



Smartphone Usage and Its Impact on Neck Pain Intensity in University

Students: A Cross-Sectional Study

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Abstract. *Introduction: Smartphone use has increased substantially in higher education and is widely used by university students for both academic and non-academic activities. Prolonged smartphone use combined with poor posture may increase mechanical load on cervical structures and lead to neck pain. This study aimed to examine the relationship between smartphone use and neck pain intensity among students at IKES Suaka Insan. Methods: A quantitative cross-sectional study was conducted involving 55 undergraduate nursing and physiotherapy students selected using cluster sampling. Smartphone use was assessed using a structured questionnaire, while neck pain intensity was measured using the Visual Analog Scale (VAS). Data were analyzed using Spearman's rho correlation test. Results: The analysis showed a weak negative association between smartphone use and neck pain intensity ($r = -0.16$), with a p -value of 0.20 (>0.05), indicating no statistically significant relationship. Conclusion: There was no significant association between smartphone use and neck pain intensity among students. Future studies should include ergonomic posture and duration of smartphone use as additional variables.*

Keywords: Musculoskeletal Symptoms; Neck Pain Intensity; Posture; Smartphone Usage; University Students.

1. INTRODUCTION

University students engage in various academic and non-academic activities to complete their education. During these activities, musculoskeletal disorders, particularly those affecting the upper body, are frequently reported and have become an important global health concern. Neck pain is one of the most common musculoskeletal complaints and may arise from multiple factors, including disorders of the intervertebral discs, muscles, ligaments, or nerve roots in the cervical region. Leluni et al. (2023) defined neck pain as pain perceived in the posterior or basal region of the head, extending from the upper cervical spine to the upper back and potentially radiating toward the scapular region. Neck pain is considered the second most prevalent musculoskeletal disorder after low back pain. Its etiology is multifactorial, ranging from cervical intervertebral disc injuries and muscle strain to inflammation or compression of ligaments and nerve roots surrounding the cervical spine (Ashraf et al., 2023).

Several occupational and lifestyle factors have been reported to contribute to the development of neck pain, including repetitive movements, heavy lifting, and the increasing use of smartphones (Ashraf et al., 2023; Côté et al., 2008; Dzuria, 2021). Neck pain generally refers to pain or stiffness occurring in the posterior region of the neck, extending from the base of the skull (occipital condyle) to the seventh cervical vertebra (C7). Poor ergonomic posture, particularly forward head posture during prolonged activities, can increase mechanical load on cervical muscles and lead to neck pain as well as impairments in dynamic balance among

individuals of productive age (Patel et al., 2023). Clinically, neck pain is often characterized by discomfort such as fatigue, soreness, or bruising-like pain, particularly in muscles surrounding the neck, including the trapezius and posterior deltoid muscles (Fitriani, 2022).

Globally, neck pain represents a significant public health problem. According to the Global Burden of Disease (GBD) Study 2021, approximately 203 million people worldwide experienced neck pain in 2020 (Wu et al., 2024). Data from the Global Burden of Disease Study 2019 reported that approximately 3,551 individuals per 100,000 population suffered from neck pain globally, with higher prevalence observed in high-income countries, particularly in the Asia–Pacific region (Shin et al., 2022). In Southeast Asia, the prevalence reached 4,179.3 per 100,000 population, while in Indonesia it ranged from approximately 2,700 to 3,000 per 100,000 population (Shin et al., 2022). Studies among university students have also reported a high prevalence of neck pain. For example, Paracha et al. (2019, as cited in Zeffira et al., 2023) found that 38% of 200 medical students aged 18–25 years experienced neck pain, of whom 64.5% had acute neck pain and 35.5% had chronic neck pain. Similarly, Panggabean and Pujiastuti (2021) reported that the prevalence of neck pain among the adult population in Indonesia reached 16.6%, with 0.6% experiencing severe pain. Among medical students at UIN Syarif Hidayatullah Jakarta, the prevalence was reported to be as high as 61.7% (Zeffira et al., 2023).

A preliminary study conducted on November 29, 2024, involving 233 undergraduate students from the Physiotherapy and Nursing programs in semesters I, III, V, and VII at IKES Suaka Insan revealed a high prevalence of neck pain among students. Among seventh-semester students, 66.0% reported experiencing neck pain, while 78.1% of fifth-semester students reported similar complaints. In the third semester, 48.2% of students reported neck pain, whereas the prevalence among first-semester students reached 45.5%. Based on Visual Analog Scale (VAS) assessments, most students experienced mild to moderate pain, with moderate pain being the predominant category across nearly all semesters. These findings indicate that neck pain is a common musculoskeletal problem among students at IKES Suaka Insan.

Technological advancements, particularly the widespread use of smartphones and internet-based services, have facilitated various daily activities but have also contributed to increasingly sedentary lifestyles. Smartphone use in the educational sector has increased substantially, especially among university students who rely on these devices to access information, complete academic tasks, communicate, and participate in online learning activities (Jamun & Ntelok, 2022; Kuss & Griffiths, 2017).

Data from Indonesia also demonstrate the rapid growth of internet and smartphone use. According to Wibisono et al. (2023), the number of internet users in Indonesia reached approximately 150 million people, with around 60% accessing the internet through smartphones. Furthermore, survey data from the Indonesian Internet Service Providers Association (APJII) indicated that internet penetration reached 73.7% during 2019–2020, with 95.4% of users accessing the internet via smartphones. Despite the numerous benefits offered by digital technology, excessive use of electronic devices has been associated with various adverse health outcomes, particularly musculoskeletal disorders (Jamun & Ntelok, 2022).

University students often spend long periods using smartphones for both academic and recreational purposes. In many cases, students engage extensively in activities such as browsing social media, using messaging applications, and playing online games, sometimes even during lectures or study sessions. Such behaviors may negatively affect concentration and academic performance while also increasing the risk of musculoskeletal complaints (Kuss & Griffiths, 2017).

Several factors contribute to the occurrence of neck pain among university students, including prolonged smartphone use, poor posture during studying, prolonged sitting, forward head posture, and repetitive upper limb movements. In addition to physical factors, psychosocial conditions such as depression and insomnia have also been identified as important contributors to neck pain (Natashia & Makkiyah, 2024).

Excessive smartphone use may also lead to smartphone dependency, causing students to spend considerable amounts of time engaging in entertainment or social media activities instead of academic tasks (Kuss & Griffiths, 2017). Przybylski et al. (2013) suggested that the recommended maximum duration of smartphone use among adolescents is approximately 4 hours and 17 minutes per day. Exceeding this duration may indicate problematic smartphone use and may interfere with cognitive functioning.

Prolonged smartphone use and computer-related activities can lead to repetitive muscle activation, resulting in muscle strain and cumulative musculoskeletal injuries affecting the neck and shoulder regions (Eitvivipart et al., 2018). Extended smartphone use may increase cervical muscle tension and alter neck movement patterns involving the upper trapezius, scalene, splenius capitis, splenius cervicis, and rhomboid muscles.

Persistent exposure to these conditions, especially when combined with poor posture, may lead to anatomical changes and increased muscle tension in the cervical region, ultimately resulting in neck pain. The multifunctionality of smartphones, including their use for social

media, communication, learning, and entertainment, further contributes to prolonged daily usage (Lai et al., 2023).

The consequences of neck pain include decreased concentration and productivity, musculoskeletal complaints such as soreness, stiffness, numbness, and tingling sensations, and an increased risk of structural injury involving muscles, ligaments, nerves, and bones. Neck pain may also cause psychological effects, including stress and postural disturbances due to recurrent pain episodes (Jamun & Ntelok, 2022). Among university students, neck pain can negatively affect physical health, postural alignment, and mobility while also contributing to psychological problems such as stress, depression, and anxiety, which may ultimately interfere with academic performance (Prayogo et al., 2025).

Despite the increasing prevalence of smartphone use among university students and its potential association with musculoskeletal complaints, limited research has specifically examined the relationship between smartphone use and neck pain intensity among students in Indonesian higher education settings. Therefore, this study aims to investigate the relationship between smartphone use and the severity of neck pain among students at IKES Suaka Insan Banjarmasin.

2. METHODS

The sample in this study consisted of 55 regular undergraduate students enrolled in the Bachelor of Nursing and Bachelor of Physiotherapy programs in the sixth semester at IKES Suaka Insan. A cluster sampling technique was applied to select the participants.

This study used a quantitative correlational research design with a cross-sectional approach to examine the relationship between smartphone use and neck pain intensity. Data were collected at a single point in time using a smartphone usage questionnaire and the Visual Analog Scale (VAS) to measure neck pain intensity.

The data collection process was conducted directly at Marie Anne Hall, IKES Suaka Insan, under supervision to ensure that respondents completed the questionnaires independently and honestly. After data collection, the data were processed and analyzed using the Spearman's rho correlation test to determine the relationship between smartphone use and the level of neck pain.

3. RESULTS AND DISCUSSION

The data in this study included respondents' characteristics (age, sex, and study program), smartphone usage, and the level of neck pain among students at IKES Suaka Insan. A total of 55 respondents participated in this study, which can be described as follows:

Respondent Characteristics

Table 1. Characteristics of Students at IKES Suaka Insan.

Characteristics	n	Frequency	(%)
Age			
18-21 years	55	48	87,30
22-25 years		7	12,70
Mean		20,52±0,79	
Sex			
Male	55	10	18,20
Female		45	81,80
Program Study			
Nursing	55	48	87,30
Physiotheray		7	12,70

Based on the respondent characteristics (Table 1), age was categorized into two groups: 18–21 years, comprising 48 respondents (87.38%), and 22–25 years, comprising 7 respondents (12.70%). The mean age of the respondents was 20.52 ± 0.79 years, which falls within the early adulthood age range. Regarding sex, the majority of respondents were female, with 45 participants (81.80%), while male respondents accounted for 10 participants (18.20%). In terms of academic background, most respondents were enrolled in the Nursing study program, totaling 48 participants (87.30%), whereas 7 respondents (12.70%) were from the Physiotherapy study program.

Smartphone Use

Table 2. Smartphone Use Among Students at IKES Suaka Insan.

Smartphone Use	n	Frequency	(%)
Low		1	1,80
Moderate	55	6	10,90
High		32	58,20
Very High		16	29,10
Mean		45,56±5,83	

The results presented in Table 2 indicate that the majority of students were classified in the high smartphone use category, comprising 32 respondents (58.20%), followed by the very high category with 16 respondents (29.10%). The moderate category included 6 respondents (10.90%), while only 1 respondent (1.80%) was classified in the low category. The mean

smartphone use score was 45.56 ± 5.83 , indicating that, overall, respondents tended to demonstrate a high level of smartphone use.

Neck Pain Severity

Table 3. Neck Pain Severity Among Students at IKES Suaka Insan.

Neck Pain Severity	n	Frequency	(%)
No Pain	55	3	5,50
Mild Pain		27	49,10
Moderate Pain		22	40,00
Severe Pain		3	5,50
Mean		3,7 $\pm$ 1,7	

The results presented in Table 3 show that the majority of respondents experienced mild neck pain, accounting for 27 respondents (49.10%), followed by moderate neck pain in 22 respondents (40.00%). Severe neck pain was reported by 3 respondents (5.50%), while 3 respondents (5.50%) reported no neck pain. The mean neck pain score was 3.7 ± 1.7 , which falls within the moderate pain category. These findings indicate that although a considerable proportion of students experienced neck pain, the overall severity was predominantly mild.

The Relationship Between Smartphone Use and the Level of Neck Pain Among Students at IKES Suaka Insan Banjarmasin

The correlation analysis in this study was conducted using Spearman's rank correlation test to determine whether smartphone use was associated with the level of neck pain among students at IKES Suaka Insan. The results are presented as follows:

Table 4. Results of the Spearman's Rho Test on the Association between Smartphone Use and Neck Pain Severity among Students at IKES Suaka Insan.

Smart Phone Use	Neck Pain Severity				P-Value	OR
	No Pain	Mild Pain	Moderate Pain	Severe Pain		
Low	0	0	1	0	0,2	-0,16
Moderate	0	4	2	0		
High	3	11	15	3		
Very High	0	12	4	0		

The data presented in Table 4 indicate that the majority of students were classified in the high smartphone use category, with moderate neck pain being the most frequently reported level of pain. Correlation analysis using Spearman's rho revealed a *p*-value of 0.20 (> 0.05) and a correlation coefficient (*r*) of -0.16 . These findings indicate that smartphone use was not significantly associated with the level of neck pain in this study population. The relationship observed was negative and of very weak strength.

Discussion

Univariate Analysis (Respondent Characteristics, Neck Pain Level, and Smartphone Use)

The respondents in this study were aged between 18 and 25 years, with the majority aged 18–21 years (48 respondents). The mean age was 20.52 years, indicating that most respondents were within the early adulthood stage. This finding is consistent with Papalia et al. (2011), who stated that undergraduate students are typically within the age range of 18–24 years, which falls into the early adulthood category. Dzuria reported that individuals aged 15–24 years are at risk of experiencing neck pain, and the prevalence of neck pain tends to increase with age, reaching its peak between 65 and 69 years. Furthermore, Zeffira et al. suggested that age may influence the occurrence of neck pain, as muscle strength increases during early adulthood (approximately 20–30 years) and begins to decline after the age of 40.

The results of this study also showed that the majority of respondents were female, indicating a substantially higher proportion of female participants compared to males. This finding is consistent with the study conducted by Lai et al., which reported that females have a higher risk of experiencing neck pain than males. This difference may be related to physiological factors, as males generally possess greater muscle mass and strength, allowing them to better withstand physical loads. In contrast, females tend to have lower muscle mass and muscle endurance, making them more susceptible to muscle fatigue and pain perception.

Putra et al. also reported that sex influences the incidence of neck pain. Males tend to have larger intervertebral discs compared to females, which allows them to better tolerate the mechanical load of the head during neck flexion. Consequently, females are more likely to experience neck pain. Similarly, Côté et al. found that females report musculoskeletal complaints, including neck pain, more frequently than males. These differences may be associated with hormonal influences, muscle structure, and psychosocial factors. Ichsanti and Sari further supported these findings by reporting that females are more prone to neck pain than males. In line with Wang et al., females also demonstrate a higher chronicity of neck pain compared to males, which may be influenced by psychological factors such as a lower pain threshold.

Most respondents in this study were from the Nursing study program (48 respondents), while only 7 respondents were from the Physiotherapy program. This distribution is consistent with data from the Academic Administration Bureau (BAA), which indicates that the number of nursing students at IKES Suaka Insan is substantially larger than that of Physiotherapy students.

Regarding smartphone use, the majority of respondents were categorized as having high smartphone usage. This finding reflects the important role of smartphones in students' daily activities, particularly in supporting academic tasks and social communication. Previous studies have reported that high smartphone use occurs because smartphones are considered an essential tool for many individuals, especially students who rely on them for accessing information and completing academic assignments that require internet connectivity⁽²⁶⁾. High levels of smartphone use are also associated with communication needs, academic support, information seeking, and entertainment purposes, such as reducing stress, loneliness, or anxiety. Among young adults, excessive smartphone use is often influenced by social and emotional needs, academic demands, digital learning environments, lifestyle patterns, and entertainment activities.

The findings of this study also showed that most respondents experienced mild neck pain (27 participants). This condition may be related to the relatively young age of the respondents, as musculoskeletal structures at this stage generally retain good elasticity, strength, and regenerative capacity. During early adulthood, the muscles and ligaments of the neck are better able to adapt to postural stress, resulting in symptoms that are usually mild in intensity. In addition, respondents may have frequently changed posture while using smartphones, limited the duration of continuous use, and obtained sufficient rest.

These findings are consistent with Eitivipart et al., who reported that mild pain intensity may occur when individuals frequently change body posture or obtain adequate rest. Postural variation and adequate rest have also been identified as protective factors against musculoskeletal disorders. Similarly, Puspitasari and Hikmah reported that the majority of respondents experienced mild neck pain, with 76 participants (86.4%) classified in this category. Putri et al. also reported that among 45 respondents, 42 students (93.33%) experienced mild neck pain.

Overall, neck pain among smartphone users may be influenced by the intensity of smartphone use, which affects the duration of neck flexion posture. However, neck pain in young individuals may also be influenced by other contributing factors such as sex, age, workload, and duration of smartphone use. Wardana et al. similarly reported that 42 respondents (64.6%) experienced mild neck pain, which may be associated with factors such as age, non-ergonomic smartphone posture, and prolonged smartphone use that may lead to cervical muscle fatigue.

Bivariate Analysis (Relationship Between Smartphone Use and the Level of Neck Pain Among Students at IKES Suaka Insan Banjarmasin)

The correlation analysis between smartphone use and the level of neck pain using the Spearman's rho test showed a p-value of 0.20 ($p > 0.05$) and a correlation coefficient (r) of -0.16 (95% CI: -0.30 to 0.00). These findings indicate that there was no statistically significant relationship between smartphone use and the level of neck pain among students at IKES Suaka Insan Banjarmasin. The correlation coefficient also showed a negative and very weak relationship. Therefore, the alternative hypothesis (H_a) was rejected and the null hypothesis (H_0) was accepted.

Although the majority of respondents reported high levels of smartphone use, most of them experienced only mild neck pain. This finding suggests that smartphone use alone may not be sufficient to cause severe neck pain among university students. Neck pain is a multifactorial condition that may be influenced by various factors, including body posture, psychological stress, physical activity, and sleep quality.

This finding is consistent with the study conducted by Zeffira et al., which reported no significant relationship between smartphone use and neck pain complaints among medical students at Baiturrahmah University, Padang (p-value = 0.853)⁽¹⁰⁾. The absence of a significant association in that study may be explained by the respondents' smartphone use patterns, which were not continuously prolonged because they frequently took breaks or engaged in other activities. Such intermittent use allows muscle movement and reduces stiffness in the neck muscles.

Similarly, Hikmah reported that respondents often felt more relaxed and were able to change their body posture while using smartphones, even when the level of smartphone use was high. This behavioral pattern may reduce the risk of excessive cervical muscle tension. Lai et al. also reported no significant relationship between smartphone use and neck pain severity, as respondents managed their symptoms by performing stretching exercises, applying warm or cold compresses to the neck area, and using medication when necessary.

Sitomorang et al. also concluded that smartphone use is not the sole factor contributing to neck pain complaints, as other factors such as posture, age, sex, and workload may also influence the occurrence of neck pain. Similarly, Lianto et al. reported no significant relationship between smartphone use and sitting posture in relation to neck pain among medical students at Udayana University. The authors suggested that hand position, particularly an arms-forward posture commonly adopted during smartphone use, may also contribute to the development of neck pain.

In contrast, Lee et al. reported that prolonged smartphone use may lead to cervical muscle strain due to sustained forward head posture. Hikmah and Puspitasari also indicated that high levels of smartphone use may cause neck muscle fatigue resulting from prolonged static posture, thereby increasing muscle tension. However, during the COVID-19 pandemic, despite the high use of smartphones among university students, students reported feeling more relaxed during online learning because they were able to change posture freely and were not required to maintain static positions for extended periods. This finding is consistent with Lai et al., which showed that although smartphone use was high, the neck pain experienced by respondents remained predominantly mild.

The findings of this study differ from those reported by Alzaid et al., who found a significant relationship between smartphone use and neck pain, suggesting that excessive smartphone use may negatively affect posture and contribute to the development of neck pain⁽³⁵⁾. Similarly, Simamora and Ningsih reported a significant association between smartphone use and neck pain, indicating that high levels of smartphone use may increase the risk of musculoskeletal complaints in the cervical region.

4. CONCLUSIONS AND SUGGESTION

This study found that smartphone use among students at IKES Suaka Insan was generally high, while most respondents experienced neck pain at a mild level. The correlation analysis showed a negative relationship with very weak strength ($r = -0.16$) and a p-value greater than 0.05, indicating that there was no statistically significant association between smartphone use and the level of neck pain among students. These findings suggest that smartphone use alone may not be the primary factor contributing to neck pain, as other factors such as posture, duration of use, and individual characteristics may also play important roles. Future studies are recommended to include additional variables such as ergonomic posture, duration of smartphone use, and physical activity to better understand the factors associated with neck pain among university students.

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