

Original Research Article

Prevalence, knowledge and predictors of Text Neck Syndrome among undergraduate students in East Khasi Hills, Meghalaya, India: a cross-sectional study

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ABSTRACT

Background: Young adults' extensive use of smartphones has resulted in several health concerns and one of which is Text Neck Syndrome. Prolonged neck flexion during smartphone use can lead to neck pain, disability and functional limitations. The study focused on determining the prevalence and knowledge regarding Text Neck Syndrome and identify predicting factors associated with the condition.

Methods: A cross-sectional study was carried out among 240 undergraduate students selected using convenience method of sampling from four colleges in East Khasi Hills, Meghalaya. A standardized questionnaire with questions on demographics, participant behaviour and understanding of text neck syndrome was used to gather data. Two standardized tools neck disability index and the smartphone addiction scale-short version were used with prior permission to assess neck disability and smartphone addiction.^{8,9}

Results: The results demonstrated that, prevalence of Text Neck Syndrome among the participants discovered to be 35.8% (95% CI:29.8%–42.3%) and 41.0% participants had smartphone addiction. Majority (71.7%) participants had adequate knowledge regarding Text Neck Syndrome and smartphone addiction was identified as a significant independent predictor of Text Neck Syndrome, with 2.2 times higher odds of developing the condition. Additionally, there was a significant positive correlation found between smartphone addiction and neck disability.

Conclusions: Text Neck Syndrome is a prevalent health issue among undergraduate students in Meghalaya, affecting more than one-third of the study population. Although most of the participants had adequate knowledge regarding text neck syndrome, the occurrence of the syndrome suggests the need of targeted educational, ergonomic and behavioural interventions among young adults.

Keywords: Neck disability index, Smartphone addiction, Smartphone addiction scale short version, Text neck syndrome, Undergraduate student

INTRODUCTION

Neck pain is one of the main causes of disability worldwide and is currently ranked as the fourth most common cause of disability, with an annual prevalence of approximately 30%.¹ Increasing use of smartphones and other handheld electronic devices has contributed to the emergence of new musculoskeletal health concerns, particularly among adolescents and young adults. One

such condition is TNS, an injury caused by repetitive stress due to prolonged forward flexion of the head while using smartphones, tablets and other digital devices.²

The term “text neck” was first introduced by Dean L. Fishman to describe the overuse syndrome associated with overstressing the cervical spine resulting from prolonged device use. During smartphone use, individuals often adopt a forward head posture for extended periods,

increasing the mechanical load on the cervical spine. This posture has become increasingly common in contemporary society due to the widespread integration of digital technology into educational, occupational and recreational activities. Lee et al demonstrated that the forces exerted on the cervical spine increase substantially as the angle of head flexion increases, reaching approximately 60 pounds at 60° of flexion.³

Such excessive loading places considerable stress on the cervical vertebrae, intervertebral discs, muscles and ligaments, contributing to neck pain, shoulder discomfort, upper back pain, headaches and postural abnormalities. Severity of musculoskeletal strain has been shown to increase proportionately with the degree and duration of forward head posture, emphasizing the importance of maintaining proper ergonomics during digital device use.

A systematic review by Xie et al highlighted the growing burden of musculoskeletal disorders associated with prolonged use of handheld mobile devices.⁴ The review reported that neck pain was among the most frequently observed complaints, with prevalence rates reaching as high as 67.8% among device users. Identified risk factors included prolonged duration of device use, frequent smartphone usage, poor posture and inadequate ergonomic support. These results highlight the significant influence of smartphone use on musculoskeletal health and the need for effective preventive strategies.

Young adults represent a particularly vulnerable population because smartphones have become integral to their academic, social and recreational lives. Students' screen time has increased due to the quick growth of online education and virtual communication, particularly after the COVID-19 epidemic.⁵ Prolonged smartphone use often requires users to maintain sustained neck flexion and forward head posture, resulting in muscular imbalance, shortening of cervical musculature and excessive stress on the cervical spine.⁶ In addition, increasing dependence on smartphones has led to concerns regarding smartphone addiction, which may further exacerbate unhealthy usage patterns and increase the risk of developing TNS.

Understanding of Text Neck Syndrome among young adults remains variable. Paleti et al reported that almost half of the participants didn't know what Text Neck Syndrome was and its adverse health effects, while approximately 70% experienced symptoms suggestive of the condition.⁷

Lack of awareness may delay the adoption of preventive measures and contribute to the persistence of musculoskeletal issues linked to smartphone use. Although several studies have investigated the prevalence and associated factors of TNS in different populations, evidence from Northeast India remains limited. In particular, there is a paucity of data regarding the prevalence, knowledge and predictors of TNS among

undergraduate students in Meghalaya. Understanding the magnitude of the problem and identifying associated factors are essential for developing targeted educational and preventive interventions. Therefore, the present study aimed to determine the prevalence and knowledge regarding TNS among undergraduate students in East Khasi Hills, Meghalaya, identify its predictors and examine how smartphone addiction and neck impairment are related.

METHODS

Study design and settings

Cross-sectional study design was used and undergraduate students were selected from four colleges in East Khasi Hills, Meghalaya, India between October and November 2025.

Participants and sampling

Convenience sampling technique was used to select 240 undergraduate students between the ages of 18 and 24. Although there were around 18 eligible colleges in East Khasi Hills district, data were collected from 4 colleges that were conveniently accessible to the researcher and granted permission for data collection. Students enrolled in arts, science and commerce streams, who were open to taking part were included. Students with congenital or pathological cervical disorders were excluded.

Development of tool

To determine the Text Neck Syndrome prevalence, two established assessment tools were employed. The neck disability index (NDI), introduced by Vernon et al and Mior et al was used to measure the extent of neck-related functional limitation linked to TNS.⁸

Additionally, smartphone dependency among participants was evaluated using the smartphone addiction scale–short version (SAS-SV), developed by Kwon et al.⁹ The reliability of the study instruments was assessed using Cronbach's alpha. The neck disability index demonstrated internal consistency of 0.95, while the SAS-SV also showed high internal consistency of 0.91. Both the instruments were administered in their original, unaltered form to preserve their established reliability and validity.

In addition to these standardized tools, a researcher-developed questionnaire was prepared to gather information regarding demographic characteristics of undergraduate students and to evaluate their level of knowledge regarding TNS.

Operational definition of Text Neck Syndrome

For the purpose of this study, TNS was operationally defined as the coexistence of neck disability (NDI score

≥ 5) and smartphone addiction (SAS-SV score ≥ 31 for males and ≥ 33 for females).^{8,9}

Scoring and interpretation

For section II

This section focuses on assessing the prevalence of TNS among undergraduate students using two standardized tools: the NDI and the SAS-SV.^{8,9} NDI includes 10 items, with a score of 0 to 5 assigned to each item. The total score is between 0 and 50.⁸

SAS-SV comprises 6-point Likert scale, with 1 denoting "strongly disagree" and 6 denoting "strongly agree," was used to rate ten topics. The range of possible scores is 10 to 60.⁹

Interpretation of SAS-SV score

For male participants

Scores of 31 or higher indicate smartphone addiction.

For female participants

Scores of 33 or higher indicate smartphone addiction.

In the present study, the prevalence of TNS is determined based on the NDI scores indicating the presence of neck disability along with the level of smartphone addiction measured by SAS-SV.^{8,9}

Section III

This section comprised 16 items assessing knowledge regarding TNS. Each correct response was scored as 1 and each incorrect or unanswered response as 0. Total scores ranged from 0 to 16 and were categorized as inadequate knowledge (0–8) and adequate knowledge (9–16).

Statistical analysis

The demographic features of the participants, the prevalence of TNS and the degree of awareness of TNS among the study participants was described using descriptive statistics like frequency and percentage. Logistic regression was used for inferential analysis to determine the predictors of TNS. Additionally, correlation analysis was carried to investigate the connection between neck impairment and smartphone addiction.

Ethical considerations

Necessary ethical approval was obtained from the NEIGRIHMS Institute Ethics Committee (NEIGR/IEC/M3/T2/25).

RESULTS

Among the 240 participants, the majority were females (57.1%), aged 18–20 years (55.4%), from the 5th semester (59.2%) and belonged to the Arts stream (49.2%). Most participants had used smartphones for ≥ 5 years (61.7%), while 90.0% were unaware of the term TNS. Regarding behavioral factors, lying on the bed was the most common smartphone-use posture (55.8%) and more than half of the participants used smartphones for over 4 hours daily (54.6%). Most participants reported occasional neck exercises (71.2%) and screen-time breaks (56.7%).

The prevalence of TNS was 35.8% (95% CI: 29.8%–42.3%). Overall, 78.3% of participants had some degree of neck disability, predominantly mild disability (63.3%), while smartphone addiction was observed in 41.0% of participants. (Figure 1–3). Most participants demonstrated adequate knowledge regarding TNS (71.7%). Knowledge was highest in the domain of general awareness (71.0%) and lowest in prevention and management (48.5%) (Table 1).

Univariate analysis showed that younger age, lower semester, smartphone use of ≥ 5 hours per day and higher smartphone addiction were associated with increased odds of TNS. In multivariable analysis, smartphone addiction remained a significant independent predictor, increasing the odds of TNS by 2.2 times (Table 2–4).

Study results also showed a significant positive correlation between smartphone addiction and neck disability index ($r=0.251$, $p<0.001$), indicating that neck disability increased with higher smartphone addiction (Figure 4).

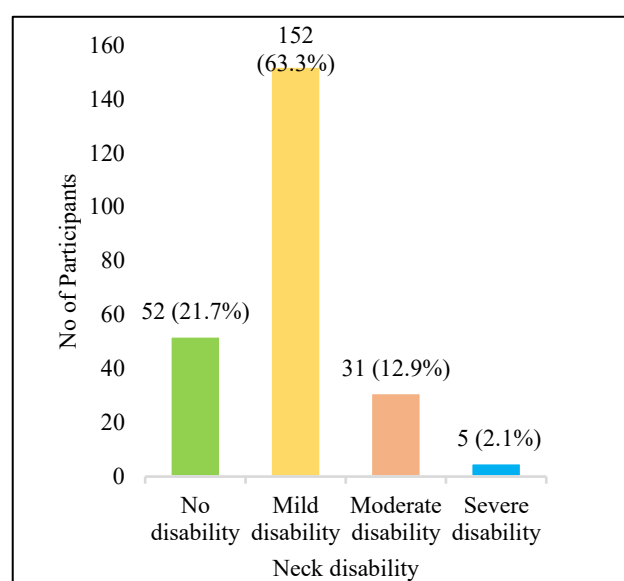


Figure 1: The percentage distribution of neck disability among undergraduate students (n=240).

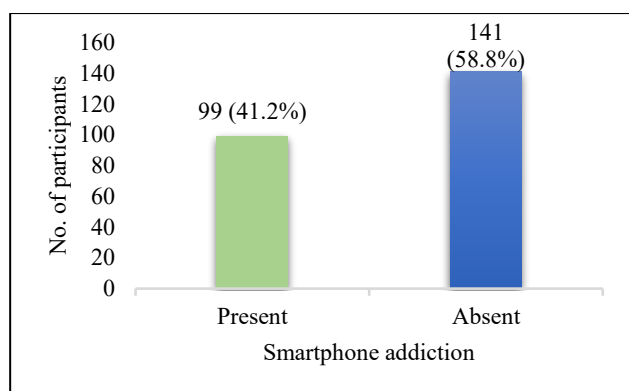


Figure 2: The percentage distribution of smartphone addiction among undergraduate students (n=240).

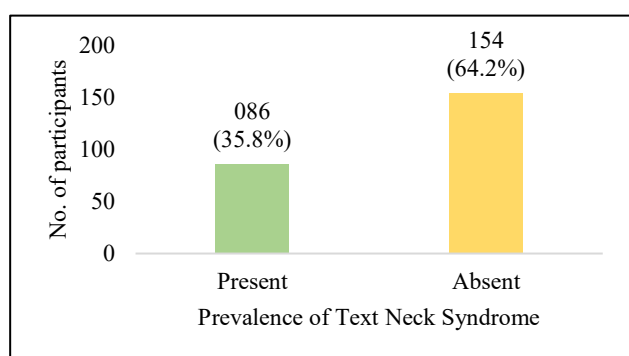


Figure 3: The percentage distribution of prevalence of Text Neck Syndrome among undergraduate students (n=240).

Figure 1 shows that out of 240 participants, 188 (78.3%) participants had some level of neck disability, among them, 152 (63.3%) participants had mild, 31 (12.9%) participants had moderate and 5 (2.1%) participants had severe neck disability. Figure 2 shows that out of 240 participants, 99 (41.2%) participants have smartphone addiction. Figure 3 shows that out of 240 participants, 86 (35.8%), at 95% CI (29.8%-42.3%) participants had TNS. Figure 4 shows a significant positive correlation between smartphone addiction and neck disability index ($r=0.251$, $p<0.001$), indicating that neck disability increased with

higher smartphone addiction. Table 1 shows that out of 240 participants, 172 (71.7%) participants had adequate knowledge regarding TNS. Table 2 shows that with each additional year of age; the odds of developing TNS decreased by 0.2 times and 1st semester students had 2.3 times higher odds of developing TNS compared to 5th semester students. However, gender, stream, years of using smartphone and awareness of the term TNS were not significantly associated with TNS.

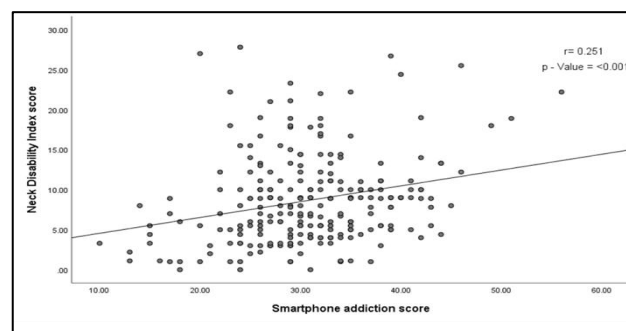


Figure 4: The correlation between smartphone addiction score and neck disability index score (n=240).

Table 3 shows that participants who spent ≥ 5 hours per day on smartphones had significantly higher odds (2.9 times) of developing TNS compared to those using 0-4 hours per day and participants with higher smartphone addiction had 2 times higher odds of developing TNS compared to those with lower addiction. However, common reading posture, common posture of using smartphone, pillow usage while sleeping, thickness of pillow and regular neck stretching, screen time break, knowledge regarding TNS are not significantly associated with TNS. Table 4 shows that, after adjusting for other variables, higher smartphone addiction remained as a significant independent predictor of TNS, with 2.2 times higher odds of developing TNS. The variable logistic regression model includes gender, age, current semester of study, stream, years of using smartphone, common reading posture, common posture of using smartphone, hours spent on smartphone per day, screen time break and smartphone addiction.

Table 1: Frequency and percentage distribution of knowledge regarding Text Neck Syndrome among undergraduate students (n=240).

Knowledge category	Score	Frequency (N)	(%)
Adequate	9-16	172	71.7
Inadequate	00-08	68	28.3

*Based on desired score >8 (minimum score= 0, maximum score=16).

Table 2: Univariate analysis of sociodemographic factors in relation to Text Neck Syndrome (n=240).

Variables		Unadjusted odds ratio (95% ci)	Unadjusted P value
Gender	Male	1.1 (0.6-1.8)	0.767
	Female	Reference	
Age (in years)		0.8 (0.6-0.9)	*0.004
Current year/semester of study	1 st semester	2.3 (1.3-4.0)	*0.005

Continued.

Variables		Unadjusted odds ratio (95% ci)	Unadjusted P value
	3 rd semester	0.4 (0.1-1.3)	0.127
	5 th semester	Reference	
Stream	Arts	1.1 (0.5-2.3)	0.72
	Science	1.3 (0.4-2.8)	0.542
	Commerce	Reference	
Years of using smartphone	0-4	Reference	
	≥5	1.1 (0.6-1.9)	0.79
Awareness of the term Text Neck Syndrome	Yes	Reference	
	No	2.3 (0.8-6.3)	0.11

*Significant p value=<0.05.

Table 3: Univariate analysis of behavioural factors in relation to Text Neck Syndrome (n=240).

Variables		Unadjusted odds ratio	Unadjusted P value
Common reading posture	Appropriate	Reference	
	Inappropriate	0.8 (0.5-1.4)	0.512
Common posture of using smartphone	Appropriate	Reference	
	Inappropriate	2.2 (0.7-6.9)	0.170
Hours spent on smartphone per day	0-4 hours	Reference	
	≥5 hours	2.9 (1.6-5.1)	*<0.001
Pillow usage while sleeping	Yes	Reference	
	No	0.8 (0.2-2.6)	0.690
Thickness of pillow	Thin	1.1 (0.3-3.7)	0.834
	Moderate	1.9 (0.7-5.7)	0.225
	Thick	Reference	
Regular neck stretching or exercise	Yes	Reference	
	No	1.3 (0.6-2.4)	0.460
Screen time break	Yes	Reference	
	No		
Knowledge regarding Text Neck Syndrome	Adequate	Reference	
	Inadequate	1.6 (0.6-4.6)	0.370
Smartphone addiction		2.0 (1.7-2.5)	*<0.001

*Significant p value=<0.05.

Table 4: Multivariable analysis of independent predictors of Text Neck Syndrome (n=240).

Variables		Adjusted odds ratio (95%)	Adjusted P value
Gender	Male	2.5 (0.8-8.1)	0.132
	Female	Reference	
Age (in years)		0.9 (0.6-1.8)	0.963
Current year/semester of study	1 st semester	3.6 (0.8-15.72)	0.120
	3 rd semester	0.4 (0.2-3.8)	0.444
	5 th semester	Reference	
Stream	Arts	2.2 (0.5-10.7)	0.330
	Science	1.5 (0.3-7.4)	0.590
	Commerce	Reference	
Years of using smartphone	0-4	Reference	
	≥5	1.4 (0.5-4.2)	0.557
Common reading posture	Appropriate	Reference	
	Inappropriate	0.4 (0.1-1.2)	0.094
Common posture of using smartphone	Appropriate	Reference	
	Inappropriate	2.7 (0.2-35.7)	0.445
Hours spent on smartphone per day	0-4 hours	Reference	
	≥5 hours	1.0 (0.3-3.0)	0.975
Screen time break	Yes	Reference	
	No	0.4 (0.04-3.7)	0.357
Smartphone addiction		2.2 (1.7-2.9)	*<0.001

*Significant p value=<0.05.

DISCUSSION

Text Neck Syndrome has emerged as a significant health concern in the era of digitalization; therefore, the present study aimed to explore its prevalence and associated factors in a specific region of Meghalaya. The present study found that Text Neck Syndrome prevalence among undergraduate students was 35.8%, indicating that more than one-third of the participants were affected by the condition. This finding highlights the growing musculoskeletal health concern associated with Overuse of smartphones by young adults. The prevalence observed in the present study is comparable to that reported by Jeyanthi et al who documented a prevalence of 27.25% among college students.¹⁰

However, Gupta et al reported comparatively higher prevalence of 63.59% among physiotherapy students.¹¹ Similarly, Benilsha et al reported a prevalence of 46.8% among medical students in Chennai.¹² Differences in research populations may be the cause of variations in prevalence between studies, smartphone usage patterns, assessment criteria, academic demands and lifestyle factors. The increasing dependence on smartphones for educational, social and recreational purposes among young adults may contribute significantly to the occurrence of Text Neck Syndrome.

The present study revealed that 71.7% of participants had adequate knowledge regarding Text Neck Syndrome. This finding is higher than that of majority of the studies conducted elsewhere. For instance, a study by Kunnath et al, showed that the majority of paramedical students demonstrated poor knowledge regarding the condition.¹³ Similarly, Abdali et al reported limited knowledge of Text Neck Syndrome among university students.¹⁴ Also, Renitha et al, found that 58% of young adults had good knowledge regarding Text Neck Syndrome.¹⁵ Despite of having adequate knowledge, more than one-third of the participants were found to have Text Neck Syndrome suggesting that awareness alone may not necessarily translate into healthy behavioural practices.⁴ Many young adults may continue to engage in prolonged smartphone use, maintain poor posture or neglect preventive ergonomic measures despite being aware of the associated health risks. Participants who used smartphones for five or more hours per day had significantly higher odds of developing Text Neck Syndrome compared to those with lower daily usage. Similar results have been documented by Salameh et al who identified prolonged digital device use as an important risk factor for Text Neck Syndrome among medical students.¹⁶ Excessive smartphone use often requires prolonged forward head posture and sustained cervical flexion, resulting in elevated cervical spine mechanical stress.^{17,18}

However, in this study, the association between smartphone use of ≥ 5 hours per day and Text Neck Syndrome was no longer significant after adjusting for

potential confounding factors. This finding suggests that the occurrence of Text Neck Syndrome may not depend solely on the amount of time spent using a smartphone. Other factors, such as the posture adopted during smartphone use, may also contribute to its development. Moreover, smartphone addiction remained significantly associated with Text Neck Syndrome in the adjusted analysis, highlighting that problematic smartphone-use behavior may have a greater influence on the development of the condition than duration of use alone.

The study further showed that younger age and lower semester of study were significantly associated with Text Neck Syndrome in univariate analysis. Students in the earlier semesters may spend more time using smartphones for social networking, entertainment, which may increase their exposure to poor postural habits. However, these factors did not continue to be significant following correction for other variables in the multivariable model, indicating the influence of other behavioural factors on the development of Text Neck Syndrome.

A key finding of the present study was that smartphone addiction emerged as a significant independent predictor of Text Neck Syndrome. Participants with smartphone addiction had 2.2 times higher odds of developing Text Neck Syndrome compared to those without addiction. This result is in line with earlier research that has shown a strong association between smartphone addiction and musculoskeletal complaints.^{19,20} Individuals with smartphone addiction tend to engage in prolonged and uninterrupted smart phone use maintaining unfavourable postures for longer duration. The persistence of smartphone addiction as a significant predictor after adjustment for potential confounding variables highlights its importance as a modifiable risk factor among young adults.

The present study also identified a positive correlation between smartphone addiction and neck disability ($r=0.251$, $p<0.001$), indicating that increasing levels of smartphone addiction were associated with greater neck disability. Similar findings were reported by Gupta et al Laksmi et al who observed that excessive smartphone use was associated with higher levels of neck pain and disability.^{11,21} Although the correlation was weak, still it suggests that smartphone addiction contributes to the development and progression of neck-related functional limitations.

Strengths

The present study contributes valuable evidence regarding Text Neck Syndrome among undergraduate students from Meghalaya. The use of validated instruments such as the neck disability index and smartphone addiction scale–short version strengthened the reliability of measurements.^{8,9} However, certain limitations should be considered while interpreting the findings.

Limitations

The findings of this study should be interpreted in light of certain limitations. Since the study employed a cross-sectional design, it was not possible to determine cause-effect relationships between the variables. In addition, Convenience sampling may have had an impact on the sample's representativeness, thereby limiting the degree to which the results can be applied to all young adults. In addition, Text Neck Syndrome was operationally defined based on the coexistence of neck disability and smartphone addiction for the purpose of this study, as there is currently no universally accepted definition of the condition. The findings underscore the importance of promoting healthy smartphone-use behaviours and ergonomic practices to reduce the risk of neck-related problems in this population.

CONCLUSION

Text Neck Syndrome was prevalent among more than one-third of undergraduate students in Meghalaya and was significantly associated with smartphone addiction. Although most participants demonstrated adequate knowledge regarding the condition, the continued occurrence of Text Neck Syndrome highlights a gap between awareness and preventive practices. Smartphone addiction emerged as an important modifiable risk factor and was positively correlated with neck disability. These findings emphasize the need for targeted digital health promotion, ergonomic education and behavioural interventions to encourage healthy smartphone use and reduce neck-related disability among young adults.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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