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The prevalence of text neck syndrome and its association with smartphone use among medical students in Jeddah, Saudi Arabia

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ABSTRACT

Objectives: Text neck syndrome was first described by Fishman D. It refers to neck pain caused by repetitive stress injury resulting from prolonged neck flexion among smartphone users. The association of neck disability with various behaviors during the use of smartphones is still unclear in the literature. Therefore, we aimed to estimate the frequency of such factors and evaluate whether they contribute to text neck.

Methods: A cross-sectional study was conducted at six medical colleges in Jeddah, Saudi Arabia, from July 2020 to January 2021. An electronic, self-administered questionnaire was distributed to medical students online. In addition, participants were asked to complete the smartphone addiction scale-short version (SAS-SV) and the neck disability index (NDI).

Results: A total of 428 medical students participated, of which 304 (71.02%) were female, while 124 (28.97%) were male. The mean age was 22.11 ± 2.07 years. The prevalence of text neck syndrome was 68.1%. Among the participants, 49.5% had mild, 16.1% had moderate, and 2.6% had severe neck disabilities. The Spearman correlation coefficient showed a moderate positive correlation between SAS-SV and the NDI ($r_s = 0.328$, $P < 0.001$).

Conclusion: The current study found that most medical students had a neck disability, and there was a significant association between text neck syndrome and smartphone use. In addition, a lack of appropriate neck positioning and prolonged use of smartphones were found in most students. Therefore, more emphasis should be placed on raising awareness of the necessity of maintaining appropriate sitting posture and limiting the duration of mobile phone use.

Keywords: Neck disability, Neck pain, Smartphone addiction, Text neck syndrome, Saudi Arabia

INTRODUCTION

In the era of technology, portable devices have become increasingly reliable and useful. The main reason underlying the widespread use of mobile phones is the presence of a device that contains all of the means of communication, entertainment, and more.[1] Spending much time using

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electronic devices will result in prolonged neck flexion and leads to text neck syndrome.[1-4] Fishman D., an American chiropractor, was the first to describe text neck syndrome. It refers to neck pain that is caused by repetitive stress injury or overuse. It results from neck flexion, which happens when the person bends his/her neck in a downward position for a prolonged time, while looking at mobile phones or other digital devices such as tablets and laptops.[5] An adult head weighs 4.5–5.5 kg (10–12 pounds) in the normal position. Forward head flexion at different angles directly affects the cervical spine. At 15° head flexion, around 12 kg of force is placed on the neck. This force rises to 18 kg at 30°, 22 kg at 45°, and 27 kg at 60°.[6,7] Because children's head/body ratio is larger than adults', they may be more affected by text neck syndrome.[7] Text neck syndrome is characterized by pain in the cervical spine, upper back, and shoulder regions. Furthermore, it may lead to rounded shoulders, forward head posture, increased vertebral column curvature, and spasms in the surrounding muscles.[5,8,9] Untreated conditions may lead to permanent damage of the spinal cord, such as flattening of the spinal curvature, early onset of arthritis, spinal cord degeneration, disc compression, and herniation.[5,8,10,11] Prevention is the first step in managing text neck syndrome.[12]

A systematic review of 15 articles showed that mobile device users' most prevalent musculoskeletal complaints were neck related (17.3–67.8%).[2] Two studies conducted in Pakistan and India reported that the prevalence of text neck syndrome was 43.6% and 42.5%, respectively.[13,14] Another two studies conducted in Saudi Arabia at Aljouf University and Qassim University among mobile phone users showed that 71.2% and 59.5% complained of cervical pain, respectively.[10,15] Several studies reported a significant relationship between neck pain and smartphone addiction. The first study, conducted in India, showed a positive correlation between Nomophobia Questionnaire scores and the neck disability index (NDI) ($r = 0.36$).[13] The second study conducted at King Saud University, Riyadh, showed a significant relationship between the Smartphone Addiction Scale (SAS) and NDI scores ($P < 0.05$).[16] In addition, a study carried out in Australia reported a significant moderate correlation between the time spent on electronic devices and neck pain intensity ($P \leq 0.05$).[17]

These days, text neck syndrome is an alarming problem as more people engage in technology. Due to the worldwide spread of smartphones, more studies exploring the prevalence of text neck syndrome in other countries are needed. Moreover, the association of neck disability with various behaviors during the use of smartphones is still unclear in the literature. Therefore, we aimed to estimate the frequency of such factors and evaluate whether they contribute to text neck.

MATERIALS AND METHODS

This cross-sectional study was approved by Dr. Soliman Fakeeh Hospital Scientific Research Review Committee. It was conducted at six medical colleges (King Abdulaziz University, King Saud bin Abdulaziz University for Health Sciences, Fakeeh College for Medical Sciences, Ibn Sina National College, Batterjee Medical College, and University of Jeddah) in Jeddah, Saudi Arabia, from July 2020 to January 2021 among medical students. According to the Raosoft sample size calculator, the minimum sample size needed for the study with a 95% confidence level, a 5% margin of error, and a 50% response distribution was 370.[18] Therefore, all undergraduate medical students were invited to participate.

An electronic self-administered questionnaire was distributed online among medical students. Each batch leader of each medical college was contacted through WhatsApp to distribute the link of the questionnaire among the students. The questionnaire consisted of three parts. The first part collected basic demographic data including age, gender, university/college, the amount of daily smartphone use, the purpose of smartphone usage, warming up neck muscles before using a mobile phone, taking breaks while using their cell phone, subjective neck pain, and neck position while using their smartphone. Participants 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]. The second part included the SAS-Short Version (SAS-SV). The third part included the NDI.

The SAS-SV involves 10 items scored using a Likert scale (1 = strongly disagree, 2 = disagree, 3 = weakly disagree, 4 = weakly agree, 5= agree, and 6= strongly agree), with a total score ranging from 10 to 60. The cutoff value was 31 for male and 33 for female students. A score more than the cutoff value indicated a high risk for smartphone addiction. The SAS-SV is a valid and reliable tool for the assessment of smartphone addiction.[19]

The NDI includes 10 items. Each item is scored from 0 to 5, thus generating a minimum total score of 0 and a maximum total score of 50. The interpretation of the total score is based on five categories of neck disability (0–4 = no disability, 5–14 = mild disability, 15–24 = moderate disability, 25–34 = severe disability, and >34 = complete disability). This index is strongly validated for assessing disability in patients with neck pain.[20]

Statistical methods

Data were entered into Microsoft Excel 2019 and analyzed using the Statistical Package for the Social Sciences, version 25 (REL. 2017; IBM Corp., Armonk, NY, USA). $P < 0.05$ was considered statistically significant. Descriptive statistics were used to express the prevalence of text neck

syndrome and other univariates. Correlation and Chi-square analyses were used to express the presence of a relationship.

RESULTS

A total of 428 medical students from six medical colleges were involved. The majority of the responders were female; 304 (71.02%) and 124 (28.97%) were male. The mean age was 22.11 ± 2.07 years. More students were from the 4th year (29%). Among participants, 56.3% used their phones for browsing the internet. Only 32 (7.47%) warmed up their neck muscles before using their smartphones, and 261 (60.98%) took frequent breaks when using their smartphones [Tables 1a-c].

We found that the prevalence of text neck syndrome was 68.1%. Among the participants, 49.5% had mild, 16.1% had moderate, and 2.6% had severe neck disability. The majority of the responders were addicted to their smartphones (63.1%). The mean SAS-SV score was 35.29 ± 9.8 and the median value on the NDI was 7 (IQR = 8). There was no statistically significant relationship between gender and NDI or gender and SAS-SV (P = 0.056 and 0.462, respectively) [Figure 2 and Table 2].

The majority of students used their smartphones 4–5 and more than 5 h (20.3% and 58.2%, respectively). The duration of smartphone use was significantly related to NDI scores (P = 0.0049). Furthermore, 77% of students who used their phones 4–5 h and 69.9% of students who used their phones for more than 5 h had a neck disability. There was a significant relationship between NDI with neck pain ($P < 0.001$). Almost half (45.3%) of the responders reported having neck pain, among them, 87.6% had neck disability. Most responders maintained a 30° neck position during their smartphone usage (46.3%).

There was a significant relationship between neck position and NDI ($P < 0.001$) [Table 3]. On the Kruskal–Wallis test with pairwise comparisons, students using their smartphones with 60° neck position were found to have more neck

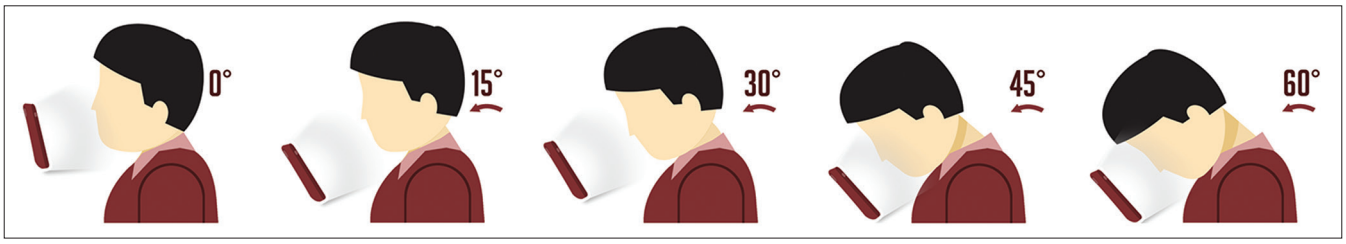

Figure 1: Illustration of neck positions while using a smartphone at varying degrees.

Table 1a: Demographic data.

Colleges	KAU	KSAU-HS	FCMS	ISNC	BMC	UOJ	Total	Percentage of total
Mean age	22.08	20.47	22.05	22.47	23.37	21.45	22.11	
Academic year								
Second	20	22	7	6	6	9	70	16.4
Third	13	4	13	15	7	8	60	14
Fourth	32	11	28	46	3	4	124	29
Fifth	24	10	2	17	10	7	70	16.4
Sixth	30	4	5	32	28	5	104	24.3
Total	119	51	55	116	54	33	428	100
Percentage of total	27	11.9	12.9	27.1	12.6	7.7		

KAU: King Abdulaziz University, KSAU-HS: King Saud Bin Abdulaziz University for Health Sciences, FCMS: Fakeeh College for Medical Sciences, ISNC: Ibn Sina National College, BMC: Batterjee Medical College, UOJ: University of Jeddah

Table 1b: Demographic data.

	Yes	No
Warm up neck muscles (%)	32 (7.47)	396 (92.52)
Breaks from smartphones (%)	261 (60.98)	167 (39.01)

Table 1c: Demographic data.

Purpose of smartphone use (%)	Browsing internet	Social media	Education	Calling	Gaming
	56.3	27.57	9.11	3.73	3.27

Table 2: Cross-tabulation of the gender of the students with NDI and SAS-SV.

	Gender		Total (%)
	Male	Female	
NDI			
No disability (0–4)	49	87	136 (31.8)
Mild (5–14)	50	162	212 (49.5)
Moderate (15–24)	23	46	69 (16.1)
Severe (25–34)	2	9	11 (2.6)
P-value		0.056	
Median (IQR)		7 (8)	
SAS-SV			
No addiction	42	116	158 (36.9)
Addiction	82	188	270 (63.1)
P-value		0.462	
Mean±SD		35.29±9.8	

NDI: Neck disability index, SAS-SV: Smartphone Addiction Scale-Short Version, IQR: Interquartile range

Table 3: Cross-tabulation of NDI with warming up neck muscles, taking breaks from smartphones, neck pain, duration of smartphone use, and neck position during smartphone use.

NDI	No disability (%)	Disability (%)	Total (%)	*P*-value
Neck pain				
Yes	24 (12.4)	170 (87.6)	194 (45.32)	<0.001
No	112 (47.86)	122 (52.2)	234 (54.67)	
Duration of smartphone use daily				
1–2 h	3 (75)	1 (25)	4 (0.9)	0.009
2–3 h	7 (33.3)	14 (66.6)	21 (4.9)	
3–4 h	31 (46.3)	36 (53.7)	67 (15.7)	
4–5 h	20 (23)	67 (77)	87 (20.3)	
More than 5 h	75 (30.1)	174 (69.9)	249 (58.2)	
Neck position during smartphone use				
0°	2 (16.7)	10 (83.3)	12 (2.8)	<0.001
15°	44 (44.9)	54 (55.1)	98 (22.9)	
30°	63 (31.8)	135 (68.1)	198 (46.3)	
45°	24 (28.2)	61 (71.8)	85 (19.9)	
60°	3 (8.6)	32 (91.5)	35 (8.2)	

NDI: Neck disability index

disability compared with students with 15°, 30°, and 45° neck positions (mean difference ± SE: 6.56 ± 1.29, 5.22 ± 1.20, and 3.80 ± 1.31; *P* <0.001, <0.001, and = 0.032, respectively).

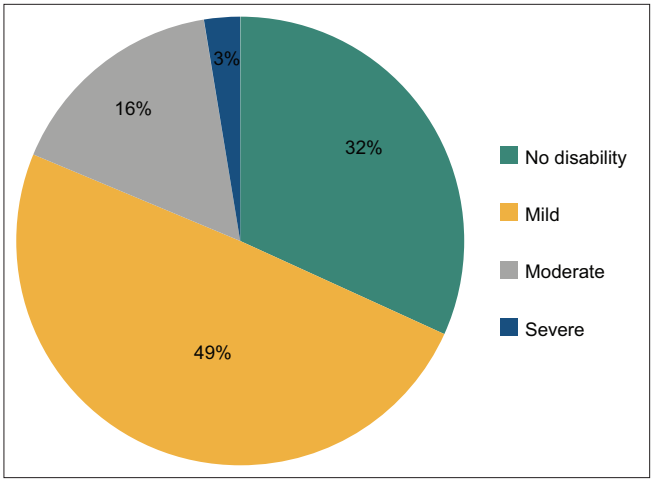

Figure 2: Neck disability index.

Moreover, of the 35 students who used their phones at a 60° neck position, only three did not have neck disability while the remaining 32 students had neck disability. Among these 32 students, three used their phones for 3–4 h, four used them for 4–5 h, and the majority (25 students) used them for more than 5 h [Table 4]. Using a Spearman's correlation, we found a moderate positive correlation between SAS-SV and NDI scores (r = 0.328, *P* < 0.001).

DISCUSSION

In this study, the prevalence of text neck syndrome among medical students was 68.1%. This result is almost the same as a study carried out in Aljouf University among cell phone users from the medical and dental colleges reported that 71.2% of 282 students complained of cervical pain.[10] According to a recent study conducted in India, 42.5% of participants had neck disabilities.[14] Another recent study conducted in India with similar social groups as in our study (82% of females and 17% of males) concluded that the prevalence of text neck syndrome was 32% of a total of 100 physiotherapy students.[21] There is also a study conducted in Korea among 2353 university students reported that 34.0% had a neck disability.[3]

In our study, most participants who had text neck syndrome reported experiencing mild neck disability (49.5%). This finding is consistent with other studies in the literature. The study in India that reported text neck syndrome in 42.5% of the participants showed that the prevalence was mostly contributed by those with a mild disability (constituted 31.9%).[14] Among 34% of students in the Korean study with a neck disability, a vast majority also had mild neck disability (they constituted 32.85% of the total percentage).[3]

A high prevalence of text neck syndrome among medical students in our study might be explained by the fact that medical students need to study for prolonged periods bending

Table 4: Cross-tabulation of NDI with neck position during smartphone use and duration of smartphone use.

Neck position	NDI	Duration of smartphone use daily					
		1–2 h	2–3 h	3–4 h	4–5 h	More than 5 h	Total (%)
0°	No disability				1	1	2 (0.5)
	Disability		2	1	2	5	10 (2.3)
15°	No disability	2	2	11	7	22	44 (10.3)
	Disability		2	3	16	33	54 (12.6)
30°	No disability	1	4	9	11	38	63 (14.7)
	Disability	1	9	24	29	72	135 (31.6)
45°	No disability		1	11	1	11	24 (5.6)
	Disability		1	5	16	39	61 (14.2)
60°	No disability					3	3 (0.7)
	Disability			3	4	25	32 (7.5)

NDI: Neck disability index

their necks looking toward the screen of smartphones or electronic devices for educational purposes. In addition, the integration of technology into the medical field may increase its usage among such students. Another factor that might have contributed to the problem is the suspension of in-person education due to the COVID-19 outbreak and the transition to online learning in Saudi Arabia on March 8, 2020,[22] which forced the students to use their electronic devices more excessively.

The majority of participants in our study were addicted to smartphone use, with a prevalence of 63.1%. Regarding the amount of daily use, most students use their phones for more than 4 h per day (78.5%). Two studies, one in Korea and one in Brazil, found that 42.1% and 76.6% of participants spent more than 4 h per day on their mobile phones, respectively.[4,23] The high prevalence of participants using a mobile phone for more than 4 h per day is an alarming problem since the severity of musculoskeletal symptoms in the upper extremities is significantly related to the amount of time spent using smartphones.[24] In addition, the duration of mobile phone use is not only associated with the severity of neck pain (r = 0.14, $P = 0.001$) but is also associated with the duration of the pain (r = 0.1, $P = 0.036$).[25]

In our study, there is a moderate positive correlation between SAS-SV and NDI scores (r = 0.328, $P < 0.001$). Two studies support this finding. The first study, conducted in Riyadh, Saudi Arabia, assessed the association between SAS and NDI scores. It revealed a significant Spearman correlation between the two variables ($P < 0.05$).[16] The second one was in India, where the Spearman correlation showed a moderately positive significant correlation between SAS and NDI (r = 0.671, $P < 0.001$).[26]

However, in the current study, no statistically significant relationship was found between gender and NDI nor gender and SAS-SV ($P = 0.056$ and 0.462, respectively). This result opposes a study conducted at the University of Jordan that found female students tend to use mobile phones for a longer period compared with their male counterparts ($P = 0.005$).[25] Moreover, a study carried out in Korea found that female students' mean NDI scores were significantly higher than male students' ($P < 0.05$).[3]

Regarding neck position, we found that most students had a 30° neck position during their smartphone use (46.3%). Moreover, students using their smartphones with 60° neck positions had more neck disability compared with the 15°, 30°, and 45° neck positions.

The correlation between neck posture and neck pain has been reported in the literature. A study in Portugal sought to determine the relationship between postural angles and the presence of neck and shoulder pain. They discovered that participants with forward head posture had more neck pain than those who did not have forward head posture (29.8% vs. 8.4%).[27] This finding is supported by another study conducted in Hong Kong, which revealed that the craniovertebral angle (CV) is negatively correlated with the Northwick Park Neck Pain Questionnaire (r = –0.395, $P = 0.002$), even after the correlation was adjusted for age (r = –0.3101, $P = 0.015$). That is, the more forward the head posture (i.e., the smaller the CV angle), the more neck disability occurs.[28]

This idea is challenged by studies showing that neck posture had no association with neck pain.[23,29] However, these studies did not consider potential factors such as neck muscle exercise and warm-up, taking frequent breaks, and whether the participants used analgesics to relieve the pain. Participants with more severe neck pain use analgesics more than participants with less severe neck pain (44.6% vs. 12.1%) ($P < 0.001$). In addition, they are more likely to change their positions during mobile phone use to relieve the pain (64% vs. 50.4%) ($P < 0.001$).[25]

Our study shows that only 7.5% of students warmed up their neck muscles before using their smartphones, and 61% took frequent breaks when using smartphones. A study conducted in Pakistan among 500 medical students reported

that only 6% warmed up their neck muscles before using mobile phones, and only 12% took breaks while using mobile phones.[13] Stretching exercises, warming up neck muscles, and taking frequent breaks to relax the neck muscles every 20 min might help to prevent neck injuries caused by prolonged smartphone use.[5]

Our study has several limitations. First, the study was conducted during the outbreak of COVID-19 and we faced some issues as a result. We had to distribute the questionnaire online and, therefore, we could not measure neck posture during smartphone use objectively. Second, this study was conducted among medical students only. Hence, it may not be representative of the whole population. We recommend further studies on the entire population to generalize the results.

CONCLUSION

We found the prevalence of text neck syndrome to be 68.1% and there was a significant albeit moderate positive correlation between the SAS-SV and the NDI.

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Recommendations

Inappropriate neck positioning and the prolonged use of smartphones were found in most of the students. Therefore, more emphasis should be placed on raising awareness of the necessity of maintaining appropriate sitting posture as well as using smartphones for limited durations to control the increasing prevalence of text neck syndrome, especially given the current transition to online learning. Furthermore, a guideline needs to be established to promote appropriate neck position and decent use of smartphones or any other electronic devices.

AUTHORS' CONTRIBUTION

KTA designed the study, did literature search, data acquisition, data analysis, and manuscript preparation. RMA, RAH, SAA, and AJA did literature search, data acquisition, data analysis, and manuscript preparation. MMB designed the study and defined intellectual content. All authors have critically reviewed and approved the final draft and are responsible for the manuscript's content and similarity index.

ETHICAL APPROVAL

Approval number: 111/IRB/2020, Date: July 27, 2020, source: IRB of Fakeeh College for Medical Sciences, Jeddah, Saudi Arabia.

Declaration of participants consent

The authors certify that they have obtained all appropriate participants consent forms. In the form, the participants have given their consent for their clinical information to be reported in the journal. The participants 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.

REFERENCES

1. Kim MS. Influence of neck pain on cervical movement in the sagittal plane during smartphone use. J Phys Ther Sci 2015;27:15-7.
2. Xie Y, Szeto G, Dai J. Prevalence and risk factors associated with musculoskeletal complaints among users of mobile handheld devices: A systematic review. Appl Ergon 2017;59:132-42.
3. Lee JI, Song HS. The correlation analysis between hours of smartphone use and neck pain in the Gachon University students. Acupunct 2014;31:99-109.
4. Kim HJ, Kim JS. The relationship between smartphone use and subjective musculoskeletal symptoms and university students. J Phys Ther Sci 2015;27:575-9.
5. Neupane S, Ali UI, Mathew A. Text neck syndrome-systematic review. Imp J Interdiscip Res 2017;3:141-8.
6. Hansraj KK. Assessment of stresses in the cervical spine caused by posture and position of the head. Surg Technol Int 2014;25:277-9.
7. Park J, Kim K, Kim N, Choi I, Lee S, Tak S, *et al*. A comparison of cervical flexion, pain, and clinical depression in frequency of smartphone use. Int J Biosci Biotechnol 2015;7:183-90.
8. Vate-U-Lan P. Text neck epidemic: A growing problem for smart phone users in Thailand. Int J Comput Internet Manag 2015;23:27-32.
9. Gray JC, Grimsby O. Interrelationship of the spine, rib cage, and shoulder. In: Physical Therapy of the Shoulder. Amsterdam, Netherlands: Elsevier; 2004. p. 133-85.
10. AlZarea BK, Patil SR. Mobile phone head and neck pain syndrome: Proposal of a new entity. Headache 2015;251:63.
11. Al-Gharabawi B. Text neck syndrome: A new concern for physical therapists worldwide. EC Orthop 2017;8:89-91.
12. Toh SH, Coenen P, Howie EK, Straker LM. The associations of mobile touch screen device use with musculoskeletal symptoms and exposures: A systematic review. PLoS One 2017;12:1-22.
13. Chaudary AA, Aslam F, Ali A, Asghar AR, Bashir H, Awais A, *et al*. Frequency of text neck syndrome in medical students due

to excessive usage of electronic devices. J Pak Orthop Assoc 2019;31:79-82.
14. Ahmed S, Akter R, Pokhrel N, Samuel AJ. Prevalence of text neck syndrome and SMS thumb among smartphone users in college-going students: A cross-sectional survey study. J Public Health 2019;29:2-7.
15. Alsalameh AM, Harisi MJ, Alduayji MA, Almutham AA, Mahmood FM. Evaluating the relationship between smartphone addiction/overuse and musculoskeletal pain among medical students at Qassim University. J Family Med Prim Care 2019;8:2953-9.
16. AlAbdulwahab SS, Kachanathu SJ, AlMotairi MS. Smartphone use addiction can cause neck disability. Musculoskeletal Care 2017;15:10-2.
17. Reid S, Portelli A. The effects of 'text neck' on head repositioning accuracy: A two group comparative study. Physiotherapy 2015;101:e1270.
18. Sample Size Calculator by Raosoft, Inc.; 2021. Available from: http://www.raosoft.com/samplesize.html. [Last accessed on 2021 May 22].
19. Kwon M, Kim DJ, Cho H, Yang S. The smartphone addiction scale: Development and validation of a short version for adolescents. PLoS One 2013;8:e83558.
20. Awwad WM, Alabdulkarim NH, Alhaidri NE. Exploratory and confirmatory factor analysis of the Arabic neck disability index: A cross-sectional study. J Musculoskelet Surg Res 2021;5:171-7.
21. Sathya P, Tamboli SA. Prevalence of text neck syndrome in young-adult population. Int J Med Exerc Sci 2020;6:749-59.
22. Minister of Education Appreciates Leadership Support in Remote Educational Process Success, Extends his Thanks to Education Staff for Their Sincere National Efforts the Official Saudi Press Agency; 2021. Available from: https://www.spa.gov.sa/viewstory.php?lang=en and newsid=2198275. [Last accessed on 2021 May 22].
23. Damasceno GM, Ferreira AS, Nogueira LA, Reis FJ, Andrade IC, Meziat-Filho N. Text neck and neck pain in 18-21-year-old young adults. Eur Spine J 2018;27:1249-54.
24. Alruzayhi MK, Almuhaini MS, Alwassel AI, Alateeq OM. The effect of smartphone usage on the upper extremity performance among Saudi Youth, KSA. Rom J Rhinol 2018;8:47-53.
25. Al-Hadidi F, Bsisu I, AlRyalat SA, Al-Zu'bi B, Bsisu R, Hamdan M, *et al*. Association between mobile phone use and neck pain in university students: A cross-sectional study using numeric rating scale for evaluation of neck pain. PLoS One 2019;14:e0217231.
26. Shah PP, Sheth MS. Correlation of smartphone use addiction with text neck syndrome and SMS thumb in physiotherapy students. Int J Community Med Public Health 2018;5:2512-6.
27. Ruivo RM, Pezarat-Correia P, Carita AI. Cervical and shoulder postural assessment of adolescents between 15 and 17 years old and association with upper quadrant pain. Braz J Phys Ther 2014;18:364-71.
28. Yip CHT, Chiu TT, Poon AT. The relationship between head posture and severity and disability of patients with neck pain. Man Ther 2008;13:148-54.
29. Richards KV, Beales DJ, Smith AJ, O'Sullivan PB, Straker LM. Neck Posture Clusters and their Association with Biopsychosocial Factors and Neck Pain in Australian Adolescents. Oxford: Oxford University Press; 2016.