Section: Aesthetics & Prosthetics

Original Research Article

ASSOCIATION BETWEEN SMARTPHONE USAGE DURATION AND NECK PAIN AMONG KHWAJA FAREED UNIVERSITY OF ENGINEERING AND INFORMATION TECHNOLOGY (KFUEIT) UNIVERSITY STUDENTS: A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Among college students, neck pain is a prevalent musculoskeletal condition. It is frequently associated with sedentary lifestyles, screen use, and bad posture. Young people are using mobile phones more frequently, which is leading to a number of new health issues, such as excessive forward bending of the head while use the phone. Despite the growing number of reports in the literature linking smartphone use to neck pain, Pakistani colleges have ignored this problem, making it a neglected field of medical study in the country. **Objective:** The aim of the study was to investigate the relationship between the duration of smartphone use and neck pain among undergraduate students of Khwaja Fareed University of Engineering and Information Technology (KFUEIT) in Rahim Yar Khan, Pakistan. **Materials and Methods:** A cross-sectional study was conducted on 100 undergraduate students of KFUEIT. Participants' data were obtained from a self-reported questionnaire that contained students' demographic data, mobile phone use, mobile phone use postures and neck pain. Data were analyzed with IBM SPSS. Frequencies and percentages were calculated using descriptive statistics and the Pearson correlation coefficient was used to evaluate the relationships between the variables. **Results:** Eighty-six percent of the pupils were female and between the ages of 18 and 22. The majority of students (88%) said they used their smartphones for at least an hour per day, and almost a quarter (22%) said they used them for seven or more hours. Sitting (51%) and laying down (46%) were the most common smartphone positions. Eighty-three percent of students said they occasionally or frequently tilted their heads when using their smartphones. 38% of students said they had minor neck pain, 28% moderate neck pain, and 6% severe neck pain. Screen time and posture were found to positively correlate ($r = 0.203$, $p = 0.043$). However, there was no clear correlation between neck pain and smartphone use among students. **Conclusion**: According to this study, KFUEIT students' neck pain is not directly predicted by screen time. But the high correlation between screens time and bad posture suggests that using a smartphone may cause musculoskeletal problems indirectly. In order to prevent young students from acquiring musculoskeletal issues in the future as a result of excessive smartphone use, this study highlights the necessity for college campuses to teach students proper posture and ergonomics.

INTRODUCTION

The increasing prevalence of smartphone use globally has radically changed communication and productivity and learning and play. Over the last 20 years, these hand-held devices have grown from basic communication devices to powerful devices that can connect to the internet, and communicate with others and search for information and play games and watch videos and enhance productivity at work. The International Telecommunication Union (ITU, 2023) reports that in 2023, 6.8 billion people

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(85%) of the world's population had a smartphone. This is rapidly increasing. This has led to increases in the time spent on a smartphone. A recent survey suggested four to six hours per day. There are no doubt good benefits of smartphone use, but there is concern about health problems associated with their use. Recently, musculoskeletal issues and in particular neck and associated structures have been receiving attention.

In recent empirical studies the link between prolonged use of smartphones and musculoskeletal symptoms, including neck pain, shoulder pain, upper limb symptoms and thumb injuries has been investigated. The biomechanics of smartphone use (involves neck flexsion of 30-60 degrees, activating upper trapezius, levator scapula and cervical extensors beyond their neutral capacity) in the commonly-held flexed neck posture to view the screen is thought to be a biomechanical risk factor for the development and worsening of neck pain.(Hansraj, 2014) This could lead to symptoms from mild discomfort to chronic musculoskeletal symptoms.(Kietrys et al., 2015)

Neck pain refers to any pain, discomfort, aching or soreness in the cervical region (from the base of the skull to the level of the first thoracic vertebra) with or without radiation into the shoulders and/or arms, reported to have occurred in the past four weeks at the time of the survey. Neck pain is a very common musculoskeletal condition, and a major cause of disability. There are significant economic consequences of neck pain in health-care costs, lost productivity and other work-related problems. Neck pain is a major contributor to direct and indirect economic losses in high-income regions due to productivity impact, absenteeism and health-care costs, with additional aggravation in low- and middle-income regions due to the lack of diagnostic and rehabilitation services. (Hoy et al., 2010) Epidemiological studies have demonstrated that neck pain is more common in young people engaged in sedentary and screen-based occupations and educational activities. Recent studies that have examined the neck pain prevalence in adolescents and young adults have indicated neck pain is now occurring at a younger age - a fact that some researchers have linked to the rise in smartphone and other device use. (Kim et al., 2018)

The biopsychosocial model of pain initially proposed by Engel (1977) and applied to musculoskeletal pain by Waddell (1987) among others, recognizes that pain is a complex phenomenon, influenced not only by nociceptive (painful) stimuli that arise from peripheral damage or irritation, but also by psychological and social factors. According to this model, the use of smartphones can cause neck pain through biomechanical and indirect psychosocial pathways (encouragement of sedentary behaviors, reduction of restorative activities and increase of stress and anxiety through social media). This dual pathway explanation is supported by evidence that neither biomechanical nor psychological descriptions are sufficient to explain the musculoskeletal disorders related to smartphone use.

Biomechanical understanding of smartphone-related neck pain is essential for the interpretation of epidemiological studies, and for the development of prevention measures. The cervical spine is made up of seven vertebrae (C1-C7) that support the head and allow for rotation and extension-flexion. The biomechanical concept of forward head posture (FHP) has emerged as a point of interest in the clinical and biomechanical research of smartphone-related neck pain. Ergonomic factors - including the level of the smartphone held and time periods of smartphone use, the use of supportive chairs and the use of postural breaks - play a vital role in moderating the relationship between smartphone use and the cervical musculoskeletal response. Biomechanical studies using surface electromyography (EMG) have demonstrated that using the smartphone at eye level or above results in much lower cervical muscle activity than holding the device in the lap or on a table, and have clear implications for the formulation of public health messaging to improve safe smartphone usage. (Straker et al., 2008)

University students are a distinct subpopulation of smartphone users with a distinctive combination of educational, social and entertainment motives for using their devices, which combine to drive high daily use. Academically, they use their devices to access course management portals, review lecture notes, communicate with their peers and lecturers and conduct preliminary research. Socially, messaging services such as WhatsApp, Instagram, TikTok and Twitter are prominent tools for communication with friends and to express personal identity. Finally, using social media to watch videos, play games and listen to music are other forms of screen use that add to the time spent "working". (Demirci et al., 2015)

In survey studies, the average smartphone use times reported range from 5.8 hours to 7.2 hours in university students with several bouts of use per day. (Hawi & Samaha, 2017)

The sedentary nature of many smartphone activities, combined with the posture described above, means that the risks associated with smartphone use are different to other sedentary tasks (such as computer use) where there is greater variability in screen height and there are usually recommendations about workstation setup. At risk: university students. The demands of the academic curriculum, together with the high rates of social media and non-educational screen-based activities mean that this population is often among the highest for daily smartphone use. Cross-sectional studies in different countries report that university students have a daily smartphone screen time of six to eight hours, with students using their smartphones in postures and environments that pose a musculoskeletal risk.(Namwongsa et al., 2018)

Several cross-sectional studies have shown a dose-response relationship for neck pain and smartphone use. In Korea, university students in a 2014 study had

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Kendall's tau correlations ($p<0.05$) between daily use of more than 3 hours and NDI sub-scales of pain intensity, headache and concentration. (Lee & Song, 2014)

Pakistan has seen a particularly high rate of smartphone adoption among the university age population as a result of the introduction of 3G and 4G mobile networks in 2014 and low cost Android devices.

Khwaja Fareed University of Engineering and Information Technology (KFUEIT) in Rahim Yar Khan, Punjab, Pakistan, is a new Pakistani public university with a student population which is primarily made up of engineering and information technology students. The IT content of their curriculum is likely to result in high smartphone usage patterns among KFUEIT students and this is a suitable and methodologically valid population to investigate the association between smartphone duration of use and neck pain. This is a significant gap in research conducted at the KFUEIT on the relationship between duration of smartphone use and neck pain among its students.

There are several novel aspects to this study on technology-related musculoskeletal health. This is the first study examining the relationship between the use of smart phones and neck pain among KFUEIT students, and in engineering and information technology students in southern Punjab, Pakistan. It is the first study, to our knowledge, to use validated outcome measures and a systematic cross-sectional study design to avoid some of the interpretational drawbacks of previous research studies in Pakistan.

The findings will contribute to the health and well-being of KFUEIT students, by informing the development and implementation of ergonomic training, posture education and occupational health and safety strategies specifically for technology students. More broadly, the aim of the study is to add to the current body of knowledge and evidence that will inform national and international guidelines for smart phone use, occupational ergonomics and musculoskeletal health promotion in young adults.

This study will investigate the association between hours spent using a smart phone and the prevalence and severity of neck pain among the undergraduate students of Khwaja Fareed University of Engineering and Information Technology (KFUEIT), Rahim Yar Khan, Pakistan. It also seeks to report the incidence of neck pain in KFUEIT undergraduates. To report the duration and patterns of smartphone use in the sample. To investigate the association between time of smartphone use and neck pain (Neck Disability Index - NDI). To explore the potential moderating effect of demographic variables, behaviors and physical activity on the smartphone use-neck pain relationship. To examine the impact of posture while using smartphone on neck pain.

MATERIALS AND METHODS

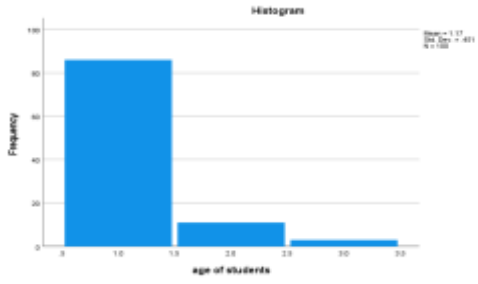
The present cross-sectional study was conducted at Khwaja Fareed University of Engineering and Information Technology (KFUEIT), Rahim Yar Khan, Pakistan, to investigate the association between smartphone usage duration and neck pain among undergraduate students of Khwaja Fareed University of Engineering and Information Technology (KFUEIT), Rahim Yar Khan, Pakistan. A total of 100 participants were selected using a random sampling technique from smartphone-using students, based on predefined inclusion and exclusion criteria. Data were collected through a structured, self-administered questionnaire that comprised sections on demographic characteristics, daily smartphone usage duration, commonly adopted postures, and the presence and severity of neck pain. Prior to data collection, the questionnaire was pilot-tested to ensure clarity and reliability. Informed consent was obtained from all participants, and confidentiality and anonymity were strictly maintained throughout the study. The collected data were entered and analyzed using IBM SPSS software, where descriptive statistics (frequencies and percentages) were used to summarize variables, and Pearson correlation analysis was applied to assess the relationship between smartphone usage duration and neck pain. . Inclusion criteria included undergraduate students actively using smartphones, while exclusion criteria comprised students with pre-existing neck pathology unrelated to smartphone use and those who did not provide consent.

Data Analysis Procedure

SPSS 27.0 (Statistical packages for social sciences) is the most recent version of statistical software used to evaluate data obtained through questionnaires. We will compute some basic statistics; frequencies, histogram and correlation.

RESULTS

Histogram



The findings show that most respondents (86%) were in the age group 18-22 years. A smaller percentage (11%) were between 23-25 years old and only 3% were aged 25-30 years. The findings indicate that the study participants were young adults. This indicates that the majority of the respondents were students. The distribution is heavily skewed towards the young. Thus, the results represent the practices of

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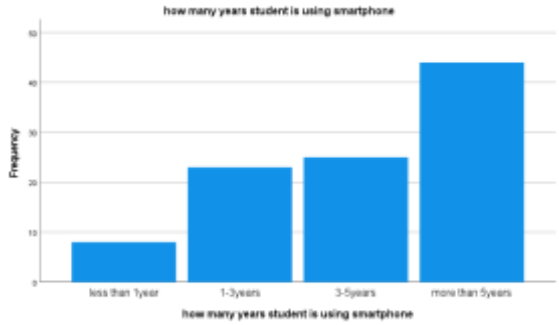
young university students. This may affect smartphone usage and neck pain experiences.



The findings show that 44% of the participants had been using smartphones for over 5 years. Further, 25% had been using smartphones for 3-5 years and 23% for 1-3 years. At most, 8% had been using smartphones for less than 1 year. This study indicates that the students are long-term smartphone users. This suggests that they have been exposed to smartphone activities for a long time. This may lead to musculoskeletal symptoms, including neck pain. In conclusion, the results show ubiquitous and systematic smartphone use by students.

Table 1: Individual Distribution of Commonly Adopted Postures

		Frequency	Percent	Valid Percent	Cumulative Percent
V	sitting	51	51.0	51.0	51.0
	standing	3	3.0	3.0	54.0
	lying down	46	46.0	46.0	100.0
	Total	100	100.0	100.0	

The findings indicate 51% of the participants frequently used smartphones in a sitting position. The figures for lying down (46%) were comparable. Just 3% used smartphones in the standing position. The findings suggest students use postures that involve sitting and lying. This implies a lack of postural diversity when using smartphones. Sitting and lying for long periods may lead to poor posture. So, posture may be a relevant factor for neck pain.

Table 2: Individual Distribution of Neck Bending While Using Smartphone

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	44	44.0	44.0	44.0
	no	17	17.0	17.0	61.0
	may be	39	39.0	39.0	100.0
	Total	100	100.0	100.0	

Our findings show 44% reported that they bend their neck when using smartphones. Also, 39% gave the response "maybe", which indicates they sometimes bend their necks. Only 17% answered that they do not bend their neck. The findings indicate most students experience neck bending. This may indicate a high risk of awkward posture. Repeated bending of neck may lead to musculoskeletal injuries. Hence, this could contribute to neck pain in students.

Table 3: Individual Distribution of Neck Pain in the Last 7 Days

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	23	23.0	23.0	23.0
	no	63	63.0	63.0	86.0
	may be	14	14.0	14.0	100.0
	Total	100	100.0	100.0	

The findings reveal 23% of respondents had neck pain in the past 7 days. However, 63% had no neck pain and 14% were unsure. The findings suggest that the majority of students did not have recent neck pain. But it was still present among a significant number. This indicates that neck pain is experienced by a significant proportion of the population. The inclusion of "maybe" also shows variability in pain. So neck pain is still an issue for smartphone users.

Table 4: Individual Distribution of Average Neck Pain

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0 no pain	28	28.0	28.0	28.0
	1-3mild pain	38	38.0	38.0	66.0
	4-6moderate pain	28	28.0	28.0	94.0
	7-10 severe pain	6	6.0	6.0	100.0
	Total	100	100.0	100.0	

From these data, we can see that the highest percentage of participants, 38%, reported mild neck pain. No pain and moderate pain was reported by 28% of the sample. Only 6% claimed to have severe

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pain. We found that the majority of students are in the mild to moderate pain categories. This indicates that severe pain is not that frequent. But a substantial number experience pain. So, there is neck pain of different levels among the participants.

Table 5: Individual Distribution of Students' Average Screen Time

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	less than 3hours	12	12.0	12.0	12.0
	3-5hours	36	36.0	36.0	48.0
	5-7hours	30	30.0	30.0	78.0
	more then 7 hours	22	22.0	22.0	100.0
	Total	100	100.0	100.0	

The findings indicate 36% of the participants reported 3-5 hours of screen time per day. Further, 30% of participants reported 5-7 hours of screen time and 22% reported over 7 hours. A small percentage (12%) reported less than 3 hours of screen time. The findings suggest most students have medium to high levels of screen use. This implies long-term use of electronic devices. Increased screen time may lead to higher risk of neck pain. Thus, screen time may be a significant variable in this study.

Table 6: The Pearson correlation between posture & screentime

Correlations

		posture commonly adopted using smartphone	usually bend neck using smartphone	average screentime of all devices combined
posture commonly adopted using smartphone	Pearson Correlation	1	.042	.203*
	Sig. (2-tailed)		.677	.043
	N	100	100	100
usually bend neck using smartphone	Pearson Correlation	.042	1	.007
	Sig. (2-tailed)	.677		.945
	N	100	100	100
average screentime of all devices combined	Pearson Correlation	.203*	.007	1
	Sig. (2-tailed)	.043	.945	
	N	100	100	100

*. Correlation is significant at the 0.05 level (2-tailed).

The Pearson correlation analysis with 100 students reveals a weak positive association ($r = .203, p = .043$) between the common posture and average daily screentime, suggesting that as screen time increases, there is a change in the body positions. But the results demonstrate no significant relationship between screentime and the particular posture of neck bending ($r = .007, p = .945$) or between the adopted posture and neck bending ($r = .042, p = .677$). As a result, although the total duration of screen time affects the overall posture, it did not have a direct impact on the habit of bending the neck in this particular sample at the $.05$ significance level.

DISCUSSION

This cross-sectional study aimed to investigate the association between screen use and neck pain among undergraduate students at Pakistan's Khwaja Fareed University of Engineering and computer science (KFUEIT) in Rahim Yar Khan. A sample of 100 students was surveyed; the majority of them were women (86%) and most were in the age range of 18-22 years (86%). We found no association between the timestudents spend looking at their phones (88% use their phone for three or more hours per day) and neck pain. It appears that the impact of smartphone use on physical discomfort is explained by posture, rather than the amount of time spent using the phone, given that we found a positive association between screening time and posture ($r = 0.203, p = 0.043$). The results of this study are only partially consistent with (M. F. Maayah et al., 2023) which suggested screen time was a good predictor of the duration and severity of neck pain in university students and that a history of neck and shoulder pain was one of the most important individual variables in predicting pain. While the history of pain was not considered in this study, the findings that frequent smartphone use was common but with no significant link to pain may be explained by the differences in demographics, gender representation and the factors studied. Future longitudinal studies are required to further assess the possible relations between screen time and musculoskeletal system, as a high correlation between attitude and screen time was found in this study. (M. F. Maayah et al., 2023) notes it's important to consider these factors to develop preventative measures that will reduce the prevalence of neck pain in college students.

The current study's findings are supported by other studies that found students had high usage of digital devices. The sample had a staggering 87.5% who used digital devices, with a staggering 70% of them lying down in bed, which is biomechanically a poor posture for the cervical spine (Kandasamy et al., 2024). In agreement with the present study, the authors reported that 46% of KFUEIT students used their cellphones while lying down, which is

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biomechanically a poor posture for the cervical spine. Moreover, 88% of KFUEIT students reported using technology for more than 3 hours per day which is important for the sample since (Kandasamy et al., 2024) highlighted that physical health issues, such as neck and back pain, are associated with an increased risk of prolonged use of digital devices. Additionally, it's been shown that exercise, particularly activities that stretch and strengthen the cervical spine, may reduce the incidence of neck pain. Thus, more research is warranted at KFUEIT to determine if low participation in sport reported by university students is a significant (modifiable) risk factor.

The findings of the present study reveal that while the time spent on the smartphone might not be a direct (statistically significant) predictor of neck pain in KFUEIT university students, it is an important indirect predictor that can result in musculoskeletal pain and injury over time through its effects on postural control. The high prevalence of prolonged screen time, lying down and neck flexion postures noted in the current study indicates that the risk of developing musculoskeletal conditions due to smartphone use is a considerable issue among these students. These findings suggest the need for institutional postural and ergonomic training.

CONCLUSION

The aim of this cross-sectional study was to investigate the association between neck pain and smartphone use among students of Khwaja Fareed University of Engineering and Information Technology (KFUEIT) in Rahim Yar Khan, Pakistan. Even though most students in this study reported using their smartphones for a considerable amount of time, we could not find a direct significant association between the duration of smartphone use and neck pain. However, a significant positive correlation was found between daily screen time and posture ($r = 0.203$, $p = 0.043$) which suggests that prolonged smartphone use can cause cervical musculoskeletal disorders primarily through poor posture rather than simply due to the excessive use of a smartphone.

The study also showed that KFUEIT students preferred postures to use their smartphones that were previously shown to place high mechanical loads to the cervical region, such as lying and sitting with a forward flexed head position. A significant number of students also reported that they flexed their neck to use their smartphones, which has been previously reported to be one of the leading causes of cervical musculoskeletal disorders. These usage postures, and the common practice of excessive daily smartphone use make KFUEIT students vulnerable to musculoskeletal problems. Furthermore, among the small sub-group of students who reported neck pain, most of them reported it as being low to moderate, with only a small percentage reporting severe pain. This suggests that while severe musculoskeletal impairment may not be highly prevalent in this cohort, mild to moderate pain is prevalent, and may develop into more severe musculoskeletal conditions if not diagnosed and treated in a timely manner.

It is clear from the findings of this study that hours spent on smartphone use does not predict neck pain in KFUEIT students. On the other hand, it seems that body postures adopted during smartphone use (i.e. neck flexion and overall postures while using the phone) is a significant predictor of musculoskeletal symptoms. Therefore, it is strongly recommended that universities, especially the ones that are involved in technology-based educational programs (such as KFUEIT) should consider implementing ergonomic educational programs, informing students of the need to maintain proper posture and take part in physical exercise. This will help prevent the rising trend of the smartphone-related symptoms in the university settings. Lastly, future research in this area needs to consider longitudinal designs, valid and reliable measures of neck pain and representative samples including equal numbers of men and women.

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