EUROPEAN JOURNAL OF BIOMEDICAL AND PHARMACEUTICAL SCIENCES
http://www.ejbps.com

ISSN 2349-8870
Coden USA: EJBPBO
Volume: 13
Issue: 9
Year: 2026

PREVALENCE OF MECHANICAL NECK PAIN AND ITS ASSOCIATION WITH SMARTPHONE USE, SMARTPHONE ADDICTION, NECK DISABILITY, AND CERVICAL RANGE OF MOTION AMONG UNIVERSITY STUDENTS: A CROSS-SECTIONAL STUDY

[1*]Tehreem Fatima, [2]Ameer Hamza

[1]Department of Physical Therapy, Government College University, Faisalabad, Pakistan.
[2]Department of Allied Health Sciences, The Superior University Lahore, Pakistan.

***Corresponding Author: Tehreem Fatima**

Department of Physical Therapy, Government College University, Faisalabad, Pakistan.

DOI: https://doi.org/10.5281/zenodo.22159359

How to cite this Article: [1*]Tehreem Fatima, [2]Ameer Hamza. (2026). Prevalence of Mechanical Neck Pain and Its Association with Smartphone Use, Smartphone Addiction, Neck Disability, and Cervical Range of Motion Among University Students: A Cross-Sectional Study. European Journal of Biomedical and Pharmaceutical Sciences, 13(9), 169–178.

Article Received on 04/08/2026 **Article Revised on 25/08/2026** **Article Published on 01/09/2026**

ABSTRACT

Background: Smartphones have become an essential part of university students' daily lives, supporting academic work, communication, entertainment, and social interaction. Extended smartphone use often encourages prolonged neck flexion and poor postural habits, increasing mechanical stress on the cervical spine and potentially contributing to musculoskeletal discomfort. While some studies have indicated the relationship between smartphone use and neck pain, few studies have simultaneously investigated the issue of smartphone addiction, neck disability, and cervical range of motion in the same group of people. **Objective:** To identify the prevalence of mechanical neck pain in university students and its relationship with smartphone usage, smartphone addiction, neck disability, and cervical range of motion. **Methods:** A cross-sectional observational study was conducted to investigate 100 university students who frequently use their smartphones. Data collection instruments included a well-structured questionnaire that contained demographics, Numeric Pain Rating Scale (NPRS), Neck Disability Index (NDI), Nordic Musculoskeletal Questionnaire (NMQ), and Smartphone Addiction Scale – Short Version (SAS-SV). The cervical range of motion was measured using a universal goniometer. Data analysis involved descriptive statistics. Normality of data was tested using the Shapiro-Wilk test, while the correlation among study variables was determined using Spearman's rank-order correlation. Internal consistency for the NDI and SAS-SV was assessed using Cronbach's alpha. A p-value of <0.05 was considered statistically significant. **Results:** The average age of participants was 21.43 ± 1.51 years, and the average body mass index was 24.10 ± 4.77 kg/m². Current mechanical neck pain was found among 45% of participants, while 25% reported a past history of neck pain. The average NPRS score was 2.38 ± 2.30, NDI score was 25.56 ± 20.40%, and SAS-SV score was 33.31 ± 12.23. Usage of smartphones showed statistically significant positive associations with pain intensity ($r = 0.327$, $p < 0.001$), neck disability ($r = 0.323$, $p = 0.001$), and smartphone addiction ($r = 0.552$, $p < 0.001$). Pain intensity had a very strong association with neck disability ($r = 0.694$, $p < 0.001$) and had a negative correlation with cervical mobility, especially the right rotation ($r = –0.444$, $p < 0.001$). The NDI and SAS-SV were found to have excellent internal consistency (Cronbach's $\alpha = 0.940$ and 0.949, respectively).

Conclusion: Neck pain arising from mechanical factors is common among university students and is strongly related to increased use of smartphones, high smartphone addiction scores, high levels of neck disability, and poor range of motion of the neck. The results imply the need for ergonomically correct use of smartphones and preventive measures against musculoskeletal disorders of the neck.

KEYWORDS: Mechanical neck pain; Smartphone use; Smartphone addiction; Neck disability; Cervical range of motion; University students; Text neck.

1. INTRODUCTION

In recent years, smartphones have become indispensable tools for university students, serving academic, social, and recreational purposes throughout the day.[1] Increased screen time has resulted in longer periods of sustained neck flexion and static sitting postures, both of which may increase biomechanical loading of the cervical spine.[2]

Mechanical neck pain is a frequently reported musculoskeletal complaint among young adults and university students, often affecting daily activities and academic performance.[3] and it is defined as a pain originating from muscles, ligaments, joints, or any other anatomical structures except neural tissues within the cervical spine. Existing evidence suggests that prolonged smartphone use, poor posture, and excessive cervical flexion are associated with increased neck pain, greater disability, and reduced cervical mobility.[2,4]

Because university students rely heavily on smartphones for studying, communication, and entertainment, they are considered particularly vulnerable to developing smartphone-related neck problems.[1] Lack of proper body posture awareness when using smartphones constantly may result in neck pain and impaired performance during regular activities and studies.[2] Furthermore, previous research indicates that excessive smartphone use may contribute to smartphone addiction, which can further encourage prolonged exposure to poor postural habits.[5]

Despite the extensive research conducted on the association between the use of smartphones and neck pain, there are relatively few studies that have analyzed pain intensity, neck disability, smartphone addiction, cervical range of motion, and musculoskeletal symptoms using standardized measures in the same study sample.[3] In addition, research data from the students of Pakistani universities is limited.[6,7] Hence, the current study was designed to determine the prevalence of mechanical neck pain among university students and examine its association with smartphone use, smartphone addiction, neck disability, and cervical range of motion.

1.1 OBJECTIVE

Primary Objective

To determine the prevalence of mechanical neck pain among university students who use smartphones.

Secondary Objectives

- To assess the association between duration and pattern of smartphone use and the severity of neck pain, neck disability, and smartphone addiction.
- To evaluate cervical range of motion among smartphone-using university students and its association with pain and disability.
- To assess the internal consistency reliability of the NDI and SAS-SV in the study sample.

1.2 Rationale of Study

It has been noted that the increasing use of smartphones by the university students has become a cause of concern since it could adversely affect the musculoskeletal well-being of these individuals. The use of the smartphone for an extended period of time in the position of a forward head and flexed neck has the potential to cause increased loads on the cervical spine, thereby leading to neck pain and restricted movement. Therefore, this study was conducted to determine the prevalence of mechanical neck pain and investigate its association with smartphone use, smartphone addiction, neck disability, and cervical range of motion.

1.3 Research Question

What is the prevalence of neck pain with a mechanical cause among university students, and is there any significant association between the usage of smartphones, smartphone addiction, neck disability, and the cervical range of motion?.

1.4 Hypothesis

Null Hypothesis (H0)

There is no statistically significant association between smartphone usage and mechanical neck pain, neck disability, smartphone addiction, and cervical range of motion among university students.

Alternative Hypothesis (H1)

There is a statistically significant association between smartphone use and mechanical neck pain, neck disability, smartphone addiction, and cervical range of motion among university students.

1.5 Impact of Study

This paper provides empirical data concerning the association between smartphone usage patterns and neck muscle health status among university students. This information will be helpful for university health departments, physiotherapists, and academic administration in developing campaigns, guidelines, and screening strategies to reduce the incidence of neck pain associated with smartphones. The results of this study may also serve as a basis for future studies of this kind.

1.6 Study Gap

Even though various international studies have found association between smartphone usage and neck pain or text-neck syndrome, most of them only include pain measurement without objective measurement of cervical range of motion and lack the measurement of smartphone addiction along with pain and disability indicators using validated scales. The current study fills this research void by including measurements of pain and disability scales (NPRS, NDI, NMQ) and a validated scale of smartphone addiction (SAS-SV), along with an objective measurement of cervical range of motion in one sample of university students.

2. Review of Literature

A growing body of research has examined the relationship between smartphone use and musculoskeletal disorders, particularly neck pain among university students.[2]

Chan et al. (2020) investigated neck pain among undergraduate students and reported that prolonged smartphone use and poor ergonomic habits were important factors associated with neck pain.[8]

Research conducted among university students in Saudi Arabia reported that approximately half of the participants experienced smartphone-related neck pain, with poor posture and excessive smartphone use identified as major contributing factors.[9] Further to this, the findings also indicated that students with poor cervical posture and students who are addicted to their smartphones had a higher risk of developing neck problems.

Similarly, another study involving medical students demonstrated that higher smartphone addiction scores were associated with greater levels of neck disability. The study identified a moderate positive correlation between smartphone addiction scores and neck disability scores, closely reflecting the expected association between these two constructs.[10]

A cross-sectional survey of postgraduate students using the Neck Disability Index reported a text-neck syndrome prevalence of approximately 27%. Headache was identified as the most affected NDI domain, followed by disturbances in sleep, concentration, reading, and driving, all of which are domains assessed by the NDI used in the present study.[11]

Among nursing students in Mosul, researchers found that the majority of participants were regular smartphone users and reported a significant association between smartphone addiction and neck disability, particularly among female students, suggesting that gender may influence the strength of this association.[12]

A survey of university students in Jordan conducted during a period of online learning found that approximately half of the participants experienced neck pain and that unfavorable smartphone use patterns increased the likelihood of neck pain. These findings reinforce the notion that behavioral patterns of smartphone use, rather than device ownership alone, contribute to musculoskeletal risk.[13]

Recent evidence has also suggested that prolonged smartphone use may affect balance, cervical function, and neurological status in individuals experiencing neck pain. One study reported a high prevalence of static balance impairment among smartphone-using students with subclinical neck pain, whereas another identified clinical signs suggestive of cervical myelopathic involvement in a substantial minority of affected students, indicating that prolonged forward-flexed postures may have consequences beyond localized musculoskeletal discomfort.[14]

Biomechanical evidence indicates that forward head posture substantially increases compressive forces acting on the cervical spine. As neck flexion increases during smartphone use, cervical loading also increases, providing a possible explanation for the development of mechanical neck pain.[15,16]

Taken together, the current evidence suggests a clear and biologically sound link between smartphone use and neck pain, disability and cervical range of motion in students. Nevertheless, the estimates of prevalence rates of the condition widely differ (from 27% to more than 68%) depending on the group studied and definition of the problem. Moreover, relatively few studies have simultaneously incorporated validated assessments of pain, disability, smartphone addiction, and objective range-of-motion measurements within the same sample. This variability and methodological gap provided the rationale for the design of the present study.

3. MATERIAL AND METHOD

3.1 Study Design

This study was a cross-sectional observational study and was performed in order to determine the prevalence of mechanical neck pain in university students and its association with smartphone use, smartphone addiction, and cervical range of motion.

3.2 Duration of Study

Data collection and analysis for this study were conducted from December 2025 to May 2026 as part of the research project timeline, following approval of the study protocol. The study was conducted among undergraduate students enrolled at Government College University Faisalabad and The Superior University Lahore, Pakistan.

3.3 Inclusion Criteria

- University students of either sex, aged 18 years and above.
- Regular smartphone users (self-reported daily use).
- Students who provided written informed consent and completed the study questionnaire in full.

3.4 Exclusion Criteria

• Students with a history of trauma, fractures, or surgical intervention of the cervical spine.
• Students with any congenital or structural anomaly of the cervical spine.
• Students with a history of systemic, neurological, or rheumatologic disorders affecting the cervical spine.
• Students who did not participate or whose questionnaires were incomplete.

Sampling Technique
A non-probability convenience sampling technique was used to recruit eligible university students who fulfilled the inclusion criteria.

3.5 Outcomes
The main outcome was the prevalence of current mechanical neck pain. Other outcomes measured were pain severity (NPRS), neck disability (NDI), smartphone addiction (SAS-SV), answers given for neck problems in the Nordic Musculoskeletal Questionnaire, and cervical spine range of motion (flexion, extension, right and left lateral flexion, and right and left rotation) in degrees.

3.6 Scales / Tools
- Numeric pain rating scale (NPRS) - 11-point (0-10) scale for subjective rating to quantify the mean pain intensity of the neck during the previous week.[17]
- Neck disability index (NDI) - a 10-item questionnaire used to estimate the impact of neck pain on the ability to perform functional activities, quantified as a percentage.[18]
- Nordic musculoskeletal questionnaire (NMQ) - standard questionnaire used to assess any presence of musculoskeletal symptoms in the neck region for the last 12 months and 7 days.[19]
- Smartphone addiction scale-short version (SAS-SV) - a 10-item 6-point Likert scale tool to assess smartphone addiction related to excessive use of smartphones.[20]
- Cervical range of motion (CROM) - active movement of cervical spine assessed using goniometer with defined normal values of neck flexion, extension, lateral flexion to both right and left side, and neck rotation to both right and left side.[21]
- Demographic structured questionnaire including age, gender, height, weight (BMI), occupation, physical activity, daily hours of using smartphones, and main purpose of using the phone.

4. RESULTS
A total of 100 participants were included in the analysis. The mean age of the participants was 21.43 ± 1.51 years. The mean body Mass Index (BMI) was 24.10 ± 4.77 kg/m². The mean smartphone-use category score was 3.28 ± 1.08 on a five-point scale. The characteristics of the study subjects can be seen in Table 1.

Table 1: Demographic, Activity, and Smartphone-Use Characteristics.

Variable	Category	n (%)
Sex	Male	41 (41.0%)
	Female	57 (57.0%)
	Other	2 (2.0%)
Activity level	Sedentary	25 (25.0%)
	Lightly Active	33 (33.0%)
	Moderately Active	23 (23.0%)
	Very Active	12 (12.0%)
	Extremely Active	7 (7.0%)
Average smartphone use / day	<2 hours	7 (7.0%)
	2–4 hours	14 (14.0%)
	4–6 hours	36 (36.0%)
	6–8 hours	30 (30.0%)
	>8 hours	13 (13.0%)
Primary purpose of use	Academic	25 (25.0%)
	Social Media	35 (35.0%)
	Gaming	9 (9.0%)
	Communication	12 (12.0%)
	Entertainment	14 (14.0%)
	Other	5 (5.0%)

4.1 Pain History and Clinical Profile
Participants who experienced current neck pain were 45 (45.0%), while those without current neck pain were 55 (55.0%). Those with prior neck pain were 25 (25.0%) out of the total respondents, while 75 (75.0%) were free from prior neck pain.

Table 2: Pain History and Clinical Profile.

Variable	Category	n (%)
Duration of pain	No current neck pain	55 (55.0%)
	<1 week	13 (13.0%)
	1–4 weeks	10 (10.0%)
	1–3 months	8 (8.0%)
	3–6 months	8 (8.0%)
	>6 months	6 (6.0%)

Location of pain	No current neck pain	55 (55.0%)
	Upper neck	6 (6.0%)
	Lower neck	6 (6.0%)
	Right side of neck	5 (5.0%)
	Left side of neck	5 (5.0%)
	Both sides	12 (12.0%)
	Neck and shoulder region	11 (11.0%)
Nature of pain	No current neck pain	55 (55.0%)
	Dull	6 (6.0%)
	Sharp	4 (4.0%)
	Burning	4 (4.0%)
	Stiffness	10 (10.0%)
	Intermittent	11 (11.0%)
	Constant	10 (10.0%)
Previous history of neck pain	Yes	25 (25.0%)
	No	75 (75.0%)

4.2 Pain, Disability, and Cervical Range of Motion

The mean NPRS pain score = 2.38 ± 2.30. Mean NDI percentage score = 25.56 ± 20.40, while mean SAS-SV total score = 33.31 ± 12.23. The mean values of the cervical ROM are tabulated below in Table 3.

Table 3: Pain, Disability, Smartphone-Addiction, and Cervical ROM Outcomes.

Outcome Variable	Mean ± SD
NPRS pain score	2.38 ± 2.30
NDI percentage score	25.56 ± 20.40
SAS-SV total score	33.31 ± 12.23
Cervical flexion (°)	45.93 ± 3.47
Cervical extension (°)	62.38 ± 4.38
Right lateral flexion (°)	43.76 ± 3.04
Left lateral flexion (°)	43.55 ± 3.41
Right rotation (°)	77.77 ± 4.43
Left rotation (°)	76.90 ± 4.55

NDI category distribution: No disability, 28 (28.0%); Mild disability, 37 (37.0%); Moderate disability, 23 (23.0%); Severe disability, 8 (8.0%); Complete disability, 4 (4.0%).

4.3 Internal Consistency Reliability

The NDI demonstrated excellent internal consistency (Cronbach's α = 0.940), as did the SAS-SV (Cronbach's α = 0.949).

Table 4: Internal Consistency Reliability.

Instrument	Cronbach's α
Neck Disability Index (NDI)	0.940
Smartphone Addiction Scale – Short Version (SAS-SV)	0.949

4.4 Correlation Analysis

The association between smartphone usage, pain intensity, neck disability, smartphone addiction, and the cervical range of motion was evaluated using Spearman's rank order correlation test. The significant correlations are presented in Table 5.

Table 5: Statistically Significant Spearman Correlations.

Variable 1	Variable 2	r□	p-value
Smartphone use category	NPRS pain intensity	0.327	<0.001
Smartphone use category	NDI percentage	0.323	0.001
Smartphone use category	SAS-SV total	0.552	<0.001
NPRS pain intensity	NDI percentage	0.694	<0.001
NPRS pain intensity	SAS-SV total	0.518	<0.001
NPRS pain intensity	Cervical flexion	-0.389	<0.001
NPRS pain intensity	Cervical extension	-0.388	<0.001
NPRS pain intensity	Right lateral flexion	-0.248	0.013
NPRS pain intensity	Left lateral flexion	-0.308	0.002

NPRS pain intensity	Right rotation	-0.444	<0.001
NPRS pain intensity	Left rotation	-0.312	0.002
NDI percentage	SAS-SV total	0.428	<0.001
NDI percentage	Cervical extension	-0.293	0.003
NDI percentage	Left lateral flexion	-0.275	0.006
NDI percentage	Right rotation	-0.283	0.004
NDI percentage	Left rotation	-0.272	0.006
SAS-SV total	Cervical extension	-0.214	0.033
SAS-SV total	Left lateral flexion	-0.328	<0.001
SAS-SV total	Right rotation	-0.287	0.004
SAS-SV total	Left rotation	-0.354	<0.001
Cervical flexion	Cervical extension	0.268	0.007
Cervical flexion	Right rotation	0.376	<0.001
Cervical extension	Right rotation	0.216	0.031
Right lateral flexion	Right rotation	0.326	<0.001
Left lateral flexion	Right rotation	0.262	0.008
Left lateral flexion	Left rotation	0.239	0.017
Right rotation	Left rotation	0.292	0.003

4.5 Nordic Musculoskeletal Questionnaire Outcomes

Table 6: Nordic Musculoskeletal Questionnaire Neck-Related Outcomes.

Question	Response	n (%)
Neck trouble during last 12 months	Yes	45 (45.0%)
	No	55 (55.0%)
Prevented from normal activities due to neck problems	Yes	18 (18.0%)
	No	82 (82.0%)
Neck trouble during last 7 days	Yes	25 (25.0%)
	No	75 (75.0%)
Consulted a healthcare professional during last 12 months	Yes	15 (15.0%)
	No	85 (85.0%)

4.6 Normality Testing

The assumptions of normality for continuous variables were confirmed through the Shapiro-Wilk test. Age, NPRS pain intensity, average mobile phone usage, left lateral flexion, right rotation, right lateral flexion, neck flexion, NDI percent, and SAS-SV were shown to significantly deviate from the normal distribution ($p < 0.05$). Because several key study variables deviated significantly from normality, Spearman's rank-order correlation was used.

Table 7: Shapiro–Wilk Test of Normality for Continuous Study Variables.

Variable	N	Shapiro–Wilk W	p-value
Age (years)	100	0.952	0.001
BMI (kg/m²)	100	0.989	0.564
NPRS pain intensity	100	0.876	<0.001
Average smartphone use / day	100	0.908	<0.001
Left rotation (°)	100	0.977	0.077
Left lateral flexion (°)	100	0.972	0.033
Right rotation (°)	100	0.970	0.023
Right lateral flexion (°)	100	0.973	0.040
Flexion (°)	100	0.971	0.027
Extension (°)	100	0.987	0.415
NDI percentage score	100	0.890	<0.001
SAS-SV total score	100	0.973	0.036

4.7 Figures

The following figures present the main descriptive and association findings relevant to the study objectives.

Distribution of Neck Disability Index (NDI) Categories Among University Students

The most prevalent category reported was mild disability at 37%, followed by no disability (28%) and moderate disability (23%), while severe and complete disability were the least reported categories.

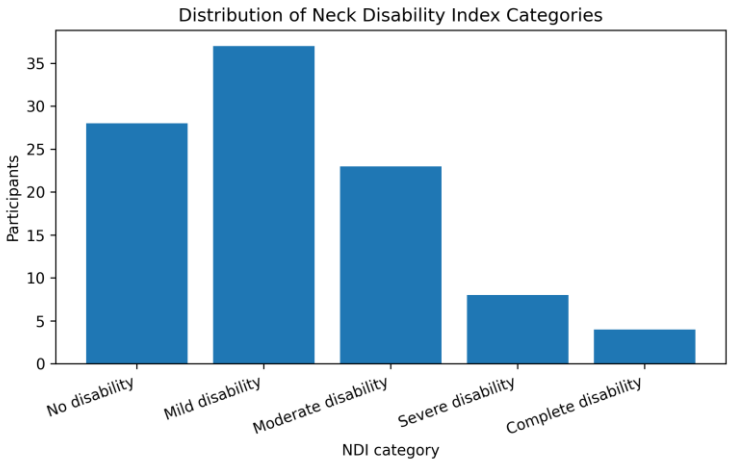

Figure 1: Distribution of Neck Disability Index (NDI) Categories Among University.

Distribution of Average Daily Smartphone Use Among Participants

Figure 2 represents the average daily usage time of the smartphone by the participants in the study. The majority of the participants use the smartphone for 4-6 hours or 6-8 hours each da.

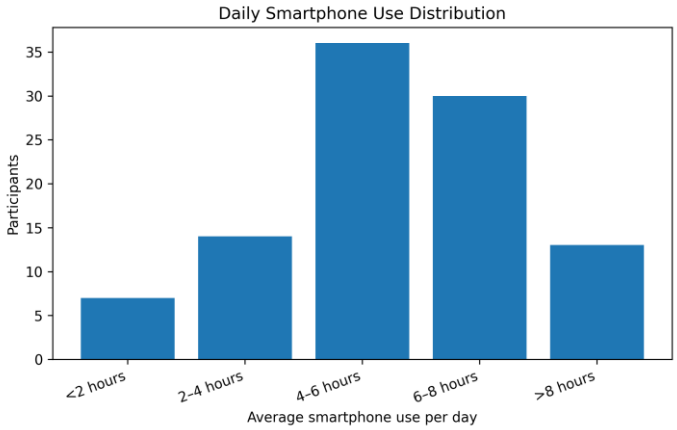

Figure 2: Distribution of average daily smartphone use.

Association Between Smartphone Use Category and Neck Pain Intensity

Figure 3 demonstrates a positive relationship between smartphone use duration and neck pain intensity. Higher categories of smartphone use were associated with increased pain scores.

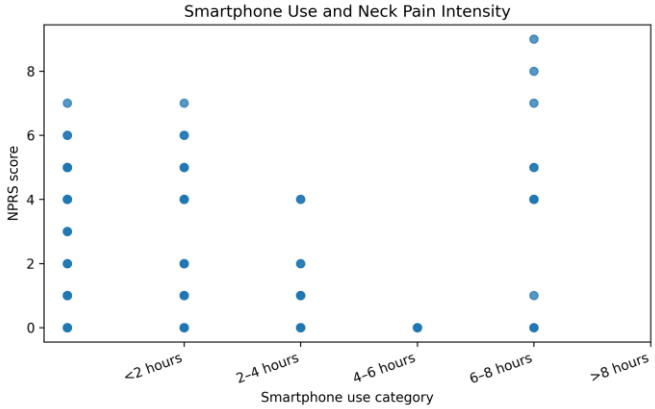

Figure 3: Relationship between smartphone-use category and neck pain intensity.

Association Between Smartphone Use Category and Neck Disability

Figure 4 illustrates that greater smartphone use was associated with increased neck disability. Participants with longer daily smartphone use demonstrated higher NDI scores.

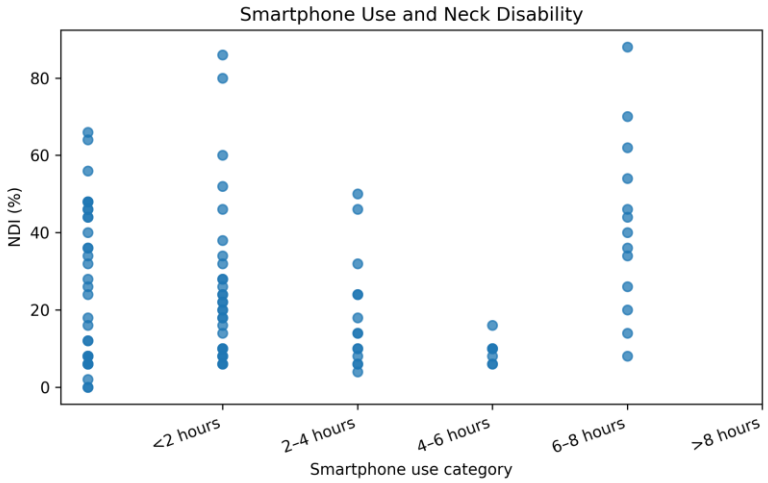

Figure 4: Relationship between smartphone-use category and neck disability.

Mean Cervical Range of Motion Among University Students

Figure 5 presents the mean cervical range of motion measured in six movement directions. Cervical extension demonstrated the highest mean value, whereas lateral flexion showed comparatively lower values.

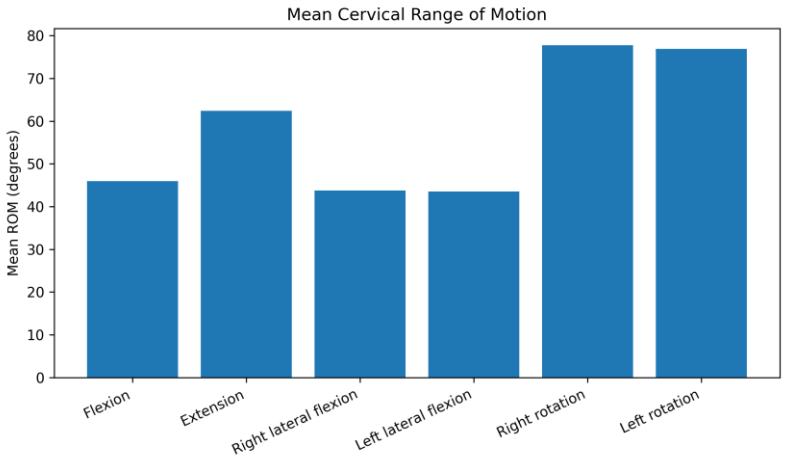

Figure 5: Mean cervical range of motion in the measured directions.

4.8 Statistical Analysis Summary

Continuous variables were described by means and standard deviation, whereas categorical variables were described in terms of frequency and percentage. Internal consistency was measured by Cronbach's Alpha. For analysis of association, Spearman's rank order correlation was performed. Statistical significance was established as $p < 0.05$.

5. DISCUSSION

In the current study, the prevalence of mechanical neck pain among university students, along with the relation between this condition and smartphone use, smartphone addiction, neck disability, and cervical range of motion, has been assessed. The results revealed that 45% of participants reported mechanical neck pain at the time of investigation. These findings indicate that mechanical neck pain is a common musculoskeletal complaint among university students. The prevalence observed in this study falls within the range reported by previous international studies involving university students.

It was found that there was a significant positive correlation between smartphone use and pain intensity, neck disability, and smartphone addiction. The longer periods of smartphone use were linked with higher NPRS, NDI, and SAS-SV scores. The observed findings suggest that prolonged smartphone use may increase

cervical loading through sustained neck flexion and poor posture, thereby contributing to neck pain and disability.

Furthermore, a substantial positive relationship was observed between neck disability and pain intensity ($r = 0.694$, $p < 0.001$), indicating that higher pain intensity was associated with greater functional limitation in carrying out everyday tasks. The result obtained from the present study supports other findings that people with high pain intensity experience difficulties when carrying out their normal physical and academic activities. These findings highlight the importance of early identification and management of neck pain among university students to minimize functional limitations.

Smartphone addiction was moderately associated with both neck pain and disability, suggesting that behavioral dependence on smartphones may contribute to prolonged exposure to harmful postural positions. Participants with higher smartphone addiction scores tended to continue using smartphones for long durations and also exhibited poor posture while doing this. Consequently, mechanical load on the cervical spine increases due to this. These findings suggest that smartphone addiction may play a significant role in the development of musculoskeletal problems.

Despite the fact that average values of cervical range of motion remained within the range of normal levels, there was evidence of a strong negative correlation between the magnitude of pain intensity and disability in the neck region, smartphone addiction, and some cervical motion measurements, especially cervical rotation and lateral flexion. Therefore, more pain and disability were related to lower cervical range of motion. Cervical range of motion can be considered an early mechanical response to prolonged static positions and repetitive strain on the neck during smartphone use. The excellent internal consistency of the Neck Disability Index (Cronbach's $\alpha = 0.940$) and the Smartphone Addiction Scale–Short Version (Cronbach's $\alpha = 0.949$) indicates that these instruments were highly reliable in the present study population.

From a clinical perspective, the findings emphasize the importance of ergonomic education, posture correction, regular movement breaks, and awareness programs to reduce the burden of smartphone-related neck pain among university students. University health promotion programs can play an essential role in reducing the prevalence of mechanical neck pain among the population of university students.

There are some limitations that should be considered when interpreting these results. First, due to the nature of the study (cross-sectional), causality between smartphone use and mechanical neck pain cannot be determined. Secondly, time spent using a smartphone and the history of pain was collected using self-reported data; thus, there is a chance for recall bias. Thirdly, the sample for this study consists of students from two universities, which may impact the validity of the results.

In summary, this study highlights the high prevalence of mechanical neck pain amongst university students and its strong association with higher smartphone usage, higher smartphone addiction, higher neck disability, and decreased neck range of motion. The results further emphasize the necessity for preventative measures focusing on proper smartphone usage and avoiding the negative musculoskeletal implications resulting from it.

5.1 CONCLUSION

This study demonstrated that mechanical neck pain is common among university students and is significantly associated with increased smartphone use, greater smartphone addiction, higher neck disability, and reduced cervical range of motion. These findings suggest that prolonged smartphone use may increase the risk of developing musculoskeletal problems affecting the cervical region. It may be useful for university students to learn about ergonomically correct smartphone use, proper posture, regular breaks during smartphone use, and other healthy practices related to smartphone use.

5.2 Strength

- The study made use of validated scales of self-report instruments (NPRS, NDI, NMQ, SAS-SV) along with an objective assessment of cervical range of motion using a universal goniometer to obtain both subjective and objective measures within the same sample.
- The internal consistencies of NDI and SAS-SV were found to be excellent (Cronbach's $\alpha > 0.90$) in the current sample.

5.3 LIMITATION

- The cross-sectional nature of the study prevents any conclusions regarding causality of the relationship between smartphone use and neck pain; a longitudinal study design would be required.
- There is no objective measure of time spent on the smartphone since it was categorized based on self-reports of the participants.
- Only 100 subjects were selected from two locations; thus, generalizing the findings to other cohorts of students or other age groups would not be possible.

5.4 Recommendation

Time: Future research should adopt a longitudinal study design to observe neck pain, neck disability, and cervical range of motion over time based on patterns of smartphone use.

Patient Collaboration: Future studies should involve collaboration with affected students in designing and evaluating ergonomic and postural-education interventions, and should consider objective smartphone-use tracking (e.g., screen-time applications) to reduce

reporting bias and improve the accuracy of exposure measurement.

REFERENCES

1. Candussi CJ, Kabir R, Sivasubramanian M. Problematic smartphone usage, prevalence and patterns among university students: A systematic review. Journal of Affective Disorders Reports, 2023; 14: 100643.
2. Gao Y, Chen Z, Chen S, Wang S, Lin J. Risk factors for neck pain in college students: a systematic review and meta-analysis. BMC Public Health, 2023; 23(1): 1502.
3. Kazeminasab S, Nejadghaderi SA, Amiri P, Pourfathi H, Araj-Khodaei M, Sullman MJ, et al. Neck pain: global epidemiology, trends and risk factors. BMC musculoskeletal disorders, 2022; 23(1): 26.
4. Ayhualem S, Alamer A, Dabi SD, Bogale KG, Abebe AB, Chala MB. Burden of neck pain and associated factors among smart phone user students in University of Gondar, Ethiopia. Plos one, 2021; 16(9): e0256794.
5. Lu X, An X, Chen S. Trends and influencing factors in problematic smartphone use prevalence (2012–2022): A systematic review and meta-analysis. Cyberpsychology, Behavior, and Social Networking, 2024; 27(9): 616–34.
6. Saeed A, Shahed A, Liaqat M, Farhat R, Khursheed R, Ahmed S, et al. Prevalence of forward head posture and its association with smartphone use among university students: prevalence of forward head posture and association with smartphone use. Pakistan BioMedical Journal, 2024; 13–8.
7. Rehman A, Karim A, Ali FS, Shakil M, Tanveer F. RELATION BETWEEN SMARTPHONE USAGE ADDICTION AND TEXT NECK SYNDROME IN STUDENTS OF LAHORE INSTITUTE OF SCIENCE AND TECHNOLOGY. Pakistan Journal of Physical Therapy (PJPT). 2024.
8. Chan LLY, Wong AYL, Wang MH, Cheung K, Samartzis D. The prevalence of neck pain and associated risk factors among undergraduate students: A large-scale cross-sectional study. International Journal of Industrial Ergonomics, 2020; 76: 102934.
9. Sirajudeen MS, Alzhrani M, Alanazi A, Alqahtani M, Waly M, Unnikrishnan R, et al. Prevalence of text neck posture, smartphone addiction, and its association with neck disorders among university students in the Kingdom of Saudi Arabia during the COVID-19 pandemic. PeerJ., 2022; 10: e14443.
10. Alsiwed KT, Alsarwani RM, Alshaikh SA, Howaidi RA, Aljahdali AJ, Bassi MM. The prevalence of text neck syndrome and its association with smartphone use among medical students in Jeddah, Saudi Arabia. Journal of Musculoskeletal Surgery and Research, 2021; 5(4): 266–72.
11. Aswini G, Manimozhi K. Prevalence of text neck syndrome among university students. Physiotherapy-The Journal of Indian Association of Physiotherapists. 2025; 19(1): 44–50.
12. Alzaidy ZF, Mukhlif HH. Smartphone Addiction Effect on Vision Syndrome and Fatigue for Students Colleges at Mosul City Universities, Iraq. Journal of Pioneering Medical Sciences, 2026; 14: 93–6.
13. Hawamdeh M, Al-Nassan SM, Obaidat SM, Shallan A, Hawamdeh ZM, Eilayyan O, et al. The relationship between using smartphones and text neck syndrome in online learning among university students in Jordan: A Survey Study. Ortopedia Traumatologia Rehabilitacja, 2023; 25(6): 315–20.
14. Lin P-Y, Lin Y-C, Wu W-T, Lee R-P, Peng C-H, Yao T-K, et al. Smartphone use and back pain: a narrative review of postural pathologies. Open Medicine, 2025; 20(1): 20251336.
15. Puntumetakul R, Chatprem T, Saiklang P, Phadungkit S, Kamruecha W, Sae-Jung S. Prevalence and associated factors of clinical myelopathy signs in smartphone-using university students with neck pain. International Journal of Environmental Research and Public Health, 2022; 19(8): 4890.
16. Hansraj KK. Assessment of stresses in the cervical spine caused by posture and position of the head. Surg Technol Int., 2014; 25(25): 277–9.
17. Modarresi S, Lukacs M, Ghodrati M, Salim S, MacDermid J, Walton D. CATWAD Consortium Group A Systematic Review and Synthesis of Psychometric Properties of the Numeric Pain Rating Scale and the Visual Analog Scale for Use in People With Neck Pain. Clin J Pain, 2021; 38: 132–48.
18. MacDermid JC, Walton DM, Avery S, Blanchard A, Etruw E, McAlpine C, et al. Measurement properties of the neck disability index: a systematic review. Journal of orthopaedic & sports physical therapy., 2009; 39(5): 400–17.
19. Horn CG, Jensen K, Hartvigsen J, Wekre LL, Skou ST, Folkestad L. Evaluation of the Nordic Musculoskeletal Questionnaire for measuring prevalence and the consequence of pain in a Danish adult OI population: a pilot study. Calcified Tissue International, 2024; 115(4): 405–12.
20. Zhao H, Rafik-Galea S, Fitriana M, Song T-J. Translation and psychometric evaluation of Smartphone Addiction Scale—Short Version (SAS-SV) among Chinese college students. PloS one, 2022; 17(11): e0278092.
21. Kiatkulanusorn S, Luangpon N, Srijunto W, Watechagit S, Pitchayadejanant K, Kuharat S, et al. Analysis of the concurrent validity and reliability of five common clinical goniometric devices. Scientific reports, 2023; 13(1): 20931.