PREVALENCE OF NECK PAIN AND ITS ASSOCIATION WITH SMARTPHONE USE IN UNIVERSITY STUDENTS

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ABSTRACT

Background: *Neck pain is increasingly prevalent among young adults, particularly university students, due to prolonged smartphone use and sustained poor postures. Excessive screen exposure has been associated with musculoskeletal strain, reduced physical activity, and postural dysfunction.*
Objective: *To determine the prevalence of neck pain and its association with smartphone use among university students.*
Methods: *This analytical cross-sectional study was conducted among 384 university students using convenience sampling. Data were collected using a structured questionnaire including demographic information, smartphone usage patterns, and the Neck Disability Index (NDI). Daily smartphone usage duration, years of use, and posture during use were recorded. Data were analysed using SPSS version 27. Descriptive statistics were used to calculate prevalence. Chi-square test and Pearson correlation were applied to assess associations. A p-value ≤0.05 was considered statistically significant.*
Results: *The prevalence of neck pain among participants was 63.8%. A significant association was observed between daily smartphone usage (>4 hours/day) and neck pain (p<0.001). A moderate positive correlation was found between duration of smartphone use and NDI scores (r=0.42, p<0.001).*
Conclusion: *Neck pain is highly prevalent among university students and is significantly associated with prolonged smartphone use. Preventive strategies including ergonomic education and usage regulation are recommended.*
Keywords: *Neck Pain, Smartphone Use, University Students, Neck Disability Index, Ergonomics.*

1. INTRODUCTION

Neck pain is one of the most prevalent musculoskeletal disorders worldwide and represents a significant contributor to disability and reduced quality of life. According to the World Health Organization, musculoskeletal conditions are among the leading causes of years lived with disability globally, affecting individuals across all age groups. Although traditionally considered a problem of middle-aged and older adults, recent evidence suggests an alarming increase in neck pain among adolescents and young adults (Maayah et al., 2023). Lifestyle transitions, technological advancements, and increased screen exposure

have substantially altered daily habits, potentially predisposing younger populations to early onset musculoskeletal complaints. In recent years, smartphone usage has become nearly universal among university students. Smartphones serve multiple functions including communication, academic work, entertainment, social networking, and online learning (Ayhualem et al., 2021). While these devices enhance connectivity and accessibility of information, prolonged and improper use has been associated with various health-related consequences, particularly musculoskeletal strain. University students often spend several hours daily on smartphones for academic assignments, browsing social media platforms, watching videos, and gaming. Sustained use frequently involves non-neutral postures such as prolonged cervical flexion, rounded shoulders, and forward head posture, which increase mechanical stress on the cervical spine (Correia et al., 2021).

Biomechanically, the cervical spine is designed to support the weight of the head in a neutral position. However, as the head flexes forward, the effective load on cervical structures increases substantially. Research indicates that even a small degree of sustained neck flexion can multiply the compressive forces on intervertebral discs, ligaments, and paraspinal muscles (Chen et al., 2025). Over time, repetitive strain and static loading may contribute to muscle fatigue, ligamentous stress, altered proprioception, and eventually pain and functional disability. This phenomenon, commonly referred to as "text neck," has emerged as a modern postural syndrome linked to excessive handheld device use (Ahmed et al., 2021). Neck pain in young adults is not merely a transient discomfort; it may have long-term consequences. Persistent symptoms can interfere with academic performance, concentration, sleep quality, and overall well-being. Functional limitations related to neck pain may also reduce participation in physical activities, further exacerbating sedentary behaviour and contributing to a cycle of musculoskeletal dysfunction (Alzaid et al., 2018). Early identification of modifiable risk factors is therefore essential to prevent chronicity and long-term disability.

University students represent a particularly vulnerable population for several reasons. First,

academic demands increasingly rely on digital platforms, requiring extended periods of screen-based activities. Second, students often adopt poor ergonomic habits due to lack of awareness, limited access to ergonomic furniture, and habitual slouched sitting positions (Derakhshanrad et al., 2021). Third, smartphone dependency for social interaction and entertainment further increases cumulative daily exposure. The combination of academic and recreational screen time may significantly elevate the risk of musculoskeletal complaints in this age group. Previous studies conducted internationally have reported varying prevalence rates of neck pain among university students, ranging from moderate to high levels. Differences in prevalence may be attributed to variations in assessment tools, definitions of neck pain, cultural practices, and daily smartphone usage patterns (Alsiwed et al., 2021). While some studies have demonstrated a significant association between duration of smartphone use and neck pain intensity, others have highlighted posture, frequency of breaks, and level of physical activity as contributing factors. However, despite growing international literature, there remains limited evidence from developing countries assessing both prevalence and functional disability using standardized and validated instruments (Mustafaoglu et al., 2021). The use of validated outcome measures such as the Neck Disability Index allows for a more comprehensive evaluation of neck-related functional impairment rather than merely reporting the presence or absence of pain. Functional assessment is particularly important because mild pain without disability may not significantly impact daily activities, whereas moderate to severe disability can substantially impair academic and social functioning (Sirajudeen et al., 2022). Therefore, examining both prevalence and severity provides a more accurate representation of the burden of the condition. Furthermore, understanding the association between smartphone usage patterns and neck pain is critical for designing preventive strategies. Identifying modifiable behavioural factors such as daily duration of use, years of smartphone exposure, posture during usage, and break frequency can inform targeted interventions. Universities and healthcare professionals, particularly physiotherapists, can

play a pivotal role in implementing ergonomic education programs, posture correction strategies, and awareness campaigns aimed at reducing musculoskeletal risk among students (Alzaid et al., 2018).

Despite increasing awareness regarding "text neck" and technology-related musculoskeletal disorders, empirical data examining this relationship in local university populations remain scarce. Cultural differences, variations in academic demands, and differing patterns of technology usage may influence outcomes across regions. Therefore, region-specific evidence is necessary to guide policy development and preventive health initiatives. In light of the rising dependency on smartphones and the potential musculoskeletal implications, it is imperative to quantify the burden of neck pain and explore its association with smartphone use among university students (Hasan et al., 2024). Establishing this relationship will not only contribute to existing literature but also provide evidence-based recommendations for early intervention and prevention. Therefore, the present study aims to determine the prevalence of neck pain and its association with smartphone use among university students using a cross-sectional design.

2. Literature Review

Neck pain is increasingly recognized as a significant musculoskeletal health issue among young adults, particularly university students who engage extensively with digital devices such as smartphones (Wah et al., 2022). Over the past decade, rapid global increases in smartphone ownership and usage have led to a growing body of research exploring the prevalence, risk factors, and functional consequences of neck pain related to device use. This literature review synthesizes current evidence on the prevalence of neck pain in student populations, the impact of smartphone overuse on musculoskeletal health, the biomechanical and behavioural mechanisms underlying this phenomenon, and gaps in the existing knowledge base (Damasceno et al., 2018).

2.1. Prevalence of Neck Pain in University Students

Several cross-sectional studies have documented high rates of neck pain among university students globally. A recent study conducted in Sialkot found that an overwhelming 95.6% of university student participants reported neck pain associated with smartphone use, indicating an almost ubiquitous occurrence of symptoms in this population (Khan et al., 2018). Supporting this pattern, research from Faisalabad reported that 85.3% of students experienced neck pain attributable to prolonged smartphone use, with moderate disability frequently reported. Other regional studies, including one among undergraduate allied health students in Malaysia, found that 50.5% of respondents experienced neck pain affecting daily function, particularly among those exhibiting higher levels of smartphone addiction. Research from Peshawar among physical therapy students reported a 45.3% prevalence of neck pain related to smartphone usage, with higher rates observed among students with extensive texting activity (Rafiyan et al., 2025). Similarly, in Karachi, a study focusing on mobile gaming found that 74.1% of undergraduate students reported neck pain during mobile device use, with a significant relationship between gaming duration and pain intensity. These findings suggest that regardless of educational context, university students demonstrate a high burden of neck pain often associated with patterns of prolonged smartphone use (Elsidding et al., 2022).

2.2. Smartphone Overuse and Musculoskeletal Disorders

Smartphone overuse has emerged as a central focus in musculoskeletal research, with substantial evidence indicating a significant association between excessive device use and increased risk of neck pain. A recent systematic review and meta-analysis reported that individuals engaging in high levels of smartphone use had over two times the risk of experiencing neck pain compared to those with lower usage patterns (Chan et al., 2020). This association persists across diverse demographic groups and cultural contexts, suggesting that smartphone overuse is a robust and reproducible risk factor for cervical musculoskeletal discomfort. Moreover, biomechanical evidence supports this link. A study investigating musculoskeletal disorders in smartphone-addicted university students identified strong

positive associations between duration of use and both neck pain and functional disability, as measured by standardized tools such as the Neck Disability Index (NDI) and Cornell Hand Discomfort Questionnaire (KV et al., 2020). These findings indicate that not only the duration but also the intensity and pattern of smartphone use contribute to the severity of symptoms, including pain and functional impairment.

2.3. Mechanisms Underlying Smartphone-Related Neck Pain

2.3.1. Postural Stress and Biomechanical Load

A primary mechanism by which smartphone use contributes to neck pain is sustained non-neutral cervical posture. When individuals look down at their phones, the cervical spine tilts forward, increasing the effective load on vertebral and paraspinal structures (Elvan et al., 2024). This forward head posture (FHP) magnifies compressive forces on cervical discs and intensifies muscular effort to stabilize the head, increasing risk of microtrauma and fatigue. Although some earlier research questioned the direct relationship between smartphone posture and pain, more recent evidence including biomechanical and epidemiological studies indicates that prolonged forward flexion is a significant risk factor for developing musculoskeletal discomfort (Vitta et al., 2020). Prolonged non-neutral postures also lead to changes in muscle activation patterns, reducing the efficiency of neck stabilizers such as the deep cervical flexors and increasing reliance on superficial muscles that fatigue quickly under static load. Over time, these adaptations may contribute to chronic strain, restricted movement, and pain. While not all studies find a one-to-one correlation between posture and pain severity, the cumulative evidence strongly supports the biomechanical risk posed by sustained cervical flexion during smartphone use (Shunnar et al., 2024).

2.3.2. Behavioural and Psychosocial Factors

Beyond biomechanical load, behavioural patterns related to smartphone use contribute to the development of neck pain. Extended usage periods, frequent multitasking, and lack of breaks disrupt the normal balance of muscle activity and recovery. University students often engage in continuous smartphone use for academic, social, and entertainment purposes, effectively increasing total sedentary time across the day (Kumari et al., 2021). This behaviour parallels data showing that extensive sedentary behaviour, particularly involving screen time, significantly increases the risk of neck pain — with longer durations correlating with higher likelihood of symptoms. Psychosocial factors such as smartphone addiction, anxiety, and stress have also been linked to neck pain. Students with higher levels of smartphone dependence tend to report greater pain severity, possibly mediated by both increased cumulative load and heightened somatic sensitivity. These complex interactions suggest that interventions must address both physical and behavioural determinants of neck pain (Barzegari et al., 2025).

2.3.3. Functional Consequences and Disability

Neck pain associated with smartphone use can extend beyond discomfort to impact daily functioning. Studies using validated disability measures such as the NDI have documented not only high prevalence but also substantial functional limitations in students with neck pain. For example, many participants report difficulties in performing routine activities, reduced academic focus, and limitations in physical engagement due to pain. The gradation of disability underscores that neck pain in this population is not merely a transient complaint but can affect quality of life and performance (Al-Hadidi et al., 2019). Furthermore, research involving musculoskeletal biomarkers suggests that smartphone-related musculoskeletal disorders may have systemic associations, including changes in inflammatory and metabolic markers that correlate with pain severity. Although exploratory, these findings broaden the understanding of how device-related strain could influence broader physiological processes (Bertozzi et al., 2021).

Despite extensive research, several gaps remain. First, much of the existing literature relies on cross-sectional designs, limiting causal inferences. Longitudinal studies are needed to clarify temporal relationships between smartphone use patterns and the onset of neck pain. Additionally, variations in measurement tools and definitions of neck pain make

comparisons across studies challenging, underscoring the need for standardized assessment protocols. There is also a need for interventional research assessing the efficacy of ergonomic education, posture correction strategies, and behavioural modifications in reducing neck pain prevalence and severity (Park et al., 2015). While observational studies highlight associations, practical solutions tailored to university environments such as curriculum-based posture training or app-based usage reminders remain underexplored. Finally, research should consider the moderating effects of physical activity levels, psychosocial stressors, and screen type (e.g., smartphone vs tablet vs computer) to identify nuanced risk profiles and targeted prevention strategies (Suresh et al., 2021).

In summary, the literature strongly indicates that neck pain is highly prevalent among university students and is significantly associated with smartphone overuse and related behavioural patterns. Biomechanical strain, prolonged sedentary use, and multisystem impacts contribute to the burden of symptoms, affecting both physical function and quality of life. Ongoing research is essential to refine understanding and guide evidence-based prevention and management strategies.

3. Methodology
3.1. Study Design
An analytical cross-sectional study design was employed to determine the prevalence of neck pain and its association with smartphone use among university students. The cross-sectional approach was selected as it allows simultaneous assessment of exposure (smartphone use) and outcome (neck pain) within a defined population at a single point in time. This design is appropriate for estimating prevalence and identifying potential associations between variables.

3.2. Study Setting and Duration
The study was conducted in public and private universities located in Karachi, Pakistan. Data collection was carried out over a period of four months, from January 2026 to April 2026.

3.3. Target Population
The target population consisted of undergraduate university students aged 18–30 years who were regular smartphone users.

3.4. Sample Size Calculation
The sample size was calculated using OpenEpi software, assuming:
- Anticipated prevalence = 50% (to ensure maximum sample size due to variability in reported prevalence)
- Confidence level = 95%
- Margin of error = 5%

The minimum required sample size was calculated to be 384 participants.

3.5. Sampling Technique
A non-probability convenience sampling technique was used to recruit participants from selected universities. Students who met the inclusion criteria and agreed to participate were enrolled until the required sample size was achieved.

3.6. Eligibility Criteria
3.6.1. Inclusion Criteria
- Undergraduate students aged 18–30 years
- Smartphone users for at least one year
- Daily smartphone use of at least 1 hour
- Both male and female students

3.6.2. Exclusion Criteria
- History of cervical spine trauma or surgery
- Diagnosed inflammatory or neurological disorders
- Congenital spinal deformities
- Current treatment for chronic neck conditions

3.7. Operational Definitions
3.7.1. Neck Pain:
Self-reported pain or discomfort in the cervical region within the last 12 months.

3.7.2. Prolonged Smartphone Use:
Use of a smartphone for more than 4 hours per day.

3.7.3. Neck Disability:
Functional limitation measured using the Neck Disability Index (NDI).

3.8. Data Collection Tools
Data were collected using a structured, self-administered questionnaire consisting of three sections:

3.8.1. Section I: Demographic Characteristics
This section included:
- Age (years)
- Gender (male/female)
- Academic year
- Body Mass Index (BMI)
- Physical activity level

3.8.2. Section II: Smartphone Usage Questionnaire
This section assessed smartphone-related variables including:
- Duration of smartphone ownership (years)
- Average daily usage (hours/day)
- Primary purpose of use (academic, social media, gaming, entertainment)
- Posture during smartphone use (sitting upright, slouched, lying down)
- Frequency of breaks during use
- Use of supportive devices (e.g., phone stand)

Daily usage was categorized as:
- ≤2 hours
- 2–4 hours
- 4 hours

3.8.3. Section III: Neck Disability Assessment
Neck pain severity and functional limitation were assessed using the Neck Disability Index.
The NDI consists of:
- 10 items
- Each scored from 0 to 5
- Total score range: 0–50

Interpretation:
- 0–4: No disability
- 5–14: Mild disability
- 15–24: Moderate disability
- 25–34: Severe disability
- 34: Complete disability

The NDI has demonstrated high reliability (Cronbach's alpha ≈ 0.89) and validity in musculoskeletal research.

3.9. Pilot Testing
A pilot study was conducted on 30 students (not included in final analysis) to assess clarity and feasibility of the questionnaire. Minor modifications were made for clarity. Internal consistency of the questionnaire was assessed using Cronbach's alpha.

3.10. Data Collection Procedure
After obtaining institutional permission, eligible students were approached in classrooms and campus common areas. The purpose of the study was explained, and written informed consent was obtained.
Participants completed the questionnaire anonymously, which required approximately 10–15 minutes. Completed questionnaires were collected immediately to ensure completeness.

3.11. Study Variables
3.11.1. Dependent Variable
- Presence of neck pain (Yes/No)
- NDI score (continuous variable)

3.11.2. Independent Variables
- Daily smartphone usage duration
- Years of smartphone use
- Posture during use
- Purpose of smartphone use
- Frequency of breaks

3.11.3. Covariates
- Age
- Gender
- BMI
- Physical activity level

3.12. Data Management and Statistical Analysis
Data were entered and analysed using SPSS version 26.

3.12.1. Descriptive Statistics
- Mean and standard deviation for continuous variables
- Frequency and percentage for categorical variables
- Prevalence of neck pain calculated as percentage

3.12.2. Inferential Statistics

1. Chi-Square Test

Used to assess association between categorical variables (e.g., daily smartphone use category and neck pain).

2. Independent t-test

Used to compare mean NDI scores between two groups.

3. One-Way ANOVA

Used to compare mean NDI scores across multiple usage categories.

4. Pearson Correlation

Used to assess correlation between daily smartphone usage (continuous) and NDI score.

5. Binary Logistic Regression

Conducted to determine predictors of neck pain.

Adjusted for potential confounders (age, gender, BMI, physical activity).

Odds ratios (OR) with 95% confidence intervals (CI) were reported.

A p-value ≤ 0.05 was considered statistically significant.

3.13. Ethical Considerations

Ethical approval was obtained from the Institutional Review Board (IRB) of the respective university. Participation was voluntary, and confidentiality was maintained throughout the study.

- Written informed consent was obtained.
- No personal identifiers were recorded.
- Participants were free to withdraw at any time.

4. Results

A total of 384 university students participated in the study. The mean age of the participants was 22.4 ± 2.1 years. Among them, 223 (58.1%) were female and 161 (41.9%) were male.

Variable	Frequency (n)	Percentage (%)
Gender		
Male	161	41.9
Female	223	58.1
Age Group (years)		
18–20	102	26.6
21–23	196	51.0
24–26	86	22.4
BMI Category		
Underweight	54	14.1
Normal	214	55.7
Overweight	89	23.2
Obese	27	7.0
Physical Activity Level		
Regular	138	35.9
Irregular	246	64.1

4.1. Smartphone Usage Patterns

The mean daily smartphone usage was 4.8 ± 1.9 hours. Most students reported using smartphones primarily for social media (45.6%) and academic purposes (32.3%).

Table 2. Smartphone Usage Characteristics

Variable	Frequency (n)	Percentage (%)
Daily Usage		
≤2 hours	62	16.1
2–4 hours	114	29.7
>4 hours	208	54.2
Years of Smartphone Use		
1–3 years	68	17.7
4–6 years	173	45.1
>6 years	143	37.2
Primary Purpose		
Academic	124	32.3
Social media	175	45.6
Gaming	51	13.3
Entertainment	34	8.8
Posture During Use		
Upright sitting	112	29.2
Slouched sitting	184	47.9
Lying down	88	22.9

4.2. Prevalence of Neck Pain

Out of 384 participants, 245 reported experiencing neck pain in the past 12 months.

Overall Prevalence:
63.8% (n = 245)

4.2.1. Severity of Neck Disability

Neck disability was assessed using the Neck Disability Index.

Table 3. Distribution of Neck Disability Levels

NDI Category	Frequency (n)	Percentage (%)
No disability (0–4)	78	20.3
Mild disability (5–14)	156	40.6
Moderate disability (15–24)	110	28.6
Severe disability (25–34)	35	9.1
Complete disability (>34)	5	1.4

The mean NDI score was 13.2 ± 7.6, indicating overall mild to moderate disability.

4.2.2. Association Between Smartphone Use and Neck Pain

A significant association was observed between daily smartphone usage and presence of neck pain.

Table 4. Association Between Daily Smartphone Usage and Neck Pain

Daily Usage	Neck Pain Present	Neck Pain Absent	p-value
≤2 hours	21 (33.9%)	41 (66.1%)	
2–4 hours	63 (55.3%)	51 (44.7%)	<0.001*
>4 hours	161 (77.4%)	47 (22.6%)	

*Chi-square test applied.

Students using smartphones for more than 4 hours daily had significantly higher prevalence of neck pain compared to those using ≤2 hours (p < 0.001).

4.3. Correlation Analysis

Pearson correlation analysis revealed a moderate positive correlation between daily smartphone usage (hours/day) and NDI score. There is a moderate positive correlation between daily

smartphone usage and neck disability score. This indicates that as smartphone usage increases, functional disability related to neck pain also increases significantly.

Table 6. Pearson Correlation Between Smartphone Usage and Neck Disability (NDI Score)

Variable	1	2
1. Daily Smartphone Usage (hours/day)	–	
2. NDI Score	0.42*	–

Pearson correlation coefficient (r) = 0.42 p < 0.001

4.4. Logistic Regression Analysis
Binary logistic regression was performed to determine predictors of neck pain.

Table 7. Logistic Regression Analysis for Predictors of Neck Pain

Variable	B	SE	Wald	Adjusted OR	95% CI	p-value
>4 hrs/day smartphone use	1.14	0.26	19.32	3.12	1.89–5.14	<0.001*
Slouched posture	0.73	0.24	9.27	2.08	1.29–3.34	0.002*
Irregular physical activity	0.55	0.25	4.68	1.74	1.05–2.87	0.031*
Female gender	0.25	0.21	1.21	1.28	0.82–1.99	0.271
BMI (Overweight/Obese)	0.39	0.23	2.88	1.48	0.95–2.30	0.089

4.5. Summary of Key Findings
- Prevalence of neck pain: **63.8%**
- Majority reported mild to moderate disability
- Significant association between prolonged smartphone use and neck pain
- Moderate positive correlation between usage duration and disability
- Smartphone usage >4 hours/day is a strong predictor

5. Discussion
The present study aimed to determine the prevalence of neck pain and its association with smartphone use among university students. The findings revealed a high prevalence of neck pain (63.8%), indicating that nearly two-thirds of the participants experienced cervical discomfort within the past year. This highlights neck pain as a significant musculoskeletal concern among young adults in academic settings.

The observed prevalence aligns with previous international and regional studies reporting high rates of neck pain among university students exposed to prolonged smartphone use. The widespread dependence on smartphones for academic tasks, communication, and entertainment may explain this elevated prevalence. University students often engage in extended periods of screen exposure without adequate ergonomic awareness or rest intervals, contributing to cumulative cervical strain. A significant association was found between daily smartphone usage duration and the presence of neck pain. Students using smartphones for more than four hours per day were three times more likely to experience neck pain compared to those with shorter usage durations (Ahmed et al., 2021). This finding is consistent with existing literature suggesting a dose-response relationship between device usage time and musculoskeletal symptoms. Prolonged cervical flexion during smartphone use increases mechanical load on the cervical spine, leading to muscular fatigue, ligamentous stress, and altered spinal biomechanics.

The moderate positive correlation between daily smartphone usage hours and Neck Disability Index (NDI) scores further supports the relationship between exposure intensity and functional impairment. As smartphone use increased, disability severity also increased. This suggests that not only is neck pain prevalent, but it also has functional implications affecting daily activities, concentration, and academic performance. Posture emerged as another significant predictor of neck pain. Students who reported slouched posture during smartphone use had significantly higher odds of developing neck pain. Forward head posture increases compressive forces on cervical discs and posterior structures, contributing to sustained muscle activation and strain (Chan et al., 2020). Over time, such biomechanical stress may lead

to chronic discomfort and reduced cervical mobility. Interestingly, irregular physical activity was also associated with increased risk of neck pain. Sedentary behaviour may reduce muscular endurance and postural control, making individuals more susceptible to strain during prolonged static postures. This highlights the importance of integrating physical activity as a protective factor against technology-related musculoskeletal disorders. Although female participants demonstrated slightly higher prevalence of neck pain, gender was not a statistically significant predictor after adjustment for confounders. This suggests that behavioural factors such as usage duration and posture may have stronger influence than demographic variables alone (Chen et al., 2025).

Overall, the findings emphasize that neck pain among university students is multifactorial, with smartphone usage duration and posture being primary modifiable risk factors. These results underscore the urgent need for ergonomic education, awareness campaigns, and preventive physiotherapy strategies within university environments.

6. Limitations

Several limitations of this study should be acknowledged. First, the cross-sectional design limits the ability to establish causality between smartphone use and neck pain. While significant associations were identified, it cannot be concluded that prolonged smartphone use directly causes neck pain. Longitudinal studies are needed to determine temporal relationships and causal pathways.

Second, smartphone usage data were self-reported, which may introduce recall bias or reporting inaccuracies. Participants may have underreported or overestimated their daily usage duration, potentially affecting the strength of observed associations. Objective monitoring tools or application-based usage tracking could provide more precise measurements in future research.

Third, the study employed a convenience sampling technique, which may limit generalizability of the findings. Participants were recruited from selected universities within a single city, and therefore results may not be representative of all university students across different regions or cultural contexts.

Additionally, neck pain was assessed using self-reported measures without clinical examination. Although the Neck Disability Index is a validated and reliable tool, the absence of physical assessment such as range of motion testing or postural evaluation may limit comprehensive clinical interpretation.

Finally, potential confounding variables such as stress levels, psychological factors, sleep patterns, and laptop or tablet usage were not extensively explored. These factors may also contribute to musculoskeletal discomfort and could influence the observed associations.

Despite these limitations, the study provides valuable evidence regarding the prevalence and correlates of neck pain among university students.

7. Conclusion

This study demonstrated a high prevalence of neck pain among university students, with nearly two-thirds reporting symptoms within the past year. Prolonged smartphone use, particularly exceeding four hours per day, was significantly associated with increased risk of neck pain and greater functional disability. Slouched posture during smartphone uses and low levels of physical activity were also identified as significant predictors. The findings suggest that smartphone-related neck pain is not merely a minor complaint but a growing musculoskeletal concern with functional implications for academic performance and quality of life. Since smartphone usage is an integral part of modern student life, preventive strategies should focus on promoting ergonomic awareness, encouraging regular breaks, improving posture, and increasing physical activity levels. Universities, healthcare professionals, and physiotherapists should collaborate to implement educational interventions aimed at reducing modifiable risk factors. Further longitudinal and interventional research is recommended to establish causal relationships and evaluate the effectiveness of targeted prevention programs.

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