

PREVALENCE AND PREDICTORS OF PROBLEMATIC SMARTPHONE USE AMONG UNIVERSITY UNDERGRADUATES

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ABSTRACT

Background: A smartphone is a mobile phone that performs many of the functions of a computer, typically having a touchscreen interface, internet access, and an operating system capable of running downloaded applications. The objectives of this study were to determine the prevalence and predictors of problematic smartphone use (PSU) among university undergraduates.

Materials and Methods: Cross-sectional design. PSU was studied among the students using the Smartphone Addiction Scale- Short version (SAS-SV).

Results: Mean age was 21.3±2.59 years, mostly female (55.2%). The prevalence of smartphone ownership was 99.4% (3305). 13.9% of students had PSU. Factors associated with PSU were female gender ($p=0.001$), owning more than one smartphone ($p=0.001$), time spent on making phone calls (<0.001), surfing social media (<0.001), engaging in overnight phone call/social media

chat ($p=0.001$), use of Twitter ($p=0.002$), Instagram ($p=0.001$), Snapchat ($p=0.001$), YouTube ($p=0.001$), online gaming ($p=0.002$), presence of probable psychiatric morbidity ($p=0.001$) and insomnia ($p<0.001$). The predictors of PSU were female gender (OR 1.305, $p=0.038$), engaging in overnight calls or social media chats (OR 2.243, $p=0.001$), using a smartphone in bed when unable to sleep at night (OR 2.832, $p=0.003$), probable psychiatric morbidity (OR 1.671, $p<0.001$), and insomnia (OR 1.298, $p=0.043$).

Conclusion: Compared with other studies the prevalence of PSU among our participants is relatively low. However, PSU is a potentially disruptive behavioural addiction in undergraduates. Knowing predictors of PSU offers an opportunity for preventive counselling early in the course of study of all undergraduates.

Key words: Problematic smartphone use, university undergraduates, smartphone addiction

1.0 Introduction

Smartphone ownership and screen time are increasing all over the world. (1) More than fifty percent of the world's population now own smartphones majority of whom are adolescents and young adults. (2) Teenagers and young adults are an important target market for smartphones. (3) A smartphone is a mobile phone that performs many of the functions of a computer, typically having a touchscreen interface, internet access, and an operating system capable of running downloaded applications (apps). For university undergraduates, smartphones are now an indispensable item of daily living. They are useful as a learning aid and because of it being a gateway to involvement in many other online or app-based activities they have become a focal object influencing social, psychological and behavioural aspects of their lives. (4)

There is evidence that prolonged or excessive smartphone use predisposes to the phenomenon of Problematic smart phone use (PSU) which refers to the loss of control over phone use to the extent that it affects normal human functioning and relationships. (5) Because unrestrained use of technological devices may affect developmental, social, mental and physical well-being and result in symptoms similar to other behavioral addictions, excessive use of various technologies, such as smartphones, internet surfing, television watching, and computer/online gaming are considered as "addictions"(6) This explains why internet addiction has been formalized as a diagnostic entity in Diagnostic and Statistical Manual of Mental Disorders (DSM)-5.(7) Smartphone addiction has not been so identified in DSM-5 though the phenomenon of "smartphone addiction" is medically recognized.(8) However, rather than use the label 'addiction' some authors have recommended that it should be labelled 'Problematic smartphone use' because the term 'addiction' may be stigmatizing.(9)

Among students, PSU impacts negatively on academic performance (10) and other forms of daily activities. It harms their physical and mental health, social relationships and can result in withdrawal tendencies. (11) It possesses similar addictive characteristics that are quite similar to symptoms of substance-use disorders as contained in the DSM-5 such as preoccupation, tolerance,

inability to control craving, impairment of daily life functions, disregard to harmful consequences, and withdrawal. PSU is associated with anxiety (13,14) depression (13,14), and the increased risk of development of other technological addictions such as gaming addiction or online gambling addiction. Studies have also shown that PSU is associated with poor sleep quality and insomnia. (14,15) PSU is a problem among university undergraduates. Afe et al (16) reported a prevalence of 34.5% in Sagamu while Akpunne et al (17) reported 47.5% in a survey of four Nigerian universities. The aim of this study was to determine the prevalence and predictors of PSU among undergraduates of the University of Ilorin Nigeria.

2.0 Materials and Methods

2.1 Study Design and Sample Selection

This was a cross-sectional study among students of University of Ilorin (UNILORIN). Unilorin is located in Ilorin, North Central Nigeria. It has 96 undergraduate programmes in 16 faculties and an undergraduate population of 44,897 recruited from 24 out of Nigeria's 36 states. Sample size determination was for surveys on addiction among students in schools, 10% of the sampling frame population is recommended by United Nations Office on Drugs and Crime (UNODC) but, where this appears too large to achieve, a population of between two thousand and three thousand.(17) After giving room for attrition, a sample size of 3325 undergraduate students was used for the study using multistage sampling technique ensuring proportional representation across the selected faculties. This was done in 3 stages:

Stage 1

Two-thirds (11) of the sixteen faculties were randomly selected by balloting without replacement. A sampling-by-size approach (proportional allocation) was used to determine the numbers of respondents in each faculty.

Stage 2

A list of the departments in each of the selected faculties was obtained. Two-thirds of the number of departments in each faculty was randomly selected using balloting without replacement. A sampling-by-size approach (proportional allocation) was also used to determine the number of respondents in each department

Allocation of respondents at faculty and departmental level (stages 1 & 2) was be based on the sampling-by-size approach (proportional allocation), using the formula below.

At the level of faculty:

Sample = $n / N \times ni$

n = the total number of students at the specific faculty;

N = the total number of students for all participating faculties;

ni = the total sample size required for the study at the institution

Stage 3

In each of the department selected, eligible respondents were randomly selected balloting without replacement until the desired sample size for the department was obtained

The inclusion criteria were all consenting full-time undergraduate students of UNILORIN studying for a first degree. First Year as undergraduate students were however excluded because they do not have the university's statutory Cumulative Grade Point Average (CPGA) yet.

2.2 Study Instruments

i) A socio-demographic questionnaire with questions on the student biodata, year of study, use of various social media apps, smartphone ownership, duration of smartphone usage per day, and specific smartphone usage habits such as data usage, bedtime phone usage and engaging in overnight phone calls or social media chats. It also recorded academic performance using the university's statutory CPGA. The CGPA is graded from 1 to 5 correlating to increasing order of academic performance.

ii). Smartphone Addiction Scale- Short Version (SAS-SV) developed by Kwon et al with internal consistency and concurrent validity verified with a Cronbach's alpha of 0.967 (18) was used to examine for smartphone addiction. It consists of 6 factors (loss of control, daily-life disturbance, disregard for consequence, withdrawal, preoccupation and tolerance) which are accessed through 10 questions, based on self-reporting six-point Likert scale (1: "strongly disagree", 2: "disagree", 3: "weakly disagree", 4: "weakly agree", 5: "agree", and 6: "strongly agree"). The cut-off value for males was ≥ 43 and ≥ 42 for females according to norms established by Akpunne and Akinawo in Nigerian undergraduates(19)

iii). The 12-item General Health Questionnaire (GHQ-12) (20) which has been shown to have internal consistency and concurrent validity verified with a Cronbach's alpha of 0.87 (21) was used to measure psychological distress. It measures the following factors: ability to concentrate; loss of sleep over worry; playing a useful part in society; being capable of making decisions; being constantly under strain; being unable to overcome difficulties; enjoying normal activities; face up to problems; being unhappy and depressed; losing confidence in yourself; thinking of yourself as worthless; feeling reasonably happy. The items are scored on a 4-point severity scale (0-3) to indicate the extent to which respondents have experienced each symptom over the past two weeks. Items scores are added to create a total score of distress. A cut off score of 3 being recommended.(22)

iv). Athens Insomnia Scale (AIS) developed by Soldatos et al (23) which has been shown to have internal consistency and concurrent validity verified with a Cronbach's alpha of 0.9. It is measured

by assessing eight factors amongst which first five factors are related to nocturnal sleep and last three factors are related to daytime dysfunction. These are rated on a 0–3 scale and the sleep is finally evaluated from the cumulative score of all factors and reported as an individual's sleep outcome. A cut-off score of ≥ 6 on the AIS is used to establish the diagnosis of insomnia

2.3 Data collection

Informed consent was obtained prior to data collection following detailed explanation of the purpose and its expected outcomes. The study instruments were self-administered.

2.4 Data analysis

Data was analyzed using SPSS version 23 (SPSS Inc., Chicago, Illinois). Continuous variables which were normally distributed were expressed as mean $\pm$ standard deviation (SD) while skewed continuous variables were expressed as median and interquartile range (IQR). Categorical variables were expressed as percentages. The Chi-square test was used to assess the relationship between categorical variables and the presence of PSU. The student's t test was used to test for association between normally distributed continuous variables and PSU while the Mann Whitney U test was used to test for association between normally distributed continuous variables and PSU. Variables which had a significant association with the presence of PSU were inputted into a binary logistic regression model using the enter method in order to identify independent predictors of PSU. Confidence interval set at 95% and statistical significance was set at $p < 0.05$.

2.5 Ethical consideration

The study was approved by the Ethics and Research Committee of the Kwara state Ministry of Health, Ilorin, Nigeria (Approval code: ERC/MOH/2022/07/064).

3.0 Results

Mean age of respondents was 21.3 ± 2.59 years, mostly female (55.2%). Smartphone ownership prevalence was 99.4% (3305 respondents). The median duration of time spent on the phone per day was 540 minutes (IQR 300-900) (see Table 1).

Table 1: Socio-Demographic Variables of Study Participants

Variable	All Participants N =3325 (%)/Mean $\pm$ SD/Median (IQR)
Age (years)	21.3 $\pm$ 2.59
Gender	
Male	1491

Female	1834
Level of Study	
Year 2	1064
Year 3	1309
Year 4	790
Year 5	145
Year 6	17
CGPA rank	
< 1.5	7
1.5 – 2.39	290
2.4 – 3.49	1363
3.5 – 4.49	1368
4.5 – 5.0	297
Number of phone calls made or received in a day	5 (4-10)
Time spent on phone calls per day (minutes)	30 (10-60)
Time spent on Social media per day (minutes)	300 (120-600)
Total time spent with the phone per day (minutes)	540 (300-900)

CGPA- Cumulative Grade Point Average, IQR- Interquartile rang

PSU was present in 458 respondents (13.9%). The factors associated with PSU were female gender ($p=0.001$), owning more than one smartphone ($p=0.001$), time spent on making phone calls (<0.001), surfing social media (<0.001) and total time spent using their phone daily (<0.001). Specific habits such as leaving the phone data on all day ($p=0.001$) using the phone while in bed at night when about to sleep ($p=0.001$), surfing social media on bed while about to sleep ($p=0.001$) engaging in overnight phone call or social media chat ($p=0.001$), use of Twitter ($p=0.002$), Instagram ($p=0.001$), Snapchat ($p=0.001$), YouTube ($p=0.001$) and online gaming ($p=0.002$) were also associated with PSU (Table 2).

Table 2: Factors associated with Problematic Smartphone Use among smartphone owners (N=3305)

Variable	PSU Present N=458 N (%)/ Mean/Median (IQR)	PSU Absent N=2847 N (%)/ Mean/Median (IQR)	Test statistic X/t	p value
Age (years)	21.25± 2.52	21.3 ± 2.59	0.402	0.65
Gender				
Male	175 (11.7)	1316 (88.3)	10.234	0.001*
Female	283 (16.5)	1531 (83.5)		
Year of study				
Year 2	140 (13.2)	917 (86.8)	5.935	0.204
Year 3	173 (13.3)	1127 (86.7)		
Year 4	113 (14.3)	676 (85.7)		
Year 5	30 (20.3)	114 (79.7)		
Year 6	2 (11.8)	15 (88.2)		
Current CGPA CGPA rank	3.62±0.71	3.63±0.68	0.121	0.478
< 1.5	0 (0.0)	6 (100.0)	1.400	0.844
1.5 – 2.39	41 (15.1)	230 (84.9)		
2.4 – 3.49	183 (14.2)	1095 (85.8)		
3.5 – 4.49	182 (14.0)	1101 (85.9)		

4.5 – 5.0	42 (15.2)	235 (84.8)		
CGPA Rank 2				
< 2.4	42 (14.7)	255 (85.3)	0.022	0.882
≥ 2.4	416 (14.3)	2592 (85.7)		
Number of smart phones owned				
1	331 (12.4)	2249 (87.6)	10.419	0.001*
> 1	127 (17.5)	598 (82.5)		
Number of phone calls made or received in a day	6 (4-10)	5 (4-10)	-	0.117
Time spent on phone calls per day (minutes)	30(12-105)	25 (10-60)	-	<0.001*
Time spent surfing social media per day (minutes)	420 (240-720)	270 (120-480)	-	<0.001*
Total time spent with phone per day (minutes)	720 (480-1080)	480 (300-840)	-	<0.001*
Do you switch on phone data throughout the day?				
Yes	208 (19.98)	833 (80.02)	51.418	0.001*
No	250 (11)	2014 (89)		
Do you use your smartphone in bed when unable to sleep at night?				

Never	11 (4.2)	253 (95.8)	139.8	0.001*
Sometimes	130 (8.1)	1467 (91.9)		
Most times	315 (21.8)	1128 (78.2)		
Do you surf social media on bed when about to sleep?				
Never	12 (9.3)	117 (90.7)	95.222	0.001*
Sometimes	125 (8.0)	1432 (92.0)		
Most times	321 (19.9)	1298 (80.1)		
Do you engage in overnight calls or social media chats?				
Never	31 (5.5)	530 (94.5)	103.4	0.001*
Sometimes	229 (12.0)	1678 (88.0)		
Most times	198 (23.7)	639 (76.3)		
Use of WhatsApp				
Yes	448 (13.8)	2807 (86.2)	1.604	0.205
No	10 (20)	40 (80)		
Use of Facebook				
Yes	368 (14.5)	2174 (85.5)	3.534	0.060
No	90 (11.9)	673 (88.1)		
Use of Twitter				

Yes	275 (15.6)	1492 (84.4)	9.250	0.002*
No	183 (11.9)	1355 (88.1)		
Use of Instagram				
Yes	386 (15.9)	2035 (84.1)	36.601	<0.001*
No	72 (8.1)	812 (91.9)		
Use of WeChat				
Yes	40 (18.3)	179 (81.7)	3.816	0.055
No	418 (13.5)	2668 (86.5)		
Use of Snapchat				
Yes	348 (17.2)	1679 (82.8)	48.123	<0.001*
No	110 (8.6)	1168 (91.4)		
Use of YouTube				
Yes	382 (15.1)	2146 (84.9)	14.142	<0.001*
No	76 (9.8)	701 (90.2)		
Playing of online games				
Yes	279 (15.6)	1508 (84.4)	10.038	0.002*
No	179 (11.8)	1339 (88.2)		

CGPA- Cumulative Grade Point Average; Y- Yates corrected chi square

PSU was significantly associated with probable psychiatric morbidity ($p=0.001$) and insomnia ($p<0.001$) (Table 3). The predictors of PSU were female gender (OR 1.305, $p=0.038$), Time spent surfing social media per day (OR 1.001, $p=0.001$), engaging in overnight calls or social media chats (OR 2.243, $p=0.001$), using a smartphone in bed when unable to sleep at night (OR 2.832, $p=0.003$), probable psychiatric morbidity (OR 1.671, $p<0.001$), and insomnia (OR 1.298, $p=0.043$), (Table 4).

Table 3a. The Association between Problematic Smartphone Use and Psychiatric Morbidity and Insomnia

	PSU Present	PSU absent	Chi square	p value
GHQ-12 Category				
No psychiatric morbidity	251 (11.4)	1957 (88.6)	34.551	0.001*
Probable psychiatric morbidity	207 (18.9)	890 (81.1)		
Presence of Insomnia				
No insomnia	165 (10.4)	1410 (89.6)	28.823	<0.001*
Insomnia present	293 (16.7)	1437 (83.3)		

GHQ-12: General Health Questionnaire-12; PSU: Problem Smartphone Use

Table 3b. The Correlation between Problematic Smartphone Use and Psychiatric Morbidity and Insomnia

Variable	Pearson's Correlation coefficient r	p value
GHQ-12 score	0.209	<0.001*
Total Athens Insomnia Scale SCORE	0.041	0.018*

GHQ-12: General Health Questionnaire-12

Table 4: Multivariate analysis showing the predictors of Problematic Smartphone use among participants

Variables	B	Odds Ratio	p value	95% Confidence Interval	
				Lower	Upper
Gender	-.266	1.305	.038*	.596	.985
Male ^{REF}					
Female					
Time spent on phone calls per day (minutes)	.001	1.001	.129	1.000	1.001
Time spent surfing social media per day (minutes)	.001	1.001	.001*	1.002	1.006
Total time spent with phone per day (minutes)	.000	1.000	.505	1.000	1.001
Number of smart phones owned	.518	1.678	.180	.788	3.574
1 ^{REF}					
> 1					
Do you switch on phone data throughout the day?	.166	1.180	.200	.916	1.521
No ^{REF}					
Yes					
Use of Twitter	-.096	.908	.472	.699	1.181
No ^{REF}					
Yes					
Use of Instagram	.254	1.289	.154	.909	1.829
No ^{REF}					
Yes					
Use of snapchat	.138	1.148	.361	.854	1.542
No ^{REF}					
Yes					

Use of YouTube	.078	1.081	.645	.776	1.505
No ^{REF}					
Yes					
Playing of online games	.048	1.049	.708	.816	1.348
No ^{REF}					
Yes					
Do you surf social media on bed when about to sleep?					
Never ^{REF}					
Sometimes	-.078	.925	.863	.380	2.251
Most times	.209	1.233	.647	0.503	3.021
Do you engage in overnight calls or social media chats?					
Never ^{REF}					
Sometimes	.404	1.498	.078	.955	2.348
Most times	.808	2.243	.001*	1.382	3.642
Do you use your smartphone in bed when unable to sleep at night?					
Never ^{REF}					
Sometimes	.469	1.598	.184	.801	3.188
Most times	1.041	2.832	.003*	1.420	5.647
GHQ-12 Category					
No psychiatric morbidity ^{REF}	.513	1.671	<0.001*	1.302	2.145
Probable psychiatric morbidity					
Presence of Insomnia					
No insomnia ^{REF}	.261	1.298	.043*	1.008	1.671
Insomnia present					

^{REF} -Reference variable; GHQ-12: General Health Questionnaire-12

4.0 DISCUSSION

The mean age of participants was similar to that reported in similar studies by Afe et al (16), Akpunne et al (4), Obi et al (24) in our environment and Hossain et al in Bangladesh (10) making our study comparable to a wide spectrum of similar studies among undergraduates. The 13.9% prevalence of PSU in our study was lower than that obtained by the above studies which ranged from 34.6%, 47.4% to 88% respectively. It is also lower than findings of 29.8% by Chen et al in China. (25) This is because the cut-off scores used for diagnosing PSU using the SAS-SV in our study was higher than that used in these cited studies and in most similar studies generally. Most studies used the cut-offs of 33 among females and 31 among males recommended by Kwon et al (18) in South Korea among secondary school adolescents. Our study used cut-offs derived from SAS-SV validation study by Akpunne et al (19) among undergraduates in our environment. Using recommendations by Kwon et al (18) can thus lead to over-classification of African university undergraduates because they have expectedly greater smartphone ownership and usage profile than adolescents in secondary school. Also, socio-cultural norms and perspectives play an important role in addictions so it may not be accurate to generalize cut-off values across different cultures and age-groups. (11)

The 13.9% prevalence of PSU is however a cause for concern because of increasing usage of smartphones in the day-to-day activities of students especially for academic activities in the COVID-19 era because of online learning. This will increase the total time spent on phone in a day and this is an associated factor to PSU in this study.

Our observation of female gender being a predictor of PSU is similar to observations by Chen et al in China (25). In our environment, gender effect of PSU prevalence is mixed. Afe et al (27) and Balogun et al (3) found that it was higher in male students while Obi et al (24) found it higher in female undergraduates. Jared (28) found similar levels of PSU in both genders among Kenyan undergraduates. From this study the amount of time spent on social media and the use of some social media apps are associated with PSU. However, PSU appears to be driven more predictively among our respondents by the time spent surfing social media and not necessarily the type of medium used.

Our study shows the importance of smartphone-related habits in promoting addiction. Bedtime habits such as overnight calls or social media chats and using the phone in bed when unable to sleep are predictive of PSU. In our study, PSU is not associated with academic performance. Using the self-reported CGPA of the students to masses this may pose a limitation to the assessment of academic performance because we were unable to confirm the self-reported figures within the time frame of the study. However, Khan et al (29) have shown that smartphones can be a distraction while studying and can lead to poor academic performance.

The association between PSU and insomnia seen in our participants has also been reported in undergraduates in different parts of the world (14,30,31). Explanations for this include the sleep-disruptive effect of the blue light emitted from smartphone screens and the fact that excessive smartphone use at night could directly disrupt sleep by keeping students awake late. Such insomnia can lead to increased stress levels, anxiety and depression (32). The relationship of PSU with

psychiatric morbidity seen in this study was also observed by Afe et al (16) in our environment. Further studies will be very important to further explore this relationship since smartphones have practically become an inseparable entity for most university undergraduates.

Conclusion and Recommendations

Using appropriate norms, the prevalence of PSU among our participants is comparatively low. Our study provides an expansion in the available data of its predictors and these are valuable entry points for early preventive counselling which should be instituted as part of the initial statutory orientation for all undergraduates.

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Declaration

We hereby declare that the work in this manuscript is our own work.

Authors contribution

Author 1, 2, 3, 4, 6, 10: Conceptualisation, research coordination

Author 1, 2, 4, 5, 7, 8, 9, 11, 12,13: Developed research tools, manuscript drafting

Author 1, 2, 3, 4, 6, 7, 9, 10, 11: Supervision of data collection and analysis, manuscript drafting

Author 1, 2, 3, 5, 6, 7, 8, 11, 12,13: Data cleaning, curation and analysis

All authors: Critical review of the Manuscript and editing

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