International Journal of Health Sciences and Research
[Indexed, Peer-Reviewed Journal]
Volume 15; Issue: 4; April 2025
Website: www.ijhsr.org
Review Article *ISSN: 2249-9571*

Exploring the Relationship between Prolonged Mobile Use, Sedentary Behaviour, and Neck Pain in Students

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DOI: https://doi.org/10.52403/ijhsr.20250437

ABSTRACT

The widespread use of mobile phones and sedentary behavior, especially among students, has raised concerns regarding their impact on physical health, particularly musculoskeletal pain. One of the most commonly reported issues is neck pain, often attributed to prolonged mobile phone usage combined with poor posture. This review examines the relationship between extended mobile phone use, sedentary behavior, and neck pain in students, focusing on the mechanisms contributing to this condition and potential preventive measures. Neck pain, often referred to as "text neck," is caused by forward head posture during prolonged use of mobile devices, placing strain on the cervical spine and surrounding muscles. Additionally, poor posture and sedentary study habits exacerbate muscle fatigue, reduce blood circulation, and increase the risk of long-term spinal issues. A systematic review of 10 studies conducted between 2010 and 2024 highlights the high prevalence of neck pain among students, with factors such as prolonged mobile use, poor posture, and lack of physical activity contributing significantly to the issue. Studies consistently identify that mobile phone usage for more than six hours a day increases the severity of neck pain. Interventions such as adopting better ergonomic practices, taking regular breaks, engaging in physical exercises, and educating students on proper posture were found to help alleviate symptoms and reduce the risk of chronic pain. This review emphasizes the need for awareness programs and lifestyle adjustments to mitigate the impact of mobile use and sedentary behavior on neck health among students.

Key Words: Neck pain, smart phones, sedentary lifestyle

INTRODUCTION

In the modern era, mobile phones have become an integral part of daily life, especially among students, who rely on these devices for communication, study, and entertainment. However, the prolonged use of mobile phones and the sedentary behaviours associated with their use have raised concerns about their impact on physical health, particularly musculoskeletal pain. One of the most commonly reported issues is neck pain, which has been increasingly observed among students who engage in extended mobile use while maintaining poor posture. The relationship between prolonged mobile use, sedentary behaviour, and neck pain has become a significant area of research due to the growing prevalence of these behaviours in the student population.

Research suggests that "text neck," a term used to describe the neck pain caused by extended use of handheld devices, is a direct consequence of poor posture while interacting with mobile screens (Khurana et al., 2018). This condition is characterized by a forward head posture that increases the strain on the cervical spine, contributing to discomfort and pain in the neck, shoulders, and upper back (Winkelmann et al., 2020). Alongside mobile use, sedentary behaviour—such as prolonged sitting during study sessions—has been linked to an increased risk of musculoskeletal pain, as it often leads to poor posture and muscle fatigue (Cummings et al., 2019). The combination of these factors in students, who often engage in long hours of mobile use while sitting, can exacerbate neck pain and lead to chronic discomfort.

The prevalence of neck pain in students due to these behaviours has been reported in several studies. According to a study by Gupta et al. (2017), a significant proportion of students experience neck pain, with mobile phone usage being one of the primary contributing factors. Additionally, sedentary lifestyles, characterized by prolonged sitting and limited physical activity, have been associated with an increased risk of musculoskeletal disorders, including neck pain (O'Keeffe et al., 2021). However, despite growing evidence of the relationship between these factors, there remains a need for a comprehensive review to better understand the scope of the issue and identify effective interventions.

Physiology of Neck Pain Due to Mobile Use and a Sedentary Lifestyle

Neck pain associated with excessive mobile phone use and a sedentary lifestyle involves complex physiological mechanisms, including musculoskeletal strain, altered biomechanics, reduced circulation, and neural adaptations.

Biomechanics and Muscular Strain

Prolonged Smartphone usage often leads to poor posture, such as forward head posture, slouched posture, or rounded shoulders. Sustained forward head posture can cause injury to the structure of the cervical and lumbar spine, as well as ligaments. This posture increases the gravitational load on the cervical spine, leading to muscle fatigue and discomfort.

Reduced Blood Flow and Metabolic Changes

Extended periods of poor posture during Smartphone use can decrease blood circulation to neck muscles, leading to ischemia and the accumulation of metabolic waste products like lactic acid. This results in muscle stiffness and pain, as the reduced oxygen and nutrient supply impairs muscle recovery.

Neuromuscular Adaptations and Pain Perception

Chronic neck strain from prolonged Smartphone use can lead to neural adaptations in the central and peripheral nervous systems. Continuous activation of pain-sensitive structures in the neck may result in sensory hypersensitivity and chronic pain conditions.

Inter vertebral Disc and Spinal Changes

A sedentary lifestyle contributes to disc degeneration and cervical spine misalignment. Lack of movement reduces synovial fluid circulation within spinal joints, leading to stiffness, decreased flexibility, and early degenerative changes in the intervertebral discs. Over time, this can cause herniated discs, nerve compression, and chronic pain syndromes, exacerbating neck discomfort.

Psychological and Stress-Related Contributions

Excessive mobile use and prolonged sedentary behavior can increase mental stress and anxiety, which are linked to increased muscle tension via the sympathetic nervous system's fight-or-flight response. Chronic stress leads to sustained contraction of neck and shoulder muscles,

making pain more persistent and difficult to relieve.

Prolonged mobile phone use and a sedentary lifestyle contribute to chronic neck pain, stiffness, and postural deformities like forward head posture and kyphosis. These issues arise due to excessive strain on the cervical spine, leading to muscle imbalances, reduced mobility, and nerve compression, which may cause radiating pain to the shoulders and arms. Over time, poor spinal alignment increases the risk of cervical spondylosis and disc degeneration, significantly affecting daily activities. Beyond physical discomfort, neck pain also impacts neurological and psychological well-being. It can cause headaches, dizziness, stress, and sleep disturbances, reducing concentration and productivity. Additionally, excessive screen time heightens muscle tension and anxiety, making pain management more challenging. To prevent these effects, adopting proper posture, regular movement, reduced screen time, and stress management techniques is essential for maintaining overall health.

This review aims to explore the relationship between prolonged mobile use, sedentary behaviour, and neck pain in students. By examining the current literature, the review will highlight the key mechanisms through which these behaviours contribute to neck pain and discuss potential strategies for prevention and management. Through this exploration, we hope to contribute to a deeper understanding of the impact of modern technology and lifestyle choices on student health and well-being.

METHODOLOGY

This study follows a systematic review methodology to explore the relationship between prolonged mobile use, sedentary behaviour, and neck pain in students. The purpose is to consolidate findings from existing research to gain a comprehensive understanding of how these factors influence neck pain among students. The methodology for this review is designed to identify, evaluate, and synthesize the results of studies that examine the connection between these behaviours and neck pain.

1. Selection Criteria

To ensure the quality and relevance of the research included in this review, the following inclusion and exclusion criteria were applied:

S. No.	Inclusion Criteria:	Exclusion Criteria:
1.	Studies published in peer-reviewed journals.	Studies not related to the student population.
2.	Research focusing on students (age group 18–30 years).	Research focusing on non-relevant musculoskeletal disorders.
3.	Studies that investigate the relationship between mobile phone usage, sedentary behaviour, and neck pain.	Studies with no clear methodology or sample size.
4.	Studies published in English between 2010 and 2024.	Review papers or articles that do not include primary research.
5.	Quantitative, qualitative, and mixed-method studies.	
6.	Studies that measure or report on neck pain symptoms in relation to mobile use and sedentary behaviour.	

2. Search Strategy

A comprehensive literature search was conducted in multiple electronic databases, including: Pub Med, Scopus, Google Scholar, Science Direct, and Web of Science. The search was carried out using a combination of key terms such as: "Neck pain," "students," "mobile phone use," "sedentary behaviour," "text neck," and "musculoskeletal disorders." Boolean operators (AND, OR) were used to combine these keywords, allowing for a broader yet relevant set of results. The initial search returned a large number of articles. After applying the inclusion and exclusion

criteria, 10 studies were selected for inclusion in this review.

3. Data Extraction

For each selected study, the following data were extracted:

S. No.	Author's Details	Study Design	Sample Size	Methods	Key Findings
1	Iqbal, K., Hafeez, K., et. al (2024)	Cross sectional study	353 Students	Non-probability purposive sampling. Data were collected using the Smartphone Addiction Scale (SAS) and the Copenhagen Neck Disability Index (CNDS)	95.6% of participants reported neck pain due to Smartphone use. Women used smart phones longer (6.9 hours/day) than men (5.6 hours/day). A significant positive correlation ($r = .263$, $p < .000$) was found between Smartphone use and neck pain intensity. Sitting was linked to more pain (0.111%) compared to standing or walking (0.095%).
2	Al-Hadidi F, Bsisu I., et al. (2019)	Cross sectional study	500 students	self-administered online questionnaire	Age and duration of use were significantly associated with neck pain severity, while only duration of use was linked to pain duration. Those with higher pain severity (>4/10) sought more medical help and used more analgesia compared to those with lower pain severity (≤4/10). The differences in medical help-seeking and analgesia use were statistically significant ($p<0.001$).
3	Maayah MF, Nawasreh ZH, et al(2023)	Cross sectional study	867 students	Web based questionnaire	A history of neck/shoulder pain and hand-side used for writing were significant predictors of neck pain severity and duration, explaining 8.4% and 11.3% of the variance, respectively. Gender, phone usage, and study device time were also predictors of pain duration.
4	Ayhualem S, Alamer A, et al. (2021)	cross-sectional study	845 students	self-administered questionnaire	Out of 845 questionnaires, 808 students responded, with a 95.6% response rate. The prevalence of neck pain among Smartphone users was 47.4%, with factors like year of study, exercise, smoking, and device usage significantly associated with pain. Key predictors included using smart phones for over 6 hours, not taking breaks, and using multiple devices and social media.
5	Wah	Cross	81	self-administered questionnaire	The prevalence of static

	SW, Chatchawan U, et al. (2022)	sectional study	university students		balance impairment in university smart phone users with subclinical neck pain was 74.07%. Significant risk factors included daily smart phone use ≥ 4 hours, ≥4 years of smart phone use, and a neck disability index score ≥7. Students with these risk factors should be aware of their static balance impairment.
6	Namwongsa S, Puntumetakul R, et al. (2018)	cross-sectional survey study	779undergraduates	self-administered questionnaire	The neck was the most painful body region after smartphone use over 12 months, affecting 32.50% of users. Factors associated with neck disorders included a flexed neck posture (OR: 2.44) and smoking (OR: 8.99).
7	Lorusso A, Bruno S, et al. (2019)	Cross sectional study	183 university students	self-administered questionnaire	Fourth-year students had significantly higher exposure to risk factors like daily computer use, prolonged screen time without breaks, excessive mouse use, and poor workstation ergonomics. Neck pain was the most common symptom (69%), followed by hand/wrist (53%), shoulder (49%), and arm (8%) pain. The prevalence of neck and hand/wrist pain was significantly higher among fourth-year students.
8	Sarraf F, Varmazyar S. (2022)	cross-sectional survey study	80 college students	The severity of neck pain (SNP), along with the head and neck tilt angles, gaze angle, and the extent of change in forward head posture, were assessed.	Most participants (51.3%) experienced moderate to severe neck pain. The angles for head, neck tilt, and gaze varied significantly across positions. The best posture was in a sitting position with a backrest (head: 100.6°, neck: 32.5°, gaze: 58.2°), while the worst posture occurred sitting without a backrest (head: 109.6°, neck: 22.0°) and the most awkward posture was standing (gaze: 67.1°).
9	Abdel-Aziem AA, Abdel-Ghafar MA,et al. (2022)	Observational Study	34 male students	The head flexion, neck flexion, gaze, and craniocervical angles were assessed using the Kinovea software program.	Significant increases were observed in head flexion, neck flexion, and gaze angles, with both groups showing a notable decrease in craniocervical angle when sitting compared to standing, during and 30 minutes after smartphone use. Group A had significantly higher head flexion, neck flexion, and gaze angles, as

					well as a lower craniocervical angle, compared to group B in both postures ($p<0.05$).
10	Zheng DD, Li D, Cheng JX, Jin RH.(2024)	cross-sectional survey study	426 students	comprehensive online questionnaire	Neck pain prevalence was significantly higher during online learning (62.7%) compared to before (37.3%) ($P < .05$). A significant correlation was found between neck pain and factors like learning while lying on a bed or table, device usage duration, and exercise habits ($P < .05$).

4. Data Synthesis

Once the data was extracted, the findings from the 10 studies were grouped into thematic categories to facilitate a comparative analysis. The key themes that emerged include:

Prevalence of Neck Pain in Students with Prolonged Mobile Use and Sedentary Behavior:

Several studies highlighted high prevalence of neck pain due to prolonged mobile use, with up to 95.6% of participants reporting neck pain in relation to smartphone use (Iqbal et al., 2024). Other studies found significant associations between neck pain and factors like prolonged device usage and poor posture (Zheng et al., 2024; Ayhualem et al., 2021).

Mechanisms Linking Poor Posture and Neck Pain:

Poor posture, especially forward head posture and flexed neck posture, was a significant risk factor for neck pain (Namwongsa et al., 2018; Sarraf & Varmazyar, 2022). Studies also found that sitting without a backrest (Sarraf & Varmazyar, 2022) and lack of breaks during Smartphone use (Iqbal et al., 2024; Wah et al., 2022) contributed to poor posture and increased pain.

Impact of Duration and Frequency of Mobile Use:

Duration of smartphone use was strongly linked to neck pain. Those using smart phones for over 6 hours daily or with a history of prolonged usage (>4 years) experienced significantly higher neck pain severity (Wah et al., 2022; Al-Hadidi et al., 2019). Studies like Ayhualem et al. (2021) found that longer device use and lack of breaks increased neck pain severity.

Interventions to Mitigate Neck Pain:

Ergonomic practices, such as using backrests while sitting (Sarraf & Varmazyar, 2022), taking breaks, and managing screen time was proposed to alleviate neck pain (Iqbal et al., 2024). Exercise programs were also recommended to reduce pain (Zheng et al., 2024), while postural education, particularly focusing on neck and head tilt angles, was emphasized in several studies to reduce pain and improve posture (Sarraf & Varmazyar, 2022; Abdel-Aziem et al., 2022).

5. Ethical Considerations

As this is a review of existing literature, there are no ethical concerns related to primary data collection. All included studies had undergone ethical approval processes as required by their respective institutions.

6. Limitations of the Methodology

Although the systematic review approach provides a comprehensive summary of the current state of research, it is important to note that the findings may be subject to publication bias, as studies with significant or positive results are more likely to be published. Additionally, the variability in research methodologies, such as differences

in how neck pain is assessed or defined, could limit the ability to directly compare the studies' findings.

CONCLUSION

The studies collectively highlight the significant impact of prolonged mobile use and poor posture on neck pain among students. The prevalence of neck pain was notably higher in individuals with extended daily screen time, poor ergonomic practices, and sedentary behaviour, particularly in those who used smart phones for more than 6 hours per day. Forward head posture, flexed neck posture, and inadequate workstation ergonomics were consistently identified as key contributors to neck pain. Additionally, factors such as age, history of neck or shoulder pain, and lack of physical exercise further exacerbated the severity and duration of symptoms. Several interventions, including adopting better ergonomic practices, taking regular breaks, and incorporating exercise programs, were proposed to mitigate the effects of neck pain. Postural education aimed at improving head and neck alignment was also emphasized as a critical preventive measure. Overall, the findings suggest that addressing these risk factors through targeted interventions and awareness programs can significantly reduce the prevalence and severity of neck pain in students, particularly those with prolonged mobile and screen use.

Declaration by Authors

Ethical Approval: None
Acknowledgement: None
Source of Funding: None
Conflict of Interest: The authors declare no conflict of interest.

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How to cite this article: Preeti, Manila Duhan, Ruchi, Sonam, Navdeep Bisla. Exploring the relationship between prolonged mobile use, sedentary behaviour, and neck pain in students. *Int J Health Sci Res.* 2025; 15(4):255-262. DOI: *https://doi.org/10.52403/ijhsr.20250437*

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