



SMARTPHONE ADDICTION AND ITS HEALTH EFFECTS IN ADOLESCENT STUDENTS OF WEST BENGAL

Health Science

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ABSTRACT

Background- The rising level of smartphone addiction and its health effects among adolescent and adult is observed in different part of the world during and before COVID pandemic period. After COVID pandemic period life style and practices become change but smartphone use behaviour is unknown. More over physical, psychological and social health are inseparable. Therefore, present study aimed in assessing the health effects in terms of physical, psychological and social health of smartphone addiction among adolescent smartphone user and the differences of health effects between addicted and normal user group of adolescents. **Method-** Total 420 adolescent smartphone user were participated according to their representativeness by gender and standard of education from five secondary school of a subdivision in West Bengal. Smartphone addiction was measured by a standardized tool Smartphone addiction scale short version and health effects was measured by a three-point rating scale. **Result-** The mean of smartphone addiction score of male and female adolescent students was 28.5 ± 8.49 and 28.7 ± 8.95 respectively and there were no significant differences [$t(df_{418}) = -.258$] between mean score of smartphone addiction of male and female adolescent students. Significant higher health effects [$F(1,418) = 44.247, p < 0.001$] were observed among addicted user of smartphone than normal user of smartphone. **Conclusion** –To minimize health effects of Smartphone addiction, repeated awareness program at community level is essential and restriction of phone use at individual level is mandatory.

KEYWORDS

Smartphone addiction, Health effects, Adolescent students

INTRODUCTION

Good health is not something that we can buy but we need to develop and maintain throughout the life by good habits and healthy behaviors. Health is influenced by multiple factors including human behaviour. Research indicates that individual behavior and social circumstances together account for 60% of factors determining people's health. (WHO-2022). Behavior of smartphone use may range from normal to problematic or addicted. (MH van Velthoven et al -2018). Typical behavior of smartphone use can develop addiction to it. Addiction is defined as "a psychological and physical inability to stop consuming a chemical, drug, activity, or substance, even though it is causing psychological and physical harm".¹ The five elements of addiction includes: engagement in the behaviour to achieve appetitive effects; preoccupation with the behaviour; temporary satiation; loss of control; and suffering negative consequences. Smartphone addiction (SA) is defined as "overuse of smartphones to the extent that it disturbs the users' daily lives" (A Alkhateeb- 2020). In an Indian Urban setting 50% teenagers (13-19 years) are addicted to smart phone and 22% of them had higher risk of addiction.³ Among smartphone user adolescent, 13.5% were addicted user and 86.5% were healthy user in Korea.⁴ Another study (2018) of South Korea revealed that 30.9% middle school students were in a risk group for smartphone addiction and 69.1% were a normal user group. The two groups showed significant differences in smartphone use duration, awareness of game overuse, and purposes of playing games.⁵ In Pakistan 60% students had smartphone addiction; among them 57.3% males and 42.6% females were addicted to smartphone.⁶ A school-based cross-sectional study (2019) of China reported that the prevalence of smart phone addiction among junior school student was 22.8%.⁷ Among school children 74% were addicted to smartphones as observed in a study of Malaysia.⁸

Among Italian student smartphone addiction and risk of addiction was found 26.1% and 31.5% during pre-pandemic period and it was increased by 27.2% and 46.7% during pandemic period.⁹

Out of 426 adolescent students 57% were found addicted to smartphone and females had higher addiction scores than males in Mangalore, South India.¹⁰ In western part of India among 83.9% of smartphone user, smartphone addiction rate was 37%.¹¹ In Urban Private school of Kolkata 32% students from class VI to XII were severely addicted to smartphone and 18% of students were addicted from class I to V. The study also revealed that smartphone addiction is more common when availability of smartphone at home is more and whose parent are working and also addicted to smartphone.¹²

Functional loss and or disability of several organ is observed among addicted user of smartphone. Abnormal neck function is increases with increasing level of smartphone addiction among university students of

Saudi Arabia.¹³ Excessive Smartphone user students are often found with less physically active.¹⁴ Sleep quality and sleep duration both are affected by smartphone addiction.^{15,16} Another study of Saudi Arabia revealed that smartphone addiction was significantly associated with musculoskeletal problems, eyes and sleep complications.¹⁷ Blood pressure is an important parameter of physical health which has a strong association with problematic smartphone use.¹⁸ In a meta-analysis out of five study three study found association of high blood pressure with increased smartphone use.¹⁹ Associated medical problems with smartphone addiction were identified as sleep problems, reduced physical fitness, unhealthy eating habits, pain and migraines, reduced cognitive control and changes in the brain's gray matter volume (Y. Wacks-et al -2023). Compared to healthy user group of children, addicted group had lower craniovertebral angle (CVA) and lung functions in terms of Forced vital capacity, forced expiratory volume in 1 second and six second, maximum inspiratory pressures etc. (A. Alonazi et al-2021).

Smartphone addiction of adolescent is not suddenly disappeared but it continued when they become adult and start career as professional. Among young adult (18-30 years) of UK, smartphone addiction rate was 38.9% and poor sleep quality was observed among 68.7% of addicted people and smartphone addiction was significantly associated with poor sleep (aOR = 1.41, 95%CI: 1.06–1.87, $p = 0.018$) (S. Y. Sohn et al-2023). In a study of Soudi Arabia, among medical students smartphone addiction rate was 67.0% and Smartphone-addicted participants were more likely to: have lower academic performance; physical inactivity, poor sleep; overweight/obese; shoulder pain (39.2%), pain in eyes (62.2%) and neck (67.7%) and also had a serious mental illness (30.7%) (M. S. Alotaibi,-et al -2022). Number of health problems including eye strain, back pain and weight gain was significantly higher among young adult (24.45 ± 3.45 yrs), of Pakistan who excessively use cell phone. Along with physical problems Loneliness, depression and mood disorder are also significantly higher among the high user of cellphone in young Pakistani adult. (Danyal M et al -2022).

Among Korean adolescent sleep satisfaction of smartphone normal users was significantly higher (odds ratios: 1.372, $p < 0.001$) than that of high-risk users with smartphone addiction (E. Kim & K. Lee-2022). In a study of Turkey finds that smartphone overuse enlarges the median nerve, causes pain in the thumb, and decreases pinch strength and hand functions (E. E. İnal et al-2015). In an observational study two groups of children with high and low frequency of smartphone use were evaluated in which high level of smartphone user had diminished hand and pinch-grip strengths as well as hand function (N. L. Radwan-et al -2020). The effect of smartphone usage on neck muscle (flexors and extensors) endurance, hand grip, and pinch strength was compared

between addicted and non-addicted user of smartphone and a significant decrease in neck flexor endurance time was observed in the smartphone-addicted group (A. Alshahrani *et al*-2021). Another study of Turkey revealed a significant positive correlation between smartphone addiction with neck pain, right hand pain and right arm pain ($p < 0.05$, $r = 0.13$; $r = 0.17$; $r = 0.14$) (Ö. İnal & S. Serel Arslan-2021). A significant impact on physical health in terms of eye strain, back pain, fatigue and the habit of meal skipping was observed among smartphone user school students of Delhi (Pratap D J *et al*-2019). After adolescence adulthood is the significant stage of life starting with multi-tasking and greater responsibility of life but smartphone addiction is not reducing that evident from an Indian study in which college students shows a higher rate of addiction to smartphone and 27.1% had pain and other health related symptoms; 66.3% were aware about the symptoms of mobile phone overuse; 34.6% had changes in sleeping pattern and 43.5% had changes in sleeping hours (S Murugan-2016). Among college students of USA smartphone addiction was identified as an independent risk factor for traffic accidents. (S. R. Rosenthal-2022).

Other than physical health problems number of psychological problems also observed more among people addicted to smartphone. Among problematic smartphone user 43.3% and 32.6% were found depressed and anxious. (I. Hosen *et al*-2021). Adolescent's mental health, especially anxiety and depression and social interactions is affected as an impact of smartphone addiction (M. F. Alwi *et al*-2021). A systematic review and meta-analysis shows impact of smartphone addiction in terms of anxiety, depression and neurological disorder (Z. A. Ratan-*et al*-2021). Depression, anxiety and stress is increased with smartphone addiction among undergraduate students of United states (N. Kil *et al*-2021). In Brazil adolescent students with problematic smartphone use had more mood disturbances and symptoms of depression than adolescent students without problematic smartphone use (F. S. Pereira *et al*-2020).

Other than anxiety and depression, behavioral disorder also more common among children with smartphone addiction (R. F. Amalia *et al*-2020). In a web-based survey, adolescents with high-risk smartphone use showed a significant risk of suicidal ideation (OR: 2.49, CI: 2.21-2.81) and suicide attempt (OR: 1.87, CI: 1.48-2.37) compared to the general users of smartphone (O. Shinetsseg-*et al*-2022). Among Egyptian university students 59% had smartphone addiction and there was a significant relation between smartphone addiction, depression, anxiety, sleep disturbance, smoking, and suicide (T. Okasha *et al* -2022). Among nursing students of Cairo, Egypt 95.8% had smartphone addiction and smartphone addiction had significant positive correlation between levels of depression (S. M. Mohamed *et al*-2020). Smartphone addicted nursing students were lonelier (M. Sönmez *et al*-2021).

In Korea children with Smartphone addiction shows decreased social engagement (J. Ihm *et al*-2018). Higher smartphone addiction level negatively affects social life, verbal communication, and difficulties to education (H. K. Sut-*et al* -2016). A cross-sectional study of Turkey identified a negative impact of smartphone addiction on interpersonal communication and social life and reduce learning efficacy in nursing and medical students (U. Celikkalp-*et al*-2020). Smartphone addiction affects social interaction anxiety among undergraduate dental students (N. Krishna-*et al*-2021). Excessive use of smartphone reduces sleep quality, lower self-esteem, higher social distress; lower perceived social support or lower communication skills in nursing students (C. Osorio-Molina *et al*-2021). Another similar study also revealed a significant negative correlation between self-esteem and smartphone addiction in nursing students. ($r = -.329$, $p = .000$) (S. M. Mohamed-*et al*-2020). Children with more PSU symptoms show lower QoL, more behavioral difficulties, and poorer school performance (T. Kliesener-*et al*-2022).

Table No-1: Smartphone Addiction In Male And Female Adolescent Student n=420

	Levene's Test for Equality of variance					t test for equality of means					
	Group	Mean	SD	F	Sig	t	df	Sig (2-tailed)	Mean Difference	Standard Error Difference	95% CI of difference
Smartphone Addiction	Gr-1 Male n=189	28.497	8.49	1.461	0.227	-0.258	418	0.797	-0.221	0.858	-1.908 1.466
	Gr-2 Female n=231	28.718	8.95								

To compare the differences of smartphone addiction in male and female adolescent student independent t test was conducted. Levene's test result (Sig=0.227) indicates equal variances between two group of male and female adolescent. The mean score of Smartphone addiction

In a systematic review and meta-analysis, smartphone addiction was related to lower sleep quality, lower self-esteem, higher social distress, lower perceived social support or lower communication skills (C. Osorio-Molina *et al*-2020). In a longitudinal study total 416 smartphone user Spanish precipitants aged 15 years and more were assessed for a period of 1 year and revealed smartphone addiction decreases social support over time (J. Herrero-2019). Among high school students of Turkey revealed loneliness increases with smartphone addiction levels ($r = .208$; $p = .001$) but Academic achievement decreases (I. Yalçın-*et al*-2020). In a study of Thailand includes 341 high school and observed that Smartphone addiction had a negative impact on health, family relationship, social relationship, and academic performance of the high school students (Sinsomsack N *et al*-2023). University students of Turkey who had high-level smartphones addiction they perceived a high level of leisure constraints (F. Soyer-2019). Among the students of sport sciences life satisfaction decreases with high level of smartphone addiction (H. Kula-2023).

Adolescent is a vulnerable period of life in which risk-taking behaviors are more common due to lack of self-regulatory competence. The rising level of addiction and its health effects is a concern of health care provider. Today's adolescents are tomorrow's adult therefore recognition of smartphone addiction and its related health effect in the post Covid pandemic period is important.

Methodology

The descriptive comparative study was conducted in five secondary and higher secondary school of a subdivision in West Bengal, India. Smartphone user adolescent students (13-19 yrs) of standard IX and X were included in the study by stratified random sampling technique. Smartphone addiction was assessed by a standardized tool Smartphone addiction scale short version. Rating scale on health effects was used to measure health effects in terms of physical, psychological and social problems. Blood pressure as an indicator of physical health was measured by digital B.P apparatus.

RESULTS

Demographic Characteristics Of Adolescent Students

Among the participants out of 420 adolescent students' majority (81.0%) were in the age group of 15-16 years, 15% belongs to the age group of 13-14 years and only 4% were 17-18 years of age group. Among them comparatively female participants were more (55%) than male and 56% were from standard nine. Majority of adolescent students (81.2%) started to use smartphone after 11 years, 15.2% started to use by 6 to 10 years of age and remaining 3.6% started to use by 5 years of age or earlier. Majority (64%) of the participants were warned verbally for their excessive smartphone use; 19% reported for time out, 2.1% participants were physically punished; 1.4% not reported the nature of restriction but there was no restriction of excessive smartphone use for 13.3% of participants. The ability to control the temptation of smartphone use was reported always, most of the time, some times and not at all by 14.8%, 29.5%, 48.6%, and 7.1%. The perceived personality traits as deep thinker, very active, perceptive and impulsive was reported by 45.7%, 31.7%, 10.5% and 12.1% of participants.

Mean Arterial Blood Pressure

The mean arterial blood pressure (MAP) ranged from 53.33 to 151.33 with a mean of 83.82(± 10.87). The 5th, 50th, and 95th percentile value of MAP was 67, 83.75 and 101.67 respectively. Clinically normal range of MAP is 70 to 100 and 60 is risky for maintaining normal perfusion whereas above 100 score of MAP also risky for physical health. In the present study 5% adolescent whose MAP score was above 101.67 and they tend to be hypertensive.

Smartphone addiction among male and female adolescent students

In female adolescent (M=28.718, SD=8.95) was higher than male adolescent (M=28.497, SD=8.49) but there were no significant differences [$t(df)_{418} = -.258$] between mean score of smartphone addiction of male and female adolescent students.

Effects Of Smartphone Addiction On Health Of Adolescent Student

Table-2: Regression Analysis Result Of Smartphone Addiction And Health Effects n=20

Hypothesis	Regression weight	Standardized Beta Coefficient	R2	F	p value	Hypothesis supported
H ₀₂	SA HE	0.309	0.096	44.247	<0.001	Yes
	SA MAP	-0.027	0.001	0.510	0.476	No

Table No-3: Health Effects Of Smartphone Addiction In Addictive And Non-addictive User

	Levene's Test for Equality of variance						t test for equality of means				
	Group	Mean	SD	F	Sig	t	df	Sig (2-tailed)	Mean Difference	Standard Error Difference	95% CI of difference
Smartphone Addiction	Gr-I Addicted to SP n=138	32.406	5.06	1.842	0.175	3.939	418	<0.001	1.948	0.494	0.976 2.920
	Gr-II Not ASP n=282	30.457	4.60								

t(df)₄₁₈=3.939; p<0.001

The Levene's test result (Sig=.175, >0.05) indicates equal variances of two group. The mean score of Health effects in Group-I, addicted to smartphone (M=32.406, SD=5.06) was higher than the adolescent of Group-II, (M=30.457, SD=4.60). There were significant differences [t(df)₄₁₈ = 3.939] between mean score of health effects in Gr-I and Gr-II. The magnitude of the differences in means (mean difference= 1.948, 95%CI: .976 to 2.920) is statistically significant. Therefore, it can be interpreted that; health is significantly affected in the adolescent students who were addicted to smartphone than normal user of smartphone.

DISCUSSION

Relation between smartphone addiction and health effects among adolescent students in addicted group.

In the present study SA has a significant impact on health of adolescent students (b= .309, p<0.001).The study finding is supported by a cross-sectional study (R Soni, 2017) conducted among 587 students of Ajmer, India where sleep problem and psychological problems like anxiety and depression is increases among excessive smartphone users. In the present study physical health problems was present in 66.7% of students. These findings are congruent with previous study (J. Machado et al, 2023) which was conducted among 270 nursing students where majority 109 (40.2%) of the participants complained of headache, ringing in the ears 10 (3.7%), hearing problems 9 (3.3%), shoulder pain 45 (16.6%), cervical pain 31 (11.4%), painful fingers 29 (10.7%), joint stiffness 16 (5.9%), lack of concentration 47 (17.3%), difficulty sleeping 40 (14.8%), morning fatigue 40 (14.8%), earache 20 (7.4%), and nocturnal awakening 15 (5.5%). In both studies common physical health problem identified as headache, shoulder and cervical pain, painful fingers and difficulty in sleeping.

Health effects between the normal and addictive user of smartphone.

Adolescent Students health in terms of physical, psychological and social health was affected more among those who were addicted to Smartphone than that of non-addicted students. Another Indian study (D. Sharma et al 2023) revealed that Depression was significantly higher among the students with Smartphone addiction (77.2%) as compared to the non-addicted groups (35.4%). The Korean study (E. Kim-2022) revealed sleep satisfaction of smartphone normal users was significantly higher (odds ratios: 1.372, p < 0.001) than that of high-risk users with smartphone addiction. The study findings are consistent to the present study. A cross-sectional survey (A. Baabdullah,2020) of Jeddah identified a significant correlation between smartphone addiction and pain of wrist and hand (P= .036). This study finding is consistent with present study.

Implication Of Study

In the present study though the female adolescent students had higher score of smartphone addiction but statistically it was not significant and smartphone addiction has a significant impact on health of adolescent students. Therefore, health care provider may invite the male and female adolescent in the awareness program on prevention smartphone addiction and its health effects. Nurses can conduct counseling for adolescent and parent focusing the fact that health effect or health problem is significantly increases among addictive user than

Note: p<0.05; SA: Smartphone addiction; EH: Health effects; MAP=Mean arterial pressure

According to the simple linear regression analysis Smartphone addiction significantly predicted health effects, F (1,418)=44.247, p<0.001 which indicates that the Smartphone addiction has a significant impact on health of adolescent students (b= .309, p<0.001). Mean arterial pressure (MAP) is the other indicator of health which is not affected by Smartphone addiction, MAP,F(1,418)=.510, P=.476.

Health Effects Of Smartphone Addiction In Addictive User And Non-addictive-user

normal user. Nurse administrator can set policy for the hospital about the restriction of mobile phone use among nursing students, health personnel, patient and their family members. Based on the present study findings some interventional research can be conducted on prevention and control of smartphone addiction.

Limitations

This study provides insights into the differences of smartphone addiction in male and female adolescent students in West Bengal, and the differences in health effect between normal user and addicted groups, this study also has some limitations.

- Self-reporting was the methods of data collection; therefore, social norms may influence the adolescents' responses regarding addiction to smartphone.
- Health effects in terms of health problems were measured subjectively, using a rating scale rather than standardized scales.
- Blood pressure was measured twice in the same day with minimum gap of 15 minutes that may limits the optimum accuracy.

Recommendations

Considering the limitations of the present study and to improve the generalization, the recommendation are-

- Comparative study can be conducted to investigate the differences of smartphone usage pattern, its addiction and health effects through technological records of smartphone use in adolescent students.
- Study can be conducted to find the effect of parental smartphone addiction on the addiction behavior of children.
- Longitudinal study can be conducted to find health effect of smartphone addiction among students.

CONCLUSION

In the present study, there were no gender differences in Smartphone addiction. The study found significant impact of Smartphone addiction on adolescent health but their blood pressure is unaffected. The study also revealed that health effects or health problems are more affected in the group with smartphone addiction than that of normal user. Health problems related to smartphone addiction is preventable if it is realized by all segment of people. Restriction of smartphone in children can be started from family and school. Parents and teachers are the role model of students therefore limited and purposeful use is desirable from this group. Continuous community level awareness may bring some changes in the use of smartphone as well as addiction thereby health effects will be preventable.

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