19									
Yes (Ref)									
No	−0.68	1.46	0.644	−2.42	1.24	0.052	−0.11	1.43	0.937

Note: Coef = *Regression coefficient*; SE Coef = Standard error of the coefficient; ref = reference category.
VASC = Videogame Addiction Scale for Children, DASS = Depression Anxiety Stress Scale, ED = electronic devices.

As for the depression model, the following factors predicted higher depression score: VASC score ($p < 0.001$, **Coef** = 0.258), females ($p < 0.001$, **Coef** = 5.85), living in urban area ($p = 0.026$, **Coef** = 2.26). Being in grade 11 predicted lower depression score ($p = 0.029$, **Coef** = −4.35).

As for the anxiety model, the following factors predicted higher anxiety score: VASC score ($p < 0.001$, **Coef** = 0.213), females ($p < 0.001$, **Coef** = 4.78). The following factors predicted lower anxiety score: being in grade 11 ($p = 0.017$, **Coef** = −4.05), and being in grade 12 ($p = 0.023$, **Coef** = −3.95).

As for the stress model, the following factors predicted higher stress score: VASC score ($p < 0.001$, **Coef** = 0.255), females ($p < 0.001$, **Coef** = 5.54). Being in grade 12 predicted lower stress score ($p = 0.049$, **Coef** = −3.94).

4 Discussion

The prevalence of anxiety in our study (12.01% with 9.98 standard deviations) was reported to be slightly higher than a reported meta-analysis of a worldwide pooled prevalence of 6.5% [18]. In contrast to many studies in Saudi Arabia, the prevalence of anxiety in both genders in our study was much lower. A study done in the Al-Hasa region reported anxiety prevalence among its participants to be 49.9%; two other studies were conducted in Abha, one for boys and another for girls, where the formerly estimated anxiety prevalence to be 48.9%, and the latter had even higher anxiety prevalence at 66.2% [19–21].

In addition, one study in the Gulf region in the United Arab Emirates also showed a higher prevalence of anxiety (28%) [22]. his high prevalence of anxiety is also seen in multiple global studies with considerable diversity. For example, studies in Spain, Malaysia, and India showed prevalence at 26.41%, 50.8%, and 80.85%, respectively [23–25]. This wide variation of prevalence could be due to differences in screening tools, different stressors, and genetic and environmental factors.

As regards depression, this study found the overall prevalence of depression among adolescents in Jazan, Saudi Arabia, to be 14.55%. In comparison to the wide variation of depression rates found in the literature regarding the prevalence of depression, our results were more towards the lower rates. For example, one study in Abha, Saudi Arabia, found the prevalence of depression among its female participants to be 13.9%, which was less than the prevalence among the same gender in our study (17.28%) [21]. However, in the rest of the studies done on female participants, the vast majority showed a higher prevalence compared to our study. One cross-sectional study in Riyadh, Saudi Arabia, showed the prevalence at 30%; another in Taif found the prevalence to be 42.9%. Two studies in Abha and Al-Khobar found the prevalence to be 41.5% 70.5%, respectively [11,21,26,27]. Regarding the rates of depression among the male gender, our study showed the prevalence to be 10.73%, lower than several studies in the same group. One study in Arar found the rate of depression at 56.3%, and another in Abha showed 38.2% [20,28]. These findings agree with most of the studies in the literature that have shown the rates to be higher among females than males. Several studies have been conducted in Arab countries that showed similar rates of depression; one study in Egypt and another in Jordan found the prevalence to be

17% and 16.3%, respectively [29,30]. Globally, several studies revealed close rates; in Malaysia, reported depression rates were 17.7%, Puerto Rico reported 17.9%, and Canada reported 9% among males and 12% among females [31–33]. One explanation for the variety of depression rates could be the different scales used to assess depression.

Concerning the prevalence of stress, higher rates were reported locally in the literature. The prevalence of stress in our study was 15.55% among all participants; in contrast, the rates in other studies ranged from 35.5% to 75% [20,21,34,35]. Stress in our study was also the most reported physiological illness at 15.55%, compared to depression at 14.55% and anxiety at 12.01%. However, this comes in disagreement with two previous studies conducted in Abha that used the same scale to measure depression, anxiety, and stress. Both studies revealed stress to be the least prevalent [20,21]. The study also showed a significant difference between stress rates between males and females, with the latter being higher. Using the two Abha studies previously mentioned for comparison, one for each gender supports our statement that stress is higher among the female gender.

In an era where technology is rapidly developing, electronic devices have become an essential part of our daily lives. Yet, this comes with several consequences for our physical and mental health [36]. Our study has reported a relationship between the hours spent on electronic devices (ED) and mental health disorders. As the hours spent on ED increased, higher depression, anxiety, and stress rates were seen. For example, the depression rate among participants that used ED for 1–4 h was 11.03 (with 11.38 SD), in contrast to the participants that used ED for more than 10 h (17.03, with 12.13 SD). This agrees with several studies; one study in Al-Khobar, Saudi Arabia, showed a significant association between increased electronic device use and depression symptoms. Likewise, a study in China has shown that participants who used ED for more than two hours were at greater risk for anxiety symptoms; this was also seen in an Australian study [11,37,38].

Our results have shown the prevalence of video game addiction (VGA) among our participants is about 4%. Lower rates of VGA were reported in two local studies, which showed VGA prevalence to be 5% (2020) and 16% (2016) [34]. Other rates reported VGA among developed countries are 7.7% in Spain, 8% in the United States, 9.4% in the Netherlands, 14.6% in the UK; the lowest reported prevalence was in Germany (1.2%) [39–41]. The study also showed higher rates of video game addiction in boys than girls; this was also seen in a Chinese study [42]. In addition, the study observed a higher prevalence of VGA as the hours of ED use increased. This variation could be due to using different scales for assessing VGA, the difference in the sample characteristics, and different methodology.

It is also worth mentioning that with the global pandemic of COVID-19, lockdowns, and online learning, people are more likely to stay at home. This results in isolation, limited social interaction, loneliness, and increased internet use, which can all be predisposing factors for various mental illnesses [14]. Our result showed that 86.7% of participants reported increased ED use during the pandemic; this is evident by two studies in China and Indonesia that both reported increased ED use during the pandemic [43,44]. Our study also showed that, among those who reported increased ED use during COVID-19, there was an increased prevalence of VGA, depression, anxiety, and stress compared to those who reported no change in ED use. Again, this comes in agreement with the previously mentioned studies.

Our research has some limitations; first, the nature of the study as descriptive cross-sectional causes or associations cannot be adequately established. Second, the study used a convenience sample instead of a probability sample due to lockdowns. Third, online learning necessitated this type of sampling. Although of these limitations, this is the first study conducted in this region (Jazan) showing the prevalence of ED use and VGA.

5 Conclusion

In conclusion, our findings show that electronic device use is a challenging issue among Saudi adolescents. It has been associated with a negative impact on participants' mental well-being. The study also found a positive correlation between ED use and increased prevalence of mental health issues; participants who increased the hours spent on EDs reported higher depression, anxiety, and stress rates. We also found significantly increased use of ED during COVID-19 lockdown; as a result, more mental issues were reported.

Overall, it is obvious that ED use needs to be more controlled among adolescents. This could be achieved by involving those in this age group in other activities, like sports, which would reduce the time they spend on ED. In addition, since adolescents spend a large portion of their day at school, the school programs should include lessons about psychosocial health and how to avoid problems like depression, anxiety, and stress.

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