RESEARCH

Prevalence of insomnia in a sample of Internet addicts in different age groups in Abu Dhabi, UAE

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Abstract

Background Internet addiction, insomnia, and depression have a major health concern. The association of these problems can severely affect education, work productivity with negative outcomes for society. Internet addiction has been reported to be associated with insomnia and depression that may differ by age. The aim of the study is to assess the prevalence of insomnia and depression and their correlation with Internet addiction in all age groups and to detect age differences. A total of 386 participants were recruited. Data were collected using an online survey that contains questions about sociodemographic, Insomnia Severity Index (ISI), Internet Addiction Test (IAT), and Patient Health Questionnaire (PHQ9) to measure insomnia, Internet addiction, and depression, respectively.

Results The overall prevalence of clinically significant insomnia was 22.5% while subthreshold insomnia was present in 38.5%. There was a significant negative correlation of age with IAT and PHQ9. Also, a highly significant positive correlation was found between ISI, IAT, and PHQ9 within the total sample and each age group ($p = 0.000$).

Conclusions A great proportion of the general population suffers from insomnia, Internet addiction, and depression, and their prevalence rates differ by age. Also, there is a strong association between them. Identifying these problems is important, and interventions should include the three problems.

Keywords Insomnia, Depression, Internet addicts, Age groups

Background

Insomnia, a common sleep disturbance, is a public health problem, as it can result in physical and mental exhaustion [1]. Typical clinical symptoms of insomnia include inability to initiate sleep, maintain sleep, and/or early-morning waking with difficulty to return to sleep [2].

The prevalence of insomnia differs greatly in the general population across studies, to be from 6 to 50% [3, 4]. Insomnia has a negative impact on well-being and quality of life of people in all age groups [5]. It also has a considerable public health and social challenges, in the form accidents, decreased social, work, academic performance, and reduced work productivity [5, 6].

Internet use has increased exponentially all over the world to greater than 2.5 billion active users [7, 8]. Excessive Internet use is diagnosed when Internet use has come to be excessive, uncontrolled, and timewasting to the point of extremely disrupting people's lives [9].

Sleep difficulties are usually considered negative consequences of Internet addiction [10]. Excessive Internet use was also recorded to be related to mood disorders [11], decreased self-esteem [12], impulsivity [13], reduced levels of physical fitness [14], and medical problems (migraines, increased body weight, back pain) [15].

Relation between insomnia and depression has more than one direction. Literature shows that insomnia leads

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to depressive symptoms; some evidence characterize insomnia as a residual clinical symptom of depression, and yet, other studies propose that both have bidirectional relation [16–18].

Our hypothesis is that insomnia and depression have a major concern in society, and they have a relationship with Internet addiction that may differ by age. Detecting this association is important so that appropriate measures can be taken to address this problem. Thus, the aim of the study is to detect the prevalence of insomnia and depression and their correlation with Internet addiction in all age groups and to find age differences.

Methods

Study design and setting
It is a cross sectional study. An online survey using google form was created to collect data in Abu Dhabi, UAE. The survey was distributed through different social network applications (WhatsApp, Facebook groups, and LinkedIn) and emails via a link. Follow up reminder was sent to increase the response rate. The survey was sent in English due to the presence of multiple nationalities. The study was conducted from 1 September 2022 until 2 November 2022.

Participants
The study included people who were 18 years old or older, living in Abu Dhabi, and willing to participate. Individuals who had a medical disease, a history of diagnosed psychiatric illness (including a history of substance abuse) or were on medications were excluded from the study.

Sample size
Based on the study done by Al Karaki et al. 2020 prevalence of insomnia in general population was 47.1% [19]. Therefore, a minimum sample size of 383 subjects will be needed to reach a 95% confidence level and a margin of error 5%.

Measures
The online survey included the following data.

Sociodemographic data
Demographic characteristics were assessed, such as age, gender, marital status, educational level, occupation, and residency.

Insomnia Severity Index (ISI)
It is a 7-item self-administrated scale investigating the nature, intensity, and impact of insomnia during the past 2 weeks. Its total score ranging from 0 to 28 and interpreted as follows: no insomnia (0–7), subthreshold insomnia (8–14), moderate severity insomnia (15–21),

and severe insomnia (22–28) [20]. Clinical significant insomnia was classified if the total score was above 14 [21, 22].

Internet addiction test
It consists of 20 items, its score ranges from 0 to 100 during the past month and interpreted as follows: the normal user (total score $\leq$ 30), the mild user (score between 31 and 49), the moderate user (score between 50 and 79), and severe or excessive user (total score $\geq$ 80) [23, 24].

Patient Health Questionnaire 9 (PHQ9)
It is a self-report, 9-item scale for detecting depressive symptoms and investigating the severity of these symptoms in the last two weeks: no depressive symptoms (0 to 4), mild (5 to 9), moderate (10 to14), moderately severe (15 to19), and severe depression (20 to 27). PHQ9 scoring $\geq$ 10 was used to define depression [25].

Statistical analysis
Data was entered and statistically analyzed on the Statistical Package of Social Science Software program, version 25 (IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp.). Data was presented using median and range for quantitative variables and frequency and percentage for qualitative ones. Comparison between groups for qualitative variables was performed using chi-square or Fisher's exact tests (if expected counts were less than 5) while for quantitative variables the comparison was conducted using Mann–Whitney test (if 2 groups) or Kruskal Wallis test (if > 2 groups). Correlation between different quantitative or ordinal variables were assessed using Spearman correlation test. P values less than or equal to 0.05 were considered statistically significant.

Ethical consideration
Ethical approval was taken from the Ethical and Research Committee, Al Dhannah Hospital, Abu Dhabi, UAE (reference number EA/005/09/2022). Informed consent was obtained from all participants as it was the first question in the survey.

Results
Table 1 shows sociodemographic data of the participants. A total of 386 participants were included in the study. Of those, 261 (67.6%) were females and most responses were done by age group ranged from 30 to 39 (50.3%). Most of participants were married (63.5%), graduated (86.8%), and had a private work (50.8%).

The overall prevalence of clinically significant insomnia, Internet addiction, and depression was 22.5%, 48.4%, and 45.1%, respectively while subthreshold

Table 1 Sociodemographic data of the participants

	Description (*n* = 386)
Age	
18–29	108 (28)
30–39	194 (50.3)
40–49	63 (16.3)
50 or more	21 (5.4)
Sex	
Male	125 (32.4)
Female	261 (67.6)
Marital status	
Married	245 (63.5)
Unmarried	141 (36.5)
Educational level	
Less than university	51 (13.2)
University level	335 (86.8)
Job	
Governmental	116 (30.1)
Private	196 (50.8)
Unemployed	74 (19.2)
Residency	
Urban	274 (71)
Rural	112 (29)

insomnia was 38.6%. Age groups ranged from 30 to 39 and from 18 to 29 scored higher prevalence of insomnia, Internet addiction, and depression than other groups while participants 50 years or more had the least prevalence and it reached statistically significant difference on IAT scale (Table 2).

Median score of ISI scale was 9 ranged (0–27), males scored significantly higher than females on the ISI scale (*p* = 0.008). There was a statistically significant relation between occupation and insomnia as detected by ISI scale, where unemployed participants had more insomnia (*p* = 0.003) (Table 3).

Table 4 shows the relation between IAT and sociodemographic data where median score of IAT scale was 29 ranged (0–98), higher Internet addiction scores were in age group (18–29) (*p* = 005). Also, males scored significantly higher than females on IAT scale (*p* = 000). Besides, Internet addiction score was significantly greater in participants who were unemployed or had government jobs (*p* = 0.000), unmarried (*p* = 0.044), and those live in urban areas (*p* = 0.021).

Median score of PHQ9 was 9 ranged (0–27), younger age groups (18–29) and (30–39) scored significantly higher than older age groups on depression scale (PHQ9) (*p* = 0.002). Higher depression scores were found in unemployed participants or those with government jobs (*p* = 0.000) (Table 5).

Table 6 shows there was statistically significant negative correlation of age with IAT, and PHQ9 scales (*p* = 0.001, 0.002), respectively. Participants who were older had less Internet addiction and depression.

There was a highly statistically significant positive correlation between ISI, IAT, and PHQ9 within the total sample and each age group (*p* = 0.000). Participants who had more Internet addiction developed more insomnia and depression (Table 7).

Discussion

This study aimed to detect the prevalence of insomnia and depression and their correlation with Internet addiction among different age groups. This cross-sectional study included 386 subjects who responded through online self-reported survey. Subjects who were 18 years old and more were enrolled in the study.

Most of the subjects were females (67.6%), married (63.5%), with university level education (86.8%). Most of the participants were working whether government employment (30.1%) or private employment (50.8%), 50.3% of the subjects were ranging from 30 to 39 years old.

The current study showed that most of the participants (61.1%) had problems with their sleep where 22.5% of the participants had clinical significant insomnia and 38.6% had subthreshold insomnia. Younger age groups showed higher prevalence of insomnia, Internet addiction, and depression while participants 50 years or more had the least prevalence and it reached a statistically significant difference on IAT and PHQ9 scales (*P* = 0.005, *P* = 0.002), respectively.

This might be related to the changes in the pattern of sleep due to working and studying at this age as well as the societal, occupational, and academic needs and stressors disturb their sleep habits making them more prone to develop poor sleep quality [26]. This result was concordant with another study that was done on the prevalence of insomnia in the general population and found that younger adults with mean age less than 43 years suffer from insomnia more than older age and related these results to the rapid urbanization and industrialization that this age often faces, the stressors of society, working needs as they can work for long hours day and night, which affects their biological sleep pattern. Moreover, the widespread use of technology and new media, such as computers and smart phones in younger adults [27].

This study revealed that there was a statistically significant difference between males and females on ISI where males scored greater than females (*P* = 0.008). This result was inconsistent with Cao et al. 2017 who found no gender differences and Zeng et al. 2020 who found that the

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Table 2 Prevalence of insomnia, Internet addiction, and depression in the total sample and each age group (Insomnia Severity Index (ISI), Internet Addiction Test (IAT), and Patient Health Questionnaire (PHQ9)

	Total (*n* = 386) *N%*					
	Insomnia Severity Index					
	No insomnia	Subthreshold insomnia		Clinically significant insomnia	χ^2	*P* value
Total	150 (38.9)	149 (38.6)		87 (22.5)	2.425	0.877
Age groups						
18–29	39 (26)	47 (31.5)		22 (25.3)		
30–39	75 (50)	73 (49)		46 (52.9)		
40–49	26 (17.3)	23 (15.4)		14 (16.1)		
50 or more	10 (6.7)	6 (4)		5 (5.7)		
	Internet Addiction Test					
	Normal users	Mild users	Moderate users	Severe users		
Total	199 (51.6)	110 (28.5)	75 (19.4)	2 (0.5)	18.75	0.027
Age groups						
18–29	42 (21.1)	37 (33.6)	29 (38.7)	0 (0)		
30–39	100 (50.3)	56 (50.9)	36 (48)	2 (100)		
40–49	43 (21.6)	12 (10.9)	8 (10.7)	0 (0)		
50 or more	14 (7)	5 (4.5)	2 (2.7)	0 (0)		
	Patient Health Questionnaire					
	No depression		Depression			
Total	212 (54.9)		174 (45.1)		7.46	0.059
Age groups						
18–29	53 (25)		55 (31.6)			
30–39	103 (48.6)		91 (52.3)			
40–49	40 (18.9)		23 (13.2)			
50 or more	16 (7.5)		5 (2.9)			

χ^2 = chi-square value

prevalence of insomnia in females was higher than males. These differences might be related to the difference in the methodology as Cao et al. 2017 and Zeng et al. 2020 used meta-analysis study with larger number of participants [27, 28].

Regarding the correlation of employment with ISA, this study showed that insomnia score was significantly greater in unemployed participants ($p = 0.003$). This might be related to that the participants who are not working might suffer the stressors of socioeconomic circumstances (e.g., difficulty in job seeking, financial problems, responsibilities) that result in lower mental, physical health and sleep disturbances and this was concordant with Lallukka et al. 2012 and Soltani et al. 2012 who found that unemployed participants had higher prevalence of insomnia [29, 30].

In this study 48.4% of the participants suffered from Internet addiction and age was statistically significant related to IAT, where participants with age range from 18–29 had higher median score of Internet addiction ($p = 0.005$). This could be related to the wide spread of social media, videogames, and smartphones among this age as well as the use of media in work and online

working specially after the COVID and COVID quarantine. This result was consistent with meta-analysis study done by Blasco et al. 2022 who found that Internet addiction was higher among the new generations [31].

Moreover, males scored significantly higher than females on IAT scale ($p = 0.000$) in the current study. This was in harmony with Dieris-Hirche et al. 2017 and Ceyhan et al. 2019 who found that the prevalence of Internet addiction was higher among male gender [32, 33]. This could be explained by the fact that females are mostly involved in home duties and their children's care, as well as males are more prone to addiction in general, and their Internet addiction may involve gaming or cyber-sex, which are more common in males as well. Besides, Internet addiction median score was significantly greater in participants who were unemployed ($p = 0.000$), in a governmental job ($p = 0.000$) and unmarried ($p = 0.044$) as they might have more free time to join the Internet and social media as they do not have a lot of work or marital life, as well as suffer more from loneliness and psychological problems, which might lead them to spend more time on the Internet, as shown by other studies where they found that emotional instability, psychological problems,

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Table 3 Relation between Insomnia Severity Index (ISI) and sociodemographic data

	Insomnia Severity Index		P value
	Median (range)	Statistical values	
Total sample	9 (0–27)		
Age			
18–29	10 (0–25)		
30–39	10 (0–27)	KW = 1.842	0.606#
40–49	9 (0–23)		
50 or more	8 (0–21)		
Sex			
Male	10 (0–25)	Z = − 2.668	0.008*
Female	8 (0–27)		
Marital status			
Married	9 (0–27)	Z = − 0.001	0.999*
Unmarried	9 (0–25)		
Educational level			
Less than university	10 (0–25)	Z = − 0.453	0.650*
University level	9 (0–27)		
Occupation			
Governmental	9 (0–23)		
Private	9 (0–25)	KW = 11.775	0.003#
Unemployed	12 (1–27)		
Residency			
Urban	9 (0–26)	Z = − 0.519	0.604*
Rural	9 (0–27)		

Z Z value, *KW* Kruskal–Wallis value

* Mann–Whitney test

Kruskal–Wallis test

Table 4 Relation between Internet Addiction Test (IAT) and sociodemographic data

	Internet Addiction Test		P value
	Median (range)	Statistical values	
Total sample	29 (0–98)		
Age			
18–29	35 (2–78)		
30–39	29 (0–98)	KW = 12.968	0.005#
40–49	25 (0–72)		
50 or more	19 (0–63)		
Sex			
Male	38 (0–77)	Z = − 4.486	0.000*
Female	27 (0–98)		
Marital status			
Married	27 (0–76)	Z = − 2.015	0.044*
Unmarried	33 (0–98)		
Educational level			
Less than university	34 (0–71)	Z = − 1.865	0.062*
University level	28 (0–98)		
Occupation			
Governmental	37.5 (1–98)		
Private	24 (0–76)	KW = 35.075	0.000#
Unemployed	39 (4–78)		
Residency			
Urban	31.5 (0–98)	Z = − 2.315	0.021*
Rural	25.5 (0–95)		

Z Z value, *KW* Kruskal–Wallis value

* Mann–Whitney test

Kruskal–Wallis test

and negative socioeconomic factors were associated with Internet addiction [31–33]. Also, being unemployed or in a governmental job adds more stress on individuals, as this may affect their subjective feeling of achievement with unemployment or the economic burden of a governmental job, which will affect their mood and may lead to Internet addiction.

As regards PHQ9, 22.5% of the participants in this study were suffering from depression and age was significantly related to PHQ9 scale where those aged 18–29 and 30–39 years showed higher median score of depression ($p = 0.002$). Also, greater depression scores were in unemployed participants or those with government jobs ($p = 0.000$). This might be related to the nature of this age group (Young adulthood) as this period is considered as a transitional zone with multiple challenges and stresses regarding having independent personality from parents and searching for more stability in social relations, career, income, marital life, financial and emotional stability. This result was consistent with Babajide et al. 2020 who

found that the prevalence of depression was higher in young adults [34]

The current study revealed that there was a strong significant positive correlation between insomnia, Internet addiction, and depression within the total sample and each age group. Participants who suffer from Internet addiction and depression had higher rates and levels of insomnia. Also, those who had Internet addiction were more depressed. These findings were in harmony with other studies that were done on the association between online addiction and emotional instability and depression and revealed that difficulties in emotional regulation, anxiety and depression were statistically significantly contributed to the risk for development of Internet addiction where the severity of Internet addiction was associated not only with a higher rate of psychiatric disorders, but also with a greater severity of their symptoms [31, 33, 35]. Another study done by Parash et al. 2017 showed that there was association of insomnia, Internet addiction, and depression. The association between insomnia

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Table 5 Relation between Patient Health Questionnaire (PHQ9) and sociodemographic data

	PHQ-9 Median (range)	Statistical values	P value
Total sample	9 (0–27)		
Age			
18–29	10 (0–27)		
30–39	9 (0–27)	KW = 14.476	0.002#
40–49	6 (0–23)		
50 or more	4 (0–19)		
Sex			
Male	10 (0–27)	Z = − 1.638	0.101*
Female	8 (0–27)		
Marital status			
Married	8 (0–27)	Z = − 1.826	0.068*
Unmarried	9 (0–27)		
Educational level			
Less than university	8 (0–25)	Z = − 0.637	0.524*
University level	9 (0–27)		
Occupation			
Governmental	10 (0–27)		
Private	8 (0–27)	KW = 16.129	0.000#
Unemployed	11 (1–25)		
Residency			
Urban	9 (0–27)	Z = − 1.042	0.297*
Rural	8 (0–27)		

Z = *Z* value, *KW* = Kruskal–Wallis value

* Mann–Whitney test

Kruskal–Wallis test

Table 6 Correlation of age with Insomnia Severity Index (ISI), Internet Addiction Test (IAT), and Patient Health Questionnaire (PHQ9)

		Age
Insomnia Severity Index	r	− 0.058
	P	0.254
Internet Addiction Test	r	− 0.175
	P	0.001
PHQ-9	R	− 0.159
	P	0.002

r = Spearman correlation coefficient

and depression is mediated by Internet addiction. Also, the relation between Internet addiction and depression is mediated by insomnia [26].

An individual may not develop mental disorders just due to Internet use, but if a person does not sleep well because of excessive Internet use that is increasing daily, s/he is at risk of having mental disorders when compared

Table 7 Correlation between the three indices (ISI, IAT, and PHQ9) within the total sample and each age group

Total sample			Insomnia Severity Index	Internet Addiction Test
	Internet Addiction Test	r	0.433	
		P	0.000	
	PHQ-9	r	0.597	0.591
		P	0.000	0.000
Age			Insomnia Severity Index	Internet Addiction Test
18–29	Internet Addiction Test	r	0.454	
		P	0.000	
	PHQ-9	r	0.600	0.533
		P	0.000	0.000
Age			Insomnia Severity Index	Internet Addiction Test
30–39	Internet Addiction Test	r	0.415	
		P	0.000	
	PHQ-9	r	0.603	0.574
		P	0.000	0.000
Age			Insomnia Severity Index	Internet Addiction Test
40–49	Internet Addiction Test	r	0.384	
		P	0.002	
	PHQ-9	r	0.517	0.569
		P	0.000	0.000
Age			Insomnia Severity Index	Internet Addiction Test
50 or more	Internet Addiction Test	r	0.610	
		P	0.003	
	PHQ-9	r	0.735	0.717
		P	0.000	0.000

r = Spearman correlation coefficient

to those who sleep well [36, 37]. Staying up late at night leads to sleep problems in Internet users and continuous sleep deficiency may develop psychiatric disorders such as depressive symptoms, anxiety, affective problems, and distress in general [38, 39].

Limitations
The survey was a cross-sectional study. It was unable to detect a cause and effect. Assessment was done by an online questionnaire and depended on self-reporting tools.

Conclusions
Insomnia, Internet addiction, and depression are common health problems, and their prevalence rates differ by age. Also, there is a strong correlation between them. Identifying these problems is important, and since the three disorders are found to be linked together,

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assessment should include all three together if an individual suffers from any one of them.

Abbreviations

ISA   Insomnia Severity Index
IAT   Internet Addiction Test
PHQ9   Patient Health Questionnaire

Authors' contributions
SHS: study conception and design, developed the protocol, methodology (questionnaire), data collection, writing the manuscript, and submitting it. EAA: data collection. MMA: statistical part. NM: data collection, writing the manuscript. All authors read and approved the final manuscript.

Availability of data and materials
Upon request.

Declarations

Ethics approval and consent to participate
Ethical approval was obtained from the Ethical and Research Committee, Al Dhannah Hospital, Abu Dhabi, UAE (reference number EA/005/09/2022). Informed consent was taken from all participants as it was the first question in the survey.

Consent for publication
Not applicable.

Competing interests
All authors declare that they have no competing interests.

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