Mobile Phone Addiction and its Relationship to Sleep Quality among the General Population in Abha City, Saudi Arabia

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Abstract

Background: Smartphones are not just used for phone calls and text messaging, but also provide internet access to multimedia through social networks, videogames and Global Positioning System navigation.

Objectives: To assess extent of mobile phone use, and its possible impact on patterns of sleep quality disturbance among the general population.

Methods: A cross-sectional study was conducted among a sample of the general adult population aged >18 years, recruited from large malls in Abha City, Aseer Region, Saudi Arabia between January to December, 2020. Two data collection tools were employed in this study, i.e., the Smartphone Addiction Scale (SAS) to assess smartphone addiction and the Pittsburgh Sleep Quality Index (PSQI) to measure the quality and patterns of sleep.

Results: The study included 475 participants. Their age ranged between 18 and 60 years with a mean±SD of 28.1±8.4 years. Males represented 51.2% of them. The majority (83.8%) reported using a smartphone mainly in social media (48.8%) and considered themselves smartphone addicts. The overall smartphone addiction scale score ranged between 37 and 161 (out of 165) with a mean±SD of 100.2±21.4. Highest scores were reported among those using smartphone for playing games (p=0.003). There was a significant negative correlation between participants' age and their smartphone addiction scale scores (r= -0.112, p=0.015). Overall, poor sleep quality, based on PSQI was observed among 93.7% of participants. Smartphone addiction scale score was significantly associated with subjective sleep quality (p<0.001), sleep latency (p<0.001), sleep duration (p=0.001), habitual sleep efficiency (p=0.029), daytime sleep dysfunction (p<0.001) and overall sleep quality (p=0.001).

Conclusion: Smartphone addiction is an evident problem among our population, particularly younger people. Smartphone addiction is associated with long sleep latency, shorter sleep duration, lower sleep efficiency, higher daytime sleep dysfunction and overall poor sleep quality.

Key Words: Smartphone, Addiction, Sleep quality, Pittsburgh Sleep Quality Index, Smartphone Addiction Scale

Introduction

Under the extensive technological revolution, mobile phone (MP) usage has rapidly increased[1]. Nowadays, smartphones are not just used for phone-calls and text-messaging, but it goes beyond that. They provide internet access to multimedia through social networks, video games and Global Positioning System (GPS) navigation[2] MPs are now utilized globally as one of the chief information and communication technologies (ICTs)[1].

Despite the benefits, there are many adverse effects of smartphone irrational usage. MP can lead also to dependency problems;[3] characterized by excessive and continuous performing of an activity despite its negative outcomes. This includes mental stress, feeling of being captivated, role conflicts, and obligatory feelings to respond to all notifications, calls, and messages. Nomo-phobia is a fear of not having the MP around. Saudi Arabia is ranked the first of all countries of the Gulf Cooperation Council regarding the proportion of MP users [4].

Furthermore, sleep is crucial for preserving a person's physical and mental health. Smartphone usage might lead to sleep disturbance [5], which may affect the concentration level and academic performance[6]. However, little research has been done to determine the pattern of MP usage, and the relationship between usage and sleep quality[7] However, the real scale of this problem is largely unknown and no recent study related to this problem has been published in our area.

The present study aimed to assess extent of mobile use, and its possible impact on patterns of sleep quality disturbance among the general population.

Methodology

A cross-sectional study was conducted in Abha City, Aseer Region, Saudi Arabia that included adults aged > 18 years. The minimum sample size for this study was decided according to Swinscow and Cohen, [8] to be 385, (with z-value = 1.96; estimated prevalence in the population = 50%, and a precision level of 0.05).

Following a convenience sampling technique during the period from January to December 2020, the researchers interviewed 475 participants from community places, such as malls, in Abha City, Aseer Region, Saudi Arabia.

All respondents were exposed to the study questionnaire that was designed by the researchers. It comprised two data collection tools, as follows:

• **Smartphone Addiction Scale (SAS) [9]**.
It is a 33-item self-report measure explaining the behaviors associated with smartphone use. It is arranged into six subscales: "Daily-Life Disturbance, Positive Anticipation, Withdrawal, Cyberspace-Oriented Relationship, Overuse, and Tolerance". The measure utilizes a five-point Likert scale response format ranging from "1" (strongly disagree) to "5" (strongly agree), with a maximum total score of 165. It has high internal consistency (Cronbach's alpha = 0.97).

• **The Pittsburgh Sleep Quality Index (PSQI):**
It is an effective instrument used to measure the quality and patterns of sleep in adults. It differentiates "poor" from "good" sleep quality by measuring seven areas (components): subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medications, and daytime dysfunction over the last month. It is a self-report questionnaire that assesses sleep quality over a 1-month time interval. The measure consists of 19 individual items, creating 7 components that produce one global score, and takes 5–10 minutes to complete. Developed by researchers at the University of Pittsburgh, the PSQI is intended to be a standardized sleep questionnaire for clinicians and researchers to use with ease and is used for multiple populations. A total score of "5" or greater is indicative of poor sleep quality [10].

Collected data were checked for completeness and were stored in a personal computer, edited, coded and entered using the Statistical Package for Social Sciences (IBM, SPSS version 26). Analyzed data were described as Mean±SD for quantitative variables and frequency and percentages for qualitative variables [11]. Student t-test was used to compare means of two different groups while one-way analysis of variance test (ANOVA) was adopted to compare means between more than two groups. P-values less than 0.05 were considered as statistically significant.

The researchers fulfilled all the required official and ethical approvals. Before interviewing, informed consent was obtained from all participants. All participants had the right not to participate in the study or to withdraw from the study prior to completion. The researchers explained the purpose of the study to all respondents. Confidentiality and privacy were guaranteed for all participants. This study was carried out at the full expense of the researcher.

Results

The study included 475 participants, whose ages ranged between 18 and 60 years with an arithmetic mean of 28.1 and standard deviation (SD) of ±8.4 years. Males represented 51.2%, 78.8% were university graduated and 44.6% were employees, as shown in Table 1.

Figure 1 shows that 83.8% of participants reported using smartphone mainly in social media, while 11.4% used it for internet access. Almost half of the participants (48.8%) considered themselves smartphone addicts, while 35.6% were not sure about that, as shown in Figure 2.

Table 1: Personal characteristics of participants (n=475)

	Frequency	Percentage
Gender		
• Male	243	51.2
• Female	232	48.8
Age in years		
• Range	18-60	
• Mean±SD	28.1±8.4	
Level of education		
• School	68	14.3
• University	374	78.8
• Postgraduate	33	6.9
Job status		
• Not working	85	17.9
• Student	178	37.5
• Employee	212	44.6

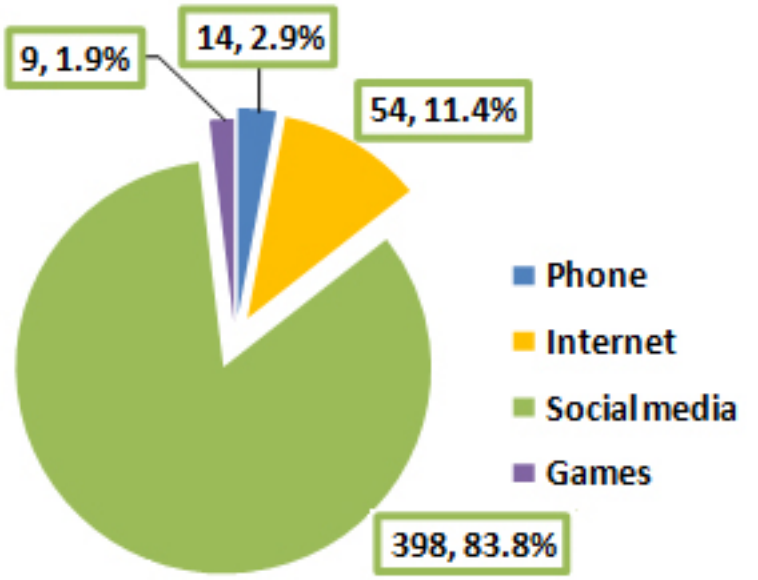

Figure 1: Main uses of smartphone among participants

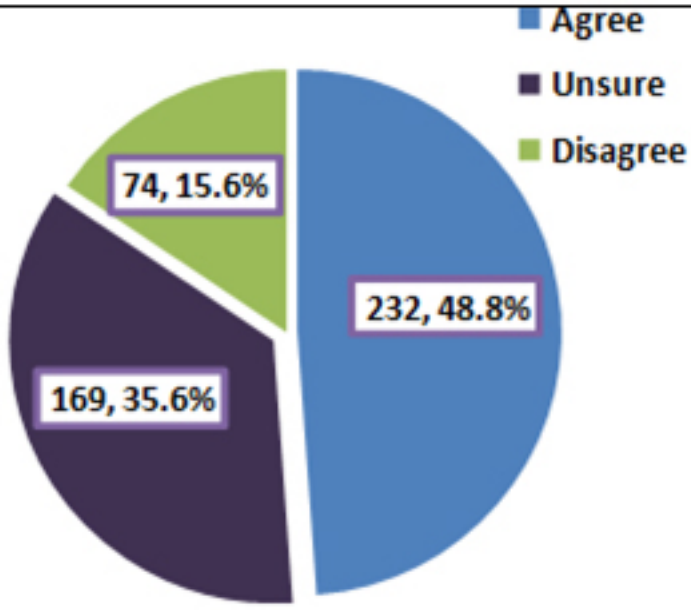

Figure 2: Self-reported smartphone addiction among participants

Table 2: Responses of participants to Smartphone Addiction Scale statements

Responses associated with smartphone use	Strongly disagree No. (%)	Disagree No. (%)	Neither agree nor disagree No. (%)	Agree No. (%)	Strongly agree No. (%)
Missing planned work	82 (17.3)	114 (24.0)	106 (22.3)	120 (25.2)	53 (11.2)
Having hard time concentrating in class, while doing assignments, or while working	0 (0.0)	126 (26.5)	105 (22.1)	110 (23.2)	134 (28.2)
Experiencing lightheadedness or blurred vision	104 (21.9)	164 (34.6)	57 (12.0)	109 (22.9)	41 (8.6)
Feeling pain in the wrists or at the back of the neck	84 (17.7)	112 (23.6)	59 (12.4)	150 (31.6)	70 (14.7)
Feeling tired and lacking adequate sleep	75 (15.8)	120 (25.3)	78 (16.4)	142 (29.9)	60 (12.6)
Feeling calm or cozy	55 (11.6)	78 (16.4)	170 (35.8)	124 (26.1)	48 (10.1)
Feeling pleasant or excited	31 (6.5)	74 (15.6)	143 (30.1)	165 (34.7)	62 (13.1)
Feeling confident	46 (9.7)	122 (25.7)	178 (37.5)	88 (18.5)	41 (8.6)
Being able to get rid of stress	52 (10.9)	86 (18.1)	115 (24.2)	157 (33.1)	65 (13.7)
There is nothing more fun to do	78 (16.4)	141 (29.7)	105 (22.1)	102 (21.5)	49 (10.3)
Life would be empty without smartphone	38 (8.0)	69 (14.5)	66 (13.9)	164 (34.5)	138 (29.1)
Feeling most liberal	40 (8.4)	99 (20.8)	118 (24.8)	146 (30.7)	72 (15.2)
Using a smartphone is the most fun thing to do.	70 (14.7)	149 (31.4)	102 (21.5)	104 (21.9)	50 (10.5)

Table 2 summarizes the responses of participants regarding the 33 statements of the SAS. Most participants (66.7%) either strongly agreed or agreed that they are using smartphones longer than they had intended, always thinking that they should shorten their smartphone use time (65.3%), that their life would be empty without their smartphone (63.6%), that their fully charged battery does not last for one whole day (61.9%), that they are preferring searching from their smartphone to asking other people (58.5%), and that they are checking social networking service sites, like Twitter or Instagram, right after waking up (58.3%). The overall score ranged between 37 and 161 (out of 165) with a mean±SD of 100.2±21.4.

Table 2 (continued): Responses of participants to Smartphone Addiction Scale statements

Responses associated with smartphone use	Strongly disagree No. (%)	Disagree No. (%)	Neither agree nor disagree No. (%)	Agree No. (%)	Strongly agree No. (%)
Won't be able to stand not having a smartphone	71 (14.9)	169 (35.6)	69 (14.5)	105 (22.1)	61 (12.8)
Feeling impatient and fretful when not holding smartphone	75 (15.8)	207 (43.6)	88 (18.5)	65 (13.7)	40 (8.4)
Having smartphone in mind even when not using it	86 (18.1)	177 (37.2)	78 (16.4)	100 (21.1)	34 (7.2)
I will never give up using smartphone even when daily life is already greatly affected by it	76 (16.0)	152 (32.0)	106 (22.3)	103 (21.7)	38 (8.0)
Getting irritated when bothered while using smartphone	60 (12.6)	130 (27.5)	108 (22.7)	127 (26.7)	50 (10.5)
Bringing smartphone to the toilet even when in a hurry to get there	130 (27.4)	95 (20.0)	52 (10.9)	116 (24.4)	82 (17.3)
Feeling great meeting more people via smartphone use	83 (17.5)	96 (20.2)	109 (22.9)	122 (25.7)	65 (13.7)
Feeling that relationships with smartphone buddies are more intimate than real-life friends	120 (25.3)	144 (30.1)	85 (17.9)	74 (15.6)	52 (10.9)
Not being able to use smartphone would be as painful as losing a friend	99 (20.8)	145 (30.6)	99 (20.8)	79 (16.6)	53 (11.2)
Feeling that smartphone buddies understand me better than real-life friends	119 (25.1)	153 (32.1)	101 (21.3)	68 (14.3)	34 (7.2)
Constantly checking smartphone so as not to miss conversations between other people on social networks	44 (9.3)	100 (21.1)	93 (19.6)	172 (36.1)	66 (13.9)
Checking social networking service sites after waking up	41 (8.6)	73 (15.4)	84 (17.7)	174 (36.6)	103 (21.7)
Preferring talking with smartphone buddies to hanging out with real-life friends or with other family members	138 (29.1)	135 (28.4)	111 (23.4)	60 (12.6)	31 (6.5)
Preferring searching from smartphone to asking other people	26 (5.5)	59 (12.4)	112 (23.6)	168 (35.3)	110 (23.2)
A fully charged battery does not last for one whole day	30 (6.3)	87 (18.3)	64 (13.5)	141 (29.7)	153 (32.2)
Using smartphone longer than intended	29 (6.1)	53 (11.2)	76 (16.0)	176 (37.1)	141 (29.6)
Feeling the urge to use smartphone again right after stopping using it	30 (6.3)	83 (17.5)	118 (24.8)	168 (35.4)	76 (16.0)
Having tried time and again to shorten smartphone use time, but failing all the time	50 (10.5)	115 (24.2)	101 (21.3)	134 (28.2)	75 (15.8)
Always thinking of shortening smartphone use time	30 (6.3)	52 (10.9)	83 (17.5)	186 (39.2)	124 (26.1)
People advise not to use smartphone too much.	86 (18.1)	156 (32.9)	77 (16.2)	99 (20.8)	57 (12.0)

Males had higher mean SAS score than females (102.05±21.48 versus 98.32±21.10), However, this difference was not significant (p=0.057). Those using smartphone in playing games expressed the highest SAS score compared to others (34.99±11.66, p=0.003). Job status and educational level were not significantly associated with SAS score, as shown in Table 3. There was a significant negative correlation between participants' age and their SAS scores (r= -0.112, p=0.015), as shown in Figure 3.

Table 3: Factors associated with smartphone addiction among the participants

	Smartphone addiction scale score (Mean±SD)	P-Value
Gender		
• Male (n=243)	102.05±21.48	
• Female (n=232)	98.32±21.10	0.057
Level of education		
• High school (n=68)	98.22±22.19	
• University (n=374)	100.07±21.24	
• Postgraduate (n=33)	106.15±20.53	0.206
Job status		
• Not working (n=85)	99.98±24.92	
• Student (n=178)	99.98±20.08	
• Employee (n=212)	100.53±20.95	0.962
Main use of smartphone		
• Phone (n=14)	90.93±16.93	
• Internet (n=54)	102.56±20.76	
• Social media(n=398)	99.90±1.05	
• Games (n=9)	134.99±11.66	0.003

Figure 3: Correlation between participants' age and total smartphone addiction scale score

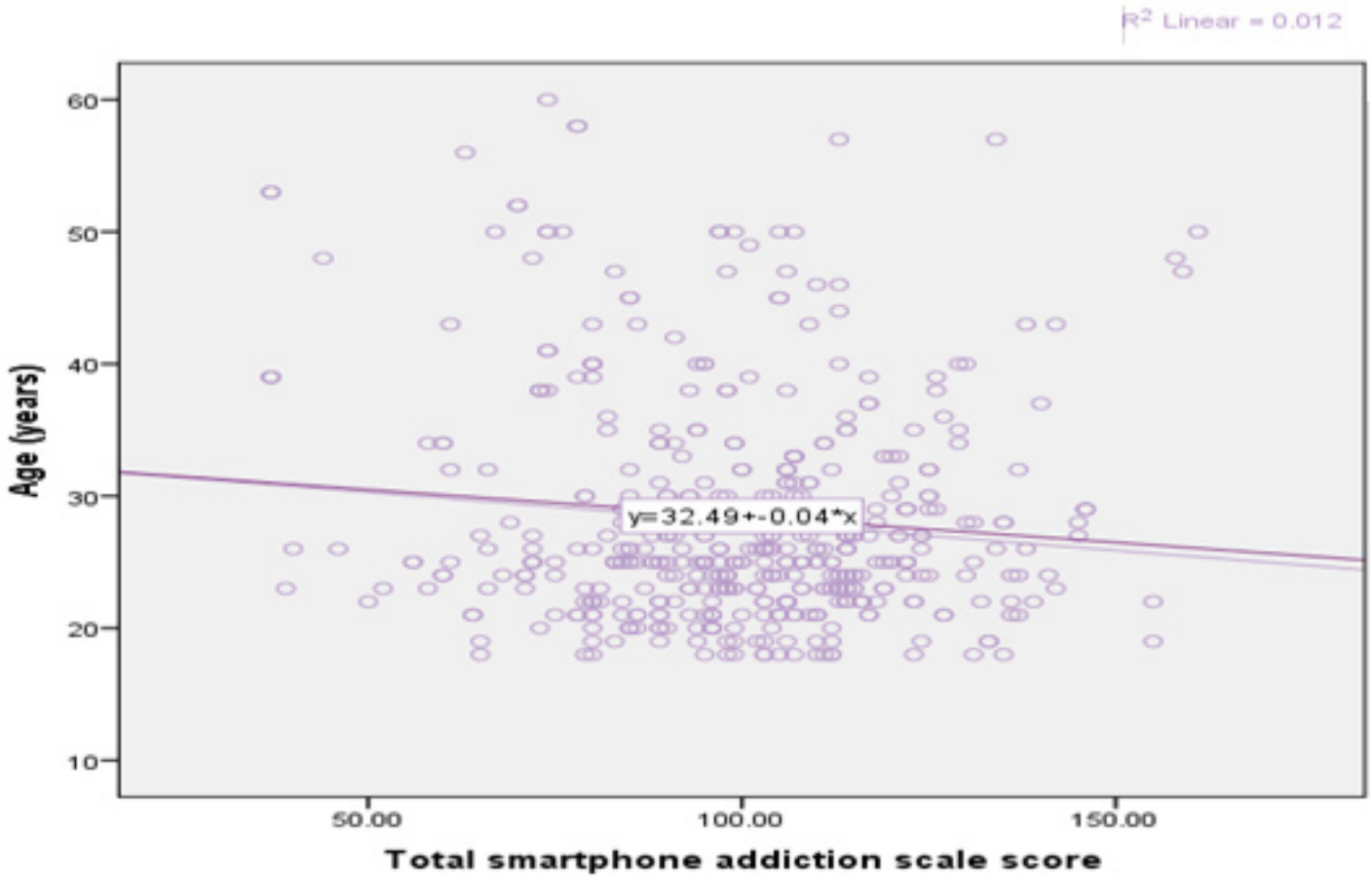

Figure 4 shows that 43.2% described their sleep quality as fairly good, whereas 23.2% and 16% described it as fairly bad and very bad, respectively. The overall, poor sleep quality, based on PSQI, was observed among 93.7% of participants, as shown in Figure.

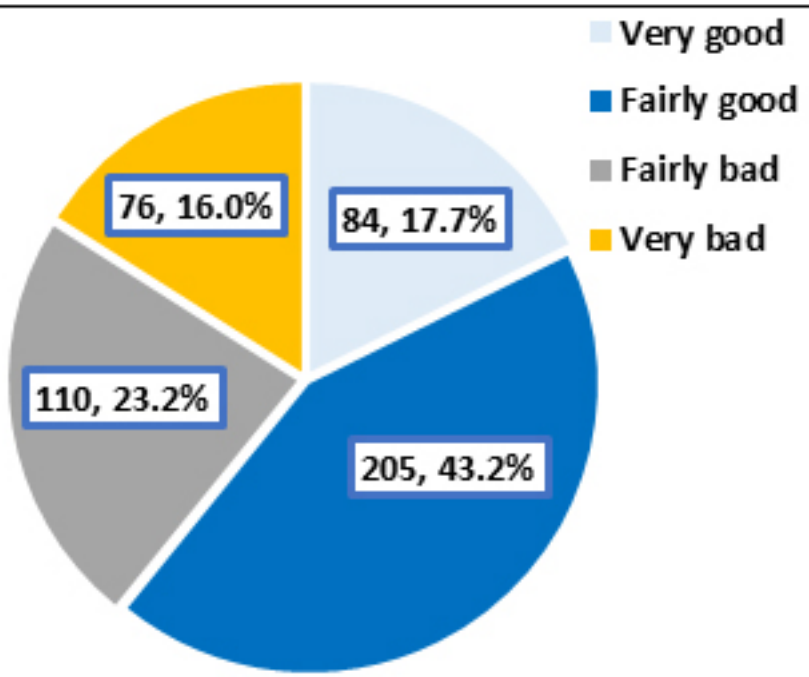

Figure 4: Subjective sleep quality among participants

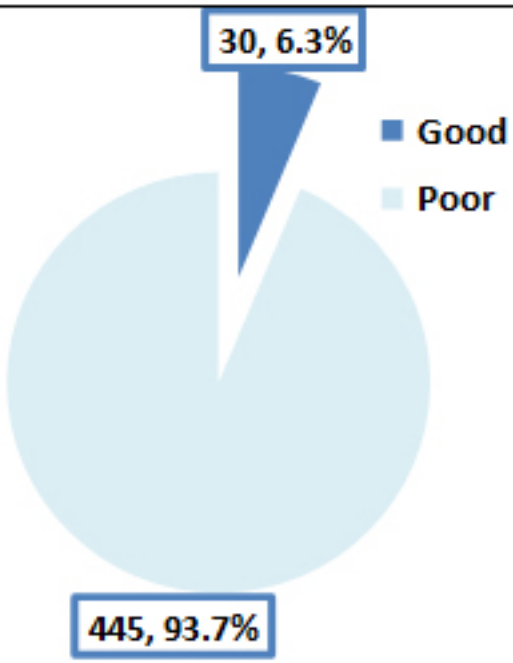

Figure 5: Overall sleep quality among the participants

Table 4: Sleep pattern among the participants in the past month

Sleep pattern	Frequency	Percentage
Duration in minutes to fall asleep each night		
• ≤15	111	23.4
• 16-30	199	41.8
• 31-60	93	19.6
• >60	72	15.2
Hours of actual sleep at night		
• <5	140	29.9
• 5-6	110	23.2
• 6-7	124	26.1
• >7	99	20.8
Hours in bed at night		
• <5	167	35.2
• 5-6	77	16.2
• 6-7	86	18.1
• >7	145	30.5
Habitual sleep efficiency		
• <65%	167	35.2
• 64-74%	77	16.2
• 75%-84%	86	18.1
• ≥85%	145	30.5

Table 4 shows that 41.8% of participants stayed between 16 and 30 minutes in bed before falling asleep each night in the past month whereas 15.2% of them stayed more than one hour. Moreover, from Table 5, more than one-third of them (35.2%) cannot get to sleep within 30 minutes three times or more a week in the past month. Only 20.8% of participants slept more than 7 hours per night in the past month while 29.9% of them reported sleeping for less than five hours each night. Habitual sleep efficiency was less than 65% among 35.2%, while it was 85% or above among 30.5% of them.

Table 5 shows that the commonest reported sleep troubles (three times or more in a week) during the past month, with the exception of sleep latency, were waking up in the middle of the night or early morning (30.5%), feeling too hot (17.3%), having to get up to use the bathroom (13.7%) and having pain (13.3%).

Table 6 shows that 5.1% reported using sleep medications three times or more a week to help in sleep in the past month. Having troubles staying awake while driving, eating meals or engaging in social activities in a frequency of three times or more a week were reported by 8.8% of participants in the last month. Additionally, 23.6% reported that three times or more a week, it has been a problem for them to keep up enthusiasm to get things done.

Table 5: Frequency of sleep troubles during the past month among the participants

	Not during the past month No. (%)	Less than once a week No. (%)	Once or twice a week No. (%)	Three times or more a week No. (%)
Cannot get to sleep within 30 minutes	83 (17.5)	109 (22.9)	116 (24.4)	167 (35.2)
Wake up in the middle of the night or early morning	104 (21.9)	122 (25.7)	104 (21.9)	145 (30.5)
Have to get up to use the bathroom	161 (33.9)	146 (30.7)	103 (21.7)	65 (13.7)
Cannot breathe comfortably	299 (62.9)	89 (18.7)	44 (9.3)	43 (9.1)
Cough or snore loudly	353 (74.3)	72 (15.2)	29 (6.1)	21 (4.4)
Feel too cold	256 (53.9)	104 (21.9)	70 (14.7)	45 (9.5)
Feel too hot	172 (36.4)	118 (24.8)	103 (21.7)	82 (17.3)
Have bad dreams	201 (42.3)	153 (32.2)	68 (14.3)	53 (11.2)
Have pain	265 (55.8)	95 (20.0)	52 (10.9)	63 (13.3)

Table 6: History of using sleep medications to help in sleep and daytime sleep dysfunction among participants

Variables	Not during the past month No. (%)	Less than once a week No. (%)	Once or twice a week No. (%)	Three times or more a week No. (%)
Using sleep medications	370 (77.9)	49 (10.3)	32 (6.7)	24 (5.1)
Having troubles staying awake while driving, eating meals or engaging in social activities	249 (52.4)	110 (23.2)	74 (15.6)	42 (8.8)
How much a problem has it been for you to keep up enthusiasm to get things done	141 (29.7)	119 (25.1)	103 (21.7)	112 (23.6)

Table 7 shows that the score of SAS was highest (108.70±20.90) among participants with subjective sleep quality of a score of 3 (very bad) and lowest (89.43±22.83) among those with subjective sleep quality score of zero (very good), $p<0.001$. Similarly, the score of SAS was highest (109.19±15.88) among participants with sleep latency of a score of 3 (>60 minutes) and lowest (91.95±21.31) among those with sleep latency score of zero (<15 minutes), $p<0.001$. Regarding sleep duration, the score of SAS was highest (104.93±22.64) among participants with sleep duration of a score of 3 (<5 hours) and lowest (95.52±19.76) among those with sleep duration score of 1 (6-7 hours), $p=0.001$. SAS score was highest (103.61±20.25) among participants with habitual sleep efficiency of a score of 3 (<65%) and lowest (96.54±22.46) among those with habitual sleep efficiency score of 0 (≥85%), $p=0.029$. SAS score was highest (106.68±19.68) among participants with daytime sleep dysfunction of a score of 2 (once or twice a week) and lowest (93.08±23.79) among those with daytime sleep dysfunction score of 0 (none), $p<0.001$. SAS score was significantly higher among participants with overall poor sleep quality compared to those with good sleep quality (101.04±21.03 versus 88.10±22.80), $p=0.001$.

Table 7: Association between smartphone addiction and sleep quality among participants

Sleep quality scores	Smartphone addiction scale score (Mean±SD)	P-Value
Subjective sleep quality		
• 0 (n=84)	89.43±22.83	
• 1 (n=205)	97.04±19.96	
• 2 (n=110)	108.55±17.64	
• 3 (n=76)	108.70±20.90	<0.001*
Sleep latency		
• 0 (n=43)	91.95±21.31	
• 1 (n=151)	93.99±20.57	
• 2 (n=167)	101.87±22.85	
• 3 (n=114)	109.19±15.88	<0.001*
Sleep duration		
• 0 (n=99)	97.11±21.30	
• 1 (n=124)	95.52±19.76	
• 2 (n=110)	102.26±20.09	
• 3 (n=142)	104.93±22.64	0.001*
Habitual sleep efficiency		
• 0 (n=145)	103.61±20.25	
• 1 (n=86)	100.38±19.21	
• 2 (n=77)	101.68±22.33	
• 3 (n=167)	96.54±22.46	0.029*
Sleep disturbances		
• 0 (n=17)	93.59±22.37	
• 1 (n=310)	100.16±20.11	
• 2 (n=141)	100.58±22.66	
• 3 (n=7)	112.29±39.69	0.271*
Use of sleeping medications		
• 0 (n=370)	99.56±21.29	
• 1 (n=49)	101.84±21.33	
• 2 (n=32)	98.06±22.37	
• 3 (n=24)	110.04±19.49	0.110*
Daytime dysfunction		
• 0 (n=102)	93.08±23.79	
• 1 (n=167)	96.89±19.43	
• 2 (n=157)	106.68±19.68	
• 3 (n=49)	105.84±20.77	<0.001*
Overall sleep quality		
• Good (n=30)	88.10±22.80	
• Poor (n=445)	101.04±21.03	0.001**

Discussion

In the present study, almost half of participants considered themselves smartphone addicts while more than a third of them were not sure about that. Furthermore, the mean±SD of smartphone addiction scale was 100.2±21.4 (out of a possible 165). These findings indicate a considerable rate of smartphone addiction among adult population in our community. Quite similar findings were observed in a study carried out among medical students in India using a short form of SAS where 44.7% were smartphone addicts[12]. In Jeddah, most medical students (73.4%) reported using their smartphones for more than 5 hours per day and the most frequently used applications were social media, similar to what has been reported in the present study [13]. In Turkey, Demirci et al. [2] used the SAS-33 items, and reported that the mean score among university students was 75.68±22.46, which is lower than that reported in the current study. However, in South Korea, a mean score of 110.02 has been reported among adolescents, [14] which is higher than that observed in the current study.

Worldwide, prevalence rates of smartphone addiction among the general populations ranged between 9.3% and 48% [15-17]. Differences between various studies could be attributed to differences in adopted scales and/or study populations.

In the current survey, higher scores of SAS were observed among males, although not significantly different. Similar results have been reported in India among medical students [12] and in Turkey among university students [2]. However, other studies carried out in Saudi Arabia,[13] Korea[18] and Turkey[5] reported that females were more smartphone addicts than males. Generally, differences between males and females regarding smartphone addiction varied from one culture to another according to the smartphone usage patterns or purpose [2] .

Most participants in the present study (93.7%) had poor sleep quality. Lower rates were reported in other studies carried out in India,[12] Palestine[19] and Jeddah,[20] where approximately two-thirds of participants had poor sleep quality.

The current survey revealed an association between smartphone addiction from one side and subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, daytime sleep dysfunction and overall sleep quality, on the other side. Similar findings have been reported by some other studies[12, 21]. In Saudi Arabia, smartphone addiction was associated with negative impacts, not only on sleep quality, but also on levels of energy, eating behaviors, body weight, exercise, and academic achievements[22].

In the USA, the longer average times spent on the smartphones through the time in bed was associated with lowering sleep efficiency, increased sleep onset latency and overall poor quality of sleep[23]. In Jeddah, Saudi Arabia, smartphone dependence score was associated with subjective sleep quality and sleep latency[13].

White et al. also reported that excessive mobile phone use was associated with poor sleep quality[24]. Demirci et al. observed that smartphone addiction was positively correlated with subjective sleep quality, daytime dysfunction, sleep troubles, and overall PSQI global scores[2].

In Switzerland, smartphone usage was associated with later bedtimes, however, it was not associated with sleep disturbance[25]. In Turkey, there were significant positive correlations between the SAS scores and subjective sleep quality, sleep disturbance, daytime dysfunction, and PSQI global scores,[13] while in Taiwan, no association was found between smartphone usage and sleep duration[26].

In accordance with Christensen et al.,[23] prevalence of smartphone addiction was shown to decrease with age in the current study. Therefore, we can say that smartphone addiction is mainly a problem for the young population.

Our study has some limitations that should be addressed. The cross-sectional design of the study that explores associations and not causality between independent variables and the outcome variable is considered a limitation of the study. Conduction of the study following convenience sampling in big malls could have played a role in confusion of participants during the assessment of smartphone use and sleep quality. Nevertheless, this study could have public health significance in evaluating this problem in a heterogeneous group of population, particularly among the young population in our region.

In conclusion, smartphone addiction is an evident problem among our population, particularly younger ones. People who use smartphones mainly for playing games are more likely to suffer from its addiction. Smartphone addiction is associated with long sleep latency, shorter sleep duration, lower sleep efficiency, higher daytime sleep dysfunction and overall poor sleep quality.

Based on findings of the current study, it is recommended to organize educational programs in public places to alert people, particularly younger ones regarding the harmful effects of prolonged use of smartphones. Mass media and social media should play more active roles in this regards. Further studies are needed to explore various psychological and physiological adverse outcomes of smartphone addiction.

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