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Indian Journal of Forensic and Community Medicine

Journal homepage: www.ijfcm.org**Original Research Article****A prevalence study on neck pain and neck disability among prolong smartphone user college students of Guwahati, Assam****Pallabi Goswami¹**, **B.C. Sarma^{2*}**¹Dept. of Physiotherapy, Faculty of Paramedical Sciences, Assam Down Town University, Guwahati, Assam, India²Faculty of Paramedical Sciences, Assam Down Town University, Guwahati, Assam, India**Abstract**

Background: Smartphone offer so many mobile applications for communication, education, and entertainment, they are quickly becoming an indispensable part of everyday life. When the neck is bent frequently forward to view the monitor for prolonged time, the muscles in the back of the neck are stressed. Bad posture can cause cervical spine flattening and pain.

Aim and Objective: The aim of this study is to investigate smartphone addiction among Guwahati college students to determine how it relates to neck pain and neck disability.

Materials and Methods: 358 college students in Guwahati participated in a cross-sectional study that used Google Forms to administer the Neck Disability Index (NDI) and the Smartphone Addiction Scale-Short Version (SAS-SV). Surveys were made available online batch-wise following collection of informed consent. Ethical clearance has been collected from Institutional ethical committee before starting the study.

Result: Results showed that out of 358 participants, 14 people without neck disabilities are addicted compared to 28 who are not. On the other hand, 143 people with mild neck disability are addicted, whereas 92 people are not. 54 out of 64 people with moderate disabilities, 14 out of 15 people with severe disabilities, and 2 people with total disabilities are classified as addicted, indicating that as the proportion of addicted individuals grows, disability severity increases.

Conclusion: This study found that among Guwahati college students, a rise in Smartphone addiction is connected with an increase in neck pain and disability. Long-term smartphone users' neck pain can be lessened with good posture and ergonomic guidance.

Keywords: Neck pain, Smartphone user, Posture correction, Ergonomic guidance.

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1. Introduction

Smartphone are becoming an increasingly important aspect of daily life since they provide a diverse range of mobile applications for entertainment, education, and communications. Everyone, from children to adults, utilizes Smartphone for a variety of reasons and for larger periods of time each day. According to research, 79% of people between the age group of 18 and 44 own and use a smartphone practically constantly, and just two hours of the waking day are spent without one.¹

Several harmful consequences of prolonged Smartphone use have been developed, which is surprisingly given the data that cell phones are vastly used by people now a days more than PCs on a daily basis. Smartphone users utilize their devices for a variety of everyday tasks, including social media, internet browsing, and conversation with other users, gaming, gambling, music listening, and many more.^{2,3}

People may perform these duties for extended periods of time without moving or performing particular actions

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repeatedly, which can result in various musculoskeletal problems.⁴

Due to increased acceptability and "addiction" to smartphone, smartphone models have evolved to include features like social media and game related apps, web browsing, handy media players, high resolution and light weighted digital cameras, and high-quality touch displays.⁵

The increasing usage of cell phones by young people throughout the day can result in a number of psychological and physical issues. The consequences of dependence and anxiety about losing Smartphone use have been emphasized by research. Numerous conditions, including as eating disorders, obsessive-compulsive disorders, depression, and other behavioural disorders, are linked to nomo phobia.^{6,7}

Smartphone addiction can lead to major issues, particularly for young people. Over time, these issues—which now seem to begin in childhood—may become social issues for a large percentage of people. Such addictions have been categorized as "technological addictions," which are behavioural addictions that do not include chemicals and involve interactions between humans and machines. The symptoms of internet, networking sites, video games, and Smartphone addiction are comparable to those of many behavioural or pharmaceutical addictions, according to studies.⁸⁻¹¹

Physically speaking, using a Smartphone is linked to the development of MSDs; according to recent studies, between 50 and 84 percent of Smartphone users have an MSD.^{12,13}

Neck and upper extremity pain are examples of musculoskeletal discomfort, which can affect functional performance, quality of life, and productivity at work.

Moreover, medical care costs might lead to a substantial burden and an increase in the need for healthcare services. Musculoskeletal pain in students might affect their academic performance and absences from class.¹⁴

Texting involves repetitive finger movements, and holding a Smartphone without assistance from the neck or upper limbs can cause an excessive amount of static muscular tension, especially when using one hand. Additionally, it's been shown that using a Smartphone with the head forward raises the risk of musculoskeletal pain by straining cervical structures and perhaps damaging and degenerating the neck structures. The probability of getting recurring neck pain and the severity of the problem may also be increased by a history of shoulder and neck pain.¹⁵⁻¹⁷

Smartphone users must tilt their neck forward to view the monitor in order to use both thumbs to operate the device. When the neck is bent forward often or for prolonged periods of time, the muscles in the back regions of the neck are constantly stretched. Bad posture may cause the cervical spine to flatten. Repetitive head hanging forward causes the

neck's anatomical structures to be overused, which is quite concerning for the next generation.¹⁷

Long-term smartphone use has been linked to musculoskeletal problems, including wrist, back, and neck pain as well as postural errors. These problems most frequently affect the upper back and neck, according to studies. The forward head posture caused by Smartphone use weakens the neck muscles and causes pain in the surrounding region. The aim of this study is to look into Smartphone addiction among Guwahati college students and how it relates to neck pain and disability.

2. Materials and Methods

2.1. Data collection and study design

A Google Form was used to administer the Neck Disability Index (NDI) and the Smartphone Addiction Scale-Short Version (SAS-SV) to college students in Guwahati as part of a cross-sectional study. Surveys were distributed to college students of Guwahati in batches after obtaining their informed consent. Before beginning the investigation, institutional ethical committee approval was obtained.

2.2. Participants

358 Guwahati college students took part in the study. Stratified random sampling was used to choose the research participants. The institutions were divided into four zones of Guwahati for convenient sampling purposes, with no objection certificates obtained from the respective college administrations prior to their participation.

2.3. Inclusion criteria

The following criteria were used for selecting the research participants: they had to be between the ages of 18 and 25; They had to be willing to participate, speak Assamese and English fluently, and have possessed a smartphone for at least a year before the event.

2.4. Exclusion criteria

Participants with musculoskeletal trauma or injury to the neck, shoulders, or upper back were excluded from the study. Individuals experiencing severe neck pain that required medical treatment, those with congenital abnormalities, severe neurological conditions, or surgical history, and those who had experienced limb injuries or limb pain with significant difficulty in movement during the previous six months, were also excluded from participation.

2.5. Questionnaire design

The overall demographic data included age, gender, academic year, and faculty. Smartphone usage hours were investigated. Self-reported smartphone addiction was evaluated using the Smartphone Addiction Scale-Short Version (SAS-SV). The SAS-SV scale, which has 33 items on a six-point Likert scale (1 being strongly disagree and 6

being strongly agree), is divided into six components. The six criteria were tolerance, usage, withdrawal, positive anticipation, cyberspace-oriented relationships, and disruption to regular life. The responder marks the statement that best captures their Smartphone use features. Scores range between 32 to 132. The more aggressively a person utilizes their Smartphone, the higher their score. SAS-SV is a valid and reliable evaluation instrument for evaluating Smartphone addiction.

Pain, personal care, lifting, reading, headaches, concentration, work, driving, sleep, and recreation are the ten items that comprise the Neck Disability Index (NDI), a functional status questionnaire that patients fill out according to their unique circumstances. "No pain" is represented by a score of 0 to 5, while "worst imaginable pain" is represented by a score of 5. A minimum of 50 was deemed to represent the test's raw score. More neck issues are associated with higher NDI scores. Both of these surveys were distributed via Google Form, and the respondents themselves reported the same results. Each participant's scores on both scales were verified, and the results were reported appropriately.

2.6. Statistical analysis

Descriptive statistics were used in this study to characterize categorical data, including percentage and frequency. Associations between categorical factors, including gender, neck disability (NDI), Smartphone addiction (SAS-SV), and daily Smartphone use hours, were evaluated using Pearson's Chi-square test. Fisher's Exact test was utilized with sparse data or small sample sizes because it produces more exact probability estimates than the Chi-square test's asymptotic approximations. All statistical analyses were performed using IBM SPSS Statistics for Windows, version 27.

3. Results

3.1. Gender wise distribution

Table 1: Distribution of hours of smartphone use/day across genders

Hours of Smartphone Use/Day	Female N = 268 ¹	Male N = 90 ¹	p-value ²
3 - 4 Hours	44 (16%)	18 (20%)	0.9
4 - 5 Hours	93 (35%)	30 (33%)	
5 - 6 Hours	76 (28%)	25 (28%)	
More Than 6 Hours	55 (21%)	17 (19%)	
¹ n (%)			
² Pearson's Chi-squared test			

According to participant data on smartphone usage, there was no statistically significant distinction between the genders in terms of the total number of hours spent using smartphones daily (p-value = 0.9).(Table 1) However, variations were noted in the distribution of hours spent using

Smartphone: females used their phones for 3-4 hours a day at a rate of 16%, while males did so at a rate of 20%. Males and females also differed in usage patterns for 4-5 and 5-6 hour blocks, with females using devices more frequently than males.

Table 2: Distribution of neck disability (NDI) across the two genders

Neck Disability (NDI)	Female N = 268 ¹	Male N = 90 ¹	p-value ²
No Disability	29 (10.8%)	13 (14.4%)	0.3
Mild	171 (63.8%)	64 (71.1%)	
Moderate	53 (19.8%)	11 (12.2%)	
Severe	13 (4.9%)	2 (2.2%)	
Complete	2 (0.7%)	0 (0%)	
¹ n (%)			
² Pearson's Chi-squared test			

The distribution of neck disability levels among female and male participants was examined using the NDI.(Table 2) There was no apparent gender disparity (p = 0.3). Neck disability was more common in women: 11% had no impairment, 64% had mild disability, 20% had moderate disability, 4.9% had severe disability, and 0.7% had total disability.

For each level of disability, the percentages were marginally higher among men, although these differences were not statistically significant.

Table 3: Distribution of smartphone addiction (SAS-SV) across genders

Smartphone Addiction short version (SAS-SV)	Female N = 268 ¹	Male N = 90 ¹	p-value ²
No Addiction	94 (35%)	37 (41%)	0.3
Addicted	174 (65%)	53 (59%)	
¹ n (%)			
² Pearson's Chi-squared test			

A non-significant p-value of 0.3 indicates that there is no statistically significant difference in the rates of smartphone addiction between the genders. Out of the 268 female participants, 65% were identified as addicted by the SAS-SV, whereas 59% of the 90 male participants were classed as addicted.(Table 3)

Table 4: Association between smartphone addiction and neck disability

Neck Disability (NDI)	Smartphone Addiction (SAS-SV) #		Total	p-value ¹
	No Addiction	Addicted		
No Disability	28	14	42	<0.001
Mild	92	143	235	
Moderate	10	54	64	
Severe	1	14	15	
Complete	0	2	2	
Total	131	227	358	

¹Fisher's exact test
#Cramer V = 0.3

The association between Smartphone addiction and neck disability was statistically significant ($p < 0.001$), as determined by Fisher's exact test. The Cramér's V value of 0.3 suggests a moderate association between the two categorical variables. A more thorough examination at the distribution shows a clear pattern: those who were addicted to smartphones were more likely to report having more neck disabilities. For example, while 66.7% (28 out of 42) of participants with no neck disability were not addicted to Smartphone, the trend reverses at higher levels of disability. Among those with moderate neck disability, 84.4% (54 out of 64) were addicted. Notably, all cases of complete disability ($n = 2$) occurred among participants with Smartphone

addiction. The observed pattern suggests a favourable correlation between the existence of smartphone addiction and the severity of neck dysfunction. The findings support the hypothesis that excessive Smartphone use may be linked to musculoskeletal health issues such as neck pain or disability.

A statistically significant association was observed between daily Smartphone use and neck disability ($p < 0.001$), based on Fisher's exact test. The calculated Cramér's V value of 0.2 indicates a small-to-moderate effect size, suggesting that while the association is statistically significant, the strength of the relationship is modest. (Table 5) The distribution of neck disability severity across usage categories reveals a discernible trend: higher durations of daily Smartphone use are associated with increased levels of neck disability. Among participants with no reported neck disability, the majority (92.9%, 39 out of 42) reported using their Smartphone for ≤ 6 hours per day, with only 3 individuals using them for more than 6 hours. In contrast, among those with moderate to severe disability ($n = 79$), a substantial number reported using Smartphone for longer durations. Specifically, of the 17 participants with moderate disability who used Smartphone for more than 6 hours per day, 41.2% (7 out of 17) had severe or complete disability. These findings suggest a potential dose-response relationship, where increased duration of Smartphone use is associated with greater severity of neck disability. Although causality cannot be established from this cross-sectional analysis, the results underscore the need for awareness regarding musculoskeletal risks associated with prolonged Smartphone use.

Table 5: Association of neck disability and hours/day of smartphone use

Neck Disability (NDI)	Hours of Smartphone Use/Day [#]				Total	p-value ¹
	3 - 4 Hours	4 - 5 Hours	5 - 6 Hours	More Than 6 Hours		
No Disability	13	15	11	3	42	<0.001
Mild	43	84	63	45	235	
Moderate	3	21	23	17	64	
Severe	3	3	2	7	15	
Complete	0	0	2	0	2	
Total	62	123	101	72	358	

¹Fisher's exact test
#Cramer V = 0.2

Table 6: An ordinal logistic regression model to find the risk of neck disability

Predictor	Odd Ratio	CI	Statistics	p
Smartphone Addiction:				
No Addiction	-	-	-	-
Addicted	3.85	2.27 - 6.70	4.89	<0.001
Smartphone Uses:				
3 - 4 Hours	-	-	-	-
4 - 5 Hours	1.6	0.84 - 3.07	1.42	0.156
5 - 6 Hours	1.53	0.76 - 3.08	1.19	0.233
More than 6 Hours	2.32	1.10 - 4.95	2.19	0.029

To investigate the relationship between neck disability levels and two key variables, an ordinal logistic regression model was used: The high incidence of smartphone addiction and the typical number of hours spent on smartphones each day. The outcome variable, neck disability, was measured using the Neck Disability Index (NDI) and treated as an ordinal variable reflecting increasing severity. Results indicated that Smartphone addiction was a statistically significant predictor of higher neck disability. (**Table 6**) Participants categorized as "Addicted" (based on the Smartphone Addiction Scale - Short Version) were nearly four times more likely to report more severe neck disability compared to their "Non-addicted" counterparts (Odds Ratio [OR] = 3.85, 95% Confidence Interval [CI]: 2.27–6.70, $p < 0.001$). This strong and statistically significant effect highlights the potential musculoskeletal risks associated with compulsive Smartphone usage.

With respect to hours of Smartphone use per day, a trend toward increasing risk of neck disability was observed with longer usage durations. Compared to individuals using Smartphone for 3–4 hours per day (reference group), those using their devices for more than 6 hours daily had over twice the odds of being in a higher neck disability category (OR = 2.32, 95% CI: 1.10–4.95, $p = 0.029$), a statistically significant finding. Although participants using Smartphone for 4–5 hours (OR = 1.60, 95% CI: 0.84–3.07, $p = 0.156$) and 5–6 hours (OR = 1.53, 95% CI: 0.76–3.08, $p = 0.233$) showed elevated odds of neck disability, these associations did not reach statistical significance.

4. Discussion

Over the past ten years, there has been a significant increase in the use of Smartphone. This may result in some people using their Smartphone improperly. Using mobile devices excessively might lead to several problems with the mental and physical well-being of these individuals. The current study's findings indicate that the distribution of Smartphone usage hours is as follows: 16% of females and 20% of males use their Smartphone 3-4 hours a day; 35% of females and 33% use them for 4-5 hours; 28% of both genders use their phones 5-6 hours daily; and 21% of females and 19% of males use their devices more than 6 hours per day. Among females ($N = 268$), 11% reported no disability, 64% had mild disability, 20% experienced moderate disability, 4.9% faced severe disability, and 0.7% were classified with complete disability. For males ($N = 90$), the corresponding percentages were slightly higher at 14%, 71%, 12%, 2.2%, and 0% for no, mild, moderate, severe, and complete disability respectively, but these differences did not reach statistical significance.

Smartphone addiction levels between females and males show that among the 268 female participants, 65% reported being addicted to Smartphone (SAS), while 59% of the 90 male participants were classified as addicted, with a non-significant p -value of 0.3 indicating no statistically significant difference in addiction rates between genders.

Notably, 35% of females and 41% of males reported no Smartphone addiction.

According to Kim and Kim's study,¹⁷ the most frequently reported musculoskeletal pain was found in areas of the body (such the neck and shoulders) linked to Smartphone use. The authors found a correlation between musculoskeletal pain and Smartphone use.

This study shows increased levels of neck disability are associated with Smartphone addiction. Among individuals without neck disability, 28 are not addicted while 14 are addicted. In contrast, for mild neck disability, 92 are not addicted compared to 143 who are addicted. As disability severity increases, the proportion of addicted individuals grows: 54 of 64 individuals with moderate disability, 14 of 15 with severe disability, and both individuals with complete disability fall into the addicted category.

Al Abdul Wahab et al. reported that Smartphone addiction can cause substantial neck damage due to bad posture.¹⁸ Because extended Smartphone use might result in bad postures including a forward head posture, the authors advised people to try to limit the amount of time they spend using their devices and to utilize them with proper posture. Prolonged smartphone use would cause severe neck discomfort and impairment. Ergonomic guidance and education on the negative impacts of smartphones and various musculoskeletal issues that might result from excessive use would be necessary for smartphone addiction.¹⁹

Longer screen time and more neck discomfort are linked to higher addiction levels. Additionally, a slight but noteworthy correlation between postural awareness and smartphone addiction was discovered. Postural awareness may have an impact on smartphone use, and excessive smartphone use and addiction among college students are strongly linked to increased screen time and neck impairment.²⁰

In this study individuals with no disability are distributed across all usage categories, but the majority are in the 3-4 and 4-5 hours groups. Mild neck disability is most prevalent, particularly in the 4-5 hours group (84 individuals). Moderate and severe disabilities become more common as Smartphone usage increases, with the highest numbers in the 5-6 hours and more than 6 hours categories. Two individuals with complete disability are in the 5-6 hours group. Overall, increasing Smartphone use correlates with greater neck disability severity.

Students who use their phones for more than four hours a day report feeling greater discomfort and have less flexor muscle endurance. Ergonomic treatments should be used for those who use phones for extended periods of time, and the frequency of daily phone use should be taken into account when evaluating neck discomfort. There is also a clear need

for better neck posture when using a phone and for thorough instructions on how to use a phone on a regular basis.²¹

In a similar vein, our study found that neck pain was linked to high SAS scores, a sign of heavy phone use. This is due to the fact that using a phone while sitting with the head bowed and the arms unsupported puts a static stress on the shoulder and neck muscles, which exacerbates upper back and neck pain. Repetitive motions and prolonged muscle load are often regarded as risk factors for musculoskeletal problems.

When using a smartphone for extended periods of time, prolonged contractions of the muscles in the neck and upper extremities can result in serious muscle damage. Because it generates tension and alters the cervical spine's normal curve, frequent neck flexion position among Smartphone users may be associated with neck restriction. This can cause discomfort, regional skeletal spasms, and cervical vertebral proprioception impairments. This study discovered, long-term smartphone ownership and prolonged smartphone use during the day have been linked to neck pain and disability.

The ordinal logistic model suggests that both Smartphone addiction and prolonged Smartphone usage contribute to an increased risk of neck disability, with addiction status showing the strongest association. These findings underscore the importance of monitoring Smartphone usage patterns among young adults and implementing ergonomic and behavioural interventions to reduce musculoskeletal health risks.

5. Conclusion

Excessive Smartphone use may cause moderate muscle damage to the neck and upper extremities. Smartphone users' frequent neck flexion posture may be connected to neck impairment since it alters the cervical spine's typical curve and places additional load on it. This study found that a rise in Smartphone addiction among college students in Guwahati is associated with an increase in neck pain and impairment. Long-term Smartphone users can reduce neck discomfort by following ergonomic tips and maintaining correct posture.

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7. Conflict of Interest

There is no conflict of interest

8. Ethical Committee Approval

AdtU/IEC/PhD Scholar/2024/14.

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