Prevalence and Severity of Neck Pain and its Association with Smartphone Addiction among Undergraduate Students at the Kulliyyah of Allied Health Sciences (KAHS), IIUM Kuantan

Mawar Erizha Azaliman, BSc
Department of Physical Rehabilitation Sciences,
Kulliyyah of Allied Health Sciences,
International Islamic University Malaysia,
Jalan Sultan Ahmad Shah, Bandar Indera Mahkota,
25200 Kuantan, Pahang,
Malaysia
mawarerizha@gmail.com

*Rozlin Abdul Rahman, PhD
Department of Physical Rehabilitation Sciences,
Kulliyyah of Allied Health Sciences,
International Islamic University Malaysia,
Jalan Sultan Ahmad Shah, Bandar Indera Mahkota,
25200 Kuantan, Pahang,
Malaysia
rozlin@iium.edu.my

*Corresponding author: Rozlin Abdul Rahman,
rozlin@iium.edu.my

Abstract:

Introduction: The prevalence of neck pain associated with smartphone addiction among students is rising with advancing technology. Excessive smartphone use leads to musculoskeletal disorders that can impair daily functional ability. This study aimed to determine the prevalence of smartphone addiction and neck pain affecting functional activities among undergraduate students at KAHS, IIUM Kuantan Campus, and to examine the relationship between neck pain and smartphone addiction. **Methodology:** A cross-sectional study was conducted with 105 undergraduate students. Smartphone addiction and neck pain were assessed using the Smartphone Addiction Scale Short Version (SAS-SV) and the Neck Disability Index (NDI) questionnaire. The questionnaire was distributed online through convenient sampling. **Results:** The prevalence of smartphone addiction was 41.9%, and neck pain affecting functional ability was 50.5%. Spearman correlation analysis revealed a weak positive correlation (r = 0.385) between smartphone addiction and neck pain, with a significance level of p<0.001. **Conclusion:** This study concludes that excessive smartphone use is significantly associated with neck pain and disability. Assessing the prevalence among university students may increase awareness of neck pain and support the implementation of preventive measures to reduce the risk of disability caused by neck pain.

Keywords: neck pain, smartphone addiction, musculoskeletal disorders, undergraduate students

Introduction:

Musculoskeletal problems affect approximately 1.71 billion people worldwide, encompassing disorders that impact muscles, bones, joints, and connective tissues (World Health Organization, 2022). Kazeminasab et al. (2022) reported that about 2.7% of the global population experienced neck pain in 2019. Data from the Global Burden of Disease shows that while the prevalence of neck pain has remained steady, its incidence and the years lived with disability remain significantly high (Shin et al., 2022). Although the prevalence of neck pain in Malaysia is relatively low at 3.0%, it has increased by 100% over the past 29 years (Shin et al., 2022).

The Handphone Users Survey 2021 by the Malaysian Communications and Multimedia Commission (MCMC) revealed that approximately 94.8% of Malaysians are active smartphone users, and 95.7% of Malaysian students own at least one smartphone. The survey also observed a significant rise in smartphone usage among Malaysians, jumping from 15.1% to 91.5% in three years. The highest

percentage of smartphone users, 93.6%, is among individuals aged 20 to 34. This high usage rate among young adults puts them at risk of developing smartphone addiction and neck pain. Isa et al. (2022) found that over half of local undergraduate students (53.6%) are at risk of neck pain. Hua et al. (2022) reported that neck disorders related to smartphone addiction are the most prevalent musculoskeletal issues among Malaysians, with a prevalence of 65.9%.

The rapid increase in smartphone users has raised concerns about the health impacts of smartphone addiction, particularly on musculoskeletal health. Several studies have shown that smartphone addiction can significantly affect neck health (Hua et al., 2022; Kazeminasab et al., 2022). Neck pain is a multifactorial condition, with prolonged computer and smartphone use being significant risk factors (Jahre et al., 2020; Gao et al., 2023.). The abnormal neck flexion required to view a smartphone can reduce the normal cervical lordosis, increasing stress on the neck's muscles, ligaments, and vertebrae (Sirajudeen et al., 2022; David et al., 2021).

A study published in the International Journal of Health Sciences found that 73.5% of university students in Malaysia were at risk of developing smartphone addiction, and 65.9% reported neck pain (Hua et al., 2022). Given these findings, this study aims to investigate the relationship between smartphone addiction and neck pain among undergraduate students at the Kulliyyah of Allied Health Sciences (KAHS) at IIUM Kuantan Campus.

Methodology:

After receiving ethical approval from the Kulliyyah Postgraduate and Research Committee (KPGRC ID NO.: KAHS 96/23) a cross-sectional study was conducted among KAHS undergraduate students with no history of musculoskeletal problems who had been using a smartphone for at least one year. A self-administered questionnaire was distributed via social media platforms which consisted of two parts:

Part A: Collection of participants' sociodemographic data including age, gender, year of study and department.

Part B: A validated structured questionnaire comprising the (i) Smartphone Addiction Scale-Short Version (SAS-SV) to assess smartphone addiction based on factors such as daily-life disturbance, positive anticipation, withdrawal, cyberspace-oriented relationships, overuse, and tolerance (Kwon et al., 2013) and (ii) Neck Disability Index (NDI) to evaluate neck pain affecting daily life, requiring participants to self-rate their ability to manage activities such as personal care, lifting, reading, headaches, concentration, work status, driving, sleeping, and recreation (Vernon, 2008). The SAS-SV cut off value for smartphone addiction varied by genders which is set at 31 or more for males and 33 or more for females. As for the NDI, the questionnaire was scored using 0-5 points with the maximum total score for 10 items is 50 points. The interpretation of NDI is based on the total score of 0 to 50 with five disability neck classifications ranging from no disability, mild, moderate, severe to complete disability.

Demographic data were analysed using descriptive statistics. The Chi-square test was used to evaluate the association between demographic data and neck disability, and the Spearman Correlation test assessed the relationship between smartphone addiction and the neck disability index.

Results:

A total of 105 students aged 19 to 25 years, with a mean age of 20.67 (±1.21), participated in this study. Among them, 82.9% were female. Most students (61.9%) spent more than 6 hours daily on smartphones. Of the participants, 41.9% met the criteria for smartphone addiction, while 58.1% did not. The demographic data can be referred in Table 1.

Half of the participants (50.5%) reported some level of neck functional disability. Among them, 43.8% experienced mild disability, and 6.7% had moderate disability. The remaining 49.5% reported no disability related to neck pain. Notably, no participants reported severe or complete disability. Figure 1 presents a bar chart of neck functional disability among KAHS students.
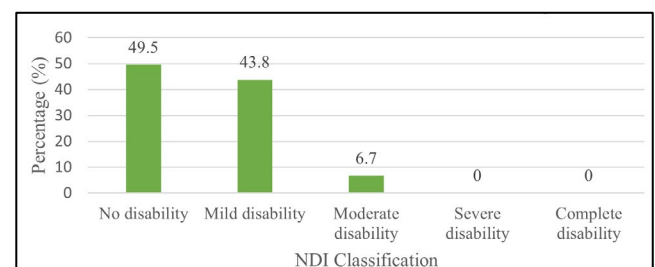

Figure 1: Prevalence of neck disability affecting daily life.

Table 1 : Demographic and time spent on smartphones among the KAHS undergraduate students at IIUM Kuantan Campus (n= 105)

Variable	Mean (SD*)	N (%)
Age (years)	20.67 (1.21)	
Gender		
Male		18(17.1)
Female		87 (82.9)
Year of Study		
First year		28 (26.7)
Second year		24 (22.9)
Third year		26 (24.8)
Fourth year		27 (25.7)
Department		
DNS		20 (19)
DBMS		20 (19)
DOVS		17 (16.2)
DDIR		10 (9.5)
DPRS		25 (23.8)
DASLP		13 (12.4)
Average time spent using smartphones		
<3 hours per day		4 (3.8)
4-5 hours per day		36 (34.3)
>6 hours per day		65 (61.9)
Smartphone Addiction		
Smartphone addict		44 (41.9)
Non-smartphone addiction		61 (58.1)

*SD = Standard Deviation **N = Numbers
DNS: Department of Nutritional Sciences, DBMS: Department of Biomedical Sciences, DOVS: Department of Optometry and Visual Sciences, DDIR: Department of Diagnostic Imaging and Radiography, DPRS: Department of Physical Rehabilitation Sciences, DASLP: Department of Audiology and Speech-Language Pathology

Association Between Neck Disability and Demographic Data

Table 2 demonstrates the association of functional neck disability and demographic data. This study found that females predominantly experienced neck functional disability. First-year students accounted for the highest proportion (41.5%) of those with neck disability, while most participants without neck disability were fourth-year students (34.6%).

Surprisingly, among those 52 participants with no neck disability, 55.8% of them reported no neck disability despite spending more than 6 hours daily using the smartphones. While those with neck disabilities, 67.9% reported using smartphones for more than six hours daily.

Correlation Between Smartphone Addiction and Level of Neck Pain Affecting Daily Life

Utilizing the NDI questionnaire, it was determined that 44 students (41.9%) were classified as smartphone addicts. Among these, 38.6% exhibited no neck disability, 50.1% experienced mild neck disability, and 11.3% had moderate neck disability, with no instances of severe or complete neck disability. In comparison, of the 61 non-addicted students, 57.4% had no neck disability, 39.3% reported mild neck disability, and 3.3% experienced moderate neck disability, also with no cases of severe or complete neck disability. These findings suggest a higher prevalence and severity of neck pain among students with smartphone addiction. Data on the frequency and percentage of each level of neck pain affecting daily life is shown in Table 3.

The relationship between the score of the Smartphone Addiction Scale-short version and the score of the NDI was assessed using the Spearman's rank-order correlation. It was found that there was a weak correlation between smartphone addiction level (SASSV) and neck disability index (NDI) in the population $r = 0.385$, $n = 105$, $p<0.001$

Table 2 : Association of functional neck disability and demographic data

Variable	Disability n (%)		Chi-square statistic (df)**	p-value
	No disability	Disability		
Gender				
Male	11 (21.2)	7 (13.2)	1.167	0.311
Female	41 (78.8)	46 (86.8)	(1)	
Year of study				
Year 1	6 (11.5)	22 (41.5)	12.917	0.004*
Year 2	13(25.0)	11 (20.8)		
Year 3	15(28.8)	11 (20.8)		
Year 4	18 (34.6)	9 (17.0)		
Time spent using smartphone				
<3 hours daily	3 (5.8)	1 (1.9)	2.119	0.326
4-5 hours daily	20 (38.5)	16 (30.2)	(2)	
>6 hours daily	29 (55.8)	36 (67.9)		

(*) indicates significant difference at p < 0.05 **df = degree of freedom

Table 3 : Descriptive statistic between level of smartphone addiction and severity of neck pain (n=105)

Variable	Neck Disability Index (NDI) n (%)				
	No disability	Mild disability	Moderate disability	Severe disability	Complete disability
SASSV					
Smartphone addiction	17 (38.6)	22 (50.1)	5 (11.3)	0 (0.0)	0 (0.0)
No smartphone addiction	35 (57.4)	24 (39.3)	2 (3.3)	0 (0.0)	0 (0.0)

Discussion:

Prevalence of Neck Pain on Functional Disability

This study reveals that 41.9% of KAHS undergraduate students are smartphone addicts, a figure higher than the 37.1% prevalence reported in a local study (Lee et al., 2023) and the global estimated prevalence of 27% (Meng et al., 2022). The higher risk of smartphone addiction among students may be attributed to internet use, social media, and gaming. Additionally, a significant portion of participants reported spending extensive time on their smartphones daily, which can increase the likelihood of developing an addiction (Isa et al., 2022).

It was also found that 50.5% of participants experienced neck pain affecting their daily lives, while 49.5% did not report this problem. A local study conducted by Isa et al. (2022) reported a neck pain prevalence of 53.6% among undergraduate students, showing a similar local prevalence. However, compared to other countries, the prevalence of neck pain is 36.7% among health sciences students in Ethiopia (Wami et al., 2021) and 17.5% in China (Chan et al., 2020), which is considerably lower. Therefore, it can be concluded that the prevalence of neck pain affecting functional ability is high among undergraduate students at KAHS IIUM. This high prevalence can be attributed to several factors such as students at KAHS IIUM might face vigorous academic demands requiring prolonged study that could lead to poor posture and neck strain and lack of physical activity due to busy schedule that leave little time for exercise, causing weakening of muscles supporting the neck (Gao et al., 2023).

A review by Galit and Felix (2021) found that the neck is the most reported site of pain among college students, indicating that neck discomfort is common and may impact daily life. Kazeminasab et al. (2022) categorized the risk factors for neck pain into psychological and biological factors. Undergraduates are particularly susceptible to neck pain related to psychological factors, including anxiety, stress, depression, and sleep problems, which are prevalent during university life. Additionally, work-related factors, particularly poor ergonomics while working, contribute to neck pain. Students may develop computer-related neck pain due to poor ergonomic posture, prolonged computer use, psychological stress, repetitive neck movements, and prolonged static strain on the neck musculature.

Association Between Demographic Factors and Neck Pain

A review by Gupta et al. (2019), Kazeminasab et al. (2022), Gao et al. (2023.), and Jahre et al. (2020) identified several risk factors associated with neck pain. Unmodifiable risk factors include gender and year of study, with several reviews indicating that being female and having more years of study increases the risk of developing neck pain. Modifiable risk factors include smartphone usage time, while the type of degree program was not found to be a risk factor. This study found no significant association between gender and neck pain. A higher proportion of female students were in the functionally disabled group. However, it should be noted that the total number of female participants outnumbered the male participants. Previous research (Shin et al., 2022; Abdel et al., 2023) supports that females are more prone to neck pain, likely due to lower pain thresholds and muscle strength compared to males. Kazeminasab et al. (2022) reported an ambiguous association between sex and neck pain, indicating the need for further meta-analysis.

This study found a significant association between the year of study and functional neck disability (p = 0.004). Surprisingly, the highest percentage of neck disability was among first-year students (41.5%), while final-year students had the lowest percentage (17%). This contrasts with Chan et al. (2020) and Wami et al. (2021), who found increasing prevalence with more years of study. The high prevalence of neck disability among first-year

students might be explained by the stress of adjusting to university life. Salam et al. (2013) explained that first-year Malaysian students experience significant academic-related stress. Stress, a known risk factor for neck pain, can affect students across all years if they cannot cope effectively.

This study also found no significant association between the duration of smartphone use and neck pain affecting functional ability (p = 0.326). This contrasts with Mustafaoglu et al. (2021), who reported a high association between smartphone use over six hours daily and neck disorders. The lack of association in this study may be attributed to students' awareness of ergonomic posture and different usage patterns, such as frequently changing positions while using their smartphones. Apart from that, participants may have underreported their symptoms or overestimated their ergonomic practices due to social desirability bias.Further studies are needed to explore the relationship between smartphone use and neck pain and to investigate effective preventive measures.

Correlation Between Smartphone Addiction and Neck Pain

Mustafaoglu et al. (2021) and Hua et al. (2022) reported a correlation between musculoskeletal disorders, particularly neck pain, and smartphone addiction. Both studies indicated that neck pain is among the most prevalent complaints among smartphone users. A study by Suresh et al. (2021) using both the SAS-SV and NDI on 88 university students in India found a moderate positive correlation between smartphone addiction and neck pain. Another study with a larger sample size of 501 university students in Turkey also found a positive correlation, albeit a low one (Badil Güloğlu & Yalçın, 2021).

This study similarly found a weak positive correlation between smartphone addiction and neck disability (r = 0.385, n = 105, p < 0.001). This may be due to participants adopting better ergonomic practices, which could mitigate the impact of smartphone addiction on neck disability. Additionally, variations in lifestyle, academic pressures and daily activities can influence the relationship between smartphone addiction and neck pain, resulting in a weaker association. Neck disability among smartphone users is often related to "text neck," a condition caused by prolonged non-ergonomic postures while using smartphones. Smartphone addicts are particularly prone to this condition due to the extensive time they spend on

their devices and the repetitive neck movements toward the screen (Chovatiya et al., 2021). This routine can injure the neck musculature and surrounding soft tissue (AlAbdulwahab et al., 2017).

Conclusion:

This study highlights the importance of raising awareness about the physical risks associated with excessive smartphone use among undergraduate students. There was a significant correlation between smartphone addiction and neck pain, which affects functional abilities. The prevalence of both smartphone addiction and neck pain is notably high among KAHS IIUM students.

The findings suggest a potential link between smartphone addiction and neck pain, which may be associated with functional disability. Poor ergonomic posture while using mobile devices is identified as the main cause of neck pain among smartphone users. To address this, health education programs and interventions should be actively implemented to reduce the risk of musculoskeletal issues caused by excessive smartphone use. Preventive measures should include managing smartphone usage and promoting ergonomic body posture. Students should be encouraged to develop good habits when using smartphones to minimize the risk of musculoskeletal disorders.

References:

Abdel-Aziem, A., Dewir, I., Alotibi, M., Morshed, H., Alkhammash, Z., & Alshahrani, M. (2023). The Relationship between Smartphone Addiction and Functional Neck Disability among University Students during COVID-19 Pandemic. Clinical and Experimental Health Sciences, 13(3), 562–570. https://doi.org/10.33808/clinexphealthsci.1116402

AlAbdulwahab, S. S., Kachanathu, S. J., & AlMotairi, M. S. (2017). Smartphone use addiction can cause neck disability. Musculoskeletal Care, 15(1), 10–12. https://doi.org/10.1002/msc.1170

Badil Güloğlu, S., & Yalçın, Ü. (2021). The Effect of Smartphone Addiction on Neck Pain and Disability in University Students. Kafkas Journal of Medical Sciences, 11(2), 225–230. https://doi.org/10.5505/kjms.2021.75057

Chan, L. L. Y., Wong, A. Y. L., Wang, M. H., Cheung, K., & Samartzis, D. (2020). The prevalence of neck pain and associated risk factors among

undergraduate students: A large-scale cross-sectional study. International Journal of Industrial Ergonomics, 76. https://doi.org/10.1016/j.ergon.2020.102934

Chovatiya, N. K., Chaudhary, H., & Kanabar, N. (2021). View of Correlation of smartphone addiction with musculoskeletal discomfort and neck disability among college students.

David, D., Giannini, C., Chiarelli, F., Mohn, A., Tchounwou, B., & Bozzola, E. (2021). Text Neck Syndrome in Children and Adolescents. Int. J. Environ. Res. Public Health, 18, 1565. https://doi.org/10.3390/ijerph18

Galit, W.-C., & Felix, L.-A. (2021). Vista de Musculoskeletal pain in college students_ a systematic review.

Gao, Y., Chen, Z., Chen, S., Wang, S., & Lin, J. (2023.). Risk factors for neck pain in college students: a systematic review and meta-analysis. BMC Public Health 23. https://doi.org/10.21203/rs.3.rs-2236117/v2

Hua, B. H., Sugumaran, S. V., Faryza, E., Atiqah, N., Jasvindar, K., Kabir, M. S., Shirin, L., & Nazmul, M. H. M. (2022). Prevalence of musculoskeletal disorders (MSD) and smartphone addictions among university students in Malaysia. International Journal of Health Sciences, 1075–1088. https://doi.org/10.53730/ijhs.v6ns2.5078

Isa, S. N. I., Kamalruzaman, N. S. A., Sabri, T. A. T., & Zamri, E. N. (2022). Associated Factors of Lower Back and Neck Pain among Health Sciences Undergraduate Students in a Public University in Malaysia. Malaysian Journal of Medicine and Health Sciences, 18(8), 247–254. https://doi.org/10.47836/mjmhs18.8.32

Jahre, H., Grotle, M., Smedbråten, K., Dunn, K. M., & Øiestad, B. E. (2020). Risk factors for non-specific neck pain in young adults. A systematic review. In BMC Musculoskeletal Disorders (Vol. 21, Issue 1). BioMed Central Ltd. https://doi.org/10.1186/s12891-020-03379-y

Kazeminasab, S., Nejadghaderi, S. A., Amiri, P., Pourfathi, H., Araj-Khodaei, M., Sullman, M. J. M., Kolahi, A. A., & Safiri, S. (2022). Neck pain: global epidemiology, trends and risk factors. In BMC Musculoskeletal Disorders (Vol. 23, Issue 1). BioMed Central Ltd. https://doi.org/10.1186/s12891-021-04957-4

Kwon, M., Kim, D. J., Cho, H., & Yang, S. (2013). The Smartphone Addiction Scale: Development and Validation of a Short Version for Adolescents. PLOS ONE, 8(12), e83558. https://doi.org/10.1371/JOURNAL.PONE.0083558

Lee, K. W., Ching, S. M., Ali, N., Ooi, C. Y., Sidek, S. K. H., Amat, A., Yatim, Y., Yahaya, Z., Shamsuddin, N., Ibrahim, I., Majid, F. A., Othman, F. S., Zakaria, N. S., Abidin, A., Talib, N. H., & Sivaratnam, D. (2023). Prevalence and Factors Associated with Smartphone Addiction among Adolescents–A Nationwide Study in Malaysia. International Journal of Mental Health Promotion, 25(2), 237–247. https://doi.org/10.32604/ijmhp.2023.013407

Malaysian Communications and Multimedia Commission. (2021). FULL-REPORT-HPUS-2021. https://www.mcmc.gov.my/skmmgovmy/media/General/pdf2/FULL-REPORT-HPUS-2021.pdf

Meng, S. Q., Cheng, J. L., Li, Y. Y., Yang, X. Q., Zheng, J. W., Chang, X. W., Shi, Y., Chen, Y., Lu, L., Sun, Y., Bao, Y. P., & Shi, J. (2022). Global prevalence of digital addiction in general population: A systematic review and meta-analysis. In Clinical Psychology Review (Vol. 92). Elsevier Inc. https://doi.org/10.1016/j.cpr.2022.102128

Mustafaoglu, R., Yasaci, Z., Zirek, E., Griffiths, M. D., & Ozdincler, A. R. (2021). The relationship between smartphone addiction and musculoskeletal pain prevalence among young population: A cross-sectional study. Korean Journal of Pain, 34(1), 72–81. https://doi.org/10.3344/KJP.2021.34.1.72

Salam, A., Yousuf, R., Bakar, M. A., & Haque, M. (2013). Stress among Medical Students in Malaysia: A Systematic Review of Literatures. In International Medical Journal (Vol. 20, Issue 6).

Shin, D. W., Shin, J. Il, Koyanagi, A., Jacob, L., Smith, L., Lee, H., Chang Yoonkyung, & Song, T. J. (2022). Global, regional, and national neck pain burden in the general population, 1990–2019: An analysis of the global burden of disease study 2019. https://vizhub.healthdata.

Sirajudeen, M. S., Alzhrani, M., Alanazi, A., Alqahtani, M., Waly, M., Unnikrishnan, R., Muthusamy, H., Alrubaia, W., Alanazi, N., Seyam, M. K., Kashoo, F., Miraj, M., Govindappa, S. C., Alghamdi, K. A., & Al-Hussinan, N. M. (2022). 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, 10. https://doi.org/10.7717/PEERJ.14443/SUPP-2

Suresh, A., Sudhan, S., Mohan, P., & Ramalingam, A. T. (2021). Impact of Smartphone Addiction on Neck Pain and Disability in University Students. Journal of Clinical and Diagnostic Research. https://doi.org/10.7860/jcdr/2021/49339.15029

Vernon, H. (2008). The Neck Disability Index: State-of-the-Art, 1991-2008. In Journal of Manipulative and Physiological Therapeutics (Vol. 31, Issue 7, pp. 491–502). https://doi.org/10.1016/j.jmpt.2008.08.006

Wami, S. D., Mekonnen, T. H., Yirdaw, G., & Abere, G. (2021). Musculoskeletal problems and associated risk factors among health science students in Ethiopia: a cross-sectional study. Journal of Public Health (Germany), 29(4), 943–949. https://doi.org/10.1007/s10389-020-01201-6

World Health Organization (WHO). (2022). Musculoskeletal health. https://www.who.int/news-room/fact-sheets/detail/musculoskeletal-conditions#:~:text=Key%20facts,of%20disability%20in%20160%20countries.