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Smartphone Addiction and Its Impact on Mental Health among Graduate Students: Evidence from South Assam, India

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Abstract A mobile phone is an electronic device designed for communication. Smartphones have become incredibly versatile and robust over time, enabling users to accomplish a wide range of tasks, which can often lead to excessive or improper use, which can harm health, especially causing various mental issues. This phenomenon is widespread among adolescents/students. Against this backdrop, the primary objective of the present study is to explore the link between smartphone addiction and mental health among graduate students in South Assam. This investigation is based on primary data collected from premier colleges of South Assam. To analyse the data, initially, the Chi-square test is applied, and then ordinal logistic regression, a more robust technique for examining the relationship between variables, is employed. We found that addiction levels varied, reflecting diverse usage habits integral to modern life. The Chi-square tests also indicated a significant association between smartphone addiction and mental health. Regression analysis further revealed a negative influence of mental health on smartphone addiction, suggesting the fact that better mental health correlates with lower addiction levels. So, promoting healthy habits and awareness of risks associated with smartphone use is crucial for building a healthy and sustainable society.

Keywords Smartphone, Addiction, Mental Health, Chi-Square, Ordinal Logistic Regression

1. Introduction

A mobile phone is an electronic device used for communication. Mobile phones are also called smartphones or cell phones. At the beginning of the evolution of smartphones, they were used only for texting and messaging. However, in recent times, the scope of smartphones has increased beyond this. At the same time, it can do many tasks, such as browsing the internet, clicking extraordinary pictures, playing games, and making online payments [1]. The use of smartphones has increased manifold in the last few decades since the cost of smartphones has dropped significantly, making them affordable for all customers. Also, various features such as GPS navigation, multimedia, access to numerous applications, e-commerce, and communication have fuelled the use of smartphones [2]. The other reasons that impacted the increase in smartphone use are the smartphone makers' advertising and the widespread use of high-speed internet, making smartphones accessible to a broader range of people.

Smartphones also positively impact education by accessing information and learning resources. Students nowadays enhance their understanding of a topic by accessing online libraries and visiting various educational apps. The smartphone also promotes flexible learning, such as studying anytime and personalized learning for individual needs and preferences [3]. Educational apps and smartphone games help students improve their literacy, numeracy, and critical thinking. On the other hand, smartphones help teachers organize lesson plans, manage classrooms, and make digital class notes [4]. It led to a situation where smartphones positively impact education and enhance the quality of education. However, with all these positive aspects of education, using smartphones for a longer duration may also have a negative impact.

Some negative aspects also exist when using smartphones. The constant notification and multiple ways of entertainment distract students from their studies, which negatively impacts education [5]. Also, smartphones result in poor sleep and health; students spend more time on mobile phones, which adversely affects their health [6]. Also, many students nowadays face eye problems and bad posture due to the increased number of smartphone use [7]. Many Studies [8, 9] tell us that using mobile phones beyond the limit can contribute to anxiety and depression. Also, nowadays, students spend more time on social networking sites, which, in turn, affects their mental health [10]. Good health is necessary for the human body. Good health does not only imply physical health , it also includes mental and psychological health. Maintaining good health increases longevity and quality of life [11]. Good health enhances academic performance by boosting focus, memory power, and cognitive function. Generally, healthier students do better in educational settings. The students who are not physically and mentally fit typically miss their regular classes, negatively impacting their performance. Also, healthy students can handle the stress, anxiety, and emotional challenges that come with academic life [12]. Under such circumstances, it is appropriate to investigate the factors affecting smartphone addiction using ordinal logistic regression.

2. Literature Review

2.1. Related Studies

Smartphone addiction is a state where individuals use their cell phones excessively and obsessively, which negatively affects their social, psychological, and mental aspects. A need to always check the mobile phone, feeling uneasy when the phone is away, and erratic sleeping cycles [13] are a few signs of smartphone addiction. Excessive smartphone use results in numerous health effects, viz. anxiety, depression, decreased productivity, complex relationships, neck pain, eye strain, and various mental issues and is negatively correlated with quality of life [14]. Teenagers who use smartphones excessively are more likely to experience sleep disruptions, perform worse academically, and develop addicted tendencies, according to another study done in India [15]. The relation between quality of sleep and smartphone addiction among medical students of North India is studied in [16]. The study [17] indicates that 46% of students were using their mobile phones for almost six hours, and the primary purpose of using smartphones is social networking. Also, the study ascertains the fact that there is a positive correlation between poor quality of sleep and smartphone addiction. Studies have shown that these variables positively impact smartphone addiction. Specifically, lower levels of grit and self-control, higher academic stress, and longer smartphone usage times are associated with increased smartphone addiction among university students. The student's smartphone addiction is influenced by various other factors, including the individual's economic status [18]. Guaranteed by family income and more so with dual-income families influencing accessibility, usage patterns and dependency levels. Additionally, individual demographic correlates also matter [19]. A few selected literature reviews on smartphone addiction and mental health are illustrated in Table 1.

Table 1. Selected Literature Review on Smartphone Addiction and Mental Health

Title	Work Done
Effect of Smartphone Addiction on the Mental Health of Adolescents: A Literature Review [20]	This literature review examines the relationship between smartphone addiction and adolescent mental health, highlighting both positive and negative impacts. While smartphones facilitate information access and social connection, they also pose risks of addiction, anxiety, loneliness, and depression.
The psychology of addictive smartphone behaviour in young adults: Problematic use, social anxiety, and depressive stress [21]	High smartphone use in youth is associated with depression, social anxiety and depressive stress and negatively affects participation in social engagements.
The associations between smartphone addiction and self-esteem, self-control, and social support among Chinese adolescents: a meta-analysis [22]	Smartphone addiction has a strong relationship with self-esteem, self-control, and social support among adolescents, with varying effects on age and gender.
Factors associated with smartphone addiction tendency in Korean adolescents [23]	Factors contributing to smartphone addiction include subjective economic level, academic stress, parental stress and bullying victimization.
Prevalence of smartphone addiction and its association with sociodemographic, physical and mental well-being: a cross-sectional study among the young adults of Bangladesh [24]	Young adults who are addicted to smartphones are more likely to be male, 25 years old, unemployed, have a big family, and struggle with their physical and mental health.
Association between problematic smartphone use and physical activity among adolescents: a path analysis based on the 2020 Korea Youth Risk Behavior Web-Based Survey [25]	Problematic smartphone use in adolescents is negatively associated with adequate physical activity, with factors such as sex, socioeconomic status, and academic performance affecting this relationship.
Smartphones, social media use and youth mental health [26]	Research links smartphone and social media use to increased mental distress, self-harm, and suicidality among youth, especially girls. Sleep deprivation, impaired cognitive control, and poor academic and social outcomes become the result of heavy usage.

2.2. Research Gap, Motivation and Contribution

From the literature, it is evident that addiction to smartphones can have severe effects on mental health. Addiction to smartphones can result in decreased attention spans, anxiety, sadness, and sleep difficulties. Although previous research has made a significant contribution towards understanding the complex interactions between mobile phone addiction and mental health, there remains a considerable gap in the potential contribution of micro-geographical and location-based research to examine the effects of mobile phone addiction on mental health. Specifically, very little of it focuses on graduate students in South Assam, India. Little is known about the distinct academic and sociocultural challenges that graduate students in this area confront. Further, the studies lack robust techniques that can figure out the factors responsible for various levels of smartphone usage patterns.

Smartphone addiction can disrupt academic performance, a critical concern for undergraduate students preparing for future career opportunities in a competitive environment. In Assam, the mental health condition of the people was worsening as in 2020, the state saw a 35 per cent spike in suicide rates, which raised to 36.9 per cent in 2021 [1] with a considerable number being students/adolescents [2]. On the one hand, the use of the smartphone is becoming incredibly important in the technological growth of M-learning and E-learning. But in the total time spent on using smartphones, streaming content is the predominant use, followed by gaming and shopping[3]. There is a scarcity of studies focusing on South Assam, leaving a gap in understanding how regional factors such as lifestyle, socio-economic conditions, and cultural norms contribute to addiction. The present study, thus, tries to examine the relation between smartphone addiction and mental health among undergraduate students of South Assam, where this issue has not previously been given noteworthy attention. Exploring these factors can promote healthy technology habits, reduce addiction risks, and build a more resilient, informed, and balanced student community in the region.

This study's primary contribution is its investigation of the connection between smartphone addiction and mental health, particularly among South Assamese graduate students. In this regard, this area has not received enough attention. The research offers a thorough examination of the relationships between different degrees of smartphone addiction and mental health outcomes by utilizing both ordinal logistic regression and chi-square test. This study

[1] https://www.thehindu.com/news/national/other-states/assam-records-most-violent-crimes-ncrb-data/article65840264.ece

[2] https://idronline.org/article/health/post-covid-19-a-mental-health-crisis-is-brewing-in-assam/

[3] https://www.indiatoday.in/india/story/smartphone-users-india-survey-people-pick-up-their-phone-half-the-time-without-any-purpose-boston-report-2503218-2024-02-16

advances our knowledge of smartphone addiction in a localized setting. In order to create a healthier, more sustainable society, it highlights how crucial it is to encourage responsible smartphone usage, increase public knowledge of its dangers, and develop countermeasures.

3. Objective

This study evaluates graduate students' smartphone addiction in South Assam. It entails assessing the degree of smartphone use, recognizing addictive behaviours, and assessing the effects on mental health. The paper also intends to investigate the consequences of smartphone addiction and how it affects graduate students' general well-being in the area. The specific objective of the study is:

- To analyse the factors behind smartphone addiction among undergraduate students in South Assam.

4. Methodology

4.1. Data Collection

This study is based on primary and secondary data. Secondary data sources are the Directorate of Economics and Statistics, Government of Assam, specifically the databases of Statistical Handbook of Assam and Economic Survey of Assam. However, to acquire the objective of the study, primary data is also collected.

A descriptive cross-sectional study involving undergraduate students of premier colleges in Barak Valley is conducted. The students who are considered for the study are selected from three Government colleges in the valley. The three colleges from each district are chosen based on the student's enrolment. The colleges that are selected are Gurucharan College, Silchar, Karimganj College, Karimganj and S.S College, Hailakandi. The distribution of the sample to these three colleges is based on the proportional sampling method. The proportion is based on the population of each district as per 2011 census data[4]. The sample individuals from each district, along with colleges, are provided in Table 2.

Table 2. Composition of the Sampled Students

District	College	Sample Students
Cachar	Gurucharan College	109
Karimganj	Karimganj College	38
Hailakandi	S.S College	17
	Total	163

The study period was three months, from January to March 2024. The study sampled and included undergraduate students with smartphones in three-year degree courses (1st, 2nd, and 3rd). Smartphone addiction was assessed using a pre-tested and pre-designed questionnaire along with other demographic and social-related information, amounting to a total sample of 163. The selection of 163 samples was made using a single population portion formula, which was used in earlier studies [27].

$$n = \frac{z^2.p.(1-p)}{d^2} \quad (1)$$

Where,

n = Required Sample Size

z = Z-Score corresponding to the desired level of confidence

p = Estimated prevelance of the event in the population

d = Margin of error

The estimated prevalence of smartphone addiction in the population is selected based on the literature. Since no study computed the prevalence of smartphone use in south Assam, we used 0.88 as the p-value.

4.2. Demographic Profile

The Barak Valley, located in the southern region of Assam, India, is a notable area characterized by its unique demographic and cultural diversity, with a blend of traditions and communities contributing to its unique socio-economic landscape. Barak Valley comprises three districts: Cachar, Karimganj, and Hailakandi. The map of the study area is presented in Figure 1. It has a population of about 3.6 million people, with a high population density in metropolitan areas like Silchar, the central city and administrative centre. Bengalis, comprising Hindus and Bengali Muslims, comprise the majority of the population in the valley.

Figure 1. Map of Study Area

[4] https://des.assam.gov.in/portlets/statistical-handbook

Hinduism is the major religion in this area, which is followed by smaller communities of Christians and adherents of other faiths, as well as a sizable Muslim community, particularly in Karimganj and Hailakandi[5]. The education system in Barak Valley features a blend of government and private institutions offering primary to higher education. Higher education is anchored by Assam University in Silchar, offering a range of undergraduate, postgraduate, and doctoral programs. Professional education is supported by institutions like the National Institute of Technology (NIT) Silchar and Silchar Medical College.

4.3. Smart Phone Addiction Measures

Researchers have created tools and evaluation instruments to gauge smartphone addiction or associated concepts. The foundation for comprehending problematic mobile phone usage among adolescents and adults was established by the initial attempts, such as the Mobile Phone Problem Usage Scale (MPPUS) [28] and the Problematic Use of Mobile Phones (PUMP) Scale [29]. Despite their pioneering nature, these scales may now be outdated because of how quickly mobile technology and usage habits have evolved. The Smartphone Addiction Scale (SAS) was a crucial development in the field [30]. It became well-known for its thorough analysis of smartphone addiction, which included aspects including withdrawal, tolerance, and disruption of regular routines. Building on this basis, other measures, such as the Smartphone Addiction Inventory (SPAI) and Smartphone Addiction Proneness Scale (SAPS), sought to enhance and broaden the assessment of smartphone addiction and its constituent parts [31]. As knowledge of smartphone addiction grew, researchers started creating scales customized for specific demographics or cultural settings.While the Addiction to Mobile Phones Scale (AMPS) [32] concentrated on measuring addiction, the Problematic Mobile Phone Use Questionnaire (PM-PU-Q) addressed both adolescents and adults. These scales addressed the requirement for age- and culturally appropriate-evaluations. Mobile Phone Addiction Inclination Scale (MPATS) measures the propensity or inclination to develop an addiction to mobile phones, including smartphones. This extended reach goes beyond present addiction levels. This change in emphasis recognized the value of preventative and early intervention initiatives. Lastly, the Smartphone Addiction Inventory-Short Version (SPAI-S) [33], satisfied the demand for effective assessment instruments in research and clinical settings by providing a succinct yet trustworthy measure of smartphone addiction. For research purposes, the Smartphone Addiction Inventory-Short Version (SPAI-S) is a perfect tool since it offers a clear and accurate assessment of smartphone addiction. Its briefness lessens survey weariness and participant burden, improving the effectiveness of data gathering.

Table 3 lists the variables or indicators, their sub-indicators, and their description employed to build the Smartphone addiction index. Now, coming to the issue of weighting indicators, we can also use different weights for indicators, but it requires a careful and well-justified approach. The absence of these criteria in the literature compels us to give equal weights to various indicators and sub-indicators. Another pertinent issue is standardizing scores. Standardization can be obtained through Z score standardization or by applying Min-Max Normalisation. The first method centres the data around the mean and scales but cannot transform the data to a specific range. So, we have used the Min-Max Normalisation procedure to convert the data, as, in our case, scaling is more important than distribution.

[5] https://des.assam.gov.in/portlets/statistical-handbook

Table 3. Smart Phone Addiction Index Indicators

Broad areas	Indicators	Nature of the variable	Description
Daily Life Disturbance	Missed Planned Works	Categorical	Yes=1, No=0
	Problem in Concentrating	Categorical	Yes=1, No=0
	Feeling tired, conflicting with family members and lacking adequate sleep	Categorical	Yes=1, No=0
Positive Anticipation	Feeling calm, pleasant or excited	Categorical	Yes=1, No=0
	Feeling confident	Categorical	Yes=1, No=0
	Get rid of Stress	Categorical	Yes=1, No=0
Withdrawal	Feeling impatient and fretful when not holding a smartphone	Categorical	Yes=1, No=0
	Having a smartphone in mind in cases of not using it	Categorical	Yes=1, No=0
	Getting irritated while using a smartphone and raises any important work	Categorical	Yes=1, No=0
Cyber Space-Oriented Relationship	Feeling that relationships with smartphone buddies are more intimate	Categorical	Yes=1, No=0
	Nonuse of smartphone looks like losing a friend	Categorical	Yes=1, No=0
	Constantly checking smartphone or SNS site update	Categorical	Yes=1, No=0
Overuse	Preferring searching from a smartphone to asking other people	Categorical	Yes=1, No=0
	Fully Charged Battery Does not last for more than 6-8 hours	Categorical	Yes=1, No=0
	Feeling the urge to use the smartphone again right after stopping usage	Categorical	Yes=1, No=0
Tolerance	Tried to short smartphone use	Categorical	Yes=1, No=0
	Always thinking about shortening smartphone use	Categorical	Yes=1, No=0
	People say smartphone use is too much	Categorical	Yes=1, No=0

Source: Authors own Definition.

4.4. Mental Health

Since anxiety disorders are among the most prevalent mental health issues globally, there is a tight relationship between mental health and anxiety disorders. Thus, anxiety problems have been used as a stand-in for mental health. People with anxiety disorders can be of any age, gender, or background. The World Health Organization (WHO) estimates that anxiety disorders affect 284 million people globally [34]. An individual's mental health can be severely impacted by these diseases, which can cause misery and impairment in many aspects of life. Symptoms may include excessive anxiety, dread, restlessness, irritation, and problems concentrating. These symptoms can cause sadness, despondency, and poor self-esteem and interfere with day-to-day activities, relationships, job, and academic performance. Anxiety disorders can be measured in several ways. One substitute is the Generalized Anxiety Disorder 7-item Scale (GAD-7) [35]. The intensity of symptoms for generalized anxiety disorder throughout the last two weeks is evaluated using this quick self-report questionnaire. However, the 15-day recall period decreases the recall accuracy and burdens the respondents. However, another excellent option for assessing symptoms of different anxiety disorders in teenagers is the Beck Anxiety Inventory (BAI) [36]. This self-report questionnaire is intended to gauge how severe anxiety symptoms have been throughout the last seven days (or the previous week). We have employed BAI with minimal adjustments that suit our primary target audience. Table 4 lists the variables/indicators, their sub-indicators, and their description employed to build the Mental health index. Now, without a well-justified approach in the literature, the issue of weighting indicators compels us to give equal weights to different indicators and sub-indicators. Another pertinent issue is standardizing scores. Standardization can be obtained through Z score standardization or by applying Min-Max Normalisation. The first method cannot transform the data to a specific range. So, we have used the Min-Max Normalisation procedure to convert the data.

Table 4. Mental Health-Anxiety Indicators

Indicators	Nature of the variable	Description
Numbness	Categorical	Yes=1, No=0
Wobbliness in legs	Categorical	Yes=1, No=0
Unable to relax	Categorical	Yes=1, No=0
Fear of the worst happening	Categorical	Yes=1, No=0
Lightheadedness	Categorical	Yes=1, No=0
The feeling of Heart Pounding	Categorical	Yes=1, No=0
Unsteady feeling	Categorical	Yes=1, No=0
Feeling afraid	Categorical	Yes=1, No=0
Nervous feeling	Categorical	Yes=1, No=0

Source: Authors own Definition.

4.5. Classification of Smartphone Addiction and Mental Health Scores

The statistical technique utilized in many domains, including social science, is the quartile-based scoring method, which determines scores by dividing a dataset's quartiles.

Table 5. Classification of Smartphone Addiction

Level of Smartphone Addiction	Smartphone Addiction Score
Very Low	<0.25 (Q_1)
Low	0.25-0.49 (Q_1 to Q_2)
High	0.50-0.74 (Q_2 to Q_3)
Very High	0.75-1 (Q_3 to Q_4)

Source: Authors own Definition.

Table 6. Classification of Mental Health

Level of Mental Health	Mental Health Score
Very Low	<0.25 (Q_1)
Low	0.25-0.49 (Q_1 to Q_2)
High	0.50-0.74 (Q_2 to Q_3)
Very High	0.75-1 (Q_3 to Q_4)

Source: Authors own Definition.

The smartphone addiction and mental health score is divided into four equal sections, each comprising 25% of the total data, using quantiles. Data points are assigned scores based on which quarter they belong (Table 5 & Table 6).

4.6. Modelling Ordinal Logistic Regression

To examine the relationship between smartphone addiction and mental health, we have started with the Chi-square test. One crucial limitation of using the Chi-square test is that it provides only a preliminary idea regarding the nature of the relationship between categorical variables; it does not indicate the magnitude of such relation. Another problem of the Chi-square test is that it investigates the relation between two variables in isolation and ignores other factors that could also affect smartphone addiction. Therefore, we move beyond and move towards regression analysis. Regression analysis is a quantitative technique to model the relationship between a dependent variable and one or more independent variables. When the dependent variable is an outcome, the choice of regression model depends on the nature of the outcome variables. Logistic regression is a powerful tool for a binary outcome-based model. However, the appropriate model is ordinal logistic regression (Proportional Odds Model) for outcomes with more than two categories having a natural order. So, ordinal logistic regression (Proportional Odds Model) is used to detect relationships between Smart Phone Addiction and Anxiety induced mental health. The list with a complete description of the variables included in the model is described in Table 10. The ordinal logistic model is given in (1). Since the main focus of the study is to determine the factors affecting smartphone addiction, smartphone addiction naturally becomes an independent variable.

The condition of anxiety-induced mental health affects smartphone addiction. People with low mental health are more prone to smartphone addiction as they do not have healthy coping skills to deal with stress. The presence of health issues is significantly associated with smartphone addiction. People with health issues tend to have more smartphone addiction to distract themselves, as social media interaction, games, or online content can provide a temporary escape. Family income is another crucial factor affecting smartphone addiction. A family with higher family income tends to have access to high-priced smartphones with extensive features, implying more smartphone use and the resultant addiction. Female economic independence is related to smartphone addiction. Mothers becoming more economically independent makes them more aware of the various drawbacks of excessive smartphone use, which, hence, affects smartphone use. Also, women are slightly more prone to smartphone addiction compared to men, primarily due to the higher use of social networking platforms, which are designed to be engaging and rewarding, justifying the gender variable in the model. Generally, people belonging to the underprivileged classes and also minority religions are more prone to smartphone addiction as they often face discrimination and social exclusion, leading to increased reliance on virtual communities and social media for a sense of belonging. Additionally, the purpose of smartphone use, especially educational ones, often leads to smartphone addiction by reinforcing continuous use. Thus, the ordinal logistic model used in this study is given in (1). The description of each variable is provided in the Appendix Section.

$$logit(P(SA \leq j) = \alpha_j + \beta_1 MH_i + \beta_2 HI_i + \beta_3 FI_i + \beta_4 FEI_i + \beta_5 GEN_i + \beta_6 CAT_i + \beta_7 RGN_i + \beta_8 PSU_i \quad (1)$$

5. Results and Description

5.1. Demographic Profile of Sample

The demographic distribution of a sample of 163 undergraduate students is shown in Figure 2, which includes information on gender, caste, and religion. This breakdown provides essential context for understanding the population's heterogeneous makeup concerning gender, caste, and religious affiliation. Males comprise 55% of the population, while females comprise 45%. The leading caste group is General (GEN), with 52% of the total. Scheduled Caste (SC) is second with 34%, Other Backward Classes (OBC) with 10%, and Scheduled Tribe (ST) with 4%. Regarding religion, Muslims comprise 28%, Christians 3%, and Hindus 69%. Approaching to family income sources, fathers have a higher employment rate compared to mothers, as shown by the larger blue segment for fathers as illustrated in Figure 3.

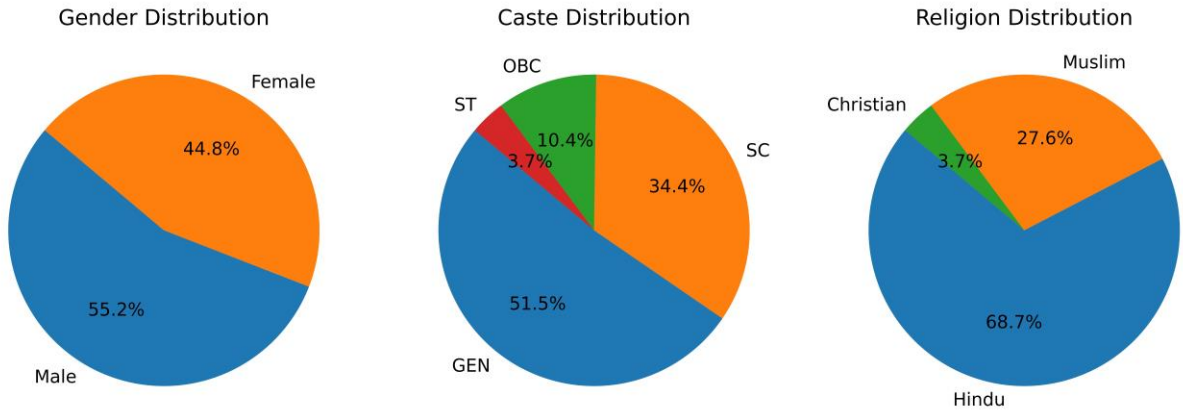

Figure 2. Demographic profile of sampled individuals

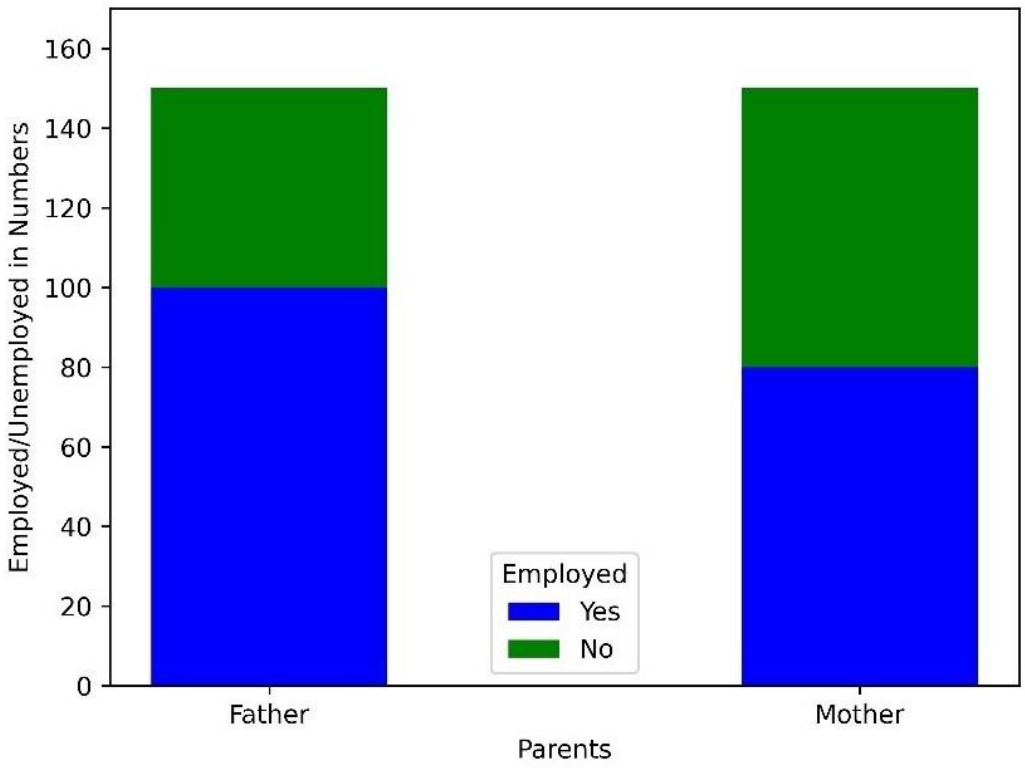

Figure 3. Parents Employment Status of sampled individuals

5.2. Smartphone Addiction

The prevalence of smartphone addiction among participants reveals a wide range of usage habits. Table 7 presents the smartphone addiction rate. Notably, 5% of respondents indicated meager rates of addiction, suggesting very little reliance on their electronics. On the other hand, a sizable 48% of respondents were classified as having a high level of addiction, indicating a heavy dependency on cell phones in daily life. In the middle, 32% said they had a modest degree of addiction, and 15% said they had a very high rate.

Table 7. Smartphone Addiction Rate in Number/ Percentage

Level of Smartphone Addiction	Addiction Rate in Number (Percentage)
Very Low	8(5)
Low	52(32)
High	78(48)
Very High	25(15)

These results highlight how common smartphone addiction is among the examined population and to what extent. From infrequent users to those who depend heavily on their gadgets, the data presents a complex picture of how contemporary technology affects behavior and way of life.

5.3. Purpose of Using Smartphone

The diverse range of objectives for which the respondents typically employed their cell phones highlights the multifarious capabilities of these gadgets. Figure 4 demonstrates various purposes of smartphone use. With 61.96% (101 respondents) reporting that it is used for academic or learning objectives, education appeared as a popular motivator. Social media came in second, with 58.28% (95 respondents) using cell phones to interact with online networks and remain in touch. Additionally, 61.35% of the 100 respondents said they frequently used the internet for information or enjoyment. The camera on the smartphone was also heavily utilized; the same proportion of respondents, 61.96% (101 respondents), said they used it to take pictures and movies. A significant percentage, 50.30% (82 respondents), mentioned more sporadic usage in addition to these typical ones, suggesting a broad range of functionality catered to personal tastes and requirements. These results highlight how versatile cell phones are, i.e., they can be used for work and play and fit in with many different facets of everyday life.

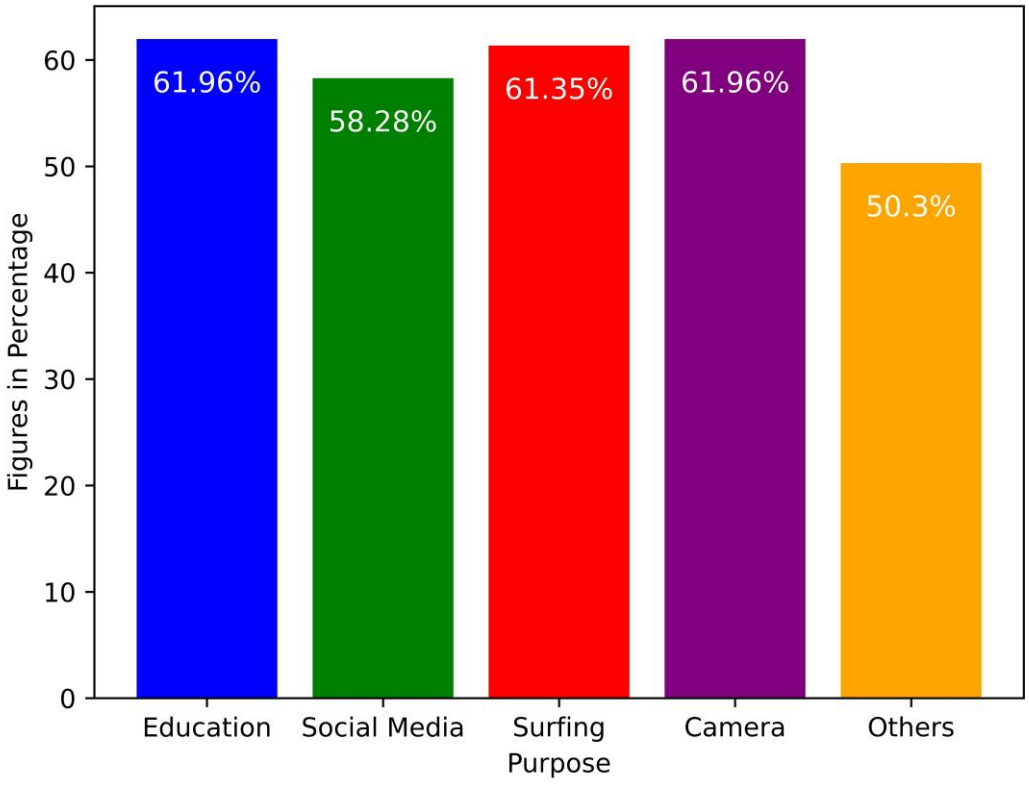

Figure 4. Purpose of smartphone use

Table 8. Level of Smartphone Addiction by level of Family Income

		Level of Smartphone Addiction				
		Very Low	Low	High	Very High	Total
Level of Family Income	Very Low	3	17	12	5	37
	Low	1	22	17	3	43
	High	4	8	26	7	45
	Very High	--	5	23	10	38
	Total	8	52	78	25	163

5.4. Smartphone Addiction and Family Income

The relationship between smartphone addiction and family income is studied along with its relationship with other important social variables, gender. Finally, the relationship between mental health and social category is studied. When the degree of smartphone addiction is compared to family income, specific trends emerge among the participants in the study, as illustrated in Table 8. Of the 37 respondents who claimed to have a meagre family income, three reported having very low addiction, 17 reported having low addiction, 12 had high addiction, and 5 had very high addiction. Out of the 43 respondents in the low-income group, 1 reported very low addiction, 22 reported low addiction, 17 reported severe addiction, and 3 reported very high addiction.

In contrast, out of 45 respondents in the high-income group, four reported having very low addiction, eight reported having low addiction, 26 had high addiction, and seven struggled with very high addiction. There were 38 respondents in the very high-income group; no one claimed very low addiction, five reported low addiction, 23 reported strong addiction, and 10 reported very high addiction. These findings underscore the necessity for specialized therapies across socioeconomic strata by pointing to a relationship between family income levels and smartphone addiction tendencies.

Again, we studied the relationship between levels of smartphone addiction and levels of family income. To examine this association, we have again used the chi-square test. The null hypothesis for this purpose is taken as:

H_{01}: there is no association between levels of smartphone addiction and family income.

The chi-square test result indicates that there is some association between smartphone addiction levels and family income (p-value = 0.3621). Thus, differences in family income may have some relationship with smartphone use.

5.5. Smart Phone Addiction and Gender

Gender-specific analysis of smartphone addiction uncovers unique trends in the sample. This is portrayed in Figure 5. Out of the 90 responses, three men claimed to have very low addiction, 30 said they had low addiction, 39 had strong addiction, and 18 had very high addiction. On the other hand, out of the female respondents, 39 struggled with very high addiction, 22 experienced high addiction, and no one reported very low addiction, for a total of 73 respondents. In general, the data indicates that female respondents were more likely than male respondents to be addicted to their smartphones.

The relationship between smartphone addiction and gender is studied in this section. To examine the relationship between two variables, we set the following null hypothesis:

H_{02}: there is no association between smartphone addiction and gender.

To test the null hypothesis, we used the chi-square test. The p-value for this test comes out to be 0.1831, which tells us that there is no relationship between smartphone addiction and the gender of the respondent.

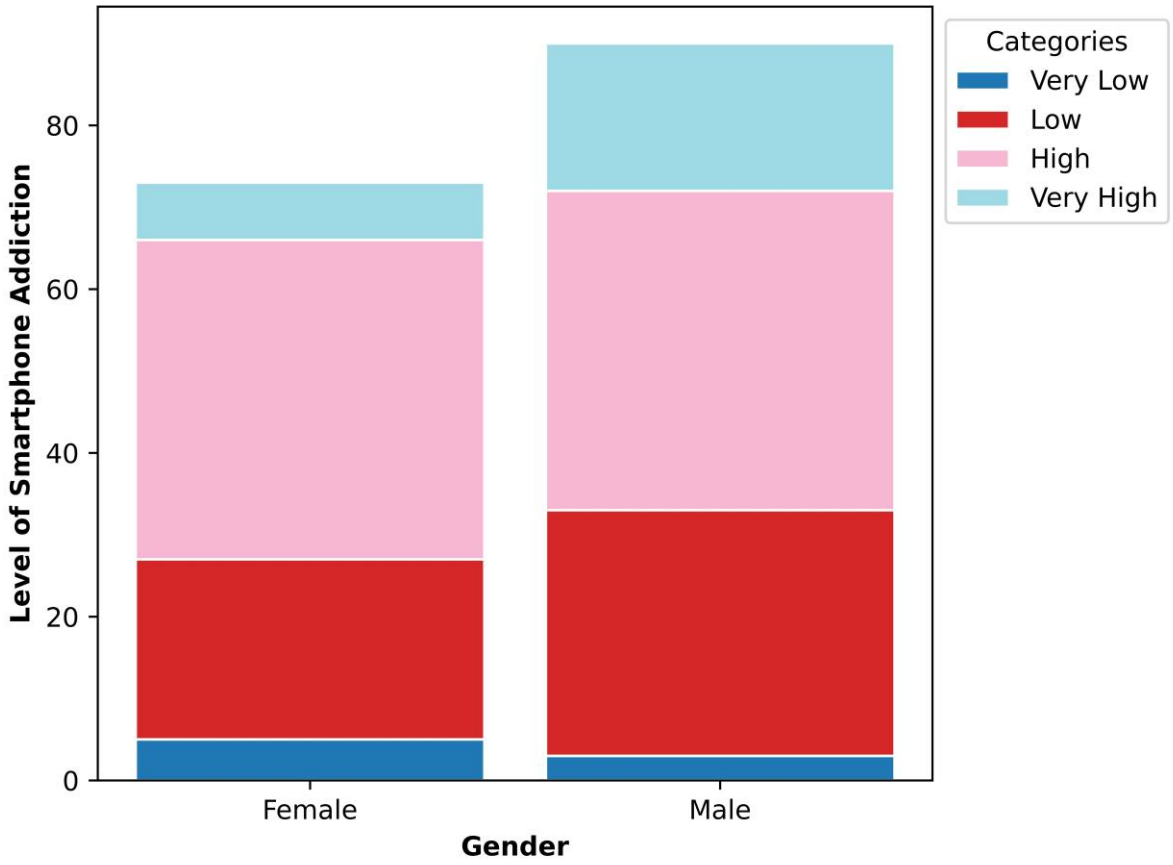

Figure 5. Smartphone Addiction by Gender

5.6. Mental Health and Social Group

The evaluation of anxiety levels among various social categories in the examined population reveals complex patterns, as illustrated in Figure 6. Anxiety levels within the General (GEN) group varied widely; of the 84 respondents, 13 reported very low anxiety, 23 reported low anxiety, 30 faced severe anxiety, and 18 struggled with very high anxiety. By contrast, the Scheduled Caste (SC) group, which consisted of 9 people with very low anxiety, 12 people with low anxiety, 19 people with high anxiety, and 16 people with very high anxiety, showed a similar pattern but significantly lower overall levels. This group totaled 56 responses. The assessment of anxiety levels across different social groups reveals nuanced patterns within the surveyed population. Among the General (GEN) category, anxiety levels were distributed across the spectrum, with 13 individuals reporting very low anxiety, 23 experiencing low levels, 30 facing high anxiety, and 18 grappling with very high anxiety, totalling 84 respondents.

In comparison, the Scheduled Caste (SC) group exhibited a similar trend but with slightly lower overall levels, encompassing nine individuals with very low anxiety, 12 with low anxiety, 19 with high anxiety, and 16 with very high anxiety, summing up to 56 respondents. In contrast, the Scheduled Tribe (ST) group showed far lower levels of anxiety, with just one respondent, that is, six respondents reporting very low, low, high, and very high levels of worry. Out of the 17 respondents, the Other Backward Classes (OBC) group showed a varied pattern: 3 reported very low anxiety, 9 reported low anxiety, 4 reported high anxiety, and 1 reported very high anxiety.

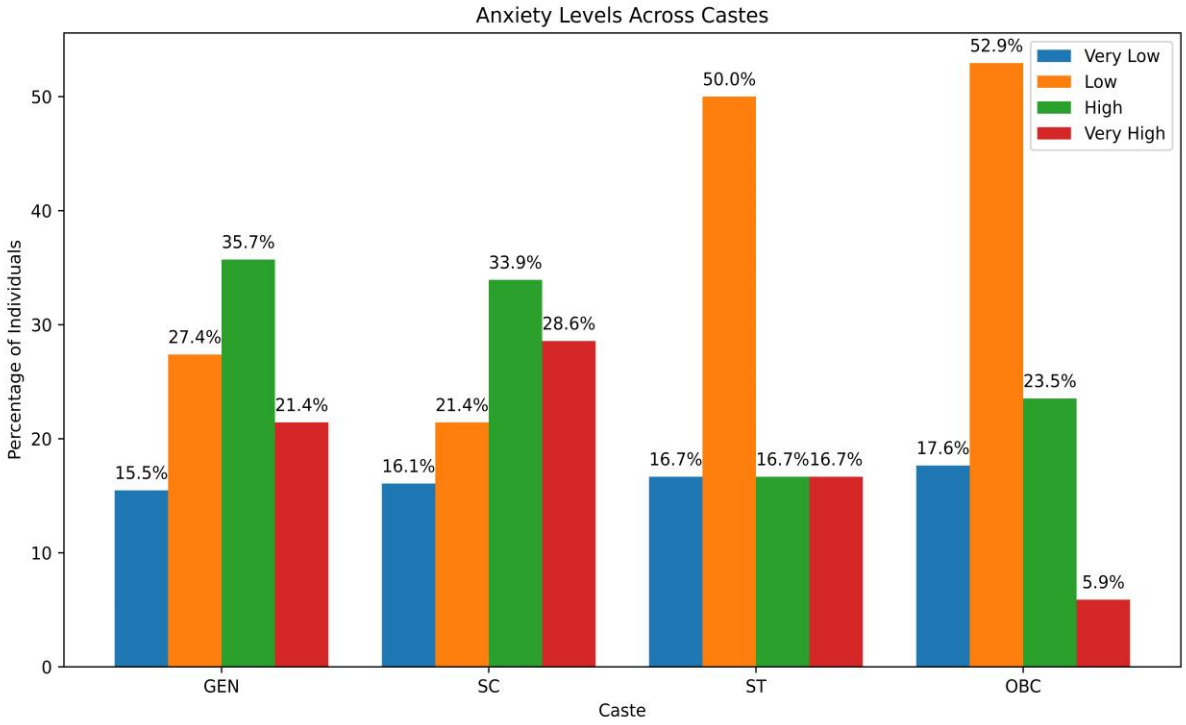

Figure 6. Caste-wise Anxiety Levels

Overall, the research highlights how different social groups suffer anxiety, with the General and SC categories showing comparatively greater levels than the ST and OBC groupings. These results point to the impact of socioeconomic and cultural variables on mental health outcomes and emphasize the necessity for specialized therapies and support systems that are adapted to the particular difficulties that various social groups experience.

Next, we investigated the existence of potential associations between mental health issues and different social groups. To study this association, we used the chi-square test, which is used to test the relationship between two variables [37]. This test is crucial in understanding the underlying relationship between variables, which enables researchers make an informed decision about the phenomenon. The null hypothesis for this purpose is,

H_{03}: there is no association between mental health issues with different social groups.

The chi-square test results indicate no association between different social groups and mental health issues (p-value = 0.3621).

5.7. Smartphone Addiction and Mental Health

Examining the correlation between mental health status and smartphone addiction reveals complex trends in the sample group. This is particularized in Figure 7. Of the eight respondents who reported having deficient levels of smartphone addiction, seven had deficient mental health, and one had very excellent mental health. The mental health of those with mild smartphone addiction varied as well: out of 52 respondents, 10 had deficient mental health, 16 had low mental health, 16 had excellent mental health, and 10 had very high mental health issues. Six respondents—or twenty-one people—reported feeble mental health, twenty-seven reported low mental health, twenty-seven reported excellent mental health, and twenty-four reported very high mental health in the high addiction group. The mental health of those who reported having an extreme addiction to smartphones varied as well; out of a total of 25 respondents, three reported having feeble mental health, 10 had low mental health, 10 had good mental health, and two struggled with very high mental health. Overall, the evidence points to a complicated relationship—with differing degrees of connection across different addiction levels—between mental health and smartphone addiction. There may be a complex association between these variables because some respondents with high levels of smartphone addiction also reported having excellent mental health. In contrast, others indicated poor mental health. Comprehending these processes is crucial in order to devise focused therapies and support systems that successfully tackle smartphone addiction and mental health issues.

To study whether there is any association between smartphone addiction and mental health, we conducted a chi-square test to ascertain a relationship between the two variables. The null hypothesis for this purpose is

H_{04}: there is no association between smartphone addiction and mental health.

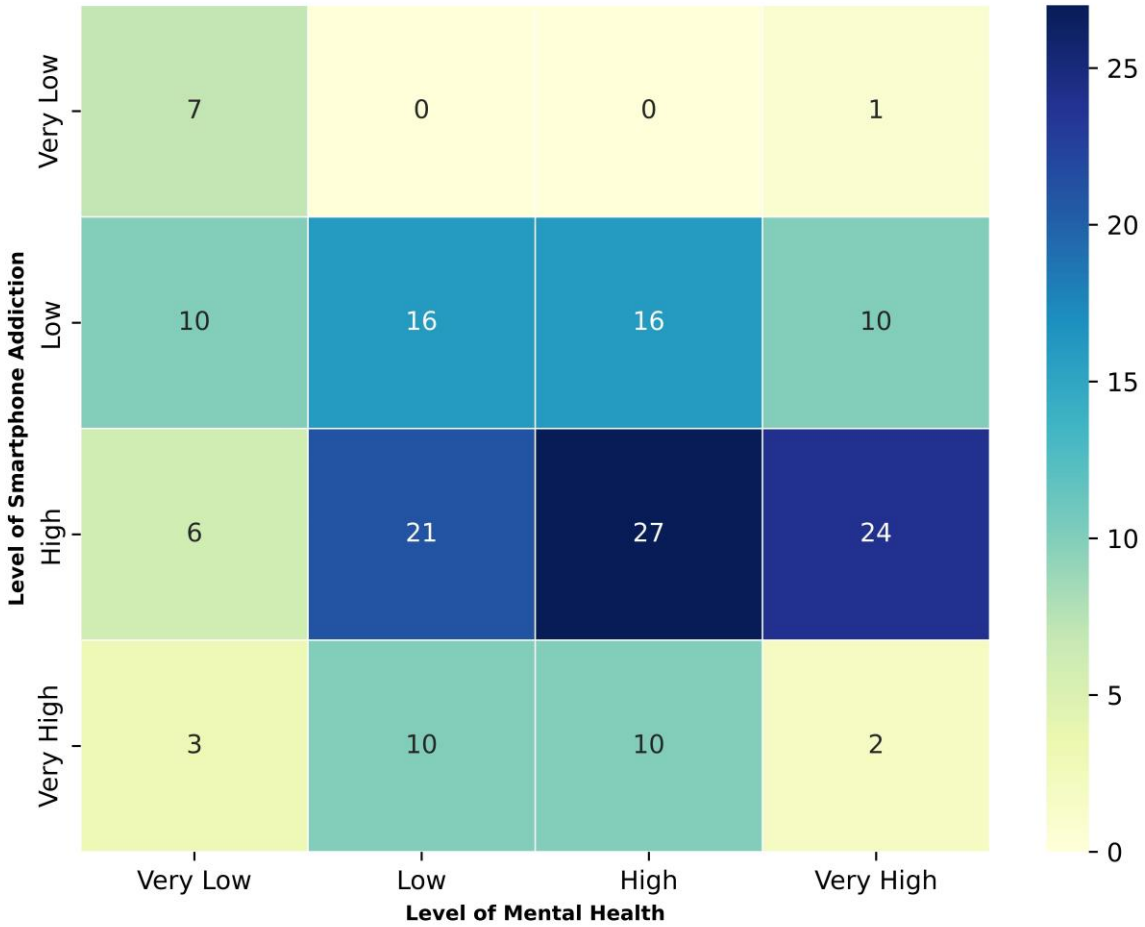

Figure 7. Smartphone Addiction and Level of Mental Health

Upon conducting the chi-square test, the p-value < 0.001, which signifies that we need to reject our null hypothesis and conclude that there is an association between mental health and smartphone addiction. It provides an elementary idea about the nature of the relationship between variables; it does not indicate the magnitude of such a relation. Also, it ignores other factors that could also affect smartphone addiction.

Thus, to measure the relationship between Smartphone addiction and the level of mental health captivating other factors, the ordinal logistic regression is found suitable and is used. Other variables in the regression model include the Presence of health issues, Family income, Female economic independence, Purpose of smartphone use, Gender, Social Category, and Religion of the respondent. The results are provided in Table 9. The coefficient of mental health is -1.6116, indicating a decreasing chance of migrating to a higher category of smartphone addiction as mental health rises. It is ascertained by a (p-value = 0.039), which links that the relationship is statistically significant.

The log odds of switching to a higher smartphone addiction rise as family income grows, according to the coefficient of 9.13. Their relationship is statistically significant with (p-value < 0.001). The coefficient of health issues stands at -0.2225, which recommends a negative impact on the log odds of rising to a higher category of smartphone addiction. However, the association is not statistically significant (p = 0.749). The coefficient of gender is 0.2703, suggesting that gender has a positive effect on the log odds of moving to an advanced category of mobile phone addiction. However, the relationship is not statistically significant (p-value = 0,986). Again, the social category of respondents has a coefficient value of -0.0057, indicating a negative effect of social category on mobile phone addiction. This relationship is statistically insignificant (p-value = 0.986). The variable religion has a positive impact on moving to an advanced category of mobile phone addiction. The association is not significant at a 5% significance level but at a 10% level.

Table 9. Ordinal Logistic Regression Results

Log-Likelihood: *-167.81*				
AIC: *357.6*				
BIC: *391.6*				
	Coefficient	**Standard Error**	**z-value**	**p-value**
MH_i	-1.6116	0.782	-2.062	0.039
HI_i	-0.2225	0.696	-0.320	0.749
FI_i	$9.137e^{-05}$	$1.23e^{-05}$	7.545	0.000
FEI_i	-0.9887	0.363	-2.720	0.007
GEN_i	0.2703	0.316	0.856	0.392
CAT_i	-0.0057	0.326	-0.017	0.986
RGN_i	0.8579	0.481	1.784	0.074
PSU_i	-0.1414	0.350	-0.404	0.686
0/1	1.4565	0.672	2.167	0.030
1/2	0.4451	0.145	3.066	0.002
2/3	1.2228	0.122	9.208	0.000

The coefficient for smartphone use for educational purposes is found to be -0.1414, showing a negative effect on the log odds of moving to the superior category of mobile phone addiction, but the connection between these two variables is not significant (p = 0.686). The coefficient of female economic independence is negative, showing unfavourable log odds of moving to a higher mobile phone addiction level. The relationship is statistically significant (p = 0.000). The threshold between a very low level of mobile phone addiction (0) and a low level of mobile phone addiction (1) is statistically significant (p-value = 0.030). On the other hand, the threshold between low and high levels of mobile phone addiction is statistically significant (p-value = 0.002). Also, the threshold between a high level of mobile phone addiction and a very high level of mobile phone addiction is statistically significant (p-value < 0.001). It means that there is a clear distinction between these categories.

5.8. Addiction of Smartphone and its Consequences

Figure 8 lists various issues related to using smartphones in percentage. First of all, we look into Eye Issues: of the 163 respondents, 67 (41.10%) said using a smartphone had caused them to have eye issues. It might involve signs including dry eyes, blurry vision, or eye discomfort. Reduced Physical Activity: Of the respondents, 66 (40.49%) stated that using a smartphone has reduced their level of physical activity. It implies that using a smartphone excessively might result in a sedentary lifestyle or less physical activity. Headache: 88 respondents, or 53.99%, stated that smartphone usage gave them headaches. It could result from eye strain, glare, or extended screen usage. Neck discomfort: of the respondents, 87 (53.37%) reported having neck discomfort. This pain may have been brought on by hunching over cellphones or bending over for prolonged periods. Strains: of the respondents, 84 (51.53%) reported having strained muscles or skeletal structures. These strains might include wrist or hand strains associated with using a smartphone. Sleep Disturbance: 75 respondents (46.01%) reported having trouble sleeping, suggesting that using a smartphone before bed may harm sleep quality or interfere with sleep habits. Anger and Restlessness: 92 respondents (56.44%) said using a smartphone made them feel angry and restless. It implies that using a smartphone excessively might exacerbate depressive symptoms. Lack of Motivation: 80 respondents (49.08%) said they felt unmotivated, which may mean that using a smartphone excessively interferes with motivation or productivity. Avoid Task: 76 respondents (46.63%) said they avoided tasks, suggesting that smartphone use might cause them to put off or become distracted from critical duties. Poor Communication: Of the 78 respondents (47.85%), 78 reported poor communication. This suggests that using a smartphone may impede one's ability to communicate with people or impair interpersonal communication abilities effectively.

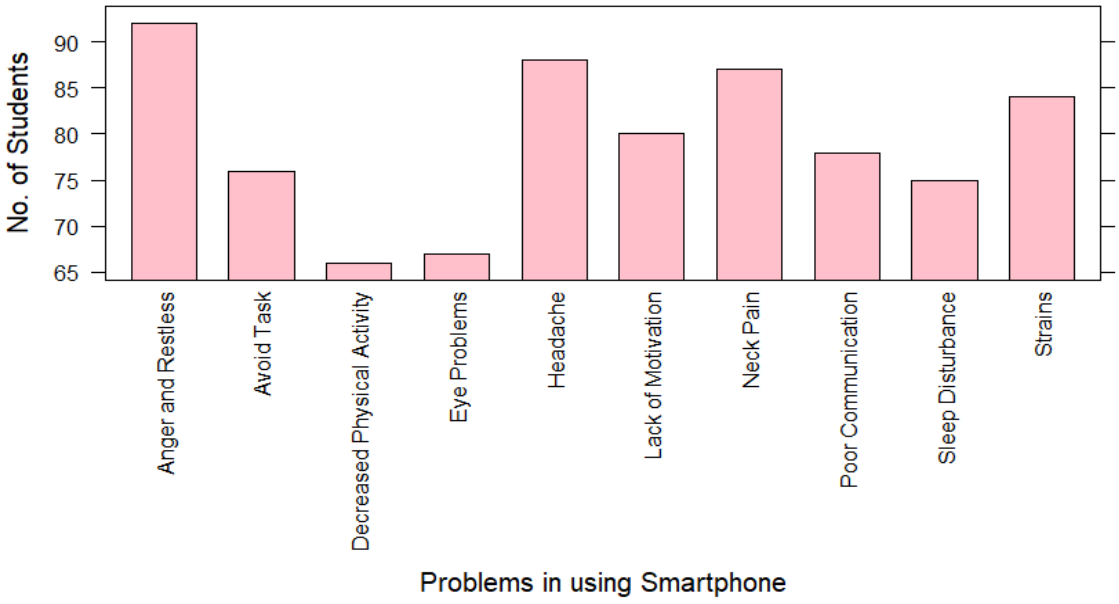

Figure 8. Problems of using the Smartphone (in Percentage)

6. Practical Implications of the Study

The study emphasizes the necessity of comprehensive therapies by highlighting the crucial connection between smartphone addiction and mental health conditions. To educate students about the dangers of excessive smartphone usage and ways to adopt healthy behaviours, educational institutions should spearhead focused awareness initiatives. Students' well-being may be supported by bolstering counselling services, offering mental health resources, and encouraging stress reduction and mindfulness practices. Digital literacy must be incorporated into the curriculum in order to prepare students to successfully manage their smartphone use for both academic and recreational purposes. Families are particularly essential because of their supporting dynamics, which promote self-control and reduce the likelihood of addiction. It can help students become more emotionally resilient, which will lessen their reliance on cell phones as a stress-reduction or anxiety-reduction tool. Stronger interpersonal bonds and a sense of belonging are fostered in families who place a high value on shared activities like meals, outdoor excursions, or hobbies as alternatives to excessive screen time. Additionally, by demonstrating moderation and thoughtful use, parents set an example of balanced smartphone use that students may follow.

7. Conclusion, Limitation and Direction for Future Study

7.1. Findings

Initially, we have looked into the level of smartphone addiction. Smartphone addiction varies widely among participants, ranging from minimal to heavy dependency, reflecting diverse usage habits. It also reflects that smartphones are integral to modern living, from education and social media to entertainment and photography. Overall, the research highlights how different social groups suffer anxiety, with the General and SC categories showing comparatively greater levels than the ST and OBC groupings. In our study, we examined the relationships between smartphone addiction and family income and gender. Chi-square tests revealed a significant association between smartphone addiction and family income. This is in line with the findings from [38]. However, like [39] no significant relationship was found between addiction and gender. Similar to the findings of [40] there was no relationship between mental health and different social groups. However, a significant link exists between mental health and smartphone addiction. For a more detailed analysis, the regression analysis clarifies that the mental health status of an individual exerts a negative influence on the level of smartphone addiction, reinforcing the notion that better mental health is associated with lower levels of smartphone addiction. Individuals with solid mental health tend to have developed healthy coping mechanisms to deal with stress, anxiety, and other challenges. People with good mental health often have high self-awareness and can better regulate their emotions and behaviours. This is in line with the findings of [41]. They may engage in activities like exercise and meditation rather than seeking constant distraction through their smartphone. However, physical health conditions and mobile phone addiction do not provide a significant relationship as health outcomes take time to manifest, making them difficult to capture in short-term studies. The study, alike with [38] also highlighted

that higher family income often correlates with better smartphone access and related technology. Increased access can lead to more frequent and prolonged usage, contributing to higher addiction rates. However, gender and social categories do not significantly influence the smartphone addiction rate [42]. One possible reason is that the use of smartphones is universally high across different genders and social categories, driven by widespread adoption and similar patterns of use. The relationship between people belonging to minority religions and smartphone addiction is positive and statistically significant because, for many religions, it provides a strong sense of community and social support. The availability of religious content online can lead to increased smartphone use. Devout individuals might consume this content significantly, contributing to higher smartphone usage. A negative coefficient for the level of female economic independence in a logistic regression model indicates that higher levels of female financial independence are associated with lower levels of mobile phone addiction [43]. One of the causes is that economically independent women are often engaged in their jobs or businesses, leaving them less time for activities that could lead to mobile phone addiction and better education and awareness about the potential harms of excessive mobile phone use. The purpose of smartphone use is not statistically significant in the logistic regression model predicting mobile phone addiction, likely because people use smartphones for a myriad of purposes, making it difficult to isolate the impact of any single purpose on smartphone addiction levels. In conclusion, smartphone usage entails diverse issues beyond convenience [44]. Promoting healthy habits and raising awareness of potential risks are crucial for fostering a balanced relationship with technology.

7.2. Limitations

The study provides valuable insight into the relationship between smartphone addiction and mental health among undergraduate students. However, since each qualitative research has some limitations, the present study is also no exception. Firstly, the study's sample size, which is acceptable for its scope, may limit its generalizability. Further, the study is based on collecting primary data directly from the respondents. The study's accuracy is based on the information obtained from the respondents. Respondents may positively represent themselves, or their ability to recall and report accurate data on smartphone usage and mental health symptoms may hamper the study's accuracy. The study also used a cross-sectional design to collect information from respondents. Since it captures data for a single time frame, it may pose a challenge in explaining the exact cause-and-effect relationship between smartphone addiction and mental health.

7.3. Recommendation for Future Study

In future, the researchers may adopt a larger sample spanning different districts of South Assam and beyond to improve the general acceptability of the results. Also, the researchers may take the challenge of doing longitudinal studies on this topic to precisely explain the cause-and-effect relationship between mobile phone addiction and mental health at different periods and compare the results. Future studies could further explore the connection between gender-specific responsibilities and their effect on smartphone use and mental health by examining the differences in behavioural standards and societal pressures between male and female students. Examining the financial impact of excessive smartphone use is another crucial topic. Research can concentrate on how it affects financial stress and loss in productivity, especially for students from low-income groups. Further, comparing students at different educational levels—undergraduate, graduate, and doctoral—can help clarify how the impact and severity of smartphone use differ based on life phases, maturity levels, and academic expectations.

Appendix

Table 10. Description of variables used in Ordinal Logistic Model

Variable	Broad variable Name	Type of Variable	Category of Variable	Coding Description of the Variable (in case of Nominal/Ordinal variable)
SA_i	Level of Smartphone Addiction	Ordinal	Dependent	Very Low=0 Low=1 High=2 Very High=3
MH_i	Condition of Anxiety induced mental health	Continuous	Independent	
HI_i	Presence of health issues	Continuous	Independent	
FI_i	Family Income	Continuous	Independent	
FEI_i	Female Economic Independence	Nominal	Independent	Mother is employed (Yes=1, No=0)
GEN_i	Gender of the Respondent	Nominal	Independent	Male=1, Female=0
CAT_i	Category of the Respondent	Nominal	Independent	Under priviledged Class=1, otherwise=0
RGN_i	Religion of the respondent	Nominal	Independent	Minority Religion=1, otherwise=0
PSU_i	Purpose of Smartphone use	Nominal	Independent	educational=1, otherwise=0

Source: Authors own Definition.

Declaration of Conflicting Interests

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Data Availability

Data will be made available on request.

REFERENCES

[1] R. Wei, "Motivations for using the mobile phone for mass communications and entertainment," *Telematics and Informatics*, vol. 25, p. 36–46, 2008.

[2] P. Zheng and L. M. Ni, "Spotlight: the rise of the smart phone," *IEEE Distributed Systems Online*, vol. 7, p. 3–3, 2006.

[3] M. Milrad and D. Spikol, "Anytime, anywhere learning supported by smart phones: Experiences and results from the MUSIS project," *Journal of Educational Technology & Society*, vol. 10, p. 62–70, 2007.

[4] M. Anshari, M. N. Almunawar, M. Shahrill, D. K. Wicaksono and M. Huda, "Smartphones usage in the classrooms: Learning aid or interference?," *Education and Information technologies*, vol. 22, p. 3063–3079, 2017.

[5] M. Tamilarasi, "Mobile empowerment: Enhancing education and connectivity for college students," *International Journal of English Literature and Social Sciences*, vol. 8, p. 294–300, 2023.

[6] V. S. Nakshine, P. Thute, M. N. Khatib and B. Sarkar, "Increased screen time as a cause of declining physical, psychological health, and sleep patterns: a literary review," *Cureus*, vol. 14, 2022.

[7] H.-J. Kim and J.-S. Kim, "The relationship between smartphone use and subjective musculoskeletal symptoms and university students," *Journal of physical therapy science*, vol. 27, p. 575–579, 2015.

[8] S. Hashemi, F. Ghazanfari, F. Ebrahimzadeh, S. Ghavi and A. Badrizadeh, "Investigate the relationship between cell-phone over-use scale with depression, anxiety and stress among university students," *BMC psychiatry*, vol. 22, p. 755, 2022.

[9] S. M. Coyne, L. Stockdale and K. Summers, "Problematic cell phone use, depression, anxiety, and self-regulation: Evidence from a three year longitudinal study from adolescence to emerging adulthood," *Computers in Human Behavior*, vol. 96, p. 78–84, 2019.

[10] G. J. Hjetland, V. Schønning, R. T. Hella, M. Veseth and J. C. Skogen, "How do Norwegian adolescents experience the role of social media in relation to mental health and well-being: a qualitative study," *BMC psychology*, vol. 9, p. 78, 2021.

[11] K. M. Murphy and R. H. Topel, "The value of health and longevity," *Journal of political Economy*, vol. 114, p. 871–904, 2006.

[12] R. Beiter, R. Nash, M. McCrady, D. Rhoades, M. Linscomb, M. Clarahan and S. Sammut, "The prevalence and correlates

of depression, anxiety, and stress in a sample of college students," *Journal of affective disorders*, vol. 173, p. 90–96, 2015.

[13] B. Rathakrishnan, S. S. Bikar Singh, M. R. Kamaluddin, A. Yahaya, M. A. Mohd Nasir, F. Ibrahim and Z. Ab Rahman, "Smartphone addiction and sleep quality on academic performance of university students: An exploratory research," *International journal of environmental research and public health*, vol. 18, p. 8291, 2021.

[14] Y. Wacks and A. M. Weinstein, "Excessive smartphone use is associated with health problems in adolescents and young adults," *Frontiers in psychiatry*, vol. 12, p. 669042, 2021.

[15] P. V. Kulkarni, L. Kumar and L. R. Naidu, "Smartphone use and sleep disturbances, depression and anxiety in adolescents," *Int J Public Health Res*, vol. 6, p. 61–67, 2019.

[16] S. Chatterjee and S. K. Kar, "Smartphone addiction and quality of sleep among Indian medical students," *Psychiatry*, vol. 84, p. 182–191, 2021.

[17] A. R. Sethuraman, S. Rao, L. Charlette, P. V. Thatkar and V. Vincent, "Smartphone addiction among medical college students in the Andaman and Nicobar Islands," *International Journal of Community Medicine and Public Health*, vol. 5, p. 4273–4277, 2018.

[18] O. Vasiliu, D. Vasile, D. G. Vasiliu and F. Vasile, "Cell Phone Addiction: A Review of the Available Data," *International Journal of Communications*, vol. 2, 2017.

[19] H. Mohan and Z. A. Lone, "Demographic correlates of smart phone addiction and selfie clicking behavior," *International Journal of Emerging Technologies and Innovative Research*, vol. 5, 2018.

[20] S. Goswami and A. Deshmukh, "Effect of Smartphone Addiction on the Mental Health of Adolescents: A Literature Review," *Mind and Society*, vol. 12, p. 37–42, 2023.

[21] A. Pera, "The psychology of addictive smartphone behavior in young adults: Problematic use, social anxiety, and depressive stress," *Frontiers in psychiatry*, vol. 11, p. 573473, 2020.

[22] Y. Ding, X. Wan, G. Lu, H. Huang, Y. Liang, J. Yu and C. Chen, "The associations between smartphone addiction and self-esteem, self-control, and social support among Chinese adolescents: a meta-analysis," *Frontiers in Psychology*, vol. 13, p. 1029323, 2022.

[23] J.-H. Kim, "Factors associated with smartphone addiction tendency in Korean adolescents," *International Journal of Environmental Research and Public Health*, vol. 18, p. 11668, 2021.

[24] Z. A. Ratan, A.-M. Parrish, M. S. Alotaibi and H. Hosseinzadeh, "Prevalence of smartphone addiction and its association with sociodemographic, physical and mental well-being: a cross-sectional study among the young adults of Bangladesh," *International journal of environmental research and public health*, vol. 19, p. 16583, 2022.

[25] A. Jeong, S. Ryu, S. Kim, H.-K. Park, H.-S. Hwang and K.-Y. Park, "Association between problematic smartphone use and physical activity among adolescents: a path analysis based on the 2020 Korea Youth Risk Behavior Web-Based Survey," *Korean Journal of Family Medicine*, vol. 44, p. 268, 2023.

[26] E. Abi-Jaoude, K. T. Naylor and A. Pignatiello, "Smartphones, social media use and youth mental health," *Cmaj*, vol. 192, p. E136–E141, 2020.

[27] J. S. Park, Y. J. Choi, K. Kwon, S. J. Choi, S. M. Moon, K.-H. Song, E. S. Kim, K. U. Park and H. B. Kim, "In-vitro activity of delpazolid and comparator agents against methicillin-resistant Staphylococcus aureus involved in bloodstream infection," *Annals of laboratory medicine*, vol. 43, p. 389, 2023.

[28] A. Bianchi and J. G. Phillips, "Psychological predictors of problem mobile phone use," *Cyberpsychology & behavior*, vol. 8, p. 39–51, 2005.

[29] M. Takao, S. Takahashi and M. Kitamura, "Addictive personality and problematic mobile phone use," *CyberPsychology & Behavior*, vol. 12, p. 501–507, 2009.

[30] M. Kwon, D.-J. Kim, H. Cho and S. Yang, "The smartphone addiction scale: development and validation of a short version for adolescents," *PloS one*, vol. 8, p. e83558, 2013.

[31] Y.-H. Lin, L.-R. Chang, Y.-H. Lee, H.-W. Tseng, T. B. J. Kuo and S.-H. Chen, "Development and validation of the Smartphone Addiction Inventory (SPAI)," *PloS one*, vol. 9, p. e98312, 2014.

[32] Q.-Q. Liu, X.-P. Xu, X.-J. Yang, J. Xiong and Y.-T. Hu, "Distinguishing different types of mobile phone addiction: Development and validation of the Mobile Phone Addiction Type Scale (MPATS) in adolescents and young adults," *International journal of environmental research and public health*, vol. 19, p. 2593, 2022.

[33] Z. D. Muharremoğlu and N. P. Erbaydar, "Adaptation of Smartphone Addiction Inventory-Short Form to Turkish," *ADDICTA: The Turkish Journal on Addictions*, vol. 8, p. 58–64, 2021.

[34] A. Alshehri, B. Alshehri, O. Alghadir, A. Basamh, M. Alzeer, M. Alshehri and S. Nasr, "The prevalence of depressive and anxiety symptoms among first-year and fifth-year medical students during the COVID-19 pandemic: a cross-sectional study," *BMC Medical Education*, vol. 23, p. 411, 2023.

[35] S. A. Mossman, M. J. Luft, H. K. Schroeder, S. T. Varney, D. E. Fleck, D. H. Barzman, R. Gilman, M. P. DelBello and J. R. Strawn, "The Generalized Anxiety Disorder 7-item (GAD-7) scale in adolescents with generalized anxiety disorder: signal detection and validation," *Annals of clinical psychiatry: official journal of the American Academy of Clinical Psychiatrists*, vol. 29, p. 227, 2017.

[36] L. J. Julian, "Measures of anxiety: state-trait anxiety inventory (STAI), Beck anxiety inventory (BAI), and Hospital anxiety and Depression scale-anxiety (HADS-A)," *Arthritis care & research*, vol. 63, p. S467–S472, 2011.

[37] A. Srivastava, A. B. Taly, A. Gupta and T. Murali, "Post-stroke depression: prevalence and relationship with disability in chronic stroke survivors," *Annals of Indian Academy of Neurology*, vol. 13, p. 123–127, 2010.

[38] M. S. Alotaibi, M. Fox, R. Coman, Z. A. Ratan and H. Hosseinzadeh, "Smartphone addiction prevalence and its association on academic performance, physical health, and mental well-being among university students in Umm Al-

Qura University (UQU), Saudi Arabia," *International journal of environmental research and public health*, vol. 19, p. 3710, 2022.

[39] Y.-Y. Wu and W.-H. Chou, "Smartphone addiction, gender and interpersonal attachment: A cross-sectional analytical survey in Taiwan," *Digital Health*, vol. 9, p. 20552076231177134, 2023.

[40] A. Gupta and D. Coffey, "Caste, religion, and mental health in India," *Population Research and Policy Review*, vol. 39, p. 1119–1141, 2020.

[41] N. Kil, J. Kim, J. T. McDaniel, J. Kim and K. Kensinger, "Examining associations between smartphone use, smartphone addiction, and mental health outcomes: A cross-sectional study of college students," *Health Promotion Perspectives*, vol. 11, p. 36, 2021.

[42] I. S. Albursan, M. F. Al. Qudah, H. S. Al-Barashdi, S. F. Bakhiet, E. Darandari, S. S. Al-Asqah, H. I. Hammad, M. M. Al-Khadher, S. Qara, S. H. Al-Mutairy and others, "Smartphone addiction among university students in light of the COVID-19 pandemic: prevalence, relationship to academic procrastination, quality of life, gender and educational stage," *International Journal of Environmental Research and Public Health*, vol. 19, p. 10439, 2022.

[43] G. Porter, K. Hampshire, A. Abane, A. Munthali, E. Robson, A. De Lannoy, A. Tanle and S. Owusu, "Mobile phones, gender, and female empowerment in sub-Saharan Africa: Studies with African youth," *Information Technology for Development*, vol. 26, p. 180–193, 2020.

[44] K. Devi, S. Harshini, and R. Mageswari, "Study of smartphone addiction and its predictors among medical college students in Puducherry, South India," *Universal Journal of Public Health*, vol. 10, no. 1, pp. 70-78, 2022. DOI: 10.13189/ujph.2022.100108.