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Research Article

Factors Associated with Problematic Smartphone Use among Secondary School Children in Rajshahi City, Bangladesh

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Abstract

Background: The use of smartphones has grown significantly on a global scale in recent years, bringing advantages as well as health risks. This study aims to estimate the prevalence of Problematic Smartphone Use (PSU) and identify the associated factors among secondary school children in Rajshahi City, Bangladesh.

Methods: This cross-sectional study considered a total of 473 students of classes VIII to X aged 13-18 years from Rajshahi City, Bangladesh. The PSU is considered as the outcome variable and socio-demographic as well as smartphone-related characteristics were considered as the predictors. A Receiver Operating Characteristic (ROC) curve and an Area Under the Curve (AUC) were used to determine the cutoff scores for significant predictors of PSU. A binary logistic regression model was used to explore the association between outcome variable with predictor variables.

Results: The PSU was reported by around one-third (31.9%) of the total children analyzed. Children's age, gender, academic grade, family type, father's education, father's occupation, mother's age, mother's education, mother's occupation, family income, smartphone ownership, availability of internet connection, and playing hours were found significantly associated with the PSU. In logistic regression model, it was found that girls were 0.73% (95% CI: 0.154, 0.478) less likely to be PSU than boys, academic grade who had IX and X was 0.454 (95% CI: 0.256, 0.806) times less and 1.287 (95% CI: 0.738, 20243) times more likely to be PSU compared to the students of class VIII. Moreover, having a personal smartphone or having family members with one increased the likelihood of having PSU by 5.978 (95% CI: 3.126, 11.431) times compared to not having one. Again, the respondents who had mobile data connection and broadband connection were 2.087 (95% CI: 1.194, 3.648) and 2.542 (95% CI: 1.256, 5.144) times more likely to be PSU compared to those who had no internet connection.

Conclusions: There an excessive prevalence of PSU, an outcome associated with demographic, socioeconomic, and smartphone use characteristics. Interventions aimed at reducing PSU, such as school-based counseling services and the creation of smartphone use policies, should be implemented in order to potentially lessen the factors linked to PSU.

Keywords: Smartphone; Mobile applications; PSU; χ^2-test; Logistic regression model

Abbreviations: PSU: Problematic Smartphone Use, AUC: Area Under the Curve, ROC: Receiver Operating Characteristic, OR: Odds Ratio, CI: Confidence Interval, SD: standard Deviation

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Background

A smartphone (a portable device that combines integrated computer and other features) is a cell phone that allows users to make phone calls, send text messages, browse the internet, and run software programs. It has been becoming popular since earlier in the 21st century, and it is now considered a vital part of our daily lives [1]. Moreover, smartphone use is becoming cheaper and cheaper because of competition among network providers as well as phone companies, which lead to increased use of smartphone among all parts of the population. Nowadays, smartphone users are increasing drastically across the world. In 2023, globally the current number of smartphone users is 6.92 billion, meaning 86.34% of the world's population owns a smartphone. This figure is up considerably from 2016, when only 3.668 billion users were 49.40% of that year's global population [2]. In Bangladesh, mobile phone users are increased drastically; 97.4% households have mobile phones and the number of households with a smartphone is 2,21,93,311 [3]. Currently 55.89% of Bangladeshis use mobile phones, according to the latest census [4]. The number of secondary school students in Bangladesh is 8,93,0245 (girls student: 54.92) [5]. So, it is important to pay close attention to a study on smartphone use among secondary school students.

In our everyday life, smartphones are used through different activities, which containing Wi-Fi technology have a key role in exchanging information and data to show images, audio, videos, and transfer applications from mobile emit radio waves [6-8]. However, the excessive use of smartphones has become an emerging health issue. It is the exposure to Radio-Frequency Radiation (RFR), which may increase human carcinogenicity [9]. Part of these waves may be absorbed by the human body, particularly during voice calls [10,11]. The health and biological effects of the emitted waves occur mainly in the head and neck areas [12,13]. The cause is that the frequency of radiations emitted from the mobile is utilized in a range from 3 kHz to 300 GHz [6]. Children are often more vulnerable to the potential harm from radio microwaves when using mobile devices to connect to Wi-Fi. This increased susceptibility is due to their thin skulls, developing nervous systems, higher rate of body cell division, and weakened immune systems. Consequently, the higher number of smartphone users without restriction becomes an emerging public health issue [14]. Especially, children's smartphone uses concerns exist regarding excessive use and the impact of frequent consumption of mobile media on children's health and welfare [15,16]. There are numerous studies identified the potential health and psychological effects of smartphones on the developing brains of children [17,18], increased upper extremely muscle activity and caused greater upper trapezius pain [19], neck problem [20], hand pain [21], memory performance [22,23], and emotional and behavior difficulties [14,24].

Prior research has highlighted connections between particular sociodemographic factors and PSU. Several of these studies found a gender effect, with females reporting higher levels of intensive use and signs of addiction compared to males [25-28]. Regarding age, some studies identified that younger individuals are more likely to show excessive use of mobile phones and symptoms of dependence on the mobile phone than are older persons [29,30]. Furthermore, although the findings were mixed, socioeconomic status [31,32] was also linked to compulsive mobile phone use. While some research indicated that problematic mobile phone use is associated with a lower socioeconomic status [31,32], other research reached the opposite conclusion [31,32]. One study also found that students majoring in humanities were more likely to use mobile phones more problematically than were those majoring in natural science [33]. The previous studies contributed to our knowledge on excessive use of smartphones, for their research in this domain in warranted. Again, to formulate policy recommendations that enhance children's welfare, there is a growing need for reliable evidence to assess the factors associated with smartphone use in children. This study aims to identify the factors associated with the problematic smartphone use (PSU) among secondary school children in Rajshahi City, Bangladesh.

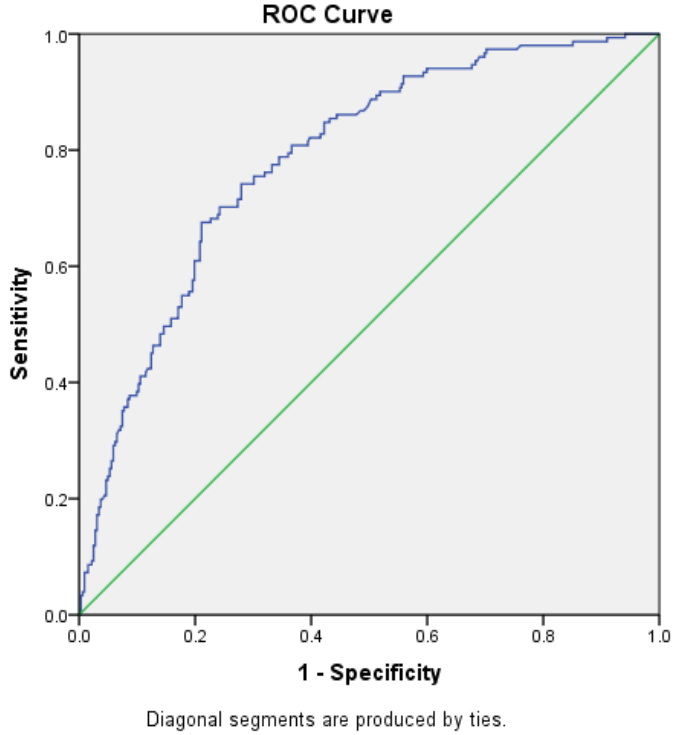

Figure 1: The ROC curve plot of the sensitivity versus 1-specificity of a diagnostic test.

Methods

Data Collection

This is an epidemiological, cross-sectional, quantitative, and analytical study whose population consistent of secondary school students enrolled in public and private institutions in Rajshahi City, Bangladesh was conducted between October and November, 2022. Data were collected by following a multi-stage stratified random sampling technique. In the 1st stage, Rajshahi City was selected purposively (out of 12 city corporations); in the 2nd stage, five wards (ward numbers: 8, 12, 20, 24, and 29) out of 30 wards were selected randomly, in the 3rd stage, five secondary schools from those five wards were selected randomly for data sources; and in the 4th stage (final stage), the respondents were selected from classes VIII to X aged 13-18 years. However, the children within the 13-18 years age bracket who had some form of physical disability were not included in this study. To select the schools, a list of educational institutions generated by the Government of Bangladesh (GoB) was used as the sampling frame. In case of sample size selection, it has been determined by using the following formula [34]:

$$n = \frac{Z^2 p(1-p)}{\epsilon^2} = \frac{Z^2 pq}{\epsilon^2}, \quad (1)$$

where, n = sample size, Z = tabulated value = 1.96 (at 5% level of significance), p = proportion of success (assuming that,

$p = 0.9$), q = portion of failure = $1 - p$, and ϵ = margin of error = 0.03. Based on the above formula (Eq. (1)), the study was supposed to select 384 respondents, but for the betterment of research 473 respondents were considered for this study.

Table 1: Socio-demographic and smartphone use related characteristics of the children, $N = 473$.

Characteristics	Categories	n	%	mean±SD
Age (in years)	13-14	63	13.3	15.40±1.38
	15-16	296	62.6	
	17-18	114	24.1	
Gender	Boys	190	40.2	
	Girls	283	59.8	
Academic grade	VIII	112	23.7	
	IX	210	44.4	
	X	151	31.9	
Type of family	Nuclear	359	75.9	
	Extended	114	24.1	
Number of family members	2-4	226	47.8	5.19±2.14
	5-6	176	37.2	
	>6	71	15	
Number of siblings	1	74	15.6	2.36±0.99
	2	225	47.6	
	3	127	26.8	
	>3	47	9.9	
Living with family	No	15	3.2	
	Yes	458	96.8	
Place of residence	Rural	80	16.9	
	Urban	393	83.1	
Father's age (in years)	30-40	172	36.4	44.68±6.92
	41-50	220	46.5	
	>50	81	17.1	
Father's education	No education	79	16.7	
	Primary	34	7.2	
	Secondary	165	34.9	
	Higher secondary	98	20.7	
	Graduate and above	97	20.5	
Father's occupation	Job	291	61.5	
	Business or farming	33	7	
	Labor	46	9.7	
	Others	103	21.8	
Mother's age (in years)	25-35	213	45	37.81±6.01
	36-45	209	44.2	
	> 45	51	10.8	
Mother's education	No education	82	17.3	
	Primary	92	19.5	
	Secondary	215	45.5	
	Higher secondary	37	7.8	
	Graduate and above	47	9.9	
Mother's occupation	Housewife	432	91.3	
	Job	25	5.3	
	Others (including business)	16	3.4	
Monthly family income (in taka)	<10000	158	33.4	20,718.71±20,572.45
	10000-20000	184	38.9	
	20000-30000	67	14.2	
	30000-40000	25	5.3	
	>40000	39	8.2	
Smartphone ownership	No	138	29.2	
	Yes	73	15.4	
	Family members have	262	55.4	
Availability of internet connection	No connection	215	45.5	
	Mobile data connection	174	36.8	
	Broadband connection	84	17.8	
Time spent (in hours) on smartphones (per day)	No use smartphones	198	41.9	1.81±2.44
	<1	63	13.3	
	1-3	91	19.2	
	3-5	78	16.5	
	>5	43	9.1	
Problematic smartphone use status	No (2≤ hours)	322	68.1	
	Yes (>2 hours)	151	31.9	
Playing hours (per day in hours)	No playing	199	42.1	0.65±0.84
	0-1	161	34	
	1-2	86	18.2	
	2-3	20	4.2	
	>3	7	1.5	

Note: 'n, number of children', 'SD, standard deviation'.

A semi-structured questionnaire was used to collect data from the respondents. A pilot survey was conducted prior to finalizing the questionnaire. The questionnaire included two parts (*viz.*, i. socio-demographic information and ii. information on smartphone use). The questionnaire was first developed in English and later it has been translated into native language (Bangla) for the respondents. To collect data, the questionnaires were distributed among the students of classes VIII to X. In this regard, prior permission was taken from the head of the institution. The enumerators were provided a briefing to the students about the purpose of this study and the process to fill up the questionnaire. The students were to bring the questionnaires and complete it following a conversation with their parents. The enumerators were collected these filled up questionnaires in the subsequent days.

Outcome Variable

The response variable was daily time spent on a smartphone in hours through phone calls, video games, Facebook, YouTube, etc. The cut-off point was considered based on current recommendations to limit daily spent time on using smartphones to a maximum of 2 hours [35-37]. Thus, daily time spent on smartphones ≤ 2 hours is termed as non-PSU and > 2 hours is termed as PSU.

Explanatory Variables

The explanatory variables were considered students' age, gender, academic grade, family type, mother's age, mother's education, mother's occupation, monthly family income, smartphone ownership, and availability of internet connection. Above variables were found significantly associated with the time spent on smartphone use in previous studies [37-40].

Statistical Analysis

Descriptive statistics (frequency, percentage, mean, and Standard Deviation [SD]) were used to describe the characteristics of the respondents. The χ^2-test was used to find the associations between time-spent on smartphone use (non-PSU vs. PSU) with explanatory factors. Multivariate binary logistic regression model was used to explore association of time-spent on smartphone use (non-PSU vs. PSU) with explanatory variables considered. The Odds Ratios (ORs) and 95% Confidence Intervals (CIs) were produced the logistic regression models to measure the significant associations between smartphone use status (non-PSU vs. PSU) and the socioeconomic and smartphone related factors. In binary logistic regression model, smartphone use status is treated as the dependent variable (y), and other socioeconomic and smartphone related factors found to be statistically significant $(p < 0.05)$ in bivariate analysis $(\chi^2 - \text{test})$ were selected as independent variables $(x_i, i = 1, 2, \ldots, 11)$. In the binary logistic regression model, the dependent variable was classified in the following manner:

$$\text{y = smartphone use status} = \begin{cases} 0, & \text{non} - \text{PSU } (\leq 2 \text{ hours}); \\ 1, & \text{PSU } (> 2 \text{ years}). \end{cases}$$

The multicollinearity between each explanatory variable in the regression model was checked by examining the Standard Error (SE) for the regression coefficients. However, there is no exact method to detect the multicollinearity problem in logistic regression analysis. This study used the magnitude of SE to detect it. If the magnitude of SE lies between 0.001 and 0.50, it can be considered as no evidence of a multicollinearity problem [41]. The magnitudes of SE were found to lie between the accepted ranges, indicating an absence of a multicollinearity

problem. The results of regression analysis were presented by OR with a 95% CI. Model fitness was checked using Hosmer-Lemeshow goodness of fit test ($p > 0.05$). The Receiver Operating Characteristic (ROC) curve was also used to determine the cutoff scores for independent predictors of non-PSU vs. PSU of the respondents. The accuracy of significant predictors was determined within the Area Under the ROC Curve (AUC). Statistical Package for Social Sciences (SPSS) version 22.0 (SPSS Inc., Chicago, IL, USA) was used for statistical analysis.

Ethical Consideration

The Institutional Animal, Medical Ethics, Biosafety and Biosecurity Committee (IAMEBBC) of the Institute of Biological Sciences (IBSc), the University of Rajshahi, Bangladesh reviewed and approved this study (Memo No: 249(35)/320/IAMEBBC/IBSc). Moreover, informed verbal consents were obtained both from the study participants and their parents after exploring the objectives of this study. The confidentiality of the participants was ensured as well.

Results

A total of 473 children were considered for this study. The socio-demographic and smartphone use related characteristics of the respondents are presented in Table 1. The higher portion of the respondents were aged 15-16 years (n =296, 62.6%), girls ($n = 283$, 59.8%), in class IX ($n = 210$, 44.4%), living in nuclear family ($n = 359$, 75.9%), having 2-4 family members ($n = 226$, 47.8%), number of siblings 2 ($n = 225, 47.6\%$), living with family ($n = 458, 96.8\%$), and living in the urban areas ($n = 393, 83.1\%$). The average ages of their fathers were 44.68 (±6.92) years and mothers were 37.81 (±6.01) years, and the average monthly income was 20,718.71 (±2,057.22) taka (Bangladeshi currency, $1=100 Taka). In the case of ownership of smartphones, most of the children (70.80%) have personal smartphones or their family members have, the mean time spent on smartphone use (per day) was 1.82 (± 0.24) hours, around one-third ($n = 151, 31.90\%$) children were excessive used smartphones (> 2 hours per day), and around three-fourths of the children's (76.10%) playing hours was less than one hour (no playing, 42.01%).

The bivariate analysis ($\chi^2 - \text{test}$) was used to find the association between 'smartphone use status' (non-PSU vs. PSU) with 'socioeconomic and smartphone use related' factors of the respondents and the results are presented in Table 3. This analysis identified that time spent on smartphones was found statistically significantly ($p < 0.05$) associated with respondent's age, gender, academic grade, family type, mothers' age, mothers' education, mother's occupation, family income, smartphone ownership, availability of internet connection, and playing hours per day.

Finally, multivariate binary logistic regression model was used to determine the factors associated with the status of smartphone use and the results are presented in Table 4. Various methods can verify the model result or assess the goodness of fit of the regression model. In this study, the Hosmer-Lemeshow test, Cox and Snell R^2, Nagelkerke R^2 and -2log likelihood ($-2LL$) methods were employed to check the model's suitability. In case of Hosmer-Lemeshow goodness of fit, it is considered suitably fitted if the significance of χ^2 value of the test is $p > 0.05$ [42]. In this study, when the test was performed, the significance of χ^2 value of 5.406 was obtained for the model (Table 3), which indicates the suitability. In other words, the dataset was suitable for logistic regression analysis. Cox and Snell R^2 and Nagelkerke R^2 were used to assess how the logistic regression model fits the data. The Cox and Snell R^2 value was 0.304 and Nagelkerke R^2 value was 0.405, which indicates a relatively good fit (Table 4). Thus, the Cox and Snell R^2 indi-

Table 2: Association between problematic smartphone use and socio-demographic as well as smartphones related factors among secondary school children.

Characteristics	Categories	Smartphones use status		*p*-values
		Problematic (n_1) (≤2 hours) (%)	Non-problematic (n_2) (>2 hours) (%)	
Age (in years)	13-14	44(69.8)	19(30.2)	0.039
	15-16	190(64.2)	106(35.8)	
	17-18	88(77.2)	26(22.8)	
Gender	Boys	143(75.3)	47(24.7)	0.006
	Girls	179(63.3)	104(36.7)	
Academic grade	VIII	89(58.9)	62(41.1)	0.008
	IX	77(68.8)	35(31.3)	
	X	156(74.3)	54(25.7)	
Type of family	Nuclear	255(71.0)	104(29.0)	0.014
	Extended	67(58.8)	47(41.2)	
Living with family	No	9(60.0)	6(40.0)	0.495
	yes	313(68.3)	145(31.7)	
Place of residence	Rural	58(72.5)	22(27.5)	0.352
	Urban	264(67.2)	129(32.8)	
Father's age (in years)	30-40	125(72.7)	47(27.3)	0.144
	41-50	148(67.3)	72(32.7)	
	>50	49(60.5)	32(39.5)	
Father's education	No education	69(87.3)	10(12.7)	0.789
	primary	27(79.4)	7(20.6)	
	secondary	104(63.0)	61(37.0)	
	Higher secondary	72(73.5)	26(26.5)	
	Graduate and above	50(51.5)	47(48.5)	
Father's occupation	Job	201 (69.1)	90(30.9)	0.895
	Business or farming	21 (63.6)	12 (36.4)	
	Labor	30 (65.2)	16 (34.8)	
	Others	70 (68.0)	33 (32.0)	
Mother's age (in years)	25-35	157(73.7)	56(26.3)	0.031
	36-45	136(65.1)	73(34.9)	
	> 45	29(56.9)	22(43.1)	
Mother's education	No education	67(81.7)	15(18.3)	0.000
	Primary	65(70.7)	27(29.3)	
	Secondary	151(70.2)	64(29.8)	
	Higher secondary	20(54.1)	17(45.9)	
	Graduate and above	19(40.4)	28(59.6)	
Mother's occupation	Housewife	299 (69.2)	133(30.8)	0.045
	Others	23(56.1)	18(43.9)	
Monthly family income (in taka)	<10000	122(77.2)	36(22.8)	0.000
	10000-20000	131(71.2)	53(28.8)	
	20000-30000	38(56.7)	29(43.3)	
	30000-40000	11(44.0)	14(56.0)	
	>40000	20(51.3)	19(48.7)	
Smartphone ownership	No	132 (95.7)	6(4.3)	0.000
	Personal or family members	190(56.7)	145(43.3)	
Availability of internet connections	No connection	178(82.8)	37(17.2)	0.000
	Mobile data connection	102(58.6)	72(41.4)	
	Broadband connection	42(50.0)	42(50.0)	
Playing everyday	No	158(79.4)	41(20.6)	0.000
	Yes	164(59.9)	110(40.1)	
Total		322(68.1)	151(31.9)	

Table 3: The effects of some selected socio-demographic and smartphones related characteristics on the problematic smartphone use employing logistic regression model.

Characteristics	Categories	Coefficients (β)	*p*-values	Odds Ratio (OR)	95.0% CI for OR	
					Lower limit	Upper limit
Age (in years)	13-14 (ref.)			1		
	15-16	-1.607	.000	.200	.096	.420
	17-18	-3.404	.000	.033	.014	.082
Gender	Boys (ref.)			1		
	Girls	-1.304	.000	.272	.154	.478
Academic grade	VIII (ref.)			1		
	IX	-.790	.007	.454	.256	.806
	X	.252	.373	1.287	.738	2.243
Type of family	Nuclear (ref.)					
	Extended	.365	.156	1.440	.870	2.386
Mother's age (in years)	25-35 (ref.)			1		
	36-45	.044	.858	1.045	.646	1.690
	> 45	.353	.357	1.423	.672	3.013
Mother's education	No education (ref.)			1		
	Primary	.106	.797	1.111	.496	2.488
	Secondary	-.177	.636	.838	.403	1.743
	Higher secondary	.556	.298	1.743	.612	4.963
	Graduate and above	.869	.118	2.386	.803	7.091
Mother's occupation	Housewife (ref.)			1		
	Others	.177	.669	1.194	.530	2.690
Monthly family income (in taka)	<10000 (ref.)			1		
	10000-20000	-.304	.314	.738	.408	1.334
	20000-30000	-.273	.503	.761	.343	1.692
	30000-40000	-.034	.952	.967	.326	2.870
	>40000	-.674	.177	.510	.192	1.356
Smartphone ownership	No (ref.)			1		
	Personal or family members	1.788	.000	5.978	3.126	11.431
Availability of internet connections	No connection (ref.)			1		
	Mobile data connection	.736	.010	2.087	1.194	3.648
	Broadband connection	.933	.009	2.542	1.256	5.144
Playing everyday	No (ref.)			1		
	Yes	.385	.098	1.470	.932	2.320
Model summary: Model $\chi^2 = 5.406^{a}$, -2 Log likelihood = 484.594^{**}, Nagelkerke R^2 =.405, Cox & Snell R^2 =.304						

Note: *p < 0.05; **p < 0.01; [a]p > 0.05; CI, represents the confidence interval; ref., the reference category.

cates that 30.04% of the variation in the independent variables is explained the logistic model and Nagelkerke R^2 indicates that 40.50% variation in the dependent variable.

Again, $-2LL$ is another method used to evaluate the model's goodness of fit. This method is a key concept to understand the test in multiple regressions [43]. Generally, the smaller value of $-2LL$ implies better results, which shows that the model yields lowest value $(-2LL = 484.594)$, meaning that the independent variables selected for the model construction were prime factors for smartphone use status and that the factors were perfectly suited for the model. Finally, the ROC curve was prepared to validate the accuracy of logistic regression model. The graphical representation of ROC curve and AUC indicates good accuracy in the model (Figure 1). The value of AUC was 78.5% (AUC = 0.785, 95% CI: 0.743-0.828, p < 0.000), which reveals that the result of the logistic regression model is very close to the perfect analysis of the data. Again, the asymptotic significance of the ROC curve apprises that the curve is statistically significant. Therefore, the binary logistic regression model constructed in this study was well fitted. In this model, it is observed that age, gender, academic grade, smartphone ownership, and availability of internet connection day of the respondents are statistically significant predictors on the PSU among secondary school children in Rajshahi City, Bangladesh. The age of the respondent who had 15-16 years and 17-18 years were 0.200 (95% CI: 0.096, 0.42) times and 0.033 (95% CI: 0.014, 0.082) times less likely to have PSU compared to those who had 13-14 years, respectively. Girls had 0.272 (95% CI: 0.154, 0.478) times less likely to have PSU than boys. Academic grade who had IX and X was 0.454 (95% CI: 0.256, 0.806) times less and 1.287 (95% CI: 0.738, 20243) times more likely to have PSU compared to those who had VIII, respectively. Smartphone ownership of personal or family members had 5.978 (95% CI: 3.126, 11.431) times more likely to have PSU than no smartphone ownership. Respondents who had mobile data connection and broadband connection were 2.087 (95% CI: 1.194, 3.648) and 2.542 (95% CI: 1.256, 5.144) times more likely to have PSU compared to those who had no internet connection, respectively.

Discussion

Students use smartphone in everyday life through different activities. But their excessive use smartphone accompanies negative consequences [44]. Particularly, students are identified as the most vulnerable group of the population as they waste their most valuable time through smartphone use, which is associated with a lower quality of life, more behavioral difficulties, and poorer school performance [45]. This study determined the prevalence and potential risk factors associated with the PSU. A total of 473 secondary school children of classes VIII- X were included in this study and their time spent on smartphone use more than 2 hours per day is considered as the excessive use of smartphone. This study identified that excessive use of smartphone in children aged 13-18 years to be 31.9%, which is higher than the global prevalence (26.99%) [46]. The excessive use of smartphones among students found 23% in Germany [37], 31% in Korea [47], and 12% in Japan [48]. A recent study conducted in Bangladesh and found that 61.4% of the young adults aged 18-32 years and 40.7% females were addicted to their smart-

phones [49]. These results supported the trend our study finding that excessive use of smartphones are higher prevalent among Bangladeshi children compared to their Asian peers. Possible reasons may be cultural differences and differences in the digitalization process [50]. Again, this study identified that the excessive use of smartphones is more prevalent among girls (36.70%) than that of boys (24.70%). This results also supported by a study conducted in Germany among adolescents [37]. Smartphone use status is statistically significantly ($p < 0.05$) associated with adolescent's socioeconomic factors, *e.g.*, age, sex, academic grade, family type, mother's age, mother's education, mother's occupation, family income, having internet connection, and availability of internet connection. The findings of this study are also consistent with the results of the previous research studies among children [48,49,51,52]. This study has also identified some potential limitations. First off, because this was a cross-sectional study, it was unable to establish a causal relationship between PSU and its effects. Second, because the questionnaire was self-reported, bias in recall or reporting may have occurred. Third, given that the survey was conducted in class, it's probable that some students- particularly those with PSU were not present when the questionnaire was given out. Because of this, it's possible that the survey underestimated the prevalence of PSU by omitting to include responses from people who are so engrossed in their work on the smartphone that they hardly ever leave their rooms. Future studies should attempt to determine implementation of preventive measures, and the development of treatment approaches for PSU.

Conclusions

This study found the higher prevalence of PSU among secondary school children in Bangladesh. The PSU among secondary school students is identified as a growing concern. The study findings suggest that there is a need to find solutions to address the significant impact of excessive use of smartphones at a national and international levels. National and international organizations should develop policies and guidelines to reduce excessive use of smartphones. It is the high time to implement strategic policies that take into account the findings to restrict smartphone usage among children. This will enable Bangladesh to safeguard its future generation from the harmful effects of PSU. To better understand the cause of this increasing PSU, more research is required in the future to expand on this knowledge.

Author Statements

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Data Availability Statement

The data presented in this study are available on request from the Corresponding Author. The data are not publicly available due to privacy restriction.

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