Prevalence of neck and shoulder pain among Saudi universities’ students who are using smartphones and computers

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ABSTRACT

Aim: This study aimed to identify the prevalence and associated factors of neck and shoulder pain that result from using smartphones and computers among Saudi university students. Methods: A cross-sectional study was conducted on 516 students. An online questionnaire containing data about participants’ characters, type of device used, reason and duration of use and position when using smartphones, suffering neck or shoulder pain, severity, pain relief medicines, exercises for the neck and shoulder after use, and effect of pain on daily routine was distributed on Google Form. Results: 45% of participants were using smartphones; 35.1% spent 6-9 hours on average. Further, 40.5% used mobiles with one hand with a slight neck tilt below the horizon line; 59.1% complained of neck or shoulder pain while using devices, and only 2.7% of those suffering from pain were using pain relief medicines. Moreover, 34.3% were doing exercises after using devices, and 20.3% experienced pain in their daily routines. Participants using both iPads or tablets and computers had a significantly higher percentage of neck or shoulder pain compared to other user devices. Participants using devices for studying accounted for a significantly higher percentage of suffering from neck or shoulder pain compared to those using it for other purposes. Participants using mobile with one hand with a large neck tilt below the horizon line had a significantly higher percentage of suffering from neck or shoulder pain. Conclusion: University students should be given top attention when it comes to raising awareness about health and safety risks associated with computer use.

Keywords: Neck, pain, prevalence, Saudi, students, smartphones

Introduction

A repetitive strain injury (RSI) is an injury to a part of the musculoskeletal or nervous system caused by repetitive use, vibrations, compression, or long periods in a fixed position. Commonly, it happens in the arm, shoulder, and neck. Other common names include repetitive stress disorders, cumulative trauma disorders (CTDs), and overuse syndrome.¹,² Shoulder and neck pain is a moderate musculoskeletal disorder; however, it is very common in community health care problems related to major disablement.³ There are many factors that have been found to be related to shoulder and neck pain, such as high levels of physical activity and sports participation.³ The psychological problems and poor self-assessed health also increase the spread of neck and shoulder pain.³ Continuous use of the computer without taking a break, uncomfortable postures, and the duration and frequency of laptop use have also been suggested as risk factors for musculoskeletal disorders.³ According to computer use, a
systemic review of studies on the European working population published in 2010 revealed that 25% have pain in the neck and shoulder. Another study on workers who have symptoms of RSI showed a relation between symptoms and a decrease in quality of life score among 31% of them.\[\text{[6]}\]

According to mobile users, a study done in Canada found that 46%–52% of participants reported shoulder symptoms and 68% reported neck symptoms.\[\text{[6]}\] Another study conducted in China on young phone users found that 40% of participants reported neck and shoulder pain.\[\text{[7]}\]

The use of electronic devices has become common among college students.\[\text{[6]}\] A study conducted on college students found that 53% suffered from musculoskeletal pain when using a laptop, with a higher rate of neck pain and shoulder pain in females than males.\[\text{[6]}\] Preceding researches has informed a high prevalence of neck pain among medical students.\[\text{[8]}\] A study carried out in Malaysia medical college discovered the percentage of neck pain among the students as 41.8% with a relation with clinical years, computer use, and history of trauma.\[\text{[6]}\] Another study found a prevalence of mobile devices obsession within medical students as 60.3%, and the common pain associated with mobiles obsession was neck pain 60%, followed by 40% in the shoulder.\[\text{[6]}\]

In the Kingdom of Saudi Arabia (KSA), a study done in 2017 in the Taif region of KSA found that 98% were using electronic devices, 92% were using both smartphones and iPads for entertainment, while 32% used these devices for studying. Approximately 64% of the students never complained of neck pain, while 8.2% suffered from neck pain either often or very often. This study found a significant association between neck pain and risk factors such as gender, type of devices used for entertainment, and type of devices used for studying.\[\text{[6]}\] Another study done in 2019 stated a prevalence of 56.5% of neck pain among medical students in central Saudi Arabia.\[\text{[6]}\]

This study aimed to identify the prevalence and associated factors of neck and shoulder pain that result from using smartphones and computers among Saudi university students and identify the posture that is most related to neck and shoulder pain.

**Methodology**

**Study design:** An observational cross-sectional study was conducted.

**Subjects:** The study's population consisted of Saudi university students who use smartphones and computers. The inclusion criteria were university students aged 18 years and older of both genders who agreed to participate in the study. The exclusion criteria were participants younger than 18 years and non-university students.

**Sample size:** The minimum calculated sample size was 385 participants with a confidence level of 95% and a margin of error of 5%.

Method for data collection and instrument: An Arabic self-administered questionnaire was distributed online on Google Form, containing items to collect data about participants characters, type of device used, reason and duration of use and position of the neck and hands when using smartphones, suffering neck or shoulder pain on using electronic devices, severity, use pain relief medicines, doing exercises for the neck and shoulder after using the electronic devices for a long time, and relation of pain with previous injury and its effect on daily routine.

**Ethical considerations:** Ethical approval was obtained from the research ethics committee of Taif University.

**Statistical analysis**

Data were analyzed using SPS version 25. Qualitative data were expressed as numbers and percentages, and Chi-squared test ($\chi^2$) was applied to test the relationship between variables. Quantitative data were expressed as mean and standard deviation (Mean $\pm$ SD), and Mann–Whitney test was used for nonparametric variables. $P < 0.05$ was considered statistically significant.

**Results**

Table 1 shows that the mean age of the participants was 20.86 ± 2.81 years; 88.4% were females. Further, 98.6% had a Saudi nationality and 77.3% were from the Western region. Of them, 36% were students of literary collages and 24.8% were 2nd-year students. Most of the participants were using smartphones as electronic devices (45%); 35.1% were spending 6–9 hours using these devices, and most of them (40.5%) were using the mobile with one hand with a slight tilt of the neck below the horizon line.

Table 2 shows that 59.1% of the participants were suffering from neck or shoulder pain while using the electronic devices and the percentage of moderate and severe pain were 22.3% and 4.4% for neck pain and 19.8% and 6.6% for shoulder pain, respectively. Only 2.7% of those suffering from pain were always using pain relief medicines; 34.3% were doing exercises for the neck and shoulder after using the electronic devices for a long time and 31.8% of them were feeling better. (77.5%) of our participants the pain caused by using the devices not from previous injury, and 2.9% and 20.3% reported that this pain sometimes and always affecting their daily routine, respectively.

Table 3 shows that most of the participants (34.5%) had the body position number one on using the tablet or computer.

Table 4 shows that a nonsignificant relationship was found between having neck or shoulder pain and participants’ characters, duration of use, and doing exercises for the neck and shoulder after using the electronic devices for a long time ($P = 0.05$). A nonsignificant relationship was found between position of the neck and hands when using the smartphones and presence of neck pain ($\chi^2 = 4.38, P = 0.465$).
Elsiddig, et al.: Prevalence of neck and shoulder pain among Saudi students using smartphones

Table 1: Distribution of studied participants according to their characters, type of device used, reason and duration of use, and position of the neck and hands when using smartphones (n=516)

| Variable                                                                 | n (%)          | n (%)          |
|-------------------------------------------------------------------------|----------------|----------------|
| Age                                                                     | 20.86±2.81     |                |
| Gender                                                                  |                | 456 (88.4)     |
| Female                                                                  |                | 60 (11.6)      |
| Nationality                                                             |                | 509 (98.6)     |
| Saudi                                                                   |                | 7 (1.4)        |
| The regions                                                             |                | 29 (5.6)       |
| Southern                                                                |                | 26 (5)         |
| Eastern                                                                 |                | 7 (1.4)        |
| Northern                                                                |                | 399 (77.3)     |
| Western                                                                 |                | 55 (10.7)      |
| Collage                                                                 |                | 186 (36)       |
| literary collage                                                        |                | 157 (30.4)     |
| Health collage                                                          |                | 173 (33.5)     |
| Collage                                                                 |                |                |
| 1st                                                                     |                |                |
| 2nd                                                                     |                |                |
| 3rd                                                                     |                |                |
| 4th                                                                     |                |                |
| 5th                                                                     |                |                |
| 6th                                                                     |                |                |
| Academic year                                                           |                |                |
| 1st                                                                     |                | 101 (10.6)     |
| 2nd                                                                     |                | 128 (24.8)     |
| 3rd                                                                     |                | 101 (19.6)     |
| 4th                                                                     |                | 70 (13.6)      |
| 5th                                                                     |                | 79 (15.3)      |
| 6th                                                                     |                | 32 (6.2)       |
| Other                                                                   |                | 5 (1)          |
| Type of device used                                                      |                |                |
| iPads or tablets                                                        |                | 30 (5.8)       |
| iPads or tablets and computers                                          |                | 2 (0.4)        |
| Computers                                                               |                | 14 (2.7)       |
| Smartphones                                                             |                | 232 (45)       |
| iPads or tablets and smartphones                                        |                | 51 (9.9)       |
| iPads or tablets, smartphones and computers                            |                | 88 (17.1)      |
| Smartphones and computers                                               |                | 99 (19.2)      |
| Time spent on used device                                              |                |                |
| 1-3 h                                                                  |                | 24 (4.7)       |
| 4-6 h                                                                  |                | 158 (30.6)     |
| 6-9 h                                                                  |                | 181 (35.1)     |
| 9 h and more                                                            |                | 153 (29.7)     |
| Reason for using the electronic devices (most of the time):            |                |                |
| Entertainment and Social media                                          |                | 343 (66.5)     |
| Studying                                                                |                | 173 (33.5)     |
| The position of the neck and hands when you use the smartphones         |                |                |
| Mobile use (with both hands) with a slight tilt of the neck below the horizon line |                | 148 (28.7)     |
| Mobile use (with both hands) with a large neck tilt below the horizon line |                | 38 (7.4)       |
| Mobile use (with one hand) with a large neck tilt below the horizon line |                | 65 (12.6)      |
| Mobile use (with one hand) with a slight tilt of the neck below the horizon line |                | 209 (40.5)     |
| Mobile use (both hands) with proper neck position                       |                | 30 (5.8)       |
| Mobile use (with one hand) with proper neck position                    |                | 26 (5)         |

Figure 1 shows that participants who were using both iPads or tablets and computers accounted for a significantly higher percentage of those who were suffering neck or shoulder pain compared to other used devices ($P =<0.05$).

Figure 2 shows that the participants who were using electronic devices for studying accounted for a significantly higher percentage of those who were suffering neck or shoulder pain compared to those using it for entertainment and social media ($P =<0.05$).

Figure 3 illustrated those participants who were using the mobile with one hand with a large neck tilt below the horizon line accounted for a significantly higher percentage of those who were suffering neck or shoulder pain compared to those using it in other positions ($P =<0.05$).

**Discussion**

Over the last decade, the use of technology has increased in many fields, including education, entertainment, socialization, and...
Elsiddig, et al.: Prevalence of neck and shoulder pain among Saudi students using smartphones

Increase use devices leading to many issues in human life physically and psychologically, one of these problems’ syndrome that discovered due to spent long time using devices called text neck syndrome. There is a significant relation between using devices and this syndrome. The present study measured the correlation between repetitive strain injury and using devices among universities students in Saudi Arabia in considering the amount of time spent on using devices, posture, and different majors. Education now depends on online learning by using computers, tablets, and iPads; this issue is a major concern with university students and may lead to serious permanent damage as untreated neck pain can be similar to occupational overuse syndrome. A study was conducted among the students of Aljouf university to assess the health impacts resulting from using a mobile phone; it was found that 71.2% of subjects were suffering

**Table 2: Distribution of studied participants according to suffering neck or shoulder pain on using electronic devices, severity, use pain relief medicines, doing exercises for the neck and shoulder after using the electronic devices for a long time, relation of pain with previous injury, and its effect on daily routine? (n=516)**

| Variable                                                                 | n (%)      |
|--------------------------------------------------------------------------|------------|
| Do you suffer from neck pain while using electronic devices?             |            |
| Yes                                                                      | 305 (59.1) |
| No                                                                       | 211 (40.9) |
| Mild                                                                     | 234 (45.3) |
| Sever                                                                    | 23 (4.5)   |
| No pain                                                                  | 144 (27.9) |
| Moderate                                                                 | 115 (22.3) |
| Do you suffer from shoulder pain while using electronic devices?         |            |
| Yes                                                                      | 305 (59.1) |
| No                                                                       | 211 (40.9) |
| Mild                                                                     | 169 (32.8) |
| Sever                                                                    | 34 (6.6)   |
| No pain                                                                  | 211 (40.9) |
| Moderate                                                                 | 102 (19.8) |
| If you have pain in the neck or shoulder, do you use pain relief medicines: |            |
| Sometime                                                                 | 68 (13.2)  |
| Always                                                                   | 14 (2.7)   |
| Never                                                                    | 300 (58.1) |
| Rarely                                                                   | 102 (19.8) |
| Do you do exercises for the neck and shoulder after using electronic devices for a long time? |            |
| No                                                                       | 339 (65.7) |
| Yes                                                                      | 177 (34.3) |
| If the answer is yes, do you feel better after doing the exercises?      |            |
| No                                                                       | 13 (2.5)   |
| Yes                                                                      | 164 (31.8) |
| Is the pain caused by using the devices or from a previous injury?        |            |
| Previous injury                                                          | 14 (2.7)   |
| Use the devices                                                          | 400 (77.5) |
| Other:                                                                   |            |
| Heaviness of the school bag                                              | 2 (0.4)    |
| Wrong sleeping position                                                  | 3 (0.6)    |
| Does the pain affects your daily routine?                                |            |
| Sometime                                                                 | 15 (2.9)   |
| No                                                                       | 396 (76.7) |
| Yes                                                                      | 105 (20.3) |

**Table 3: Distribution of studied participants according body position using the tablet or computer**

| Body Position               | (1)   | (2)   | (3)   | (4)   | (5)   | (6)   |
|-----------------------------|-------|-------|-------|-------|-------|-------|
| Sitting                      | 109 (21.1) | 67 (13) | 178 (34.5) | 50 (9.7) | 78 (15.1) | 34 (6.6) |

**Figure 1:** Relationship between neck or shoulder pain and type of device used N.B.: ($\chi^2 = 20.93, P = 0.002$)
from cervical pain, which was the most frequent symptom. The prevalence of neck and shoulder pain in our participants is 59.1% while using electronic devices. The prevalence mentioned in this study is lesser than the prevalence rate reported in a study conducted on adolescents in Riyadh (69.4%).

Most of our participants suffering from pain were using iPads or tablets and computers. The students who are using devices for studying accounted for a significantly higher percentage compared to other purposes of using devices.

**Table 4: Relationship between suffering neck or shoulder pain and participants’ characters, duration of use, and doing exercises for the neck and shoulder after using the electronic devices for a long time (n=516)**

| Variable | Neck or shoulder pain Present No. (%) | Neck or shoulder pain Absent No. (%) | χ² | P |
|----------|-------------------------------------|-------------------------------------|-----|---|
| Age      | 21.03±3.33                          | 20.6±1.8                            | 0.52*| 0.599|
| Gender   |                                     |                                     |     |   |
| Female   | 270 (59.2)                          | 186 (40.8)                          | 0.01| 0.897|
| Male     | 35 (58.3)                           | 25 (41.7)                           | 2.07| 0.149|
| Nationality |                                    |                                     |     |   |
| Saudi    | 299 (58.7)                          | 210 (41.3)                          |     |   |
| Non-Saudi| 6 (85.7)                            | 1 (14.3)                            |     |   |
| Collage  |                                     |                                     |     |   |
| Literary collage |                              | 119 (64)                          | 3.17| 0.205|
| Health collage |                                      | 91 (58)                            |     |   |
| scientific collage |                                      | 95 (54.9)                         |     |   |
| Academic year |                                    |                                     |     |   |
| 1st      | 65 (64.4)                           | 36 (35.6)                           | 5.09| 0.532|
| 2nd      | 70 (64.7)                           | 58 (45.3)                           |     |   |
| 3rd      | 64 (63.4)                           | 37 (36.6)                           |     |   |
| 4th      | 37 (54.9)                           | 33 (47.1)                           |     |   |
| 5th      | 47 (59.5)                           | 32 (40.5)                           |     |   |
| 6th      | 18 (56.3)                           | 14 (43.8)                           |     |   |
| Other    | 4 (80)                              | 1 (20)                              |     |   |
| The time spent on used device |                                   |                                     |     |   |
| 1-3 h    | 12 (50)                             | 12 (50)                             | 1.03| 0.793|
| 4-6 h    | 96 (60.8)                           | 62 (39.2)                           |     |   |
| 6-9 h    | 106 (58.6)                          | 75 (41.4)                           |     |   |
| 9 h and more |                                      | 91 (59.5)                           |     |   |
| Do you do exercises for the neck and shoulder after using electronic devices for a long time? | | | | |
| No       | 195 (57.5)                          | 144 (42.5)                          | 1.02| 0.31|
| Yes      | 110 (62.1)                          | 67 (37.9)                           |     |   |

N.B.: *Mann-Whitney test

Figure 2: Relationship between neck or shoulder pain and reason for using the device N.B.: (χ² = 14.02, P = <0.001)

The posture of the neck and head while using electronic devices has been correlated with musculoskeletal pain of the neck and shoulders. In the present study, the participant who were using mobile with one hand with a large neck tilt below the horizon line accounted for a higher percentage than those using it in other positions. In another study among medical students, the prevalence of musculoskeletal disorder (MSD) was high; they found that 85.3% of the students had MSD at least in one position at any time. Therefore, spending a long time using devices in the same position has a high risk of increased health problems. There is a significant relation between time spent on using devices and musculoskeletal pain. Increasing

Figure 3: Relationship between neck or shoulder pain and position of the neck and hands when using smartphones N.B.: (χ² = 25.43, P = <0.001)
the time of using devices will develop more musculoskeletal injury, similar to other studies that showed that too much use of the smartphone is related to neck pain among healthy young undergraduate students. The prevalence of pain produced from using devices in our participants was higher compared to the pain from previous trauma. The correlation between MSD and history of trauma in the study among medical students is clear. The individuals who had trauma were at a higher risk to develop musculoskeletal disorders. In our study, in most of the participants, the pain was not related to previous trauma. The pain affects many aspects of people’s life. A study showed that pain affected 13.2%, 24.7%, and 11.3% of the participants and their quality of life, which coincide with the results in other previous studies. A previous study showed a significant relationship between mood change and neck-shoulder pain in the young age group. Multiple studies found that there is an association between sleep time and neck-shoulder pain. In the present study, 2.9% and 20.3% reported this pain sometimes and always affected their daily routine, respectively. Movements such as tilting of the head, neck, and shoulders on devices, and the neck position while studying or using devices for any purpose can progressively increase compression in the cervical vertebrae. Nowadays, as it is very difficult to avoid excessive use of devices, students should perform their daily activities at the same time so that they can avoid excessive neck tilt for a long time. The management of some musculoskeletal disorders needs efforts in the primary healthcare settings that need clinical interventions with change lifestyle by doing exercise and decrease time spending on devices.

**Limitations**

The use of a self-administered questionnaire in this study could have a recall bias.

**Conclusion**

In this study, 45% of the participants used cellphones, 35.1% spent 6–9 hours on them, and 40.5% held the phone in one hand with the neck tilted slightly below the horizon line. Only 2.7% of individuals in pain always used pain relievers, 34.3% didn’t use and shoulder exercises after using electronic devices, and 20.3% complained about pain interfering with their regular routines. Participants who used iPads, tablets, and computers accounted for a significantly higher percentage of neck or shoulder pain than those who utilized other devices. Participants who used devices for studying had a much higher rate of neck or shoulder pain than those who used them for other purposes. Participants who used their phone with one hand and a large neck tilt below the horizon line were significantly more likely to have neck or shoulder pain. There should be awareness campaigns directed toward university students to raise their awareness about health and safety risks associated with computer use. The student community should be encouraged to report neck and shoulder pain and other pertinent situations associated with the use of electronic devices.

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**Declaration of patient consent**

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given her consent for her images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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**Conflicts of interest**

There are no conflicts of interest.

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