pISSN 2394-6032 | eISSN 2394-6040

## **Original Research Article**

DOI: http://dx.doi.org/10.18203/2394-6040.ijcmph20203909

# The relationship between smartphone addiction and depression among university students in Karachi: a cross-sectional study

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Received: 17 June 2020 Accepted: 17 July 2020

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### **ABSTRACT**

**Background:** Pakistan demographic and health survey (PDHS) estimated extensive ownership of cell phones in Pakistan with 94.7% in the urban population. Pakistan Advertiser Company reported 77 % of cell phone users aged between 21-30 years. Although, no research was conducted with university population for addiction and depression, so this study aims to find the link between Smartphone addiction and depression in SZABIST University students of Karachi, Pakistan.

**Methods:** Cross-sectional study was conducted with self-assessment tools, comprised of three sections: sociodemographic information, smartphone addiction scale-short version (SAS-SV) and Beck's depression inventory-II (BDI-II). Responses for SAS-SV were rated on a 6-point Likert scale and BDI-II was summated on range 0-60. Percentages mean score was commuted for SAS-SV; the mean score was computed and categorized for BDI-II. Descriptive statistics and regression analysis were used for data analysis. Statistical significance was set at p<0.01.

**Results:** Total participants were N=225, of which 140 (62.2%) were males and 85 (35.8%) were females. The mean±SD of their ages were 20.9±2.9. Age was found insignificant with depression after applying multiple linear regressions. Mean score of SAS-SV was 54.8±17.2, and BDI-II was13.4±9.6, which showed a significant positive association (OR, 0.241; 95% CI, 0.2 to 0.3; p<0.001). Prior adjusting coefficient, males were speculated having a higher level of depression.

**Conclusions:** A significant positive correlation was found between Smartphone addiction and depression, among University Students of SZABIST. Control smartphones usage is advised for undergraduate students as they are more prone to depression compared to postgraduate students.

Keywords: BDI-II, Depression, Karachi, SAS-SV, Smartphone-addiction, University-students

## INTRODUCTION

Undoubtedly, smart phones bring a massive amount of convenience to our lives and make it more effortless but on the contrary, they are highly addictive: people often abuse the smartphone while engaged in other activities such as: studying, walking, driving, crossing the road, in social gatherings and even sleeping. 1.2 This prolonged use may trigger numerous physiological problems such as

digital eye strain, cervical problems, headache, blurred vision, and pain in the wrist back and neck.<sup>3</sup> It not only leads to physical effects but more significantly to psychological effects. Smartphone addiction is a prevalent phenomenon in recent decades, and it has potentially negative repercussions over an individual's life such as mood instability, loneliness, depression, anxiety, and sleep disturbance are often found in population addicted to the Smartphone.<sup>1</sup> People with

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depression experience an unhappy mood, loss of interest or pleasure, feelings of guilt or low self-worth, disturbed sleep or appetite, low energy, poor concentration and may have suicidal ideation.<sup>4</sup> Approximately, 340 million people throughout the world suffer from depression, which in turn contributes to a substantial suicidal rate.<sup>5</sup>

Several studies have revealed that females are more likely to have smartphone addiction compared to males, one more study conducted by Korean University in 2015; they discovered Chinese students particularly female were more tend to smartphone addiction than male students (32.6% and 10.4% respectively). Women have more tendency towards the social relationship, as a result, they spend pretty good time on using social network services such as Face book, WhatsApp, Instagram, and other social networking which lead them eventually to get addicted to their smartphones.7 However, men are perceived to be more susceptible when it comes to online and offline gaming and programming than women.8 It was found that addiction to smartphone is immensely associated with physiological and mental disorders, or vice versa.9 Physical issues were: blurred vision, ophthalmoplegia, wrist pain, and stiffness in the neck. However, Insomnia, disturbing behaviour, and feelings are some of the reported psychological issues. 10

A study of 276 African Americans revealed social phobia and social anxiety emerged as autonomous predictors of Smartphone addiction.<sup>11</sup> People with mood instability or disorder are prone to become addicted to the use of smartphones, but it is crucial to find out various forms of mental disorders that are associated with excessive use of smartphone in young adults.<sup>12,13</sup> A study on university students evaluated that students with smartphone addiction have more propensity towards negative performance in college and sought to have a high level of perceived stress and disturbed sleep.<sup>9</sup> Van den Bulck's study showed that the adults spend hours staying up at late night using social apps such as Face book, Instagram, Twitter, WhatsApp, and a variety of other communication tools before falling sleep.<sup>14</sup>

Depression is a general reflection of the psychological wellbeing that is thought to be highly correlated with addiction to smartphone usage. Most studies have revealed a relationship between these two variables; however, all these studies were conducted in specific populations.<sup>15</sup> A study happened on cell phone users apprised that trait anxiety, state anxiety and mental disorders are highly associated with the excessive use of Smartphone compare to the moderate use.<sup>16</sup> However; no study has so far considered the link between sleep quality, anxiety, and depression, with Smartphone overuse or addiction.<sup>17</sup>

Researches carried out that showed around 72% masses use Smartphone, 68% of which are android users in Pakistan, from which the top leading users aged between 21-30, which constitutes around 77% of the total

population, followed by 12% between age 31-40, 9% between age 10-20 and the least user approximately 1% are above the age of 41.<sup>18</sup>

Macro's study reported that 58% of Indian's youth are addicted to their smartphone, this addiction was perceived as the need to be connected and accessible to friends, family and acquaintances. While few of them illustrated, they are just addicted to have their smartphone round a clock, the magnitude of addiction among the young population was found alike among gender and age.<sup>19</sup> However, the rest of the factors like marital status and economic status are found insignificant in literature.<sup>20</sup> In China, 8.1% of study participants had pathological internet use, high scorers in PIU were more likely to experience psychosomatic symptoms and comparatively less satisfied with their family than low scorers.<sup>21</sup> An association between excessive use of smartphone with depression symptoms and sleep disorder were found between both genders, aged between 20-24 years in Sweden.<sup>9</sup> Every community is unique in terms of its norms, practices, behaviours, and traditions. Even within a single middle eastern setting, ethno national affiliations may influence how people associate between perception, insight, and self-stigma.<sup>22</sup> Since there is no single study conducted in the setting of Pakistan, to evaluate the relationship between smartphone addiction and selfreported depression, this study aims to investigate the addiction of smartphone link with depression in young adults of the university in this region.

#### **METHODS**

This cross-sectional study was conducted in 2019. The list was obtained from the administration department of the university and participants were randomly selected via software. As many as 225 males and females were recruited for the study from the target population of undergraduate and postgraduate program, students of various disciplines from SZABIST University Karachi, Pakistan. A brief description of the study objectives was presented; informed consent was obtained from those who agreed. Incomplete questionnaires were dropped out. Participants were requested to report their demographical information. While those below 18 or above 35 years of age, as well as non-university students were excluded. Retrieved data was entered twice and rechecked to rectify the errors. An ethical permission letter for this study was approved by the Ethical Review Committee of SZABIST University. Participants were assured of confidentiality for the shared information.

The sample collection tools were comprised of three main sections, namely the socio-demographic characteristics, Smartphone addiction assessment tool, and the self-reported depression scale. Literature showed a wide use of these tools.<sup>8,18</sup> Socio-demographic information included: name, gender, age, marital status, household members, and participant's number among the household members, family dependent on the participant, education

level, enrolled program, and native language, income of the household, physical activity, duration and nature of the physical activity. A smartphone addiction scale short version (SAS-SV), was developed from the validated Smartphone addiction scale (SAS) by Kwon 2013, used to access the level of Smartphone addiction. It is a selfreported tool comprised of 10 items; each question was rated on a 6-point Likert scale from "Strongly disagree" to "Strongly agree". The original SAS Scale did not report any cut-off point. A Spanish-Belgium study utilized the cut-off point of 31/60 in males, 30/60 in females. Since no gender difference was reported, the cutoff point was classified to 32/60 or PMS=53.3%/ PMS>53% as addicts or excessive users. Internal consistency and validity were obtained for SAS-SV (Cronbach's alpha: 0.91). 14

The Beck's depression inventory- second edition (BDI-II) tool, is a self-assessment tool to assess the severity of the depressive symptoms, and that quantify objectively depression signs and symptoms; (like being guilty or feeling of being punished, hopelessness and state of mood, as well as physical aspects such as constipation, lack of interest in activities, weight loss, fatigue and lack of libido). But it is not a diagnostic tool. It comprised of 21 items, each question to be rated on a 4-point scale, ranging from 0-64. A higher score on this scale indicates a higher level of depression. "Normal" range was classified in between 0-9, "Mild Mood Disturbance" classified for the range of 10-15, 16-19 was classified for "Borderline Clinical Depression", 20-29 classified for "Moderate Depression", 30-39 classified with "Severe Depression" and >40 as "Extreme Depression". This tool has a Cronbach's alpha reliability coefficient of 0.89.18

The data were analysed by using SPSS; IBM, USA (Version 21). The Analytical figures such as smartphone addiction and self-reported depression scores were listed with continuous variables and estimated qualitatively as means, percentages, and standard deviation. Independent T-test was used to compare mean difference of depression and addiction scores among gender, marital status, and the course they are enrolled such as undergraduate and postgraduate. ANOVA was used to compare the mean difference of depression and addiction scores between age group and household income. A p value of <0.01 was considered statistically significant. Unadjusted coefficient with 95% confidence interval and adjusted coefficient with 95% confidence interval was used for bivariate and multivariate analyses before presenting factors that are significantly correlated with Smartphone addiction and depression.

#### **RESULTS**

A total of two hundred and twenty-five students were included in this study. Out of all participants, 62.2% (n=140) were males and 37.8% (n=85) were females. The subjects who participated in the study aged between 18 to 35 years.

Table 1: Description of respondent characteristics (n=225).

Chamatanistics	NI (0/)		
Characteristics Gender of the respondent	N (%)		
Male	140 (62.2)		
Female	140 (62.2) 85 (37.8)		
Age in years	63 (37.6)		
<20	136 (60.4)		
21-25	75 (33.3)		
26 or more	14 (6.2)		
Mean± SD	20.9±2.9		
Marital status	20.9±2.9		
Married	11 (4.9)		
Unmarried	214 (95.1)		
How many household members are	214 (73.1)		
there in the family	5.5±2.1		
Do you have any family dependent			
Yes	50 (22.2)		
No	175 (77.8)		
What system of education you took during			
secondary education	-8 J		
Matric	134 (59.6)		
Cambridge (OA levels)	91 (40.4)		
Which course you are enrolled in			
Undergraduate	177 (78.7)		
Postgraduate	48 (21.3)		
Which specialty you are enrolled in			
Business	113 (50.2)		
Engineering	3 (1.3)		
Finance	4 (1.8)		
Computer science	87 (38.7)		
Others specify	18 (8.0)		
Spoken language	, ,		
Urdu	149 (66.2)		
Pashto	13 (5.8)		
Punjabi	18 (8.0)		
Sindhi	40 (17.8)		
Baluchi	3 (1.3)		
Others specify	2 (0.9)		
Average household income (in PKR)			
0-20 thousand	7 (3.1)		
21-40 thousand	21 (9.3)		
41-60 thousand	20 (8.9)		
61-80 thousand	30 (13.3)		
81 to 1 lakh	41 (18.2)		
Above one lakh	106 (47.1)		
Are you involved in any physical activity			
Yes	133 (59.1)		
No	92 (40.9)		
What sort of Physical activity are you involved in			
Running jogging	54 (40.6)		
Weightlifting	21 (15.8)		
Cricket	35 (26.3)		
Football	18 (13.5)		
Others specify	5 (3.8)		

The mean of the participants' ages was  $20.9\pm2.9$  years while 95.1% (n=214) of them were unmarried. The average numbers of household family members were

5.5±2.1; 78.7% (n=177) of the students who participated in the study were in the undergraduate programs while 21.3% (n=48) were in the postgraduate program of SZABIST University Karachi (Table 1).

Table 2: Reliability analysis of depression scales and smart phone addiction scales.

Levels of smart phone addiction	N
Number of items in the scale	10
Scale reliability coefficient	0.88
Levels of depression	
Number of items in the scale	21
Scale reliability coefficient	0.89

The scale reliability coefficient of the smartphone addiction scale and depression scale were 0.88 and 0.89 respectively which showed excellent reliability (Table 2). The study results showed that out of a total of 225 participants 15 (6.7%) were non-addict to Smart phones, 166 (73.8%) were slightly addict, 44 (19.6%) were addicts while their mean Smartphone addiction score was 54.8±17.2. (Table 3 and Figure 1).

Table 3: Descriptive statistics of levels of depression and smart phone addiction (n=225).

	N (%)				
Levels of smart phone addiction					
Non-addict (PSM=0-30)	15 (6.7)				
Slightly addict (PSM=31-70)	166 (73.8)				
Addicts (PSM=71-100)	44 (19.6)				
Mean± SD	54.8±17.2				
Levels of depression					
These ups and downs are considered normal (0-9)	101 (44.9)				
Mild mood disturbance (10-15)	50 (22.2)				
Borderline clinical depression (16-19)	22 (9.8)				
Moderate depression (20-29)	35 (15.6)				
Severe depression (30-39)	15 (6.7)				
Extreme depression (≥40)	2 (0.9)				
Mean±SD	13.4±9.6				

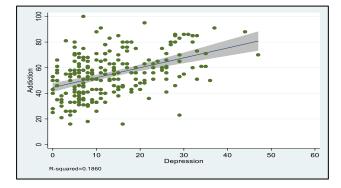


Figure 1: Relationship between smartphone addiction and depression scores.

The comparison of mean depression scores and Smartphone addiction scores across the categories of participants' characteristics highlighted mean depression scores to be significantly different across categories of course (P=0.027) where undergraduate participants had higher mean depression scores than postgraduate (14.1±9.6 versus 10.6±9.3) respectively. Mean smartphone addiction scores; however, was not significantly different across categories of any of the participants' characteristics (Table 4).

Table 4: Comparison scores of smart phone addiction and beck depression scales across by respondent's characteristics.

Variables	N	Depression (0-63) mean score±SD	Addiction (0-100) mean score±SD			
Gender						
Male	140	12.6±9.5	54.6±17.6			
Female	85	14.6±9.7	55.2±16.5			
P value		0.150	0.800			
Age in years						
<20 years	136	13.9±9.3	55.3±16.6			
21-25 years	75	12.8±10.0	53.2±18.9			
26 or more	14	11.0±10.8	58.6±12.7			
P value		0.450	0.490			
Which course you	are enro	olled in				
Undergraduate	177	14.1±9.6	55.6±17.4			
Postgraduate	48	10.6±9.3	52.1±16.0			
P-values		0.027	0.220			
Marital status						
Married	11	11.6±8.8	58.2±16.5			
Unmarried	214	$13.4\pm9.7$	54.7±17.2			
P value	-	0.540	0.510			
Average household	Average household income (in PKR)					
0-20 thousand	7	12.3±10.0	54.6±20.1			
21-40 thousand	21	$14.4 \pm 10.5$	58.4±19.9			
41-60 thousand	20	16.4±10.5	49.3±17.5			
61-80 thousand	30	11.7±9.4 52.2±18.5				
81 to 1 lakh	41	13.2±10.7 57.3±17.4				
Above one lakh	106	13.2±8.9	55.0±15.9			
P value		0.660	0.470			

Study results before and after adjusting for the confounding effects of other variables, increasing mean Smartphone addiction score was associated with an increased likelihood of self-reported depression score (OR, 0.241; 95% CI, 0.2 to 0.3; p<0.001). Moreover, postgraduate students had significantly lesser odds of depression than undergraduate students (OR, -3.445; 95% CI, -6.5 to -0.4; p=0.027). In simple linear regression, postgraduate found to be significant with a p=0.027 but after applying multiple linear regressions it resulted to be insignificant with a p=0.407. Similarly age in years was observed to be significant before adjusting coefficients and after adjusting for coefficients it became insignificant. After adjusting for all the possible

confounding factors, smartphone addiction has a positive correlation with depression (p=0.001), before and after adjusting coefficients (Table 5).

Out of the total 225, 177 were the students of the undergraduate program and 48 were the students of the postgraduate program; 140 were males and 85 were females with the age range of <20 to ≥26. According to SAS-SV scale scoring, 10 males and 5 females were non-addict (0-30). 7 participants ages were <20 years and 8 participants ages were between 21 to 25 years. 11 in this category were the students of undergraduate and 4 were

the students of the Postgraduate Program. 104 males and 62 females were slightly addict, scored in the range of (31-70); 127 were students of undergraduate, 39 were the students of the postgraduate program. Participants who scored high in this range were 102, ages were <20 years; 52 age ranged between 21-25 years and 12 were of the age  $\geq$ 26 years. Addicts scored on the range of (71-100); 26 males and 18 females, 27 were of age <20 years, 15 were aged between 21-25 years, only 2 were of  $\geq$ 26 years. 39 were the students of the undergraduate and 5 were of the postgraduate program.

Table 5: Significant factors associated with depression scores.

Smartphone addiction	Unadjusted coefficients (β) 95%CI	P value	Adjusted coefficient (β) 95%CI	P value
(%mean score)	0.241 (0.2;0.3)	< 0.001	0.245 (0.2;0.3)	< 0.001
Gender				
Male	Ref.		Ref.	
Female	1.924 (-0.7;4.5)	0.146	1.719 (-0.6;4.1)	0.151
Age in years	-0.484 (-0.9; -0.1)	0.028	-0.291 (-0.8;0.2)	0.272
Which course you are e	nrolled in			
Undergraduate	Ref.	•	Ref.	
Postgraduate	-3.445 (-6.5; -0.4)	0.027	-1.47 (-5;2)	0.407
Marital status	•	•		
Married	Ref.		Ref.	
Unmarried	1.808 (-4.1;7.7)	0.544	1.3 (-4.4;7.0)	0.651
Average household inco	me (in PKR)			
0-20 thousand	Ref.	•		
21-40 thousand	2.143 (-6.2;10.4)	0.611	1.484 (-5.9;8.9)	0.694
41-60 thousand	4.114 (-4.2;12.5)	0.333	5.455 (-2;12.9)	0.151
61-80 thousand	-0.552 (-8.5;7.4)	0.892	-0.02 (-7.2;7.1)	0.996
81 to 1 lakh	0.934 (-6.8;8.7)	0.813	-0.161 (-7.1;6.8)	0.964
Above one lakh	0.865 (-6.6;8.3)	0.818	0.981 (-5.6;7.6)	0.77

Table 6: Levels of depression and smart phone addiction by segregation gender, age and enrolled course.

W!-bl	Gender		Age in years			Which course you are enrolled in	
Variables	Male	Female	<20	21-25	≥26	Undergraduate	Postgraduate
Levels of smart phone addiction							
Non-addict (PSM=0-30)	10 (7.1)	5 (5.9)	7 (5.1)	8 (10.7)	0(0.0)	11 (6.2)	4 (8.3)
Slightly addict (PSM=31-70)	104 (74.3)	62 (72.9)	102 (75.0)	52 (69.3)	12 (85.7)	127 (71.8)	39 (81.3)
Addicts (PSM=71-100)	26 (18.6)	18 (21.2)	27 (19.9)	15 (20.0)	2 (14.3)	39 (22.0)	5 (10.4)
Total	140	85	136	75	14	177	48
Levels of depression							
Normal (0-9)	67 (47.9)	34 (40.0)	56 (41.2)	36 (48.0)	9 (64.3)	73 (41.2)	28 (58.3)
Mild mood disturbance (10-15)	30 (21.4)	20 (23.5)	34 (25.0)	15 (20.0)	1 (7.1)	42 (23.7)	8 (16.7)
Borderline clinical depression (16-19)	18 (12.9)	4 (4.7)	14 (10.3)	8 (10.7)	0 (0.0)	18 (10.2)	4 (8.3)
Moderate depression (20-29)	15 (10.7)	20 (23.5)	24 (17.6)	9 (12.0)	2 (14.3)	31 (17.5)	4 (8.3)
Severe depression (30-39)	8 (5.7)	7 (8.2)	6 (4.4)	7 (9.3)	2 (14.3)	11 (6.2)	4 (8.3)
Extreme depression (≥40)	2 (1.4)	0 (0.0)	2 (1.5)	0 (0.0)	0 (0.0)	2 (1.1)	0 (0.0)
Total	140	85	136	75	14	177	48

Beck's depression inventory (BDI-II) indicated the result in 6 sub-categories: normal, mild mood disturbance,

borderline clinical depression, moderate depression, severe depression, extreme depression. Normal category

ranged in (0-9); 67 males, 34 females; <20 years participants were 56, 36 were aged from 21-25 years and 9 were the participants of  $\geq 26$  years age. In the normal range, 73 were the students of Undergraduate and 28 were of the postgraduate program. Mild mood disturbance ranged in (10-15); 30 males, 20 females; 34 participants aged <20 years,15 were aged between 21-25 years, and 1 participant aged ≥26 years. 42 were the students of the undergraduate and 8 were of the postgraduate program. The borderline clinical depression range was (16-19); 18 males and 4 females; 14 participants aged <20 years, 8 participants aged between 21-25 years. 18 were the students of undergraduate and 4 were of postgraduate program. Moderate depression ranged (20-29); 15 males and 20 females; 24 participants aged <20 years, 9 participants aged between 21-25 years, 2 participants aged ≥26 years, 31 were the students of the undergraduate, 4 were the students of the postgraduate program. Severe depression was ranged (30-39); 8 males and 7 females, 6 were aged <20 years, 7 participants aged between 21-25 years and 2 participants ages were ≥26 years, 11 were the students of undergraduate and 4 were the students of postgraduate program. Whereas the extreme depression ranged (≥40); 2 males scored in this range. Ages of both were <20 years and were the students of the undergraduate program (Table 6).

#### **DISCUSSION**

The relationship between smartphone addiction and depression has been investigated in earlier studies, but few of those preceded and other remains arguable. In this cross-sectional study, smartphone addiction sought to have a strong positive association with self-reported depression. The sample was collected from the major disciplines of the SZABIST University i.e.: business, engineering, finance, and computer science and others, respectively. A systematic review study highlighted that Smartphone addiction was significantly associated with depression.<sup>23</sup> Several studies are conducted to evaluate the relationship between smartphone addiction and depression. A study regarding depression and Smartphone addiction in Lebanese and Austrian university students identified a positive link of smartphone addiction with depression.24

The current apps, portability, and functionality of smart phones have provided people with an excellent opportunity and flexibility to access and explore everything through the internet on-the-go by serving their smartphone at any given moment.<sup>25</sup> More than a few other studies have also speculated the occurrence of smartphone addiction in adults. In Korea (Asia), a study reported that 30.5% of the total sample size was at a high risk of Smartphone addiction (mean age=22 years). Another study highlighted that 17.9% of young people in Korea exhibited a significant level of Smartphone addiction.<sup>7</sup>

Constantly updating features of smart phones offer immense attraction and convenience, which results in the propensity of addiction to smartphone across the world. It's consistent with the PEW research facility, 67% of smartphone owners have confessed that they frequently check their phone for as a result of sensation even when their phone didn't produce any vibration; this gesture is considerably alarming and may function as a warning sign to smartphone addictive users.<sup>6</sup> The phenomenon of addiction is considerably smartphone alarming particularly for the young and new generation but yet not clearer listed within the diagnostic criteria of diagnostic and statistical manual of mental disorders-5th edition DSM-5.26 To identify the smartphone addiction, minimum of 4 of the subsequent signs and symptoms are considered to be important to present in, individual which are potentially detrimental for population life. An urge serves of the smartphone more frequently than it was supposed to obtain the preferred effect, failing to decrease their illogical use of the smartphone, obsession with the use of the smartphone, using a smartphone as means to overcome their anxiety and depressive mood, overuse of smartphone that result in loss the track of time, and many other emotional and mental signs and symptoms such as, withdrawal, tolerance, restlessness, irritability, and tension.<sup>10</sup> Past researchers showed differences between genders where excessive use of smartphone was associated with insomnia, stress, and tension for males. In contrast to women who had increased use of smartphone were found to have depression at 1-year follow-up.<sup>27</sup>

The main findings of this study indicated that there was a strong positive association between the SAS and depression, according to the SAS-SV and BDI-II cut-off values among the students of SZABIST University. Similarly, the students of the undergraduate program reported a relatively high and positive correlation between smartphone addiction and depression as compared to the students of postgraduate program. However, after applying multiple regression analysis, there was no significant difference observed. Studies have noticed differences between levels of education in terms of depression and smartphone addiction. Augner's study had shown adolescents more likely to develop smartphone addiction and depression as compared to those who were older. A study from Turkey revealed, that young adults were perceived to have higher levels of smartphone addiction.<sup>24</sup> Ladin et al study found that adults who were enrolled in a higher level of education were less tend to develop depressive symptoms as compared to those who were having low educational levels were less likely to have symptoms of depression, which is similar to our study findings.<sup>28</sup> It was observed that age had a weak and negative association with depression, which shows an inverse correlation with depression.

We found a considerable difference between various income levels in terms of depression; but when adjusted with confounding factors it resulted in no significant difference between income levels against depression. Only SAS mean score was an independent significant predictor of depression in this study. Smartphone addiction was evaluated through smartphone addictionshort version scale (SAS-SV) and depression was rated on Beck's depression inventory-II (BDI-II) along with the demographic information from each participant. Students who participated in the study were (n=225) aging from 18 to 35 years. Retrieved data were analyzed through statistical analysis showed in (Table 1-6) in the results section. The sample characteristics were represented in Table 1. The reliability of the coefficient variable of Smartphone addiction and the reliability of the depression scale were displayed in Table 2. A further finding of Smartphone addiction and the level of depression were illustrated in Table 3. Table 4 displayed the comparison scores of Smartphone addiction and Beck's depression scale across by respondents' characteristics. The study also showed results, before and after adjusting for the confounding effects of other variables in Table 5. This point is alike with many other studies, excessive use of a smartphone may lead to a variety of physical and mental health disorders i.e.: depression, stress, and insomnia in adolescents. 15 Literature also support the positive link between higher Smartphone addiction and depression.<sup>28</sup>

There are a few limitations in this study that should be considered. It was a thesis work and time-bounded. The sample size was relatively small, and all the participants were the university students who were recruited only from one university. It was not a representative sample for the entire population. Thus, the study findings cannot be generalized. More studies are required to explore this phenomenon in non-university students as well as schoolchildren who are more prone to this global problem. To the best of our knowledge, this is the first study conducted in this context within Pakistan. Before this, most of the studies were conducted outside Pakistan with this regard by administering an online questionnaire, which is subjected to bias and fraud due to the incentive. However, in this study, the questionnaire was administered face to face by interviewing participants through a systematic randomized technique to reduce bias and to acquire more accurate results by reducing errors.

#### CONCLUSION

There was a strong positive correlation between smartphone addiction and self-reported depression among university students of SZABIST in Karachi. Study analysis also revealed that postgraduate students were found to have less level of depression score as compared to undergraduate students who were at a high level. Age was reported to have a negative association with depression but was insignificant after applying multiple linear regressions. Prior adjusting coefficient males were speculated to have a higher level of depression but after adjusting coefficients it became insignificant. Similarly, bivariate analyses depicted an inverse relationship between income and the level of depression. However,

after multivariate analyses there was no significant relationship between incomes with depression. Public health care providers should provide prevention strategies about modifying the population's attitudes and behaviour while using smartphone, campaigns that include basic information, suggestions, and advice, which help young and adults to limit their smartphone use. There will be many more health-related factors that are associated with smartphone addiction, which are not yet tested and reported but this study provides a ground for other multidimensional studies.

#### **ACKNOWLEDGEMENTS**

This manuscript is a part of Ubaidullah Abid's thesis to fulfill the requirement for MS at SZABIST University. We are grateful to the SZABIST University for providing support in the data collection and to all the participants who took part in the study.

Funding: No funding sources Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Review Committee, Shaheed Zulfiqar Ali Bhutto Institute of Science and Technology-SZABIST University Karachi, Pakistan

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Cite this article as: Abid U, Khan TJ, Sheikh A, Saleem S, Kayani HA, Habib MA. The relationship between smartphone addiction and depression among university students in Karachi: a cross-sectional study. Int J Community Med Public Health 2020;7:3472-9.