Jordan Medical Journal

ORIGINAL ARTICLE

The Prevalence of Attention Deficit Hyperactivity Disorder, Internet Gaming Disorder and Their Association Among Adults in Jordan: A Cross-Sectional Study

Ahmad Kaffaf [1*], Ahmed Attarri[1], Hussein Abdulelah[1], Tamer Barakat[1], Yousef Omar[1]

[1] School of Medicine, The University of Jordan, Amman, Jordan

*Corresponding author:

Ahmadaic@outlook.com

Received: September 20, 2023

Accepted: December 12, 2024

DOI: https://doi.org/10.35516/jmj.v59i3.1769

Abstract

Objective: This study investigates the prevalence of adult ADHD and Internet Gaming Disorder (IGD) among Jordanian students and graduates and examines their associations and determinants.

Method: A cross-sectional study was conducted using an online self-administered questionnaire comprising three sections: demographics, the Adult ADHD Self-Report Scale (ASRS), and an IGD assessment.

Results: Among 1989 participants, 25.6% screened positive for adult ADHD (average ASRS score: 7.25). Factors associated with Adult ADHD included male gender, younger age, lower GPA, and prior psychiatric diagnoses. Additionally, 14.7% met IGD criteria. Male gender, younger age, single marital status, and southern Jordan residence were significantly associated with risky gaming behavior and IGD. A significant connection between IGD and ADHD was observed.

Conclusion: This study underscores a significant prevalence of adult ADHD and IGD, emphasizing the need for heightened awareness and intervention strategies to address the psychological implications on individuals' well-being.

Keywords: Adult ADHD, ADHD, IGD, ASRS, Adult Attention Deficit Hyperactivity Disorder, IGD-9, Internet Gaming Disorder.

INTRODUCTION

Attention deficit hyperactivity disorder (ADHD) is a neurodevelopmental disorder characterized by a persistent pattern of inattention and/or hyperactivity and impulsivity [1]. According to the literature, ADHD is the most common neurobehavioral disorder among children, with a worldwide prevalence of 5.3% [2]. In addition, there are many psychiatric comorbidities that co-occur with ADHD, including depression, anxiety disorders, bipolar disorder, substance abuse disorders and personality disorders [3]. Until recently, ADHD was thought to be exclusively a disorder of children and adolescents; however, multiple follow up studies have shown otherwise. Therefore, even though the incidence of ADHD

decreases with age, a meta-analysis follow-up study concluded that 65% of study subjects had "persistent ADHD" [4].

The internet is one of the most widely used tools worldwide by people of all ages and has become a necessity to most. Internet use among children, adolescents, and young adults is principally high and especially used for playing video games [5]. The excessive use of the internet for playing video games sparked controversy about whether it should be considered a disorder or not, yet studies show that excessive use of the internet for video games is problematic and has a direct negative impact on the individual's quality of life [6]. In addition, there is evidence supporting the association of video games with many psychiatric disorders including Anxiety, Depression, and OCD [7]. Recently, due to the significant negative consequences of excessive video game use, internet gaming disorder (IGD) has been added to the DSM-5 section III, as a condition warranting more research and clinical experience before inclusion in The Diagnostic and Statistical Manual of Mental Disorders (5th ed; DSM-5; American Psychiatric Association, 2013) [8]. The WHO has recently considered internet gaming as a disorder "internet gaming disorder" (IGD) in the 11th revision of the international classification of diseases (ICD11) [9]. Click or tap here to enter text. According to a global meta-analysis study, the estimated worldwide prevalence of Internet gaming disorder is 1.96%, which is comparable to other psychiatric disorders such as OCD, and substance related addictions [10].

Impulsivity plays a huge role in addictive tendencies, and as such, it is theoretical to assume a probable association between individuals with ADHD and IGD, which in fact has been shown to be the case by some studies [11]. A study performed in 2017 showed not only an association between the two disorders, but also showed when the two disorders co-occur, higher rates of hostility and impulsivity were reported [12]. Moreover, a study showed a significant association between time spent playing games for more than one hour a day and inattentive symptoms [13]. However, only a couple of studies have been conducted on adults, including a recent study in Saudi Arabia, showing a significant association between ADHD in adults and IGD [14]. To our knowledge, there are no such studies performed in Jordan, and accordingly, our cross-sectional study aims to investigate the prevalence of adult ADHD and IGD along with their association and predictors of each in adults.

MATERIALS AND METHODS

Study design and population

In this national cross-sectional study, a link to an online self-administered questionnaire was shared with Jordanian students through social media platforms. All Jordanian university students and graduates were eligible for participation in this study except those under 18 years old and who did not speak the Arabic language.

The total number of responses submitted through social media platforms from the 26th of February to the 12th of august 2022 was 2090, recruited through convenience sampling.

Questionnaire

An online, self-administered questionnaire was designed in Arabic and contained three sections which included 38 questions shared on social media platforms. The first section included questions on participants' demographics and socioeconomic status (age, gender, city of

residence, monthly salary, educational level, occupation, marital status, GPA, number of family members, birth order, the field of study, and work status). Participants were also asked about previously diagnosed mental illness.

The second section contained the Arabic version of the Adult ADHD Self-Report Scale (ASRS), which consists of 18 items [15]. Each of the 18 questions on the scale received a score of "never," "rarely," "sometimes," "often," or "very often".

In the third and final segment, the validated Arabic IGD Test (IGD-9) [16] was administered, comprising nine questions, each of which can be answered with a yes or no.

Statistical analysis

The data were analyzed using SPSS (version 26). First, inclusion criteria were applied, and outliers were deleted to insure normal distribution of data. Secondly, the IGD-SF9 and ASRS scores were converted to ADHD and gamer groups. Subsequently, descriptive analysis was used to assess study variables including means, standard deviations, percentages, and frequencies. Finally, Chi-square tests were used to examine the associations between study variables. A p-value <.05 was considered significant in this study.

Ethical approval

This research was conducted in accordance with the Helsinki Declaration. The University of Jordan Hospital's Institutional Review Board (IRB) has examined and authorized the conduct of this study. The questionnaire began with a brief explanation of the study's objectives, and participants were asked to submit and agree to a consent declaration. At all times, confidentiality was preserved.

Results

Socioeconomic characteristic

This study's sample consisted of 2090 participants, of whom 1989 were analyzed after exclusion of participants younger than 18, without university education, and those who did not speak Arabic. Most participants were female (67.3%), aged between 18-20 (56.7%), from middle Jordanian region (85.8%) and of average family income between 0-1000 Jordanian Dinars (62.5%). The largest portion of the population were students at the time of the study (75.7%). 88.1% were single and the average family members size was 6.32. The majority had no previous psychiatric diagnosis (87.7%). More than half of the sample studied medical majors (57.6%) and the most frequent GPA was very good (37.2%) and excellent (22.7%).

Respondents Internet Gaming Disorder Status and its predicators

The average IGD score was 2.52/9 with 524 participants being risky gamers (26.3%) and 292 having internet gaming disorder (14.7%). Age, gender, GPA, university major, region and social status were significantly associated with IGD status ($p<0.05$), where being a male, having younger age, being single, having positive ADHD and living in the south of Jordan were more likely to have risky gaming behavior and IGD. Furthermore, participants with higher GPA were less likely to have IGD. Number of family members, average family income, birth order, job status and previous diagnosis of psychiatric disorders had no such association with IGD. See table 1 for further details.

Table 1: Respondents Internet Gaming Disorder Status and Association Among Categorical Variables

Characteristics	IGD status				Chi-square	
	Normal gamer	Risky gamer	IGD	Total	p-values	χ2
Age	n(%)	n(%)	n(%)		.003	15.72
18-20	639(55.7)	339(29.6)	169(14.7)	1147(57.7)		
21-23	260(64)	89(21.9)	57(14)	406(20.4)		
>23	274(62.8)	96(22)	66(15.1)	436(21.9)		
Sex					<0.001	68.29
Female	874(65.3)	301(22.5)	163(12.2)	1338(67.3)		
male	299(45.9)	223(34.3)	129(19.8)	651(32.7)		
Family income					.79	1.71
0-1000	726(58.4)	329(26.5)	188(15.1)	1243(62.5)		
1000-2000	237(59.8)	108(27.3)	51(12.9)	396(19.9)		
>2000	210(60)	87(24.9)	53(15.1)	350(17.6)		
Grade					<0.001	38.12
First semester	186(52.1)	110(30.8)	61(17.1)	357(17.9)		
Weak	7(63.6)	0(0)	4(36.4)	11(0.6)		
Acceptable	35(50.7)	16(23.2)	18(26.1)	69(3.5)		
Good	196(54.1)	98(27.1)	68(18.8)	362(18.2)		
Very good	461(62.4)	183(24.8)	95(12.9)	739(37.2)		
Excellent	288(63.9)	117(25.9)	46(10.2)	451(22.7)		
Family members					.655	2.44
3-5	350(57.8)	171(28.2)	85(14)	606(30.5)		
6-7	568(58.8)	249(25.8)	149(15.4)	966(48.6)		
>7	255(61.2)	104(24.9)	58(13.9)	417(21)		
Region					.018	11.90
North	116(52.7)	65(29.5)	39(17.7)	220(11.1)		
Middle	1028(60.3)	441(25.8)	237(13.9)	1706(85.8)		
south	29(46)	18(28.6)	16(25.4)	63(3.2)		
Major					.047	12.75
Human sciences	214(57.1)	108(28.8)	53(14.1)	375(18.9)		
Scientific majors	255(60)	101(23.8)	69(16.2)	425(21.4)		
Health majors	687(60)	295(25.8)	163(14.2)	1145(57.6)		
Others	17(38.6)	20(45.5)	7(15.9)	44(2.2)		
Birth Order					.84	1.43
Youngest	225(58)	110(28.4)	53(13.7)	388(19.5)		
Middle	561(59.7)	240(25.6)	138(14.7)	939(47.2)		
Oldest	387(58.5)	174(26.3)	101(15.3)	662(33.3)		
Employment					.08	8.35

Characteristics	IGD status				Chi-square	
Employed	212(63.5)	74(22.2)	48(14.4)	334(16.8)		
Student	865(57.4)	420(27.9)	221(14.7)	1506(75.7)		
Not employed	96(64.4)	30(20.1)	23(15.4)	149(7.5)		
Social status					.010	13.27
Single	1015(57.9)	479(27.3)	258(14.7)	1752(88.1)		
Married	151(68)	42(18.9)	29(13.1)	222(11.2)		
Others(divorced, widow)	7(46.7)	3(20)	5(33.3)	15(0.8)		
Prior psychiatric diagnosis					.06	5.64
No	1043(59.8)	457(26.2)	245(14)	1745(87.7)		
Yes	130(53.3)	67(27.5)	47(19.3)	244(12.3)		
ADHD					<0.001	151.21
Positive	200(39.2)	161(31.6)	149(29.2)	510(25.6)		
Negative	973(65.8)	363(24.5)	143(9.7)	1479(74.4)		

Respondent Adult Attention Hyperactivity Disorder Status and its predictors

The average ASRS score was 7.25/18 with 510 participants having positive screening for adult ADHD (25.6%). Age, gender, GPA, and having previous diagnosis of psychiatric disorders were significantly associated with ADHD screening results ($p<0.05$), where male participants, with younger age, lower GPA score and previous psychiatric disorder were more likely to have adult ADHD. Number of family members, average family income, birth order, social status and university major category had no such association with ADHD. See table 2 for further details.

Table 2: Respondents Adult Attention Deficit Hyperactivity Disorder Status and Association Among Categorical Variables

Characteristics	Adult ADHD			Chi-square	
	No	Yes	Total	p-values	$\chi 2$
Age	n(%)	n(%)		.04	6.43
18-20	843(73.5)	304(26.5)	1147(57.7)		
21-23	292(71.9)	114(28.1)	406(20.4)		
>23	344(78.9)	92(21.1)	436(21.9)		
Sex				.037	4.36
Female	1014(75.8)	324(24.2)	1338(67.3)		
male	465(71.4)	186(28.6)	651(32.7)		
Family income				.186	3.36
0-1000	907(73)	336(27)	1243(62.5)		
1000-2000	304(76.8)	92(23.2)	396(19.9)		
>2000	268(76.6)	82(23.4)	350(17.6)		
Grade				<0.001	33.47
First semester	260(72.8)	97(27.2)	357(17.9)		
Weak	3(27.3)	8(72.7)	11(0.6)		
Acceptable	49(71)	20(29)	69(3.5)		
Good	242(66.9)	120(33.1)	362(18.2)		

Characteristics	Adult ADHD			Chi-square	
Very good	564(76.3)	175(23.7)	739(37.2)		
excellent	361(80)	90(20)	451(22.7)		
Family members				.345	2.13
3-5	438(72.3)	168(27.7)	606(30.5)		
6-7	730(75.6)	236(24.4)	966(48.6)		
>7	311(74.6)	106(25.4)	417(21)		
Region				.103	4.54
North	160(72.7)	60(27.3)	220(11.1)		
Middle	1279(75)	427(25)	1706(85.8)		
South	40(63.5)	23(36.5)	63(3.2)		
Major				.572	2.00
Human sciences	287(76.5)	88(23.5)	375(18.9)		
Scientific majors	321(75.5)	104(24.5)	425(21.4)		
Health majors	839(73.3)	306(26.7)	1145(57.6)		
Others	32(72.7)	12(27.3)	44(2.2)		
Birth Order				.171	3.54
Youngest	274(70.6)	114(29.4)	388(19.5)		
Middle	707(75.3)	232(24.7)	939(47.2)		
Eldest	498(75.2)	164(24.8)	662(33.3)		
Employment				.27	2.62
Employed	260(77.8)	74(22.2)	334(16.8)		
Student	1108(73.6)	398(26.4)	1506(75.7)		
Not employed	111(74.5)	38(25.5)	149(7.5)		
Social status				.27	2.62
Single	1293(73.8)	459(26.2)	1752(88.1)		
Married	175(78.8)	47(21.2)	222(11.2)		
Others (divorced, widow)	11(73.3)	4(26.7)	15(0.8)		
Prior psychiatric diagnosis				<0.001	62.32
No	1348(77.2)	397(22.8)	1745(87.7)		
Yes	131(53.7)	113(46.3)	244(12.3)		

DISCUSSION

This study aimed to assess the prevalence of ADHD and IGD and investigate their association among adults in Jordan, which carries a huge physical, psychological, and economic burden on members affected. With respect to that, proof supporting prevalence of adult ADHD and IGD and associated risk factors in Jordan is lacking. Interestingly, our study found that 25.6% of respondents have positive screening for adult ADHD with an average ASRS of 7.25. Another important finding was that 14.7% of respondents have met the diagnostic criteria for IGD.

Perhaps the most striking finding in our study was the remarkably high percentage of adult ADHD in Jordan, which is consistent with studies conducted in Iraq, Tunisia, and Saudi Arabia as the total percentage of participants with adult ADHD is 16.6%, 18.1%, and 28.6%, respectively [14,15,17]. However, the percentage in our study is much higher than that reported worldwide including Spain (1.2%), Lebanon (1.8%), Germany (3.1%), Netherland (5%), and USA (5.2%) [18]. This inconsistency in the prevalence of ADHD could be attributed to geographic location, diagnostic method used, and methodological characteristics. According to previous literature, the

variation in ADHD estimates is best explained by the methodological procedures used, while geographic location illustrates minor effects in the prevalence of ADHD [19]. In our study, the ASRS symptom checklist used has 99.5% specificity and 68.7% sensitivity [20].

According to our study findings, male gender, younger age, lower GPA, and having previous diagnosis of psychiatric disorders were factors found to be significantly associated with adult ADHD. In agreement with prior reports, younger males are more likely to have ADHD compared to females [21]. In terms of academic performance, several studies concluded that adults diagnosed with ADHD are more likely to exhibit educational impairments, less academic achievements, and difficulty finding jobs, which is related to disease process and ADHD-associated comorbidities [18,22-25]. Moreover, Mannuzza et. al confirmed that the percentage of adults diagnosed with ADHD since childhood who had a bachelor's degree or higher is only 12% [26]. Adult ADHD's significant association with psychiatric conditions including mood and anxiety disorders, substance use disorders, and personality disorders is very well established in the literature and is consistent with our study findings [3,25,27].

IGD has been recently included in section III of DSM-5 because of its negative consequences through limitation of real-life experiences and similarity with addictive disorders [8]. In our study, the percentage of participants who met the diagnostic criteria for IGD was 14.7%, which is considerably higher than studies conducted in Germany (1.16%), China (2%), Saudi Arabia (4.2%), and Lebanon (9.2%) [14, 28-30]. This discrepancy may be attributed to the use of different diagnostic scales and sampling methods to evaluate IGD [28,31]. Our analysis revealed that male gender, younger age, being single and living in south of Jordan were factors significantly associated with risky gaming behavior and IGD. Dong et. al found that gaming cues stimulated in males more craving-related neural activations compared to females [32]. Therefore, this study provides evidence that males are still more vulnerable to IGD even after the drastic increase in the numbers of female gamers [32-34]. Furthermore, IGD is proven to have a negative effect on academic performance [28, 35]. In our study, respondents with higher GPA were less likely to have IGD.

The significant relationship between ADHD and IGD is very well established in the current literature and is consistent with our study findings [36]. A study found that impulsivity and hostility are the main factors contributing to comorbid ADHD and IGD among young adults, because addictive and aggressive behaviors were both proven among members with ADHD and IGD [12,37,38]. Furthermore, Lee et al. found that prognosis and recovery rate of IGD is directly related to treatment and improvement of ADHD symptoms [39].

The findings of this study have to be seen in the light of some limitations that could be addressed in future research. First, this study was conducted in a single country; hence, future studies are recommended to be multinational. Furthermore, the questions in our questionnaire were mainly used for screening purposes, not for diagnosis, which may result in false positives leading to an overestimation in the resulting prevalence. Lastly, the use of convenience sampling methods in this study may increase the risk of selection bias.

Acknowledgments

Thanks to our colleagues Shahed Mazen Masoud Naser, Dana Tahseen M.S. Libzo,

Ayah Ahmed, Moh'd Subhi Jaber, Malek Ayman Ali Zahran, Lara Saqr Khalaf Alslimat, Sara Khaled Ahmed Alabdallat, Afnan Saleh Ahmad Udwan, Abdelrahman F. Samhouri, Enas Adnan Husseen Sheeb, Selina Sorour Ahmad Sorour, Nermeen Ahmed Ishaq Abuhalaweh, Noura Mohammad Nathir Alqaisi, Maryam Mohammad Mohammad Younis, Mohamad Hussam Hesham Al-Bilbisi, Rose Rayyan, Maha Saleh Ahmad Jaradat, Nour Basil Mohammad Al-momani, Taimaa tariq ahmad alomoush, Dania Mohammad Saleem Abu Hawas, Omar Mohammad Omar Dabash, Amro Nedal Mohammad Ali Ali, Rawnaq Ahmad Hareb Al Qaryouti, Alaa Mohammed, Moh'd khier Al-Tarazi, Alzahraa saleh khaleel abu zahara, Bayan muhannad taysir shiekh Ali, Tasnim Almubtasem hasan alrimawi, Juman Amin Ibrahim Habboub for contributing to data collection.

Conflict of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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انتشار اضطراب نقص الانتباه وفرط الحركة، واضطراب الألعاب الإلكترونية على الإنترنت وعلاقتهما بين البالغين في الأردن: دراسة مقطعية

أحمد قفاف[1]، أحمد عطاري[1]، حسين عبدالإله[1]، تامر بركات[1]، يوسف عمر[1]

[1] كلية الطب، الجامعة الأردنية، عمان، الأردن

Received: September 20, 2023

Accepted: December 12, 2024

DOI: https://doi.org/10.35516/jmj.v59i3.1769

الملخص

خلفية الدراسة والأهداف : يحقق هذا البحث في مدى انتشار اضطراب فرط الحركة ونقص الانتباه لدى البالغين واضطراب العاب الانترنت بين الطلاب والخريجين الأردنيين، ويفحص علاقاتهما ومحدداتهما.

منهجية الدراسة : تم اجراء دراسة مقطعية باستخدام استبيان الكتروني ذاتي الادارة يتكون من ثلاثة أقسام: المعلومات الديموغرافية، مقياس تقرير الذات لاضطراب فرط الحركة ونقص الانتباه لدى البالغين، وتقييم اضطراب العاب الانترنت.

النتائج: من بين 1989 مشاركا، أظهرت النتائج أن 25.6% من المشاركين لديهم نتائج ايجابية لاضطراب فرط الحركة ونقص الانتباه لدى البالغين (متوسط مقياس تقرير الذات لاضطراب فرط الحركة ونقص الانتباه لدى البالغين 7.25). العوامل المرتبطة باضطراب فرط الحركة ونقص الانتباه لدى البالغين تضمنت الجنس الذكري، العمر الأصغر، المعدل التراكمي المنخفض، والتشخيصات النفسية السابقة. بالإضافة الى ذلك، استوفى 14.7% معايير اضطراب العاب الانترنت. وُجد أن الجنس الذكري، العمر الأصغر، الحالة الاجتماعية العازبة، والإقامة في جنوب الأردن مرتبطة بشكل كبير بسلوكيات الالعاب الخطرة واضطراب ألعاب الانترنت. لوحظ ارتباط كبير بين اضطراب ألعاب الانترنت واضطراب فرط الحركة ونقص الانتباه.

الاستنتاجات : تؤكد هذه الدراسة على انتشار ملحوظ لاضطراب فرط الحركة ونقص الانتباه لدى البالغين واضطراب العاب الانترنت، مشددة على الحاجة لزيادة الوعي واستراتيجيات التدخل لمعالجة التأثيرات النفسية لهذه الاضطرابات على رفاهية الأفراد.

الكلمات الدالة: اضطراب فرط الحركة ونقص الانتباه لدى البالغين، اضطراب فرط الحركة ونقص الانتباه، اضطراب نقص الانتباه وفرط الحركة لدى البالغين، اضطراب ألعاب الإنترنت