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**RESEARCH ARTICLE**

## The Impact of Smartphone Usage Patterns on Health and Other Aspects of Life Post-Covid Pandemic

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**ABSTRACT**

Smartphone usage is still increasing worldwide. Life seems impossible without them as almost all activities are performed through these gadgets. Many studies have demonstrated the pattern of smartphone usage before and during the COVID-19 pandemic in teenagers and students. To observe the smartphone usage pattern and its impact on various aspects of life post-pandemic, an online survey was conducted through a questionnaire covering the demography, pattern of smartphone usage, and impact of smartphones on health, social life, and family life. The results were analysed statistically. A total of 528 responses from people, mostly from north India, with a mean age of  $33.60 \pm 11.50$  years, were collected, and 54.7% were residing in nuclear families. Occupation-wise, the maximum number of participants was professionals (32.4%), followed by 25.2% of students. Many young children (36.3%) also had their own smartphones. People agreed that phone usage caused poor academic performance (59.6%) and obsession with online shopping (44.3 %). Significant association ( $p < 0.05$ ) was observed between smartphone usage and increased BMI, physical symptoms (finger/hand pain, back pain, general fatigue, vertigo, lack of physical activity), and psychological symptoms (craving for phone use, nomophobia, poor quality sleep). Post Covid, smartphone usage increased among all age groups. Overuse of smartphones is a double-edged sword and may cause physical as well as psychological ailments. It is important to raise awareness about the mindful use of smartphones by setting boundaries and finding ways to do that.

**KEYWORDS**

Smartphones, Body mass index, poor quality sleep, hand pain, nomophobia

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**1. Introduction**

Over the last decade, information and communication systems have drastically changed. Smartphones are the most widely used gadgets that provide a continuous connection with the internet, evolved as multifunctional tools, and facilitate each activity of life. Widespread use of this technology has made individuals of all age groups dependent on it. Nowadays, no one is seen without smartphones in their hands or pockets. The number of users is increasing every year. More than 6 million people are currently using smartphones. (Sun S, 2023) Approximately 65 % of Children < 15 years of age have their own phones. (Girela B et al, 2022)

The remarkable journey of evolution of the smartphone industry began in 1993 with the IBM Simon, which combined a mobile phone with the features of a PDA (personal digital assistant), laying the base for future innovations. The entry of BlackBerry smartphones into the mass media market introduced a new era of connectivity, offering services like email, internet browsing, and an integrated camera. Apple's launch of the iPhone in 2007 marked a significant milestone, revolutionizing the user interface and app ecosystem. Later that year, Google introduced the Android operating system, which has since become a major player in the market. It is known for its open-source flexibility and wide range of hardware options. Together, these developments have shaped

the modern mobile user experience, driven by continuous technological advancements and various features and applications. (Sarwar M et al., 2013)

Smartphones have become an essential part of our daily lives as versatile tools that offer a wide range of activities on one portable device. Smartphones facilitate learning and skill development in the field of education with access to online courses and educational apps. Other common usages are navigation, travel (booking rides, tickets, hotels, etc), entertainment (Watching movies, listening to music, playing games), photography (photos & videos), social media (Connecting with friends and family), work (emails, scheduling, and various productivity apps.), health (Tracking fitness goals and monitoring health parameters). They can be used as a safety device with features like emergency calls and location sharing. They enable digital payments and banking services, making financial management more accessible and secure.

Mobile phones, despite their numerous routine usages, have become a concern for global public health. Research has identified a range of adverse physical and psychological effects on users across various age groups. The habit of using smartphones during daily activities, such as driving or studying, has been linked to vehicular accidents and diminished academic achievements. (Buctot DB et al, 2021 & Ortega CAC et al, 2021) Additionally, the radiation emitted by mobile phones could potentially lead to issues like memory impairment, sleep disruption, and headaches. The addiction to smartphones is now a growing problem; surveys reveal that 22% of young people check their devices every few minutes, indicating a dependency. (Machado J et al 2023) Recent studies have correlated the constant use of smartphones with an increase in anxiety, sleep disturbances, depression, musculoskeletal disorders, and auditory problems. The phenomenon of 'nomophobia,' or the fear of being without a mobile phone, is also gaining recognition. (Mashroor S et al., 2019) There is a need to increase awareness about appropriate usage and potential interventions to mitigate these health risks associated with smartphone usage. As India is the 2nd highest smartphone user country, hence the survey study aimed to check the pattern of mobile phone usage and its impact on health and other aspects of life. (Putta SK, Fayaz S, 2023).

## **2. Methodology**

It was an online short survey study conducted in June 2024. A questionnaire was framed in English on Google Forms, and the link was posted to family members and friends via mail and WhatsApp. They were requested to spread the questionnaire across the country. The questionnaire contained three sections. The first section had questions related to demography and general information. The second included 20 questions about the pattern of smartphone usage. In the last Section, ten questions were asked about the impact of smartphones on physical, mental health, social, and other aspects of life. After one week of data collection, the survey was closed, and an Excel sheet of the data was extracted and analysed further.

**Statistical analysis:** Data were described in terms of range, mean  $\pm$  standard deviation ( $\pm$  SD), median (IQR), frequencies (number of cases), and relative frequencies (percentages) as appropriate. For comparing categorical data, a Chi-square ( $\chi^2$ ) test was performed. A probability value ( $p$  value) less than 0.05 was considered statistically significant. All statistical calculations were done using SPSS (Statistical Package for the Social Science) SPSS 21.0 version (SPSS Inc., Chicago, IL, USA) statistical program for Microsoft Windows.

## **3. Results**

A total of 528 responses, including 56.8% females, were collected. Maximum people belonged to the age group of 36 -45 years (35.1%) followed by 15-25 years (31.5%), 26-35 years (20.9%), 46-55 years (9.5%), 56-65 years (3%) and >65 years (4.6%). The mean age of the participants was  $33.60 \pm 11.50$  years. Demography, professional, and family details are shown in **Table 1**.

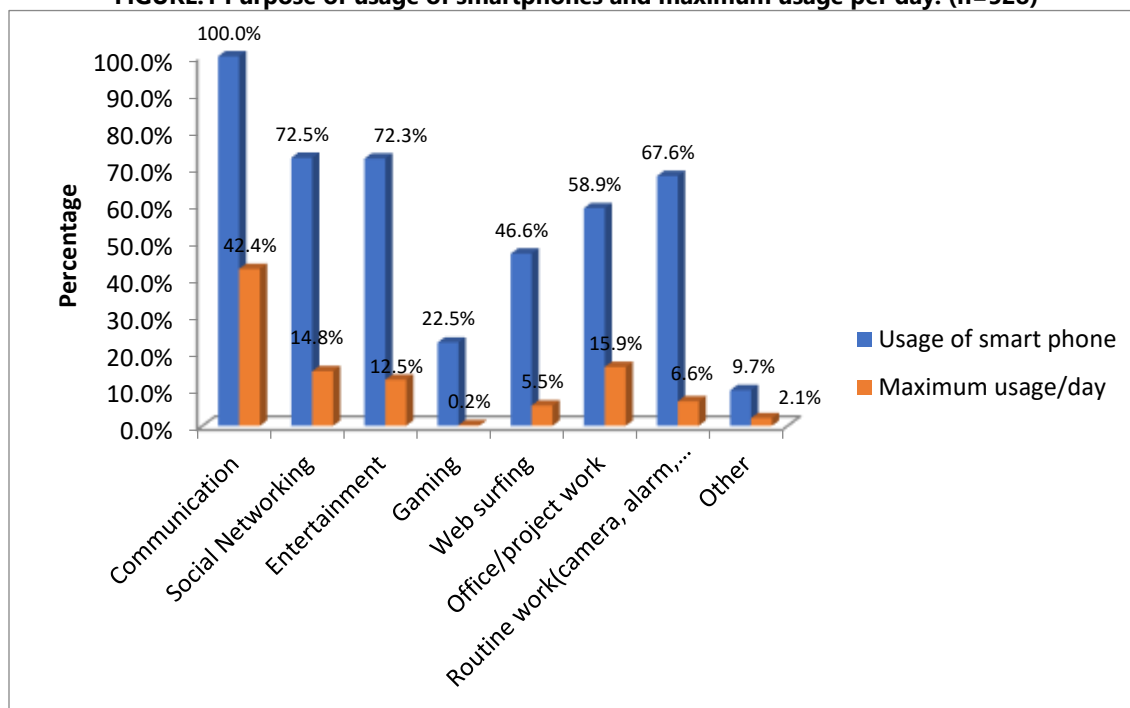
Among all of them, 62.3 % of people were using laptops and smartphones. Average time spent on smartphones in a day was noted as less than two hours (22.7%), 2-4 hours (41.1%), 4-6 hours (23.1%), 6-8 hours (9.8%) and more than 8 hours (3.2%). The purpose of smartphone usage & maximum usage in a day have been shown in **Figure:1** Smartphones were used for talking less than one hour in a day by 53.3%, up to 2 hours by 30.5%, 2-3 hours by 11.2% and for more than 4 hours by 5% of participants. Out of the total, 36.3% of children (<15 years of age) had their own phone. Maximum children (<15 years) were using their mother's phone (42.5%), followed by the grandparents (9.6%), Father's (7.2%) & siblings (3.6%). While a few of them use their friend's phone 0.8%).

In this study, 40% of users' mobile phone cost was more than 40,000 Rs, followed by 10-20 thousand Rs (27.8%), 20-30 thousand (16.7%), 30-40 thousand (8.3%) and less than 10 thousand Rs (7.4%). Other than the phone cost, a maximum (62%) of participants were spending <1000Rs monthly on the phone, followed by 1000-2000 Rs (24.2%), and 13.7% of the users were spending >2000 Rs monthly. For most people (63.6%), maximum usage was in the evening & night, followed by the afternoon (28.6%), though 7.8% had the highest usage in the morning time. The maximum usage was at home (72.2%) as compared to the workplace (25.7%) and public places (2.1%). Headphones were frequently used by 28.1% of participants, while 24.3% were not using headphones,

and the rest were used infrequently. The most common reason for overuse was entertainment (57.4%). However, 30.8% used their phone in excess to divert them from other stress of life, while 10.7% were using it to deal with loneliness and 1.2% due to gaming interest.

Usage of smartphones around sleep time (Table: 2), Usage of smartphones during other activities (Table: 3), Impact on health (Table:4), and Opinions regarding the impact of smartphone usage on various aspects of life are shown in (Table:5)

**FIGURE:1 Purpose of usage of smartphones and maximum usage per day. (n=528)**



**Table 1: Demographic and family profile (n=528)**

		Number	Percentage
<b>Gender</b>	Male	227	43
	Female	301	57
<b>Place</b>	India	508	96
	NRI(Non Resident Indians)	20	3.8
<b>Occupation</b>	Business	34	6.4
	Professional (Medical/IT/ Hospitality/HR/Finance/Administration)	171	32.4
	Teacher	36	6.8
	Home maker	30	5.7
	Student	133	25.2
	Retired	7	1.3
	Skilled worker	21	4
	Others	96	18.2
<b>Type of family</b>	Joint family	209	39.6
	Nuclear family	289	54.7
	Staying single/hostel	30	5.7
<b>BMI</b>	<25 (healthy)	283	53.6
	25-30 (over weight)	195	36.9
	>30 (obese)	50	9.5

Table 2: Usage of smartphones around sleep time(n=528)

Place where Smart phone kept while sleeping	Bedside table	On the bed	Under the pillow	Away from bed
	291(55.1%)	78(14.7%)	42(8%)	117(22.2%)
Time spent on phone before sleeping	<30 minutes	30 minutes – one hour	> one hour	Not used before sleeping
	214(40.5%)	183(34.7%)	63(11.9%)	68(12.9%)
Awakened by smart phone at night	Almost everyday	2-3 times per week	Occasionally	Never
	26(4.9%)	26 (4.9%)	157(29.8%)	317(60.3%)

Table 3: Usage of smart phones along with other activities

	Almost everyday	Few days/week /Often	Occasionally/ Sometimes	Never
<b>Carrying smart phones in the bathrooms</b> (n=528)	114(21.5%)	25(4.7%)	132(24.9%)	257(48.9%)
<b>Smart phones are used while feeding infants/ young children</b> (n=458)	70 (15.3%)	28(6.1%)	94(20.5%)	266(58.1%)
<b>Parents give phone to their children to keep them busy and to avoid disturbance in their work.</b> (n=483)	29(6%)	89(18.4%)	220(45.5%)	145(30%)
<b>Use of smart phone during driving</b> (n=416)	Mostly, but always with Bluetooth hands free	Mostly, and use of hands to operate phone also	Occasionally	Never
	74 (17.8%)	9(2.2%)	106(0.24%)	227(54.5%)

**Table 4: Impact of smart phones on Health(n=528)**

Physical symptoms due to overuse		Psychological symptoms due to overuse		
Neck pain	173(36%)	Loneliness	51(9.7%)	
Back pain	55(11.5%)			
Finger/Thumb/Hand pain	79(16.5%)	poor quality sleep	133(25.2%)	
Eye fatigue/ Eye pain	241(50.2%)	social withdrawal.	68(12.9%)	
General fatigue	67(14%)	Irritable behaviour	84(15.9%)	
Headache	141(29.4%)	lack of concentration	146(27.7%)	
Vertigo	11(2.3%)			
Lack of physical activity	119(24.8%)	Procrastination	103(18.5%)	
None	48(9.1%)	None	203(38.4%)	
<b>Other Psychological effects related to smart phone use</b>				
Feeling anxious while away from phone/ Nomophobia	A little bit stressful	Stressful	Very stressful	Not at all stressful
	252(47.7%)	47(8.9%)	11(2%)	219(41.4%)
Craving for use of phone	Mostly time	Frequently	Only during my free	Never
	49(9.3%)	60(11.4%)	313(59.3%)	106(20.1%)
Heightened peer pressure due to overuse of social media , causing	Anxiety & Depression	Inferiority Complex	Better performance	No effect
	116(22%)	73(13.8%)	36(6.8%)	303(57.4%)

**Table 5: Opinion regarding the Impact of smartphone usage on various aspects of life**

<b>Academic performance of children (n=508)</b>	Increase in performance	Decrease in performance	Not effect	-
	<b>95(18.7%)</b>	<b>303(59.6%)</b>	<b>110(21.7%)</b>	
<b>Social life (n=518)</b>	It has become better due to smartphones significantly.	It has deteriorated as frequency of meeting people in person has reduced	No effect	-
	<b>146(28.2%)</b>	<b>181(34.9%)</b>	<b>191(36.9%)</b>	
<b>Family life (causes quarrels in the family) (n=528)</b>	Very Frequently	Frequently	Occasionally	Never
	<b>34(6.4%)</b>	<b>59(11.2%)</b>	<b>234(44.3%)</b>	<b>201(38%)</b>

Online shopping by smart phones. (n=528)	Using frequently and I feel it makes life easy as I am able to control myself as per need.	Mostly leads to over expenditure & guilt due to continuous access of smartphones,	Feel Obsessed with online shopping due to overuse of smart phones	Either using sometimes /not using and always prefer offline shopping
	<b>203(38.4%)</b>	<b>61(11.6%)</b>	<b>19(32.8%)</b>	<b>245(46.4%)</b>
<b>Quality of life</b> (n=528)	Life is better with smart phones	Life is better and possible without smart phones	Life is better but not possible without smart phones	-
	<b>169(32%)</b>	<b>140(26.5%)</b>	<b>219(41.5%)</b>	

**4. Discussion**

In this study, the pattern of phone usage was compared among various groups, including gender (male & female), age groups (15-25 years, 26-35 years, 36-45 years, and >45 years), BMI (<25; healthy, 25-30; overweight, >30; obesity), type of family (joint family, nuclear family, single), professions (students, professional, Homemakers & others) and average time spent on a smartphone (<2 hours, 2-4 hours, >4 hours). Statistical significance was noted.

In our study, among 528 participants, females (57%) were more as compared to males. This is incongruent with other studies. [Chidiac M et al., 2022; Machado J et al., 2023; and Chen B et al., 2017] Similar to a few other studies, no significant association was observed between time spent on smartphones and gender in our study. [Machado J et al., 2023, and Chen B et al., 2017] On the other hand, a study on adolescents has reported associations between moderate or heavy digital media use and low psychological well-being/mental health issues were larger for girls than for boys. [Twenge JM, and Martin GN 2020] We did not observe psychological & physical symptoms with particular genders, except craving for smartphone use was reported significantly more by males, mostly females had craving to use during their free time. Males were significantly using their phones more along with other activities such as driving and carrying their phones in bathrooms., In contrast, a study by Putta et al. showed a correlation between problematic smartphone usage due to increased time spent on the phone and moderate depression in males and stronger depression among females. [Putta SK and Fayaz S.,2023] Many studies have reported females using smartphones more for social networking, and males had more diversified use. [Chen B et al., 2017] In our study, males were using phones more for web surfing, and the most common reason for overuse was loneliness, entertainment & gaming, while females reported excess use to divert them from other stresses of life (p<0.05)

In our study, the maximum number of participants was 36- 45 years (35%), followed by 15-25 years (32%). Most of the other studies related to the usage of smartphones have been done with adolescents and students. [Girela B et al., 2022; Buctot DB et al., 2022; Machado J et al., 2023] We have included all age groups and professions. Studies before the COVID-19 pandemic observed maximum usage in the teenage group, which was decreasing with age. (Andone I et al 2016 and Sun S,2022) A survey conducted in 2021 reported higher phone usage among young children and, correspondingly, among their parents too. (Basuroy T. 2023) In our study, prolonged (> 4 hours average) time spent on the phone was maximum in the age group of 26-35 years (41.8%) followed by 15-25 years (36.5%), least among people >45 years of age (25.7%) was observed.

The age group of 15-25 years had maximum usage of smartphones in a day for social networking, web surfing, and photography, and the 26-35 years age group for entertainment. The older people (>45 years) had maximum usage per day for social networking. The middle age group of 25-45 years had more phone usage along with other activities such as driving and being in the bathroom. The participants >45 years of age kept their phones on the bedside table or away from the bed before sleeping, while younger people mostly kept their phones on the bed or under the pillow. Poor quality sleep was reported to be the highest in the middle age group, 25-35 years, followed by 36-45 years. Sleep problems were seen least among the youngest and oldest groups, but craving for phone use remained most of the time in the 15-25-year-old age group. Obsession with online shopping was seen maximum in the 26–35-year age group (4.5%), while most of the older people (>45 years) preferred offline shopping (38%). A study of Generation Z individuals demonstrated mood regulation and compulsive buying association with smartphone addiction. (Mason MC et al. 2022) We compared the pattern and duration of smartphone usage among joint families and nuclear families/staying single. It was observed that people in joint families spent less time on the phone (34% for > 4 hours/day) than nuclear family members/single (37.4% for >4 hours/day). Phone use before sleeping was more in nuclear families, and psychological symptoms such as loneliness, poor quality sleep, social withdrawal, and irritable behaviour were observed

significantly more in nuclear families. However, participants from the joint families reported more frequent quarrels due to their families' usage of phones. Another study from Pakistan reported the negative influence of smartphone usage on family harmony and values. (Sarwar M et al 2021) A review study by Knitter et al. has addressed how smartphone usage has changed family interaction. (Knitter B & Zemp M 2020) Other than communication, students had maximum usage of the phone for social networking, and professionals used the phone most for office/ project work. Homemakers spend maximum time on social networking & entertainment. Camera/photography was used the most by students, followed by homemakers. A significant association was observed in various professional groups with Physical symptoms such as neck pain, back pain, finger/thumb/hand pain, headache & lack of physical activity; among the psychological symptoms, lack of concentration was observed most among students, followed by professionals. Skowronek J et al. from Germany have reported that the mere presence of smartphones leads to a lack of attention. (Skowronek J et al 2023) As compared to other groups, significantly, students were using phones for more than one hour before sleeping and reported maximum use of headphones. Studies have shown an association between ear problems and the usage of headphones. (Mushroor S et al., 2019) Similarly, literature has reported an association of smartphone usage at night with poor quality sleep and low psychological wellbeing. (Shoval D et al 2020) Professionals were significantly ahead of all other groups in talking on the phone.

There was a significant association ( $p < 0.05$ ) was observed between the number of hours of phone use and increased BMI (overweight & obesity). Similarly, a study by Zhicong Ma et al. (2021) reported a correlation between problematic smartphone usage and obesity. However, tracking of diet and exercises can be performed & records can be maintained via smartphone apps. An author has reported that every third person in Germany installed a health app on the smartphone. (Holzmann SL & Holzapfel C, 2019) In addition, it has been reported that the development of smart apps and wearables is usually non-evidence-based & with no standardized criteria available for their evaluation; also interventions with digital tools are not superior to non-digital treatments for weight loss (Holzmann SL & Holzapfel C, 2019) Nevertheless, few studies addressed the positive role of apps & wearables in promoting weight loss among adults, particularly when combined with personal contact.

Usage of phones was significantly higher in people using their phones along with other activities such as driving, carrying phones in the bathroom, and before sleeping. More number of hours on the phone were significantly associated with finger/hand pain, back pain, general fatigue, vertigo, and lack of physical activity. Also, a significant association was observed between craving for phone use, nomophobia, and poor-quality sleep. Many previous studies have found an association between physical (headache, tinnitus, eye pain, shoulder pain, finger pain, etc) and psychological symptoms (lack of concentration, detrimental cognitive function, insomnia, anxiety, difficulty in sleeping, etc) with excessive use of smartphones. (Machado J et al, 2023, Sela A et al 2022 and Tanil CT & Yong MH 2020)

In our study, 60 % of people agreed that smartphone usage leads to poor academic performance, while 19% considered better academic learning with these tools. Some recent studies have reported the negative effects of smartphones on academic performance. (Omer OZ, 2020 and Durak HY, 2019) On the other hand, various studies have reported good GPA scores among students using smartphones for learning. (Buctot DB et al. 2021)

In our study, 20% of people reported the frequent use of a phone while driving. Studies have reported smartphone usage while driving leads to distraction and has become an important cause of accidents. (Ortega CAC et al 2021) In the current study, 21% of participants reported that phones were frequently used to feed young children in their families. A review study has highlighted that using a phone while eating leads to more calorie intake and obesity as it breaks the signal between feeding and satiety centre. (La Marra M et al 2020)

In our study, the maximum number of people were using costly (>40000 Rs) phones. Studies have shown that peer pressure is one of the factors that influence the purchase decision of smartphones in different professions, and the majority of people buy their phones out of need. (Katyal M, 2017)

In our study, about 40% of people in the older age group thought that life is better with smartphones. Possibly, they were unaware of the effects of usage on various aspects of life. However, the youngest age group (50%) thought life was better but not possible without smartphones.

**Limitation:** This is a cross-sectional survey study, which may be associated with self-reported bias and requires experimental research to prove a causal relationship between the parameters. The sample size was small and represents a predominantly north Indian population.

## 5. Conclusion

The COVID pandemic has permanently changed many aspects of lifestyles. Frequent use of digital technology by all age groups is one of them. It is necessary to see the pattern of smartphone usage in different areas and populations. People must be aware of the positive and negative aspects associated with technology; hence, mindful use can be enhanced. More scientific researches are needed to develop causal relationships; therefore, preventive methods can be identified & implemented to enhance the positive use of technology.

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