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Original Article

Prevalence of text neck syndrome among Iraqi medical students: a cross-sectional study

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Abstract

Background: Excessive use of portable electronic devices causes neck flexion and the emergence of text neck syndrome (TNS). This study aims to explore the prevalence of TNS among medical students during the COVID-19 lockdown in Iraq.

Methods: A prospective cross-sectional web-based study was conducted from 1st to 30th March 2022 at the faculty of medicine, Diyala University, Iraq. A self-administered questionnaire was distributed among the medical students using Google Form through social media (WhatsApp group). The semi-structured questionnaire included the sociodemographic, the valid smartphone addiction scale-short version (SAS-SV), and the neck disability index (NDI). Univariate, bivariate, and multiple logistic regression were used to analyze the data. SPSS version 16. The statistical significance is considered at less than 0.05.

Results: Out of 273 medical students included in the study, 59.3% were males, unmarried (88.3%), and from the 1st year (21.6%). The mean age of students was 21.27 ± 1.74 years. The prevalence of text neck syndrome was 64.5%. About two-thirds (61.5%) of students were addicted to their smartphones and used them more than five h/daily (63.7%). Factors associated with neck disability were the students who did not warm up neck muscles before using the smartphone (OR = 8.796, 95% CI: 1.724 to 24.884), addicted to the smartphone (OR = 6.803, 95% CI: 3.455 to 13.397), experienced increase in daily hours using the smartphone during the COVID-19 related quarantine (OR = 5.370, 95% CI: 2.523 to 11.427), maintained smartphone use five hours and more daily (OR = 2.818, 95% CI: 1.422 to 5.587), had neck pain (OR = 2.876, 95% CI: 1.356 to 6.098), the female gender (OR = 2.756, 95% CI: 1.221 to 6.221), and those who did not have a frequent break when using the smartphone (OR = 2.693, 95% CI: 1.329 to 5.454).

Conclusion: In conclusion, the prevalence of neck disability was high among the surveyed medical students. Addiction and excessive smartphone use with a lack of attention to warm up the neck muscles before usage was the most prominent predictors of neck disability.

Keywords: Smartphone Addiction, Medical Students, Text Neck Syndrome, Neck Disability, Neck Pain, Iraq

Background

The study of medicine is a big challenge. The student spends a great effort and a long time searching for information. The time and how to exploit it is a determinant factor in the student's success. Modern technology, such as mobile phones and the Internet, formed a turning point in the curriculum of the study by providing, storing, and easy access to knowledge. The mobile phone was not limited to communication but an entertainment and education tool for different age groups [1]. Previous studies indicate that the prevalence of using a smartphone was higher among medical students [2-11].

However, prolonged looking at the electronic devices leads to undesirable bending of the head and neck to the front in a declining position. Neck pain (NP), text neck (TN), and addiction were the expected consequences of excessive dependency on smartphones [6,11,12]. Recently, COVID-19-related quarantine and the online study have significantly increased the use rates of portable devices [2,13, 14]. Meng S-Q et al. [15], in their systematic review and meta-analysis, found that the prevalence of smartphone addiction was "26.99% (95% CI, 22.73-31.73)" in a global pooled population. The term 'text neck' defines the "neck pain" resulting from undesirable usage of portable electronic devices for long periods in an incorrect body position [16,17]. There is a significant relationship between the number of hours using the smartphone and the

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prevalence of addiction. The more hours of looking at electronic devices, the more likely to become addicted [18-22]. Previous studies argued that the younger users of electronic devices are more likely to develop musculoskeletal symptoms because of the early launching of technology in their daily lives [23,24].

Moreover, a non-practicing warm-up of neck muscles before using the smartphone or taking frequent breaks during smartphones raises the possibility of musculoskeletal and neurological neck problems, especially among young people. In light of the successive waves of Covid-19 [25] and the procedures approved to combat the pandemic, such as the quarantine [26], most young users of mobile devices were university students who did not realize the health effect of incorrect use [27]. This study aimed to identify the prevalence of neck disability and the associated factors among medical students at the University of Diyala, College of Medicine, Diyala, Iraq.

Methods

Study population and sample

A prospective cross-sectional study was conducted from 1st to 30th March 2022 among medical students at the faculty of medicine, University of Diyala, Iraq. A URL link to the self-administered questionnaire was created from Google Forum and submitted to the batch leader of each class to be distributed through WhatsApp among the students.

Inclusion and exclusion criteria

All undergraduate medical students in the faculty of medicine and willing to participate at the time of the data collection were included in the study. Students who were unwilling to participate and the incomplete data were excluded from the study. Special attention has been given to ensure that the participants did not have a past or recent history of trauma or surgery around the neck area.

Sample size

The online Raosoft sample size calculator was recruited to calculate the sample size [30]. Based on the earlier prevalence (35.0%) of text neck syndrome reported in the United States [9], a 95% confidence level, and 6% margin of error, the minimum sample size needed for the current study was 240 + 24 (10% non-response) =264. Therefore, a universal sampling technique was recruited, and all medical students were invited to participate.

The study instrument

The questionnaire is composed of three sections. The first section included the sociodemographic characteristics of respondents, such as age, gender, class, and whether they have contracted COVID-19 or not. The second section included NDI-related factors such as the hours of daily use of the smartphone, the reasons behind using a smartphone, warming up neck muscles before using a mobile phone, taking breaks while using their cell phones, subjective neck pain, the neck position, and whether students experienced an increase in the daily use of the smartphone during the lockdown or not. The third section concerns the “SAS-Short Version (SAS-SV)”. The valid and reliable SAS-SV [28] is composed of ten items. Likert scale was recruited to score the scale; “1 = strongly disagree, 2 = disagree, 3 = weakly disagree, 4 = weakly agree, 5= agree, and 6= strongly agree”. The total score of SAS-SV ranges from “10 to 60”. “The cutoff value was 31 for male and 33 for female students”. Each respondent scoring above the cutoff value is at “high risk for smartphone addiction”. The fourth section has the NDI scale's valid version [29]. Ten items are included in the NDI and scored 0 to 5 for each. The obtained total score ranged from 0 to 50.

Dependent variable

The NDI total score subdivided into five categories of neck disability:

a. 0–4 = no disability,
b. 5–14 = mild disability,
c. 15–24 = moderate disability,
d. 25–34 = severe disability, and
e. >34 = complete disability.

For the purpose of analysis, the total score was categorized as “No neck disability” for the score (0-4), while the other scores considered "Neck disability."

Independent variables

The independent variables included the sociodemographic variables, the neck disability-related variables, and smartphone addiction. “Female” and “Male” giving for gender. Marital status was categorized as “unmarried” for those who did not get married and "Married" for the single, widow, and divorced. The response was “Yes” or “No” for the following questions and statements: “Have you contracted a COVID-19 infection?”; “I feel pain at the back of the neck while using a smartphone?”; “Usually, I warm up the neck before using the smartphone”; and “I frequently have breaks during the smartphone use”. The self-experience of respondents was “Increased” or “No change” for the question: Is there any difference in daily hours using the smartphone during the COVID-19 quarantine? The self-estimation for the duration of daily hours using the smartphone was categorized into: “1-2 h/d”; “2-3 h/d”; “3-4 h/d”; “4-5 h/d” and “>5 h/d”. The five responses: “Browsing Internet”; “Social media”; “Education”; “Gaming”; “Calling”. Regarding the neck position, while using the smartphone, students were shown an image of different neck positions (0°, 15°, 30°, 45°, and 60°) and asked to indicate their most frequent position when using their smartphones [Figure 1].

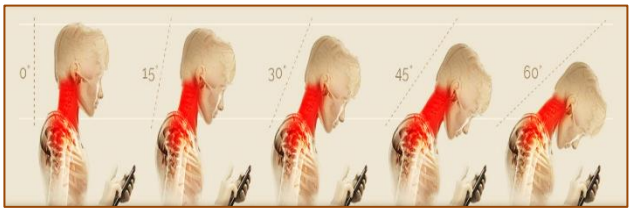

Figure 1: Neck position while watching the smartphone

Statistical analysis

Data collected were analyzed using Statistical Package for Social Science (SPSS) program version 16.0 (SPSS Inc., Chicago, IL, USA). Normality tests were done, and all the quantitative data were normally distributed. The sample profile was obtained by frequency distribution and descriptive statistics of sociodemographic variables and NDI-related factors. Chi-square tests were used in the bivariate analysis for binary or

categorical variables. Significant factors predicting neck disability on bivariate analysis (p-value <0.05) were included in the multivariate model. Multiple logistic regression analysis (Enter technique) was performed to identify significant predictors of neck disability. In the "Enter technique," the variables in the models which are not significant are removed one by one until a satisfactory model is obtained. The odds ratio and 95% confidence interval were calculated. An alpha level of $p < 0.05$ is considered to be statistically significant.

Results

Characteristics of the participants

Table 1 presents the sociodemographic factors. Data of 273 medical students have undergone final analysis. The mean age of students was 21.27 ± 1.74 years. Most of them were males (162, 59.3%), unmarried (88.3%), and from the 1st year (21.6%). About one-third (86, 31.5) of them contracted COVID-19 infection (Table 1).

Table 1: Sociodemographic characteristics of respondents (n=273)

Variables	Categories	N (%)
Age	Mean: 21.27 (+1.74)	
Gender	Females	111(40.7)
	Males	162(59.3)
Marital status	Married	31(11.4)
	Unmarried (single)	242(88.6)
Class of study	1st Year	59(21.6)
	2nd Year	47(17.2)
	3rd Year	48(17.6)
	4th Year	40(14.7)
	5th Year	38(13.9)
	5th Year	41(15.0)
Have you contracted a COVID-19 infection?	No	187(68.5)
	Yes	86(31.5)

Sociodemographic factors associated with neck disability in bivariate analysis

The mean score of SAS-SV was 36.27 ± 3.25. The prevalence of text neck syndrome was 64.5%. Among the participants, 116 (42.5%) had mild (5-14), 42 (15.4%) had moderate (15-24), and 18 (6.6%) had severe (25-34) neck disability. However, 97 (35.5%) had no disability (0-4). Cross tabulation indicated that females (chi-square test ($\chi 2$) = 22.535, $P < 0.001$) and being infected with COVID-19 ($\chi 2 = 6.768$, $P = 0.009$) were significantly associated with neck disability (Table 2).

Table 2: Characteristics of respondents associated with neck disability in bivariate analysis (n=273)

Variables	Categories	Total N (%)	No disability	Disability	Chi square	*P*-value
Gender	Females	111(40.7)	21(18.9)	90(81.1)	22.535	<0.001
	Males	162(59.3)	33(19.6)	135(80.4)		
Marital status	Married	31(11.4)	10(32.3)	21(67.7)	0.164	0.686
	Unmarried (single)	242(88.6)	87(36.0)	155(64.0)		
Have you contracted a COVID-19 infection?	Yes	86(31.5)	21(24.4)	65(75.6)	6.768	0.009
	No	187(68.5)	76(40.6)	111(59.4)		

Factors associated with neck disability in bivariate analysis

Most of the respondents were addicted to their smartphones (61.5%). About two-thirds of students used their smartphones more than five h/daily (174, 63.7%). Nearly half of students (127, 46.5%) complained of neck pain; however, the majority of them (257, 94.1%) did not practice warming up neck muscles or having breaks when using the smartphone (147, 53.8%). Most students kept a 30° and 45° neck position while they used the smartphone (41.4%) and 27.8%, respectively. Browsing the Internet (98, 35.9%) and social media (77, 28.2%) were the top reasons to use a smartphone (Table 3). Cross tabulation indicated that students who were smartphone adductors (chi-square test (χ^2) = 48.137, $P < 0.001$), had neck pain ($\chi^2 = 21.115$, $P < 0.001$), did not warm up neck muscles ($\chi^2 = 11.558$, $P = 0.001$), using a smartphone more than five h/day ($\chi^2 = 17.275$, $P = 0.002$), increased the daily using hours of the smartphone ($\chi^2 = 17.902$, $P < 0.001$), maintain a 60° neck position when using the smartphone ($\chi^2 = 27.911$, $P < 0.001$), browsing the Internet ($\chi^2 = 12.288$, $P = 0.015$), were significantly associated with neck disability (Table 3).

Factors associated with neck disability in multiple logistic regression

Table 4 shows the final model of the multiple logistic regressions. The students who did not warm up neck muscles before using the smartphone (OR = 8.796, 95% CI: 1.724 to 24.884), addicted to the smartphone (OR = 6.803, 95% CI: 3.455 to 13.397), and those who experienced an increase in daily hours using the smartphone during the COVID-19 related quarantine (OR = 5.370, 95% CI: 2.523 to 11.427), had the highest odds ratios.

While those who maintained smartphone use for five hours and more daily (OR = 2.818, 95% CI: 1.422 to 5.587) who had neck pain (OR = 2.876, 95% CI: 1.356 to 6.098), the females (OR = 2.756, 95% CI: 1.221 to 6.221), and did not have a break when using the smartphone (OR = 2.693, 95% CI: 1.329 to 5.454), had the lowest odds ratios.

The Hosmer and Lemeshow test indicated a good fit ($p = 0.365$). The total model was significant ($P < 0.001$) and accounted for 50.2% of the variance (Nagelkerke R square = 0.502).

Table 3: Neck disability associated factors in bivariate analysis (n=273)

Variables	Categories	N (%)	No disability	Disability	Chi square	p-value
SAS-SV	No Addiction	105(38.5)	64(61.0)	41(39.0)	48.137	<0.001
	Addiction	168(61.5)	33(19.6)	135(80.4)		
Neck pain	Yes	97(35.5)	27(21.3)	100(78.7)	21.115	<0.001
	No	176(64.5)	70(47.9)	76(52.1)		
Warm-up neck muscle	No	257(94.1)	85(33.1)	172(66.9)	11.558	0.001
	Yes	16(5.9)	12(75.0)	4(25.0)		
Duration of smartphone use daily	1-2 h/d	6(2.2)	4(66.7)	2(33.3)	17.275	0.002
	2-3 h/d	14(5.1)	11(78.6)	3(21.4)		
	3-4 h/d	23(8.4)	9(39.1)	14(60.9)		
	4-5 h/d	56(20.5)	22(39.3)	34(60.7)		
	>5 h/d	174(63.7)	51(29.3)	123(70.7)		
Duration of smartphone daily use during the lockdown	Increased	197(72.2)	55(27.9)	142(72.1)	17.902	<0.001
	No change	76(27.8)	42(55.3)	34(44.7)		
Neck position during smartphone use	0 degree	15 (5.5)	14(93.3)	1(6.7)	27.911	<0.001
	15 degrees	52(19.0)	20(38.5)	32(61.5)		
	30 degrees	113(41.4)	31(27.4)	82(72.6)		
	45 degrees	76(27.8)	29(38.2)	47(61.8)		
	60 degrees	17(6.2)	3(17.6)	14(82.4)		
Breaks from smartphone	Yes	126(46.2)	41(32.5)	85(67.5)	0.914	0.339
	No	147(53.8)	56(38.1)	91(61.9)		
Purpose of smartphone use	Browsing Internet	98(35.9)	26(26.5)	72(73.5)	12.288	0.015
	Social media	77(28.2)	35(45.5)	42(54.5)		
	Education	49(17.9)	23(46.9)	26(53.1)		
	Gaming	39(14.3)	9(23.1)	30(76.9)		
	Calling	10(3.7)	4(50.0)	6(60.0)		

Table 4: Predictors of neck disability in multiple logistic regression (n=273)

Variable	B	SE.	Wald	Sig.	EXP(B)	95.0% for EXP(B) Lower-upper
Females	1.014	0.415	5.959	0.015	2.756	1.221-6.221
Males					Reference	
Neck Pain	1.056	0.383	7.590	0.006	2.876	1.356-6.098
No pain					Reference	
No Warming	2.174	0.832	6.836	0.009	8.796	1.724-24.884
warming					Reference	
≥ 5 h/ daily use	1.036	0.349	8.808	0.003	2.818	1.422-5.587
>5 h/daily use					Reference	
Addiction to smartphone	1.917	0.346	30.752	0.000	6.803	3.455-13.397
No addiction					Reference	
Increased daily use during the quarantine	1.681	0.385	19.030	0.000	5.370	2.523-11.427
No change					Reference	
No break during the use of a smartphone	0.990	0.360	7.564	0.006	2.693	1.329-5.454
Have frequent breaks					Reference	

Discussion

In this study, about two-thirds (64.5%) of surveyed medical students presented with text neck syndrome. Similar prevalence was reported in studies from Jourdan (65%) [2], Saudi Arabia (68.1%, 44.8%)) [3,4], South Africa (66.2%) [5]. However, our finding is higher than that reported in Ethiopia (49.2%) [6], Pakistan (43.6%) [7], Brazil (55.44%) [8], United States (35.0%) [9], Australia (52.8%) [10], But lower than prevalence reported in Turkey (71.7%) [11]. Many educational institutions, including universities, increasingly rely on the Internet to communicate with students through email or social communication groups such as WhatsApp. Educational materials, tasks, and curriculum guidance are notified through the Internet. Therefore, students found it easy to handle a small and smart device that meets all/her educational and recreational needs instead of older devices such as laptops and desktops. Furthermore, most of our respondents experienced "mild neck

disability" (49.5%). such finding was supported by earlier studies conducted in Saudi Arabia (49.5%) [3], India (42.5%) [31], Korea (32.5%) [32]. More than sixty percent (61.5%) of our sample reported smartphone addiction. Our findings, like several studies, exceeded the global trend (26.99%) of smartphone addiction [15]. Alsiwed et al. [3] reported that 63.1% of medical students in Saudi Arabia (2021), Liu et al. [33] reported 39.7% among Chinees students (2022), Eldesokey et al. [34] reported 53.6% among Egyptian students (2021), and Dhamija et al. [35] reported 52.0% among Indian students (2021). However, a lower trend of smartphone addiction was reported by previous studies conducted by Szpakow et al. [36] among Belarus students (10.0%) in 2011, Dixit et al. [37], among Indian students (37.0%) in 2010, Khan MM [38], among Tunisian students (31.7) in 2008, and Lee et al. [39], among Korean students (16.0%) in 2007. In light of the events mentioned above, there has been a steady increase in the prevalence of smartphones among medical students in the last decade. Suppose we excluded the reasons related to the characteristics of the population, the sample size, and the tools employed to assess the levels of addiction. In that case, the significant increase in smartphone use rates between 2020-2022 could be attributed to COVID-19-related lockdown. Part of our results reinforces this hypothesis, as about seventy percent (72.2%) of students disclosed that they used their smartphones during the lockdown period more than before. More than one-third (35.9%) of our sample browse the Internet and 28.2% use smartphones for social media. In a similar situation to the COVID-19 quarantine, a previously conducted study in Iraq among internally displaced people showed that 29.3% of university students used smartphones for social media as alternatives to their previous social life [40]. Saadeh et al. [27] found that about 85.0% of 6,157 surveyed undergraduate students in Jourdan had “increased or greatly increased” the usage of smartphones during the COVID-19-related quarantine.

Perhaps the most prominent indicator of smartphone addiction was the long period of watching a smartphone. Several studies reported the likelihood of musculoskeletal disorders with an increased number of daily hours using the smartphone. Our result showed that most students (84.2%) were using smartphones for four hours and more daily, and those who were using smartphones 5 hours daily had 2.818 times more likely to increase neck disability. Similarly, Bavli et al. [21] found that 36.3% of Turkish students used smartphones for an average of 4 to 6 h daily; however, the daily use of 9 hours or more was statistically significant with high addiction points. Alsiwed et al. [3] found that 58.2% of medical students used smartphones for more than five h per day. Another study from Saudi Arabia found that 67.0% of respondents were smartphone-addicted, with average use of 6–11 h per day [19]. Damasceno et al. [41] found that Brazilian young people spent more than four h per day on smartphones. Another Korean study [42] indicated that most surveyed university students used their smartphones for more than four hours daily. Authors also found a positive correlation between the length of use and the appearance of musculoskeletal symptoms, including painful shoulders and neck. Most of our survey students (113, 41.4%) used smartphones at the "30° neck position". Cross tabulation showed that users of smartphones at "60° neck position" were more likely to develop neck disability than users at "15°, 30°, and 45° neck positions”. Our result was in line with Alsiwed et al. [3]. About 35.5% of our sample had neck pain with an odds ratio of 2.876 times likely to induce neck disability. Ethiopian study [6] found that 49.2% of medical students had neck pain with an odds ratio of 1.502 times more likely to induce neck pain when the duration of reading was 3 hours and more daily. A Jordanian study conducted by Al-Hadidi et al. [43] reported a significant association between the duration of use and the severity of neck pain and pain duration. Moreover, 44.6% of students forced analgesia when the severity of the pan exceeds four degrees. Among the results of this study, only 16(5.9%) warmed up neck muscles before using the phone, and 126 (46.2%) had breaks when using the phone. Similarly, Alsiwed et al. [3] found that 7.5% of Saudi students warmed up their neck muscles before using the smartphone, and 61.0 % had frequent breaks when using smartphones. Ali Chaudary et al. [7] found that among five hundred Pakistani medical students, 6.0% tended to warm up the neck muscles before using a smartphone, and 12.0% abandoned the phone for a while to give a chance for neck muscles' relaxation.

Moreover, an exciting finding in our multiple logistic regression showed that medical students who did not practice warm-up of neck muscle and did have frequent breaks had an odds ratio of 8.796 and 2.693 times to develop neck disability, respectively. Excessive use of the phones without rest periods to relax and warm up the neck muscles was significantly associated with symptomatic musculoskeletal injuries. At the same time, taking breaks every 20 min use is a protective action against the liable neck disability due to incorrect posture and prolonged use of portable devices [44].

The bivariate analysis found a statistically significant relationship between gender and neck disability ($P < 0.001$). Moreover, females had an odds ratio of 2.756 times to develop neck disability than males in logistic recession. Similarly, the results of the Korean study showed that the average score of NDI among female students was significantly higher than their counterparts ($P < 0.05$) [32]. Our finding is also consistent with a previous study conducted in Jourdan [43], which concluded that female students spend more time browsing smartphones than male students ($P = 0.005$). Some limitations were reported in the current study. First, we conducted the study during the COVID-19 pandemic, forcing us to choose an online survey. Second, it was impossible to “measure neck posture during smartphone use” because of COVID-19. Third, the sample was medical students; therefore, the study might not represent the total Iraqi population.

Conclusion

In conclusion, the prevalence of text neck syndrome among Iraqi medical students was high (64.5%) but in line with several neighboring and international findings. Most medical students were smartphone adductors (61.5%) using the phone for more than five h/daily (63.7%). Moreover, multiple logistic regression revealed that neck disability was significantly associated with "not warming up neck muscle before using the smartphone," "addiction to smartphone", "increased daily hours using the smartphone during the COVID-19 related quarantine", "using the phone for five hours and more daily", "neck pain", "female gender" and "have no frequent breaks during the smartphone usage."

Abbreviation

COVID-19: Coronavirus; SAS-SV: Smartphone Addiction Scale-Short Version; NDI: Neck Disability Index; IQD: Iraqi Dinar

Declaration

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Availability of data and materials

Data will be available by emailing dr.muayad67@gmail.com.

Authors' contributions

All Muayad Kadhim Rashid (MKR) and Saad Ahmed Ali Jadoo (SAAJ) were the study's designers, coordinating all aspects of the research and drafting and reviewing the article. Adil Hassan Al-Hussainy (AHA) and Ismail Ibrahim Latif (IIL contributed to the study's concept, arrangement, and data collection. Saad Ahmed Ali Jadoo (SAAJ) contributed to the analysis and interpretation of the study and the article's writing. All authors have read and approved the final version of the manuscript.

Ethics approval and consent to participate

We conducted the research following the Declaration of Helsinki. The protocol of the study was approved by the Ethics Committee of the College of Medicine, Diyala University (Ref: 1370 on 15th October 2021). Moreover, web-based informed consent was obtained from each participant after explaining the study objectives and the guarantee of secrecy.

Consent for publication

Not applicable

Competing interest

The authors declare that they have no competing interests.

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