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Case Report

Association of Neck Disability and Forward Head Posture in University Students with Smartphone Addiction

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Abstract

Background: Smartphone usage has increased tremendously among young adults over the past decade and its usage is not limited to phone calls and texting, it is widely used by students for reading eBooks, playing games, navigation etc. This has caused various musculoskeletal complaints among students relating to pain and postural defaults.

Method: University students with neck pain were taken for the study. Participants (n = 88) were assessed for smartphone addiction with smartphone addiction scale short version (SAS-SV), neck disability with neck disability index (NDI) and craniovertebral angle for assessing forward head posture which was done with 'On Protractor' application. Two groups were formed, smartphone non-addicted (n = 43) and smartphone addicted(n = 45). Score of NDI and CV angle were compared for both the groups and correlation was found out between smartphone addiction, NDI score and smartphone addiction and CV angle.

Result: A positive correlation (r = 0.42, p = 0.004) was found between smartphone addiction and NDI. No significant correlation (r = 0.08, p = 0.59) was found between craniovertebral angle and smartphone addiction. 14% participants were addicted to smartphone and 50% were having forward head posture (CVA<50°). Using unpaired t-test comparison was made for NDI score in addicted (mean = 24.67, SD = 12.81) and non-addicted group (mean = 12.19, SD = 1.22) and a significant difference was found. For measuring the difference between the CVA in non-addcited and addcited groups unpaired t-test was applied. There was a significant difference in the angles of non-addcited (mean = 50.69, SD = 2.02) and addicted (mean = 48.97, SD = 2.18) groups.

Conclusion: This study shows that smartphone addicted people are more susceptible to have neck disability. The prevalence of smartphone addiction in university students is increasing, which is leading to various musculoskeletal problems and neck joint is affected in many of the students studying at university. Percentage of students with forward head posture has also increased.

Keywords: Neck Disability; Neck Pain; Forward Head Posture; Smartphone Addiction; Musculoskeletal Problems

Background and Objectives

The term "smartphone" was first introduced in 1997. Smartphones are widely used portable devices; recent estimates showed that at least 77% of the world's population has their own smartphone [1]. Usage of smartphone has increased specifically in the past 20 years. Smartphones are small, compact and reliable

devices for entertainment and communication [2]. In addition to phone calls and chatting they are widely used for internet surfing, shopping, playing music and games with a variety of features of a portable computer like media player, camera, mobile mails and navigation [3]. Smartphones have gained popularity among students, is widespread and is considered crucial for university students. Students can easily access from important information to social media, the latest news and relevant information are at fingertips. Smartphones help the students in various ways like recording lectures through voice recording, making of videos, downloading learning material etc [4].

Excessive usage of smartphones has both short-term and long-term effects. Short term effects are decreased concentration and anxiety, while long term effects are, smartphone addiction, forward head posture and upper extremity pain.

In this 21st century, addiction is not just restricted to any substance abuse or drugs but addiction to smartphone is also often seen, which comes under the type of behavioural addiction [5]. People who are addicted to smartphone usually tend to avoid studying, working, communicating with friends with whom they hang out with but remain focused on their smartphone and only depending on it as a source of communication with others.

While using smartphones the neck usually goes into flexion while staring at the screen and continuous hours daily usage in such a position can cause postural defaults like forward head posture, rounded shoulders. While using smartphone the user usually maintains a stationary position, without any support to arms which causes misalignment of neck and shoulders. The maintenance of head and neck in forward flexion leads to decrease in cervical lordosis specifically of lower cervical vertebrae and increase in posterior curvature of upper thoracic spine is seen for maintaining the balance; this is defined as forward head posture [6-8].

Neck pain is the fourth top seed with disability globally [9]. Neck pain is usually seen in young adults and ranges from 30-50% [10]. While using smartphone there is repetitive movements and prolonged incorrect posture is kept which leads to decrease is blood circulation to muscle tissues. The blood flow restriction can cause limitation in nutrient supply to muscle tissues, which results in bad outcomes like muscle fatigue and musculoskeletal pain [11].

Thus, a study finding the correlation between neck pain and forward head posture in university students who are addicted and also who are not addicted to smartphones can help us in finding that till what limit the young generation is absorbed by their smartphones and how this can cause different complication like incorrect posture and neck disability which if continued can lead to musculoskeletal disorders.

Methodology

Methods

Study design and participants

An observational study with cross-sectional design was conducted and 88 participants were selected. The inclusion criterion was, the age limit was between 17 to 26 years, studying at the university, had neck pain and had not taken physiotherapy for the same. The exclusion criterion was any pathology in spine or upper limbs, taken any conservative treatment for neck pain, had any complaint of dizziness or radicular pain to upper limbs, cognitive disorders.

Procedure

A written consent was taken from the participants. The form had 4 components, first one asked about their demographic details, including name, age, gender, height, weight and if they had any neck pain in the last 2 weeks. If they selected that no pain was present then they were excluded from the study. The second component was of SAS-SV to measure the addiction level of the participants. The third component was of neck disability index for the assessment of disability of neck in the participants and last was the measurement of craniovertebral angle through “On protractor” application.

2 groups were formed smartphone non-addicted and smartphone addicted. The smartphone addiction level was assessed with smartphone addiction scale short version. Group 1 had participants whose score for SAS-SV was less than 32 (n = 43) and group 2 had participants whose score for SAS-SV was more than or equal to 32 (n = 45). Participants had their CVA measured to find the changes between the two groups. Difference between the score of CVA and NDI were calculated between the addicted and non-addicted group. Correlation of smartphone addiction with NDI score and CVA were also calculated.

Outcome measures

Smartphone addiction scale (Short version) (SAS-SV)

This scale has 10 items, each score on a Likert scale of 1 that is strongly disagree to 6 that is strongly agree. Summing of the items gives SAS-SV score range 10-60. Higher the score higher is the problematic smartphone use. SAS-SV mainly has 5 areas, namely everyday life disturbances, withdrawal, cyberspace-oriented relationships, overuse and tolerance. When the score is more than 32 the participants are considering to be smartphone addicted and if the score is 32 or less than 32 then they are considered to be non-addicted. Internal consistency of the 10-item SAS-SV assessed per Cronbach's alpha was 0.84 [12].

Neck disability index

It is commonly used for evaluation of neck disability and is a validated instrument. It involves the assessment of effects that are caused by neck pain and symptoms during the usual functional activities. In total there are 10 items, from which 4 are related to subjective symptoms (pain intensity, headaches, concentration and sleeping disturbances); 4 are related to activities of daily living (lifting, work, driving and recreation) and 2 to discretionary activities of daily living (personal care, reading). Each item is scored in 0 to 5 scale where 0 stands for no pain and 5 stands for worst pain imaginable. Higher the score greater the disability. Percentage value for each individual score was obtained. Reliability of NDI = 0.97 [13].

Craniovertebral angle measurement

The participants were told to sit on a stool without armrest in an erect posture the hips and the knees of the participant were at 90 degrees of flexion and the foot was flat on the ground. C7 is a prominent bony landmark which was palpated in the participants by asking them to flex and extend the neck repeatedly for 2-3 times and then palpating the spinous process of C7 [14]. The markers were placed at the C7, tragus of the ear and participants were asked to concentrate on a particular point. MI Poco F1 phone was used through which the photographs were taken using the on-protractor app through which the craniovertebral angle was measured [15]. The angle formed between the line connecting the tragus of the ear to C7 and the horizontal plane was calculated [14]. In this study CVA< 50 degrees were taken as forward head posture [16].

Figure 1: Image taken to measure CVA using "On Protractor" mobile app.

Result

The study included 88 participants, 43 in non-addicted group and 45 in addicted group. The description of sample characteristics is given in the following table.

Characteristics	Mean Standard Deviation	
	Non-addicted	Addicted
Age	23.98 ± 1.87	23.2 ± 2.29
Height	160.79 ± 25.63	159.16 ± 25.03
Weight	62.21 ± 10.29	63.49 ± 12.67

Table 1: Description of sample characteristics.

Pearson's correlation between the score of SAS-SV and NDI was applied and a positive correlation was found between the smartphone addiction of participants and neck disability as correlation coefficient is significantly different from 0.

Variables	Mean	R value	P value
SAS-SV	43.09	0.42	0.004
NDI	24.67	0.42	0.004

Table 2: Means, r value and p value for SAS-SV and NDI.

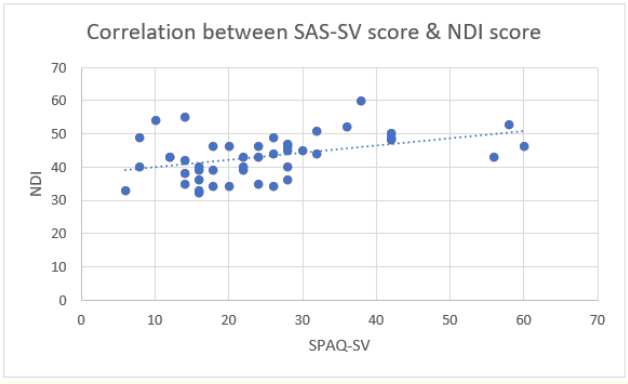

Figure 2: Correlation between SAS-SV and NDI.

Pearson's correlation between the score of SAS-SV and CVA was applied and no significant correlation was found between the smartphone addiction of participants and craniovertebral angle because correlation coefficient is not significantly different from 0.

Variables	Mean	R value	P value
SAS-SV	43.09	0.082	0.59
CVA	48.88	0.082	0.59

Table 3: Means, r value and p value for SAS-SV and CVA.

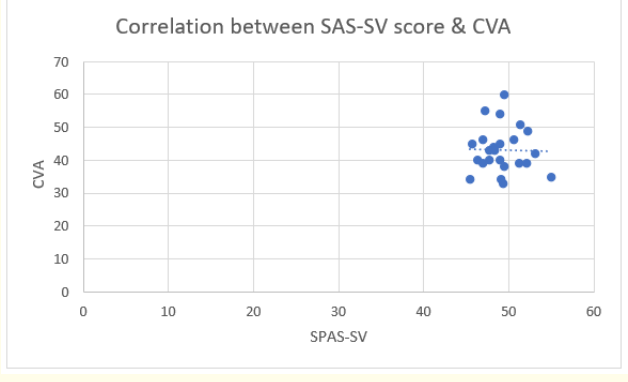

Figure 3: Correlation between SAS-SV and CVA.

Prevalence of smartphone addiction was found to be in 51.14 % (n = 45) of selected participants.

Total number of participants	Percentage of prevalence of smartphone addiction	Percentage of prevalence of no smartphone addiction
88	51.14%	48.87%

Table 4: Percentage of participants with smartphone addiction and no addiction.

Figure 4: Prevalence of smartphone addiction.

From the selected poppulation 50 % had forward head posture.

Total number of participants	Percentage of prevalence of forward head posture	Percentage of prevalence of normal neck posture
88	50%	50%

Table 5: Percentage of participants with FHP and normal neck posture.

Figure 5: Prevalence of forward head posture.

For measuring the diffrence between the neck disability in the addicted and non-addicted group unpaired t-test was applied. There was a significant difference in the scores of non addicted (mean = 12.19, SD = 1.22) and addicted (mean = 24.67, SD = 12.81) groups. The calculated t value(4.95)), p = 0.05. Hence, there was a significant difference for neck disability in non-addicted group and the addicted group.

	Non-addcited Group NDI	Addcited Group NDI
Mean	12.19	24.67
df	74	
T value	4.95	

Table 6: Difference between NDI score for non-addicted and addicted group.

For measuring the difference between the CVA in non-addcited and addcited groups unpaired t-test was applied. There was a significant difference in the angles of non-addcited (mean = 50.69, SD = 2.02) and addicted (mean = 48.97, SD = 2.18) groups. The calculated t-value (4.63) was greater than the t-critical value(1.99), p = 0.05. Hence, there was a significant difference in craniovertebral angle in non-addicted and addcited group.

	Non-addicted Group CVA	Addicted Group CVA
Mean	50.69	48.88
df	86	
T value	4.63	
T critical	1.99	

Table 7: Difference between CVA for non-addicted and addicted group.

Discussion

The purpose of the study was to find the prevalence of smartphone addiction and forward head posture in university students, to find correlation between smartphone addiction, neck disability and forward head posture and also to compare the findings of neck disability and craniovertebral angle in the two groups that is the non-addicted and the addicted group. In the present study it was found that 51.14% of participants were addicted to smartphone and 50% of the participants were having forward head posture. It was also found that the participants who were smartphone addicted were having more neck disability than the people who were not addicted to the smartphone; similarly, it was also found that there was no significant correlation between the decrease in craniovertebral angle and smartphone addiction.

Excessive and repeated use of Smartphones leads to greater degree of neck flexion so that the individuals can look at the screen of the smartphones this has led to severe neck pain in the individuals who use smartphone excessively. In the present study this can be one reason which has led to a significant association between SAS and NDI scores. Lee., *et al*. in his study discussed that size of L.C.D screen also has an effect in the musculoskeletal pain specially at the neck region as smaller the size of L.C.D the individual has to bend more leading to more degree of neck flexion leading to discomfort at cervical region [17].

One of the most common postural deformities seen in Smartphone users is that of forward head posture. One of the causes for it is the relatively small size of Smartphones. Individuals having smartphones use it for various purposes like calling, texting, browsing. In a study it was found that texting done from a single hand cause around 31 degrees of neck flexion while when done with both the hands it causes 38.5 degrees of neck flexion [18]. Deviation in the normal posture of neck leads to an increase cervical load on the muscular activities specially that of neck extensor muscles and upper trapezius [19]. It is said that decrease in CVA leads to forward head posture, in the present study a significant association was not found between participants that were smartphone addicted and forward head posture, but prevalence of forward head posture was found to be 50%. There are previous studies which tell that, musculoskeletal complaints in young generation can turn into musculoskeletal disorders if not corrected at the correct time.

Limitations

- Sample size was small.
- Other devices like computers, laptops and tabs were not taken into consideration.
- Study population was limited to university students only, evaluation of different age groups can also be done.
- Recreational activities like gym were not considered which could have increased the neck pain.

Conclusion

This study shows that smartphone addicted people are more susceptible to have neck disability. The prevalence of smartphone addiction in university students is increasing, which is leading to various musculoskeletal problems and neck joint is affected in many of the students studying at university. Percentage of students with forward head posture has also increased. The neck pain and postural defaults in a long run if not corrected can lead to musculoskeletal disorders. Thus, awareness among young generation about correct ergonomics is necessary.

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