

Original Article

Knowledge and Attitude Regarding Smartphone-Induced Musculoskeletal Disorders Among Healthcare Students

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Abstract

Objective: To determine the level of knowledge and attitude regarding smartphone-induced musculoskeletal disorders among undergraduate healthcare students.

Study Design: It is Descriptive cross-sectional study.

Place and duration of study: Data was collected from undergraduate healthcare students at PMAS–Arid Agriculture University and the Centre for Advanced Studies in Health and Technology (CASHT), Rawalpindi, along with other healthcare institutions reached through an online survey (Google Forms), over a period of six months (February–July 2026).

Material and Methods: A total of 385 undergraduate healthcare students (MBBS, DPT, BDS, Nursing, Pharmacy, and Allied Health Sciences), aged ≥ 17 years and using a smartphone for ≥ 6 months, were recruited via convenience sampling. Knowledge (8 items; 0–8) and attitude (6 items, 5-point Likert; 6–30) were assessed using a structured questionnaire adapted from a validated tool. Data were analyzed using SPSS v.26.

Results: The mean age of participants was 21.98 ± 2.57 years (range 17–29 years); 269 were female. Most participants, 335, demonstrated good knowledge, 48 moderate knowledge, and 2 poor knowledge (mean knowledge score = 6.92 ± 1.18 , out of 8). Regarding attitude, 292 participants showed a positive attitude, 86 a neutral/moderate attitude, and 7 a negative attitude (mean attitude score = 24.78 ± 3.98 , out of 30).

Conclusion: Most healthcare students demonstrated good knowledge and a positive attitude toward smartphone-induced musculoskeletal disorders, though a meaningful minority showed only moderate knowledge or a neutral attitude — suggesting that curriculum-integrated ergonomic education may be worth considering.

Keywords: Smartphone use, musculoskeletal disorders, knowledge, attitude, healthcare students, ergonomics.

1. Introduction

Smartphone use has become a near-universal part of daily and academic life, and healthcare students represent a particularly intensive user group, relying on their devices for academic reference, clinical communication, and social interaction in addition to routine use. Prolonged and repetitive smartphone operation requires sustained neck flexion, forward head posture, and non-neutral wrist and thumb positions, which together increase mechanical loading on the cervical spine and upper-limb structures.^(1,2)

A growing body of evidence links this behaviour to musculoskeletal disorders (MSDs) among students. Jacquier-Bret and Gorce demonstrated that the postures adopted during smartphone use,

particularly lying and prolonged static positions, expose university students to substantial biomechanical strain and elevated musculoskeletal risk scores.⁽¹⁾ Similarly, Alghadir et al. reported that smartphone-addicted university students showed measurable biochemical and clinical markers of neck and hand musculoskeletal involvement compared with non-addicted peers.⁽²⁾ Healthcare students, specifically, appear to be a high-risk population. Mersal et al. found that neck pain (38.8%) and shoulder pain (20.3%) were the most frequently reported musculoskeletal complaints among nursing students, with female students disproportionately affected.⁽³⁾

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Sirajudeen et al. similarly reported a high prevalence of upper-limb musculoskeletal disorders associated with smartphone addiction and overuse among university students during a period of markedly increased device dependence.⁽⁴⁾ In Pakistan, Khattak et al. documented a high prevalence of text neck syndrome and smartphone addiction among Doctor of Physical Therapy students in Peshawar, underscoring that this problem is not confined to Western or high-income settings.⁽⁵⁾

Despite this accumulating evidence of physical burden, comparatively few studies have examined what healthcare students actually know about smartphone-related musculoskeletal risk and how they feel toward it, as distinct from measuring symptom prevalence alone. Kumar et al. found gaps in students' awareness of mobile phone-related health hazards even within a medical school setting,⁽⁶⁾ while Renitha et al. reported that knowledge regarding text neck syndrome among young adults remained inconsistent despite considerable device exposure.⁽⁷⁾ Gudegowda et al. and Salameh et al. further confirmed a high prevalence of text neck-related complaints among medical students, frequently alongside limited preventive awareness.^(8,9)

This gap is particularly important for healthcare students, who are not only smartphone users themselves but will also become the clinicians responsible for educating patients on ergonomics and musculoskeletal health. Earlier work has reported greater median nerve mechanosensitivity in the dominant hand of heavy smartphone-using university students,⁽¹⁰⁾ suggesting that intensive smartphone use may place physical demands on the upper limb. However, whether healthcare students are aware of such risks, and how they regard them, has not been established, the present study therefore aimed to assess the level of knowledge and attitude regarding smartphone-induced musculoskeletal disorders among undergraduate healthcare students, to inform targeted ergonomic education and preventive strategies.

2. Materials and Methods

A descriptive cross-sectional study was conducted at PMAS-Arid Agriculture University, the Centre for Advanced Studies in Health and Technology (CASHT), Rawalpindi, and other healthcare institutions reached through an online survey (Google Forms) which was carried out over a period of six months (February–July 2026). Ethical permission for this study was obtained from S.Pharmacy and Clinic (Ref. No. SPC/RES/2026/008, dated 19 January 2026), and informed consent was obtained from all participants before enrolment.

The study population comprised undergraduate healthcare students enrolled in recognized universities, including MBBS, Doctor of Physical Therapy (DPT), BDS, Nursing, Pharmacy, and other Allied Health Sciences programmes. Students at PMAS-Arid Agriculture University and CASHT were approached in person and completed paper-based questionnaires, while students at other institutions were invited through a Google Forms link shared via WhatsApp groups and social media. Students from multiple healthcare institutions participated. Data was collected using a combination of paper-based and online questionnaires. Because the link was shared openly, the number of students reached could not be determined, and the response rate could not be calculated. The minimum required sample size was calculated using the Raosoft sample size calculator, assuming a large population, a 95% confidence level, a 5% margin of error and a 50% response distribution, which gave a required sample of 385 participants.⁽¹²⁾ All 385 participants who returned complete questionnaires were included in the analysis.

Participants were included if they were undergraduate healthcare students aged ≥ 17 years

who had used a smartphone for at least six months and were willing to participate. Students who were unwilling to participate, submitted incomplete questionnaires, were postgraduate students or interns, or had a diagnosed neurological disorder or severe musculoskeletal condition were excluded.

Data were collected using a structured, self-administered questionnaire consisting of three sections: demographic information (age, gender, academic year), a knowledge section, and an attitude section. The knowledge section comprised 8 items scored as Correct = 1 and Incorrect/Don't know = 0 (total range 0–8), categorized as poor (0–2), moderate (3–5), or good (6–8). The attitude section comprised 6 items rated on a five-point Likert scale from Strongly Disagree (1) to Strongly Agree (5) (total range 6–30), categorized as negative (6–14), neutral/moderate (15–22), or positive (23–30). Score categories were defined as a priori by dividing the possible score range of each scale into three approximately equal bands. These cut-offs are study-specific and have not been independently validated; therefore, mean scores are also reported alongside the categorical results. All attitude items were positively worded; therefore, reverse scoring was not required, and higher total scores indicate a more positive attitude. The questionnaire was adapted from a structured tool originally developed and validated by Nazari et al. to evaluate behavioural factors associated with musculoskeletal disorders in students;⁽¹¹⁾ items were modified and reworded to specifically address smartphone-related use and musculoskeletal risk, and the adapted instrument was reviewed by the research supervisor for content and face validity prior to data collection.

The data were collected using both paper-based questionnaires and Google Forms. Participation was voluntary, anonymous, and confidential, and

informed consent was obtained from all participants prior to enrolment; participants retained the right to withdraw at any stage. Data was analyzed using IBM SPSS Statistics version 26. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize demographic characteristics and knowledge and attitude scores.

3. Results

A total of 385 undergraduate healthcare students participated in the study. The sample comprised 269 females and 116 males. The mean age of participants was 21.98 ± 2.57 years as shown in Table 1.

Table 1

Demographic Characteristics of Participants (N = 385)

Variable	Category	n	%
Gender	Male	116	30.1%
	Female	269	69.9%
Age (years)	Mean $\pm$ SD	21.98 ± 2.57	
Academic Year	1st	75	19.5%
	2nd	82	21.3%
	3rd	82	21.3%
	4th	74	19.2%
	5th	72	18.7%

Figure 1: Distribution of participants by academic year

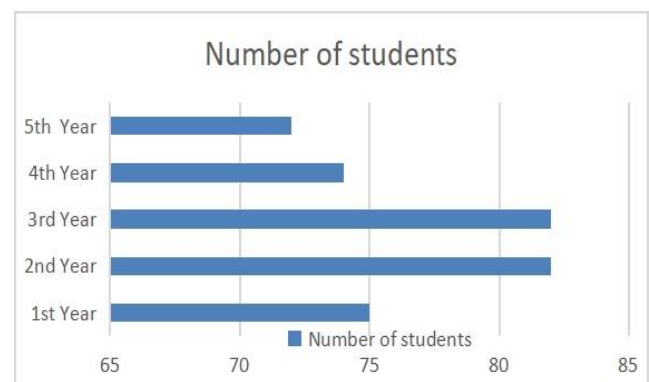
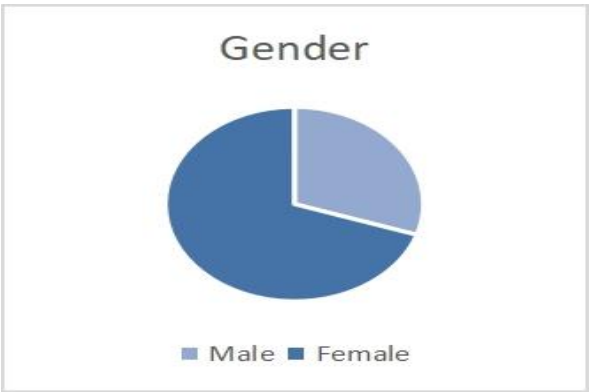


Figure 2: Gender distribution of participants



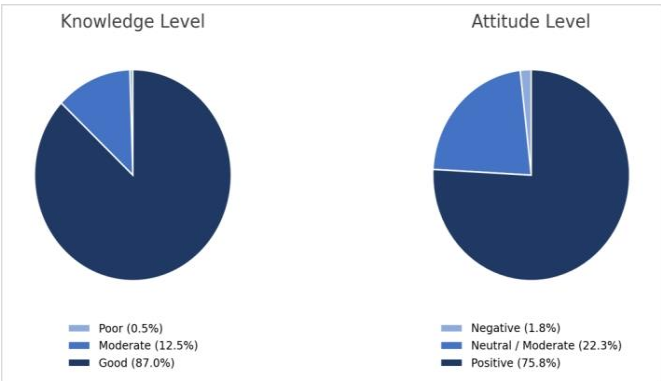
Regarding knowledge of smartphone-induced musculoskeletal disorders, the majority of participants, 335 (87.0%), demonstrated good knowledge, 48 (12.5%) demonstrated moderate knowledge, and only 2 (0.5%) demonstrated poor knowledge, corresponding to a mean knowledge score of 6.92 ± 1.18 out of a possible 8. With regard to attitude, most participants, 292 (75.8%), exhibited a positive attitude toward smartphone ergonomics and musculoskeletal risk prevention, 86 (22.3%) exhibited a neutral/moderate attitude, and 7 (1.8%) exhibited a negative attitude, corresponding to a mean attitude score of 24.78 ± 3.98 out of a possible 30, as shown in Table 2.

Table 2

Distribution of Knowledge and Attitude Scores Regarding Smartphone-Induced Musculoskeletal Disorders (N = 385)

Variable	Category	n	%
Knowledge (Score range 0–8)	Poor (0–2)	2	0.5%
	Moderate (3–5)	48	12.5%
	Good (6–8)	335	87.0%
	Mean ± SD	6.92 ± 1.18	
Attitude (Score range 6–30)	Negative (6–14)	7	1.8%
	Neutral / Moderate (15–22)	86	22.3%
	Positive (23–30)	292	75.8%
	Mean ± SD	24.78 ± 3.98	

Figure 3: Knowledge and attitude levels of participants



4. Discussion

This study found that the large majority of undergraduate healthcare students possessed good knowledge and a positive attitude regarding smartphone-induced musculoskeletal disorders, with mean scores of 6.92 ± 1.18 (out of 8) for knowledge and 24.78 ± 3.98 (out of 30) for attitude. Healthcare students receive training in musculoskeletal and neuromuscular pathology as part of their curricula, which may be relevant to this profile. However, the present study measured only knowledge and attitude; it did not assess whether these translate into safer smartphone use or protective behaviour in daily practice.

These findings differ from those of Kumar et al., who identified gaps in mobile phone-related health awareness among medical students,⁽⁶⁾ and Renitha et al., who reported inconsistent knowledge of text neck syndrome among young adults in a community sample.⁽⁷⁾ One possible explanation, which was not tested in this study, is that curricular exposure to anatomy, ergonomics or musculoskeletal pathology contributed to the higher knowledge levels observed here. Differences in study instruments, sampling methods, study populations and score cut-offs may

also explain the contrast between studies, so direct comparison should be made cautiously.

Previous studies have documented the high burden of smartphone-related musculoskeletal complaints in comparable healthcare student populations. Mersal et al. reported neck pain in 38.8% and shoulder pain in 20.3% of nursing students,⁽³⁾ while Khattak et al. found a high prevalence of text neck syndrome among DPT students in Peshawar.⁽⁵⁾ Salameh et al. and Gudegowda et al. similarly documented text neck-related dysfunction among medical students.^(9,8) Similar patterns have been reported in other health-profession and vocational student groups.⁽¹³⁻¹⁶⁾ Taken together with our findings, this literature raises the possibility that good knowledge and positive attitudes do not necessarily lead to protective behaviour. This is a hypothesis drawn from external studies; behaviour and symptoms were not measured in the present study, so it cannot be confirmed here. Taken together with the present findings, this pattern suggests a disconnect between what healthcare students know and believe about smartphone ergonomics and how consistently this translates into protective day-to-day behavior, a gap also noted in physical therapy cohorts elsewhere.

A previous study reported greater median nerve mechanosensitivity in the dominant hand of heavy smartphone users.⁽¹⁰⁾ Although the present study did not assess this, it raises the possibility that awareness alone may not prevent physical changes associated with intensive smartphone use. Knowledge and attitude assessments should therefore not be treated as a proxy for protective practice.

Because a proportion of participants did not reach the highest knowledge and attitude categories, structured ergonomic education within healthcare

curricula may be worth considering, in line with recommendations in the smartphone-related musculoskeletal literature.^(1,4) However, this descriptive study did not test whether education improves knowledge, attitude, behaviour or symptoms. Intervention studies would be needed to demonstrate its effectiveness.

Conclusion:

The majority of undergraduate healthcare students in this study demonstrated good knowledge and a positive attitude regarding smartphone-induced musculoskeletal disorders. Nonetheless, a meaningful subset showed only moderate knowledge or a neutral/negative attitude, and the wider literature continues to document a substantial burden of smartphone-related musculoskeletal complaints in comparable healthcare student populations despite general awareness. These findings suggest that structured ergonomic education could be considered in healthcare curricula, but intervention studies are needed to determine whether it improves knowledge, attitude, behaviour or symptoms.

Limitations :

The limitation of this study includes the cross sectional study, which precludes causal inference and does not capture change in knowledge or attitude over time; reliance on a self-administered, self-developed (adapted) questionnaire rather than a fully independently validated instrument; Convenience sampling combined with online recruitment may have introduced selection and volunteer bias, as students with greater interest in the topic may have been more likely to respond, which limits generalizability and the absence of an objective musculoskeletal or symptom assessment to correlate with the knowledge and attitude findings.

Suggestions:

Future research should incorporate objective musculoskeletal or symptom-based outcome measures alongside knowledge and attitude assessment, employ probability-based sampling across a broader range of institutions, and evaluate the impact of structured ergonomic education interventions on both awareness and actual smartphone-use behaviour among healthcare students.

Disclosure & Conflict of interest:

The authors declare no conflict of interest. No external funding was received for this study.

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