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Prevalence, Patterns, And Factors Associated With Excessive Smartphone Use Among University Students: A Cross-Sectional Study

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ABSTRACT

Excessive smartphone use among students can lead to physical issues like sleep problems and muscle strain, as well as psychological issues including anxiety and depression, negatively affecting their academic performance.

Objectives: The study investigated the prevalence and associated characteristics of excessive smartphone usage among college students in Kerala, South India.

Method: The research included 1,030 participants chosen randomly from five different universities in Kerala through an online survey. The study collected information about participants' socio-demographic characteristics, smartphone usage patterns and their self-assessment of smartphone addiction. The Smartphone Addiction Scale—Short Version (SAS-SV) was used to assess the level of smartphone use.

Results: The research showed that 36.7% of students demonstrated excessive smartphone use. The age of participants spanned between 18 and 24 years with an average of 20.50 years (SD = 1.66). The data showed that excessive smartphone usage was strongly related to habitual usage ($r = 0.56$, $p < .001$), process usage ($r = 0.41$, $p < .001$), and social usage ($r = 0.21$, $p < .001$). The results of multiple linear regression analysis revealed that habitual smartphone behaviour ($\beta = .50$, $p < .001$) and process usage ($\beta = .13$, $p < .001$) served as significant predictors which explained 33% of the addiction score variance.

Conclusion: The research indicates that excessive smartphone use affects more than one-third of students and highlights the influence of habitual and entertainment-driven smartphone use on addiction levels. This demonstrates an urgent need for targeted intervention to promote digital wellness and mindful smartphone use in academic settings.

Keywords: *smartphone use, influencing factors, university students, Kerala*

1. INTRODUCTION

The use of smartphones has greatly changed the social interaction among individuals, searching and finding information in life and even in management of day-to-day activity worldwide. These devices have become essential especially to students who are able to find a wide range of educational, social and entertaining features that are integrated into their academic and personal lives [1]. However, the excessive use of smartphones has also raised concerns about the possible negative impacts on the mental health and overall well-being of the users. Research findings highlight its adverse effects across different regions and demographics. More than 95% of college students have smartphones, and many of them have poor usage habits [2]. In North India, research revealed that 33.33% of female medical students and 46.15% of male medical students were addicted to smartphones with relationships to poor sleep and health [3]. Further, research done among adolescents 16–19 years showed that 37% of them had addictive behaviours, and the factors that influenced this included age, location, and the duration of use [4]. Similar results were observed in other countries, for instance, in Saudi Arabia where 19.1% of the

population was classified as addicted [5], and China where smartphone use among college students showed different patterns between the two genders [6]. In Nepal, 36.8% of medical students were addicted to smartphones, and activities such as phubbing increased the likelihood of addiction [7]. The effects of overuse of smartphones are extensive and affect students' physical, psychological and cognitive well-being. In the literature, prolonged screen time has been linked with musculoskeletal discomfort on the neck, back, and shoulders, as well as sleep issues, including the delay in falling asleep and worse quality of sleep, which results in day time fatigue and lack of focus [8,9]. In addition, current research indicates that the use of smartphones increases levels of anxiety, depression, and stress among users [10,11]. Furthermore, cognitive impairment, including the decline in the ability to focus and reduced mental flexibility, aggravate the existing academic issues [12].

Studies have concluded that there is a significant correlation between the use of smartphones and well-being. Further, studies highlight the importance of intervention strategies to mitigate the negative impacts of excessive smartphone usage [13]. Anxiety, stress, loneliness, and impulsivity have been identified as key determinants of problematic smartphone use, which predict higher levels of smartphone dependency among students [14]. Compulsive smartphone use has also been found to be predicted by personality traits such as instant gratification and low self-control [12]. However, besides psychological factors, excessive smartphone engagement is also fuelled by peer influence, and the growing dependency on digital platforms for educational resources, social networking, and entertainment at the cost of academic performance [10]. Moreover, socio-cultural factors are noted to shape smartphone usage behaviours and reveal that in collectivist societies such as India, family values and social connections are key drivers of how individuals use their devices [15].

Although the use of smartphones among college students is increasing, very few studies have investigated the type of usage and the factors that lead to excessive usage specifically in the context of Kerala. Due to the high levels of literacy and the focus on education in Kerala, the students in the state may be experiencing distinct influences on their smartphone usage, shaped by academic aspirations and societal expectations [16]. Furthermore, widespread internet accessibility and technology-friendly infrastructure in Kerala leads to excessive engagement of smartphones among young adults [17]. However, despite the fact that smartphones are used extensively by students in Kerala, the prevalence and effects of excessive use among college students in the state have not been sufficiently explored. This study seeks to determine the prevalence, types, and factors associated with excessive smartphone use among college students in Kerala. This research will be useful in identifying the determinants of excessive smartphone use, which is important in developing intervention strategies that aim to promote healthier usage habits and mitigate its negative impact on student well-being [14].

Objectives

The aim of the study was to investigate the prevalence and associated characteristics of excessive smartphone usage among college students in Kerala, South India.

2. MATERIAL AND METHODS

An online cross-sectional survey was conducted to assess the prevalence of Excessive Smartphone Usage among University students across various institutions from the state of Kerala, India. By employing a web-based survey through Google Forms, the study recruited 1,030 participants between 18 and 24 years of age. A multi-stage random sampling method was employed for selecting participants. Initially, institutions affiliated with five different universities were chosen. From each institution, specific streams (Medical and Allied Health, Engineering and IT, Arts and Science, Commerce and Management) were randomly selected. Subsequently, batches within these streams were randomly selected year-wise. Emails were sent to the respective coordinators to obtain lists of students. Finally, participants were randomly selected from these lists and invited to participate in the study via email and mobile messages. To ensure that participants understood and completed the web-based survey accurately, they had to be proficient in English. Individuals undergoing treatment or therapy for smartphone addiction or related behavioral issues were excluded to avoid any potential confounding influences on addiction-related findings. The demographic breakdown of the participants revealed a diverse age range from 18 to 24 years, with an average age of 20.50 years (SD = 1.66). In terms of gender distribution, the majority were female, making up 56.89% (n = 586) of the respondents, whereas male participants comprised 43.11% (n = 444). Ethical approval for conducting this study was obtained from the Institutional Ethics Committee (Approval No: ECASM-AIMS-2021-373).

Assessments

Socio-Demographic Information.

Participants provided details on their age, educational status, gender and the primary use pattern of the smartphone. The data collected included the average daily time spent on smartphones and the reasons for using the smartphone such as gaming, entertainment, shopping and communication. The assessment was to help understand students' smartphone usage and the primary role smartphones phones play in their' daily lives.

Self-Perceived Smartphone Addiction.

Participants rated their level of smartphone addiction using a categorical scale ranging from Non-addictive to Extremely

addictive. The classification was divided into four categories: non-addictive, slightly addictive, moderately addictive, and extremely addictive. This self-perception measure helped to reveal the students' awareness of their own smartphone dependence.

Smartphone Addiction Scale—Short Version (SAS-SV)

The Smartphone Addiction Scale-Short Version (SAS-SV) [18] was used to objectively assess smartphone addiction. This validated instrument consists of 10 self-report items that are rated on a 6-point Likert scale, ranging from 1 (strongly disagree) to 6 (strongly agree). The items include statements such as: "I have missed planned work or activities because of my smartphone use." The total score ranges from 10–60, and a higher score indicates a higher level of smartphone addiction. In the present study, the SAS-SV had high internal consistency, both McDonald's omega and Cronbach's alpha were 0.84.

Habitual Smartphone Usage Scale

The automaticity of smartphone usage was measured using the Habitual Smartphone Usage Scale, based on the work of Limayem, Hirt, and Cheung [19]. This scale consists of six items including items such as "I check my smartphone quite automatically," and the response options include a 5-point Likert scale. The internal consistency of this scale was high with both McDonald's omega and Cronbach's alpha reported as 0.89.

Process Usage and Social Usage Scale

To assess both the process and social usage of smartphones, the items developed by Chua, Goh, and Lee [20] were used. The Process Usage Scale has seven items including, "Using my smartphone is fun and helps to kill time when I am bored," on a 5-point Likert scale. The internal consistency of the scales was high, with McDonald's omega and Cronbach's alpha both reported as 0.84. Similarly, the Social Usage Scale has five items such as, "I use my smartphone to communicate with people through social media," in order to measure the frequency of using smartphones for social purposes. The Social Usage Scale had high reliability, and the point estimate of McDonald's omega and Cronbach's alpha was 0.85.

3. RESULTS

The data obtained through the online survey was analyzed using JASP [21].

Table-I: Demographics of the study participants

Variables	**No. (%)**
Age (Mean ± SD)	20.50 ± 1.66
Gender	
Male	444 (43.11%)
Female	586 (56.89%)
Education	
Medical & Allied Health	204(19.80%)
Science, Engineering & IT	355 (34.47%)
Commerce and Management	339 (32.91%)
Arts	132 (12.82%)
Socio-Economic Status	
High	44 (4.27%)
Low	51 (4.95%)
Middle	935 (90.78%)
Residential Area	
Rural	254 (24.66%)
Semi-Urban	377 (36.60%)
Urban	399 (38.74%)

Mobile Data Plan	
No	24 (2.33%)
Yes	1006 (97.67%)
Perceived level of Addiction	
Non-addictive	243 (23.59%)
Slightly addictive	479 (46.50%)
Moderately addictive	271 (26.31%)
Extremely addictive	37 (3.59%)

Table-I summarizes the sociodemographic characteristics of the 1030 study participants, including age, gender, education, socio-economic status, residential area, mobile data plan usage, and their perceived level of addiction to smartphones. The findings reveal a notable prevalence of smartphone addiction across the sample surveyed. Overall, the total prevalence of smartphone addiction is approximately 36.7%, indicating that a substantial proportion of the population is being affected by this phenomenon. When analyzing the data by gender, the prevalence is slightly higher for females at 37.71%, compared to males, where it stands at 35.36%. In the analysis, Pearson's correlation coefficient revealed significant relationships among the variables. Smartphone Addiction was positively correlated with Habitual Smartphone Usage ($r = 0.56$, $p < .001$), Process Usage ($r = 0.41$, $p < .001$), and Social Usage ($r = 0.21$, $p < .001$). Habitual Smartphone Usage also showed positive correlations with both Process Usage ($r = 0.60$, $p < .001$) and Social Usage ($r = 0.40$, $p < .001$). Lastly, a positive correlation was noted between Process Usage and Social Usage ($r = 0.43$, $p < .001$).

Table II: Distribution of time spent on various smartphone activities by participants

Activity	< 30 mins	30 mins - 1 hr	1 - 2 hrs	2 - 3 hrs	3 - 4 hrs	> 4 hrs	Not at all
Overall Smartphone Usage	11 (1.07%)	55 (5.34%)	155 (15.05%)	213 (20.68%)	261 (25.34%)	335 (32.52%)	-
Communication	279 (27.09%)	362 (35.15%)	202 (19.61%)	84 (8.16%)	51 (4.95%)	31 (3.01%)	21 (2.04%)
Entertainment	71 (6.89%)	245 (23.79%)	303 (29.42%)	196 (19.03%)	115 (11.17%)	98 (9.51%)	2 (0.19%)
Social Networking	247 (23.98%)	259 (25.15%)	223 (21.65%)	126 (12.23%)	73 (7.09%)	40 (3.88%)	62 (6.02%)
Gaming	221 (21.46%)	93 (9.03%)	71 (6.89%)	17 (1.65%)	15 (1.46%)	10 (0.97%)	603 (58.54%)
Shopping	473 (45.92%)	139 (13.50%)	40 (3.88%)	15 (1.46%)	9 (0.87%)	1 (0.10%)	353 (34.27%)

In the study examining smartphone-related activities, the time spent across various categories such as overall Smartphone Usage, Communication, Entertainment, Social Networking, Gaming and Shopping provide insight into users' behaviour among the 1030 participants of the survey (Table-II). The findings highlight a significant digital connectivity, with 32.52% (n=335) of participants reporting more than 4 hours of usage daily. The data indicate 35.15% (n=362) primarily engage in communication for 30 minutes to 1 hour. Further, the preference in smartphone utilization indicates that entertainment peaks at 1 to 2 hours for 29.42% (n=303), and 25.15% (n=259) engage in social networking for 30 minutes to 1 hour. Furthermore, gaming and shopping activities are less frequent, with a notable 58.54% (n=603) not gaming and 34.27% (n=353) not shopping via their smartphones.

Table III: Factors influencing smartphone addiction

Factors	Not Addict No. (%)	Addict No. (%)	p-value
Gender			
Female	365 (62.29%)	221 (37.71%)	*NS
Male	287 (64.64%)	157 (35.36%)	
Socio-Economic Status			
Low	39 (76.47%)	12 (23.53%)	*NS
Middle	586 (62.67%)	349 (37.33%)	
High	27 (61.36%)	17 (38.64%)	
Residential Area			
Rural	158 (62.20%)	96 (37.80%)	*NS
Semi Urban	231 (61.27%)	146 (38.73%)	
Urban	263 (65.91%)	136 (34.09%)	
Smartphone Usage Duration			
Less than 30 minutes	11 (100.00%)	0 (0.00%)	
30 minutes to 1 hour	46 (83.64%)	9 (16.36%)	
1 hour to 2 hours	127 (81.94%)	28 (18.06%)	*** p<.001
2 hours to 3 hours	143 (67.14%)	70 (32.86%)	
3 hours to 4 hours	171 (65.52%)	90 (34.48%)	
More than 4 hours	154 (45.97%)	181 (54.03%)	
Self-Perceived Addiction Levels			
Non-addictive	213 (87.65%)	30 (12.35%)	
Slightly addictive	328 (68.48%)	151 (31.52%)	*** p<.001
Moderately addictive	107 (39.48%)	164 (60.52%)	
Extremely addictive	4 (10.81%)	33 (89.19%)	

NS – Not Significant

To investigate the factors influencing smartphone addiction, a series of chi-squared tests were conducted to assess the relationships between demographics, usage patterns, and self-perceived addiction levels (Table III). A significant association was found between individuals' self-perceived addiction levels and their actual smartphone addiction status, as indicated by chi-squared test, χ^2 (3) = 177.62, p<.001 with a medium-to-large effect size (Cramer's V = 0.42). Additionally, a moderate association was observed between time spent on smartphones and addiction status, χ^2 (5) = 84.55 p<.001, Cramer's V = 0.29. However, demographic factors such as gender and residential area showed negligible to weak associations with smartphone addiction. Gender was not significantly related to addiction status, χ^2 (1) = 0.60, p = 0.44. Similarly, residential area (rural, semi-urban, or urban) had little impact on addiction likelihood, χ^2 (2) = 1.97, p = 0.37. Socio-economic status also exhibited minimal influence on smartphone addiction, as indicated by χ^2(2) = 4.04, p = 0.13.

The Mann-Whitney U test comparison of habitual smartphone behavior, process usage, and social usage between Smartphone-Addicted and Non-Smartphone-Addicted groups highlight a distinct pattern. The habitual smartphone behavior showed a significant(U = 191984.50, p < 0.001) difference, with the Smartphone-Addicted group (Mean = 18.50, SD = 4.24) exhibiting higher engagement compared to the Non-Smartphone-Addicted group (Mean = 13.15, SD = 5.39), Similarly, process usage (U = 166816.50, p < 0.001) was significantly greater in the Smartphone-Addicted group (Mean = 19.09, SD = 4.67) than in the Non-Smartphone-Addicted group (Mean = 15.87, SD = 5.27). Further in Social usage the Smartphone-Addicted participants reported slightly higher mean usage (Mean = 14.88, SD = 3.98) compared to their Non-Smartphone-

Addicted counterparts (Mean = 13.41, SD = 4.20), as indicated by the test results (U = 148652.00, p < 0.001).

Table IV: Multiple linear regression predicting smartphone addiction scores

Predictor	B	SE	β	95% CI (LL, UL)	t	p
(Intercept)	16.13	1.06	—	[14.04, 18.21]	15.17	< .001
Habitual Smartphone Behavior	0.82	0.05	0.50	[0.71, 0.92]	15.39	< .001
Process Usage	0.23	0.06	0.13	[0.11, 0.34]	3.94	< .001
Social Usage	-0.11	0.06	-0.05	[-0.24, 0.01]	-1.76	.08
Gender (Male)	-0.79	0.48	—	[-1.73, 0.15]	-1.65	.10
Residential Area (Semi Urban)	-0.43	0.61	—	[-1.64, 0.77]	-0.70	.48
Residential Area (Urban)	-1.18	0.61	—	[-2.37, 0.01]	-1.94	.05
SES (Non-High)	-1.92	1.17	—	[-4.21, 0.37]	-1.64	.10

β = standardized regression coefficient. **B** = unstandardized coefficient. **SE** = standard error. **CI** = confidence interval.

A multiple linear regression was conducted to examine the extent to which habitual smartphone behavior, process usage, social usage, gender, residential area, and socio-economic status predict smartphone addiction scores (SASTotal). The overall model was statistically significant, $F(7, 1022) = 72.33$, $p < .001$, and accounted for approximately 33% of the variance in smartphone addiction, $R^2 = .33$, Adjusted $R^2 = .33$. The residuals appeared to be independent, as indicated by a Durbin-Watson statistic of 1.80. Among the predictors, habitual smartphone behavior emerged as a strong positive predictor of smartphone addiction, $B = 0.82$, $SE = 0.05$, $\beta = .50$, $t = 15.39$, $p < .001$, with a 95% confidence interval [0.71, 0.92]. Process usage was also a significant positive predictor, $B = 0.23$, $SE = 0.06$, $\beta = .13$, $t = 3.94$, $p < .001$, 95% CI [0.11, 0.34]. Social usage showed a negative trend, but was not statistically significant ($B = -0.11$, $\beta = -0.05$, $p = .08$). Similarly, gender (male) ($B = -0.79$, $p = .10$), residential area (semi-urban) ($B = -0.43$, $p = .48$), and socio-economic status (non-high SES) ($B = -1.92$, $p = .10$) were not significant predictors. Notably, residential area (urban) had a marginally significant negative association with smartphone addiction scores, $B = -1.18$, $SE = 0.61$, $t = -1.94$, $p = .05$, 95% CI [-2.37, 0.01]. These findings suggest that habitual and process-based smartphone usage patterns are meaningful contributors to elevated smartphone addiction scores, whereas demographic factors such as gender, area of residence, and socio-economic status play a lesser to no role in predicting addiction levels in this sample.

4. DISCUSSION

A significant number of the sample in the present study had excessive smartphone use, in line with growing rates of smartphone addiction among youths in the last few years. Excessive use globally is reported between 10% and 67%. In India, the prevalence varies between 24.6% and 44% among adolescents and young adults [22]. The current study reports an excessive smartphone usage prevalence of 36.7%, which is in line with several other countries in Asia [6,7]. This high prevalence may be attributed in part to the widespread access to the internet, social media and entertainment platforms. Moreover, while some studies show that addiction is higher among females, others show that more males are likely to be addicted. In this study, females had slightly higher addiction rates than males, which might be due to the fact that females tend to use smartphones more for communication, entertainment and social networking than males who are likely to use them for gaming, learning and information search [24].

Usage of smartphones differs greatly depending on the purpose which people use them for, while specific patterns of consumption can be observed in relation to addiction. Habitual and process usage were fairly well correlated with addiction scores but were not well correlated with social usage. The participants were different in their interests and the time they allocated for the activities. Communication, entertainment and social networking were employed at moderate frequency while gaming and shopping had lower levels of actual application. This is in line with previous research that indicates that emerging adults are likely to be more interested in social networking and interactions on social media than in gaming or shopping [25]. Those students who place emphasis on the social aspect will be using the platform to talk to their friends, family, and peers, which is often a less time-consuming activity than playing video games. Moreover, social and communications activities are less likely to have addictive potential than gaming and shopping.

A significant relationship was observed between self-perceived addiction levels and actual addiction status. This strong correlation indicates that participants have a good awareness of their own smartphone addiction, such that self-assessment is

in sync with observed addiction behaviour. Moreover, there is a moderate association of time spent on smartphones with addiction status which means that although the usage duration is important, it is not the only factor that defines addiction. In line with previous findings, more time spent on screens increases the chances of developing smartphone dependency [26]. However, other variables such as the frequency of use, time of use and their impact on daily activities cannot be excluded. Further investigation is needed to determine the contribution of time spent on different activities in the onset of smartphone addiction to better understand the underlying processes.

Studies on the correlation between socioeconomic status (SES) and smartphone addiction are inconclusive. Some studies have shown that students from high income families spend more time on smartphones while other studies have shown that students from low income families are more likely to be smartphone addicts [27,28,29]. In this study, there was no significant relationship between addiction status and gender, SES, or living environment, which means that other factors besides demographics play the major role in the susceptibility to smartphone addiction. It is therefore important to consider the individual, social and environmental factors that may play a role in the development of smartphone addiction. A positive correlation was found between smartphone addiction and habitual, process, and social behaviour, in line with the findings of Park [30]. The Mann-Whitney U test results showed that there was a significant difference in habitual, process and social behaviour between the addicted and non-addicted groups.

The statistical analysis using multiple linear regression showed that the model explained 33% of smartphone addiction scores (R^2 =.332, Adjusted R^2 =.326) which indicates that the predictors are useful in explaining excessive smartphone use among college students. Among the demographic variables, residential area (urban) had a small but significant negative effect (B = -1.219, p =.047) indicating that rural students reported lower smartphone addiction scores than their urban counterparts. This may be due to differences in digital access, lifestyle, or social expectations around connectivity in different regions. Other demographic factors such as gender and socio-economic status were not significantly associated with smartphone addiction, possibly because smartphones are available to all socio-economic groups in college populations.

The study revealed that habitual smartphone behaviour proved to be the most powerful predictor (B = 0.818, β = 0.50, p <.001) which supports the notion that automatic and unconscious actions such as checking notifications lead to compulsive patterns that match addictive behaviours [31]. The continuous stream of alerts together with social validation and app engagement creates a reinforcement loop that strengthens this habit throughout time. Process usage which includes non-social passive activities like video watching and browsing also emerged as a significant predictor (B = 0.226, β = 0.13, p <.001) because its immersive and unstructured nature leads to prolonged engagement. The immersive and often escapist nature of process usage may foster emotional dependence on the device, contributing to addictive patterns. The lack of significance in social usage as a predictor (B = -0.114, β = 0. -0.05, p =.075) may stem from the fact that social usage involves more purposeful and reciprocal interactions which may act as a buffer against dependency. The main function of social usage on smartphones appears to be bond maintenance instead of compulsive or self-regulatory needs. The research results demonstrate that habit strength together with entertainment-driven usage play essential roles in problematic smartphone use but social smartphone engagement shows minimal harm.

This study adds important insights to the literature on digital addiction by deeper understanding the prevalence of smartphone addiction, its behavioural correlates, and underlying factors. The principal strength of the study is that it applies well-established psychometric scales, to measure smartphone addiction and related activities. However, there are some limitations that need to be taken into consideration. As the study is based on self-reported data, there could be response bias where participants may not accurately report their smartphone use. The cross-sectional design is also a limitation because it fails to establish cause and effect, which is based on one point in time as opposed to tracking changes over time. Also, the sample was selected from a certain population, which may not be sufficient to represent the entire population, especially with regard to cultural and socioeconomic diversity. Other factors such as internet access, peer pressure, and family environment were not considered despite their possible influence on smartphone use. Future work should include longitudinal studies to examine the dynamics of changes in smartphone use and addiction symptoms during important life transitions. Moreover, the integration of neurobiological methods, including brain imaging and biometrics, could help to expand our understanding of addiction processes. Other research should also assess the efficiency of specific interventions, like digital detox, self-regulation applications, and educational initiatives, to prevent smartphone dependency and improve the usage habits.

5. CONCLUSION

This research emphasizes the widespread presence of smartphone dependence, as over one-third of the participants display behaviours resembling addiction tendencies. The results observed predominantly align with global trends, particularly in Asian countries. The study underscores that smartphone addiction extends beyond basic demographics, emphasizing the role of individual habits, psychological factors, and digital engagement patterns. Considering the nature of smartphone dependency upcoming studies should investigate behaviors and mental processes that promote excessive usage. The results highlight the importance of addressing automatic behavioural loops and emotion-driven usage in interventions targeting smartphone overuse. Moreover, the differentiated impact of usage types suggests that not all forms of phone engagement are equally problematic, and that prevention strategies should focus more on regulating passive, habitual, and emotionally

compensatory phone use. By recognizing these elements and considering them in crafting strategies to promote balanced smartphone usage habits could lead to healthier digital behaviours overall.

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