

Frequency of Neck Pain Along with Postural Deviation and Thumb Pain Among Smartphone Users in Engineering Universities

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ABSTRACT

Background: Excessive smartphone use has been associated with musculoskeletal and postural problems, particularly among young adults. Engineering students represent a high-risk group due to prolonged screen exposure.

Objective: To determine the frequency of neck pain, postural deviation, and thumb pain among engineering university students with heavy smartphone use.

Methods: This cross-sectional study included 373 participants (218 males, 155 females; aged 20–25 years) recruited through purposive sampling from five engineering universities in Karachi. Inclusion criteria required smartphone use for more than 4 hours daily. Data were collected using validated tools: the Neck Disability Index (NDI), the Cornell Hand Discomfort Questionnaire (CHDQ), and the REEDco posture assessment. Statistical analysis was performed using SPSS version 25. Pearson correlation coefficient was applied, with significance set at $p < 0.05$.

Results: Neck pain was reported by 67.8% of participants, with 45.3% showing mild disability, 17.4% moderate disability, 4.8% severe disability, and 0.3% complete disability. Thumb pain was present in 21.2%, and forward head posture in 32.2%. Mean scores (95% CI) were: NDI 9.31 (8.53–10.10), CHDQ 17.44 (14.21–20.67), and REEDco 81.00 (79.64–82.36). NDI and CHDQ demonstrated a significant positive correlation ($r = 0.308$, $p < 0.001$).

Conclusion: Smartphone overuse among engineering students was strongly associated with neck disability and thumb pain, highlighting the need for ergonomic education and preventive healthcare strategies to reduce long-term musculoskeletal risks.

Keywords: Ergonomics, Musculoskeletal Disorders, Neck Disability Index, Posture, Smartphone Addiction, Text Neck, Thumb Pain, University Students.

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Disclaimers

Conflict of Interest: None declared

Data/Supplements: Available on request.

Funding: None

Ethical Approval: SIPM&R/IRB/2024/42

Study Registration: N/A

Acknowledgments: N/A

Article Info

Received: 02 July 2025, *Accepted:* 25 September 2025,

Published Online: 25 September 2025



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How to Cite: Khan K, Shah RA, Khan RN, Shoaib Z, Wara Z. Frequency of Neck Pain Along with Postural Deviation and Thumb Pain Among Smartphone Users in Engineering Universities. J Mod Health Rehab Sci. 2025;2(1):157.

Available from: <https://jmhrs.com/index.php/jmhrs/article/view/157>

Introduction

The rapid advancement of digital technology has transformed the smartphone into an indispensable part of daily life, functioning as a portable device capable of performing numerous computer-like tasks. Smartphones provide a wide range of utilities, including internet browsing (85.20%), mobile mailing (77.00%), phone calls (78.30%), media players (75.40%), social networking, and gaming (51.20%), all integrated through touchscreen-based interfaces (1,2). Globally, nearly 3.4 billion people are estimated to be smartphone users, with adoption rates increasing exponentially over the past decade. For instance, in Korea, the number of smartphone users rose dramatically from just 5 million in 2010 to more than 40.12 million by 2014, reflecting the unprecedented pace of this technological diffusion (3). Thailand has also emerged as a notable contributor, ranking 19th among the top 25% smartphone-producing nations worldwide (4). In terms of demographics, almost 79% of individuals aged 18–44 are active smartphone users, while in Sweden, 82% of people aged 15–24 reported routine engagement in messaging activities via smartphones, demonstrating the dominance of these devices among younger age groups (1). On average, a typical user spends about 20 hours per week and nearly 6 hours and 42 minutes per day online, which is equivalent to almost 100 days per year of screen engagement (5).

Despite their undeniable utility, excessive smartphone use has raised significant health concerns, particularly regarding musculoskeletal and psychological well-being. Frequent use of smartphones requires sustained engagement of the neck and thumb muscles, predisposing individuals to musculoskeletal problems, including pain and discomfort in the neck, hands, and wrists (1,2,6). The term “text neck” has been coined to describe an overuse syndrome or repetitive strain injury associated with prolonged forward head flexion at angles ranging from 15° to 60° while viewing handheld electronic devices (7). The prevalence of musculoskeletal pain among smartphone users has been reported to range from 1% to 67.8%, with a substantial proportion experiencing thumb-related disorders, including tendinitis, De Quervain’s disease, and first metacarpophalangeal arthritis, with approximately 28.3–29.2% reporting thumb pain (1,2,8,9). Comparative studies have shown that smartphone texting activates cervical extensors and thumb muscles more intensely than computer typing, while reducing activation in the trapezius and wrist extensors, highlighting the distinct biomechanical stresses induced by smartphones (10). Evidence suggests that excessive use among students contributes to musculoskeletal issues in the neck and hands, particularly the thumb, which may initially manifest as short-term disability but could progress to long-term functional impairment if left unaddressed (2,11).

In addition to physical strain, smartphone overuse has been consistently associated with psychological consequences. Research indicates that nearly 74.8% of users display symptoms consistent with mobile phone addiction, with psychological manifestations such as anxiety, tension, panic attacks, and impaired concentration increasingly reported (12). A study conducted in Saudi Arabia identified neck stiffness (71.2%) as the most commonly reported complaint, followed by migraine (63.3%), agitation (54.5%), nervousness (50.7%), and loss of concentration (47.4%), underscoring the multifaceted health impact of smartphone use (13). Collectively, these findings emphasize that smartphones, while integral to modern life, contribute to a growing burden of musculoskeletal and psychological conditions. Accordingly, the present study aimed to investigate the frequency of neck pain, thumb pain, and postural deviations among students at engineering universities. This research not only quantified the prevalence of these issues but also provided insights into their underlying causes, thereby highlighting the importance of ergonomic awareness and preventive strategies among young smartphone users.

Materials and Methods

This study employed an observational cross-sectional design and was conducted among undergraduate engineering students in Karachi. A total of 373 participants were recruited using a non-probability purposive sampling technique from five universities: NED University of Engineering and Technology, Dawood University of Engineering and Technology, Usman Institute of Technology, Mohammad Ali Jinnah University, and Iqra University. The sample size was calculated using the OpenEpi software, ensuring adequate statistical power for correlation analysis (14). Of the participants, 218 were male and 155 were female, with ages ranging between 20 and 25 years. All participants reported daily smartphone use of more than 4 hours. Students with a history of cervical spine disorders, such as radiculopathy or spondylosis, were excluded, as were those with severe cervical spine injuries, pre-existing musculoskeletal or neurological conditions such as stroke, Parkinson’s disease, or Alzheimer’s disease. Individuals with cardiovascular diseases, including coronary artery disease, valvular heart disease, or rheumatic heart disease, were also excluded in order to eliminate potential confounders.

Data were collected using a structured questionnaire that was divided into two sections. The first section gathered demographic information, while the second comprised three validated assessment tools. The Cornell Hand Discomfort Questionnaire (CHDQ) was employed to evaluate hand and thumb-related discomfort, the Neck Disability Index (NDI) was used to assess the degree of neck disability, and the REEDco posture assessment form was utilized to examine postural deviations (15–17).

These standardized instruments ensured reliable evaluation of musculoskeletal and postural outcomes among participants.

Ethical approval for the study was obtained from the institutional review board (SIPM&R/IRB/2024/42) and written informed consent was obtained from all participants before enrollment. Data collection was performed under standardized conditions to minimize potential bias. Confidentiality of the respondents was maintained throughout the research process, and participation was voluntary with the right to withdraw at any stage.

The data were coded and analyzed using the Statistical Package for Social Sciences (SPSS) version 25. Descriptive statistics, including means, standard deviations, and 95% confidence intervals, were calculated for all outcome variables. The Pearson correlation coefficient test was applied to examine the relationships between NDI, CHDQ, and REEDco scores. All statistical tests were performed at a significance level of $p < 0.05$ to ensure rigorous evaluation of study hypotheses.

Results

A total of 373 engineering university students participated in this study, comprising 218 males (58.4%) and 155

females (41.6%). Of these, 253 participants (67.8%) reported neck pain, whereas 120 participants (32.2%) were without neck pain. The prevalence of neck pain was slightly higher among males (39.7%) compared to females (28.1%), while the distribution of participants without neck pain was 18.8% in males and 13.4% in females (Table 1). The mean scores of NDI, CHDQ, and REEDco were 9.31, 17.44, and 81.00, respectively, with narrow 95% confidence intervals, reflecting consistent findings across the sample.

Table 1: Sample demographics and prevalence of neck pain by gender

Variable / Condition	Count (n)	Percentage (%)
Total Participants	373	100
Male	218	58.4
Female	155	41.6
With Neck Pain	253	67.8
Male	148	39.7
Female	105	28.1
Without Neck Pain	120	32.2
Male	70	18.8
Female	50	13.4

Table 2: Pain, ache, and discomfort in different hand areas (last week)

Frequency	Area A (Thumb)	Area B (Index)	Area C (Middle)	Area D (Ring)	Area E (Little)	Area F (Palm/Wrist)
Never	287 (79.9%)	254 (68.1%)	242 (64.9%)	278 (74.5%)	233 (62.5%)	284 (76.1%)
1–2 times last week	49 (31.1%)	65 (17.4%)	85 (22.8%)	53 (14.2%)	71 (19.0%)	42 (11.3%)
3–4 times last week	11 (2.9%)	30 (8.0%)	22 (5.9%)	22 (5.9%)	36 (9.7%)	25 (6.7%)
Once every day	17 (4.6%)	13 (3.5%)	12 (3.2%)	9 (2.4%)	21 (5.6%)	11 (2.9%)
Several times every day	9 (2.4%)	11 (2.9%)	12 (3.2%)	11 (2.9%)	12 (3.2%)	11 (2.9%)

When neck pain was classified using the Neck Disability Index (NDI), the majority of participants fell into the mild disability group (45.3%), followed by no disability (32.2%), moderate disability (17.4%), severe disability (4.8%), and complete disability (0.3%). Forward head posture was identified in 32.2% of participants, with its

Table 3: Mean scores of NDI, CHDQ, and REEDco

Scale	Mean	95% CI
NDI	9.31	8.53 – 10.10
CHDQ	17.44	14.21 – 20.67
REEDco	81.00	79.64 – 82.36

Neck Disability Index (NDI), The Cornell Hand Discomfort Questionnaire (CHDQ), REEDco posture tool

prevalence increasing with the severity of NDI scores. Thumb pain was reported by 21.2% of participants overall, with the proportion rising progressively across categories of NDI severity from 10.0% in those without disability to 100% in the single participant with complete disability.

Hand discomfort assessment (CHDQ) revealed that pain and discomfort were most frequently reported in the thumb (Area A) and little finger (Area E), followed by the index and middle fingers. The palm/wrist region (Area F) also showed notable complaints. Daily and multiple-times-daily discomfort was most common in the thumb and palm/wrist regions, highlighting the thumb as the most

vulnerable area to repetitive stress from smartphone use. Correlation analysis demonstrated a statistically significant positive relationship between NDI and CHDQ ($r = 0.308$, $p < 0.001$), suggesting that higher neck disability scores were associated with increased hand discomfort. In contrast, REEDco scores showed weak, non-significant negative correlations with both NDI ($r = -0.012$) and CHDQ ($r = -0.086$), indicating that posture scores were not strongly related to reported neck disability or hand discomfort in this study.

Table 4: Correlation analysis of different variables

Variables Compared	r	p-value	Interpretation
NDI & CHDQ	0.308	<0.001	Positive correlation
REEDco & NDI	-0.012	NS	Weak/No correlation
REEDco & CHDQ	-0.086	NS	Weak/No correlation

Table 5: Correlation of neck pain with postural deviation and thumb pain (n = 373)

Neck Pain (NDI Category)	Frequency (%)	Forward Head Posture (%)	Thumb Pain Present (%)
No Disability (0–4)	120 (32.2%)	18 (15.0%)	12 (10.0%)
Mild Disability (5–14)	169 (45.3%)	51 (30.2%)	34 (20.1%)
Moderate Disability (15–24)	65 (17.4%)	36 (55.4%)	23 (35.4%)
Severe Disability (25–34)	18 (4.8%)	14 (77.8%)	9 (50.0%)
Complete Disability (≥ 35)	1 (0.3%)	1 (100%)	1 (100%)
Total	373 (100%)	120 (32.2%)	79 (21.2%)

Discussion

This study investigated the association of neck pain, postural deviation, and thumb pain among engineering university students with high smartphone usage. The findings revealed a significant positive correlation between NDI and CHDQ scores ($r = 0.308$, $p < 0.001$), suggesting that increased neck disability was associated with greater hand discomfort. Conversely, no significant correlations were found between posture scores (REEDco) and either NDI or CHDQ, indicating that postural deviations may not directly predict disability or hand discomfort in this population. The mean values of NDI, CHDQ, and REEDco were consistent across the sample, further strengthening the reliability of these results.

When comparing the present findings to existing literature, some similarities and discrepancies were evident. A cross-sectional study from Haryana, India reported that 8.8% of participants were moderately disabled and 31.9% were mildly disabled (18). In contrast, this study found higher proportions, with 45.3% categorized as mildly disabled and 17.4% as moderately disabled. This difference may be attributed to the study population, as engineering students tend to spend more time using smartphones for academic and recreational purposes compared with students in other disciplines.

Hand discomfort patterns also varied compared to previous studies. For instance, research that employed the CHDQ tool in a smaller sample of 119 participants found that less than 2% reported pain several times daily in

different hand areas, with almost negligible discomfort in the thumb and palm/wrist regions (19). By contrast, in this study, 2.4% of participants reported daily thumb pain and 2.9% reported frequent pain in the wrist/palm region. This disparity may be due to differences in inclusion criteria, as the comparative study included participants with more than one hour of smartphone use daily, whereas this study restricted inclusion to individuals using smartphones for more than four hours daily.

The lack of a significant correlation between REEDco posture scores and either NDI or CHDQ in this study differed from findings reported in other populations where posture has been directly linked to musculoskeletal symptoms (20,21). One explanation may be that forward head posture is only one of many biomechanical contributors to musculoskeletal pain, and other factors such as device holding patterns, texting postures, and individual ergonomic behaviors may mediate this relationship.

The results of this study supported the growing body of evidence that smartphone use is associated with both neck disability and hand discomfort, particularly in the thumb region (2,8,9,22). Previous studies have demonstrated that repetitive thumb use during texting and gaming increases the risk of tendinitis, De Quervain's tenosynovitis, and first metacarpophalangeal arthritis (23,24). Similarly, prolonged cervical flexion while using smartphones has been linked with text neck syndrome, contributing to muscular strain and disability over time (25,26). The findings of this study, showing a high prevalence of neck

pain (67.8%) and thumb pain (21.2%), aligned with these reports and reinforced concerns about the long-term health risks of excessive smartphone use among students.

In contrast to the present findings, which showed no significant correlation between postural deviations (REEDco scores) and either neck disability or hand discomfort, a recent study from Rawalpindi reported a high prevalence of forward head posture among school children who were frequent smartphone users (27). The difference may be explained by age-related musculoskeletal adaptability, as younger children are more vulnerable to postural deviations due to incomplete musculoskeletal development, whereas university students may compensate better through stronger cervical and shoulder musculature.

This research had several strengths. It employed validated assessment tools, included a relatively large sample size compared to similar studies, and specifically targeted engineering students, a group highly exposed to smartphone usage. The multi-institutional nature of the sample also improved the representativeness of the findings. However, some limitations must be acknowledged. First, the cross-sectional design limited the ability to establish causality. Second, posture was assessed using a questionnaire-based tool rather than objective biomechanical measurements. Third, the study population was restricted to a single age group (20–25 years) and academic discipline, limiting generalizability. Additionally, the reliance on self-reported measures may have introduced recall bias.

Despite these limitations, the study highlighted important implications. Engineering students, due to prolonged smartphone use, are at risk of developing musculoskeletal discomfort that can progress from mild disability to more severe conditions if preventive measures are not adopted. Regular ergonomic education, posture correction strategies, and promotion of smartphone usage breaks could mitigate these risks. Future studies should adopt longitudinal designs to evaluate causality, incorporate larger and more diverse populations, and utilize objective postural assessment tools such as motion analysis or electromyography for greater accuracy.

Conclusion

This study concluded that excessive smartphone use among engineering university students was significantly associated with neck disability and thumb pain, with a high prevalence of musculoskeletal discomfort, while postural deviation showed weaker associations. These findings underscored the growing burden of smartphone-related musculoskeletal problems in young adults, emphasizing the need for preventive strategies such as ergonomic education, regular breaks, and awareness campaigns. From a broader healthcare perspective, early recognition and intervention are crucial to reducing the

risk of long-term disability, lowering future healthcare costs, and promoting healthier technology use behaviors among the student population and wider community.

Authors' Contributions

ICMJE authorship criteria	Detailed contributions	Authors
Substantial Contributions	Conception or Design of the work	1,2,3,5
	Data acquisition	2,3,4
	Data analysis or interpretation	1,3,5
	Draft the work	2
Drafting or Reviewing	Review critically	1,2,3,4
Final approval	Final approval of the version to be published.	1,2,3,4,5
Accountable	Agreement to be accountable for all aspects of the work.	1,2,3,4,5

References

- Kalirathinam D, Manoharlal MA, Mei C, Ling CK, Sheng TW, Jerome A, Rao US. Association between the usage of smartphone as the risk factor for prevalence of upper extremity and neck symptoms among university students: A cross-sectional survey-based study. *Res J Pharm Technol*. 2017;10(4):1184-1190. doi:10.5958/0974-360X.2017.00213.X
- Shah PP, Sheth MS. Correlation of smartphone use addiction with text neck syndrome and SMS thumb in physiotherapy students. *Int J Community Med Public Health*. 2018;5(6):2512-2516. doi:10.18203/2394-6040.ijcmph20180001
- Kee IK, Byun JS, Jung JK, Choi JK. The presence of altered craniocervical posture and mobility in smartphone-addicted teenagers with temporomandibular disorders. *J Phys Ther Sci*. 2016;28(2):339-346. doi:10.1589/jpts.28.339
- Namwongsa S, Puntumetakul R, Neubert MS, Boucaut R. Factors associated with neck disorders among university student smartphone users. *Work*. 2018;61(3):367-378. doi:10.3233/WOR-182819
- KV BM, Walarine MT. Neck pain among smartphone users: An imminent public health issue during the pandemic. *J Ideas Health*. 2020;3(Special1):201-204.
- Ahmed S, Akter R, Pokhrel N, Samuel AJ. Prevalence of text neck syndrome and SMS thumb among smartphone users in college-going students: A cross-sectional survey study. *J Public Health*. 2021;29:1-7.
- Kumari S, Kumar R, Sharma D. Text neck syndrome: The pain of modern era. *Int J Health Sci Res*. 2021;11(11):161-165. doi:10.52403/ijhsr.20211121
- Walankar PP, Kemkar M, Govekar A, Dhanwada A. Musculoskeletal pain and risk factors associated with smartphone use in university students. *Indian J Occup Environ Med*. 2021;25(4):220-224. doi:10.4103/ijoem.ijoem_351_20
- Maayah MF, Nawasreh ZH, Gaowgzeh RA, Neamatallah Z, Alfawaz SS, Alabasi UM. Neck pain associated with smartphone usage among university students. *PLoS One*. 2023;18(6):e0285451. doi:10.1371/journal.pone.0285451
- Namwongsa S, Puntumetakul R, Neubert MS, Boucaut R. Effect of neck flexion angles on neck muscle activity among smartphone users with and without neck pain. *Ergonomics*. 2019;62(12):1524-1533. doi:10.1080/00140139.2019.1661525

11. AlAbdulwahab SS, Kachanathu SJ, AlMotairi MS. Smartphone use addiction can cause neck disability. Musculoskeletal Care. 2017;15(1):10-12. doi:10.1002/msc.1170
12. Ahmed S, Pokhrel N, Roy S, Samuel AJ. Impact of nomophobia: A non-drug addiction among students of physiotherapy course using an online cross-sectional survey. Indian J Psychiatry. 2019;61(1):77-80. doi:10.4103/psychiatry.IndianJPsychiatry_361_18
13. AlZarea BK, Patil SR. Mobile phone head and neck pain syndrome: Proposal of a new entity. Headache. 2015;63(2):313-317.
14. OpenEpi: Open Source Epidemiologic Statistics for Public Health. [Software].
15. Kuorinka I, Jonsson B, Kilbom A, Vinterberg H, Biering-Sørensen F, Andersson G, Jørgensen K. Standardised Nordic questionnaires for the analysis of musculoskeletal symptoms. Appl Ergon. 1987;18(3):233-237. doi:10.1016/0003-6870(87)90010-X
16. Vernon H, Mior S. The Neck Disability Index: A study of reliability and validity. J Manipulative Physiol Ther. 1991;14(7):409-415.
17. Chekhovska L, Dutchak M, Zhdanova O, Luzhna M, Guzii O. The effect of rehabilitation fitness on mature women with scoliosis. Physical Rehabilitation and Recreational Health Technologies. 2024 Nov 30;9(6):476-85.
18. Neupane S, Ali U, Mathew A. Text neck syndrome: Systematic review. Imp J Interdiscip Res. 2017;3(7):141-148.
19. Bahathiq M, Almadaabgy A, Marzogi K, Alnahdi AM, Mufti HH, Alsharif K. The association between smartphones and thumb/wrist pain among students at Umm Al-Qura University, Makkah, Saudi Arabia. Int J Med Dev Ctries. 2020;4(11):1924-1930. doi:10.24911/IJMDC.51-1601759283
20. Gustaffson E, Thomee S, Grimby-Ekman A, Hagberg M. Texting on mobile phones and musculoskeletal disorders in young adults: A five-year cohort study. Appl Ergon. 2017;58:208-214. doi:10.1016/j.apergo.2016.06.012
21. Tsantili AR, Chrysikos D, Troupis T. Text neck syndrome: Disentangling a new epidemic. Acta Med Acad. 2022;51(2):123-129. doi:10.5644/ama2006-124.380
22. Sharan D, Mohandoss M, Ranganathan R, Jose J. Musculoskeletal disorders of the upper extremities due to extensive usage of handheld devices. Ann Occup Environ Med. 2014;26:22. doi:10.1186/s40557-014-0022-3
23. Ackermann PW. Tendinopathy I: Epidemiology, pathology, healing, and treatment. In: Tendon Regeneration. Academic Press; 2015. p. 113-147. doi:10.1016/B978-0-12-801590-2.00004-1
24. Goel R, Abzug JM. De Quervain's tenosynovitis: A review of the rehabilitative options. Hand. 2015;10(1):1-5. doi:10.1007/s11552-014-9649-3
25. Kim HJ, Kim JS. The relationship between smartphone use and subjective musculoskeletal symptoms in university students. J Phys Ther Sci. 2015;27(2):575-579. doi:10.1589/jpts.27.575
26. Neupane S, Ali U, Mathew A. Text neck syndrome: Systematic review. Imp J Interdiscip Res. 2017;3(7):141-148.
27. Zehra H, Tariq A, Raja AJ. Prevalence of forward head posture among school children using smartphones in Rawalpindi: Forward head posture and smartphone use. J Mod Health Rehab Sci. 2024;12:1-5.