International Journal of Allied Medical Sciences and Clinical Research (IJAMSCR)

ISSN: 2347-6567

IJAMSCR |Volume 8 | Issue 3 | Jul - Sep - 2020
www.ijamscr.com

Research article *Medical research*

Prevalence of smartphone addiction and its correlation with forward head posture and neck disability among physiotherapy students

Shivani Patil*[1], Surbhi Hindocha[2], Jaywant Nagulkar[3]

[1]*Physiotherapy Intern, Dr Ulhas Patil College of Physiotherapy, Jalgaon, Maharashtra-425309, India*
[2]*Assistant Professor, Dr Ulhas Patil College of Physiotherapy, Jalgaon, Maharashtra 425309, India*
[3]*HOD, Physiotherapy department, Dr Ulhas Patil College of Physiotherapy, Jalgaon, Maharashtra 425309, India*

***Corresponding Author**: **Shivani Patil**
Email id: shivanipatil135@gmail.com

ABSTRACT

Background
A smart phone is a device which is used for voice and data communication. Smartphone addiction is defined as a behavioral addiction, loss of control by excessive immersion and obsessions to smartphone use. Forward head posture is a poor habitual neck posture defined by hyperextension of the upper cervical along with forward translation of the cervical vertebrae and is identified by measuring craniovertebral angle. Normal craniovertebral angle is 49.9 degrees. Hours of spending on smart phone leads to poor posture and pain and compromise the pain sensitive structures around neck leading to neck disability. So, the present study was aimed to find out the prevalence of smartphone addiction among physiotherapy students and to further find out its correlation with forward head posture by using craniovertebral angle and also with neck disability.

Materials and methodology
The study was carried out in the population of 199 physiotherapy students at Dr Ulhas patil college of physiotherapy who use smartphone daily. Data was collected by using structured interview questionnaire, Smartphone Addiction Scale-SV, Neck Disability Index and the photographic postural analysis of CVA for FHP. Secured scores of the scales were analyzed and presence of FHP was confirmed to further identify the correlation between smartphone addiction, FHP and neck disability.

Result
A significant correlation was seen between Smartphone Addiction & CVA(FHP) (r=-0.59), Smartphone Addiction & Neck Disability (r=0.79) and CVA(FHP) Neck Disability (r=-0.57).

Conclusion
The study concludes that there is higher prevalence of smartphone addiction among physiotherapy students which in turn leads to forward head posture causing neck disability.

Keywords: Smartphone Addiction, Craniovertebral Angle (CVA), Forward Head Posture (FHP), Neck Disability

INTRODUCTION

A smart phone is a device which is used for voice and data communication. Along with the basic voice function of a phone, smart phones may support various additional mobile services such as text messaging, email, gaming, camera, whatsapp, facebook, GPS etc[1]. A smart phone is one of the most popular devices among adolescents. The prevalence of smartphone usage among youth was found out to be 97% in 2016. Advancement in smart phone models, including portable media players, compact digital cameras, access to emails, GPS navigation unit and high-resolution touch screens, contribute to the frequent use and addiction of smart phones[1].

Addiction not only refers to drugs or substance abuse, but it also refers to gambling, internet games, or even smart phone.[2] Smartphone addiction is defined as a behavioral addiction, loss of control by excessive immersion and obsessions to smartphone use[9]. Along with the rise in smart phone use potential risks for musculoskeletal problems at neck have been reported[3].

Most smart phone tasks require users to stare sharply downwards or to hold their arms out in front of them to read the screen which makes the head moves forward and causes an extensive anterior curve at cervical spine and an excessive posterior curve in upper thoracic spine leading to abnormal posture at cervical spine particularly forward head posture.[3]

Forward head posture is a poor habitual neck posture defined by hyperextension of the upper cervical along with forward translation of the cervical vertebrae. This posture is also called as "text neck", "scholar's neck", "wearies neck", "reading neck" etc. There are many factors causing it such as, sleeping with the head elevated too high, prolonged computers & laptop use, reduced back muscle strength, lack of nutrients such as calcium and the most prevalent cause nowadays among adolescents i.e. prolonged smartphone use[8.] Forward head posture is identified by measuring CRANIOVERTEBRAL ANGLE. The craniovertebral angle (CVA) refers to the degree of FHP and is the angle between the horizontal line through the C7 spinous process and the line connecting spinous process of C7 and the tragus of ear on photographs. Normal craniovertebral angle is 49.9 degrees[8]. In general, subjects with smaller the CVA indicates more FHP. Various effects of forward head posture includes: reduced cervical ROM, greater thoracic kyphosis with greater cervical flexion[8].

Hours of spending on smart phone may lead to poor posture and pain. The term "TEXT NECK" was coined by Dr. Dean L Fishman, who is a US chiropractor.[5] The term text neck or turtle neck is used to describe repetitive stress injury or an overuse syndrome where a person has his/her head hung or flexed in a forward position and is bent down looking at his/her mobile or other electronic devices for prolonged period of time.[5] This neck disability occurs as there is compression of these pain sensitive structure around neck and cervical spine which there by affect the functions of cervical spine, causing a musculoskeletal imbalance in the upper quarter of body.[6]

Smartphone use in a static position and with an unsupported arm could bring about abnormal alignment of the neck and shoulders. Because smartphones have small monitors that are typically held downward near the laps, users must bend their heads to see the screens which may lead to forward head posture. In forward head posture due to increase in the anterior curve of the cervical spine there is weakness of the deep cervical flexor muscle, the midthoracic rhomboid muscle for scapular retraction, and the mid and lower trapezius muscles. FHP also shortens the pectoralis major and neck extension muscles. Upper trapezius muscle activity is increased more in FHP than in correct anatomic positions, and most patients complain of pain from muscle overuse and triggers and band formation in upper trapezius muscle. If this neck disability is not treated or corrected in right time it can lead to serious permanent damage. Long term untreated neck disability can result into inflammation of the neck ligaments, muscles, nerve endings leading to permanent arthritic changes[4]. In rare cases it may also lead to flattening of the spinal curve onset of early arthritis, spinal miss alignment, spinal degeneration, disc compression disc herniation etc[.4, 5]

A recent study showed that 79% of the population between the age 18-44 have their smart phones with them almost all the time, with only 2 hours of their waking day spend without their smart phone in hand.[1] A recent systemic review done in Hong Kong suggests that prevalence of musculoskeletal problems of mobile phone usage are high ranging from 17.3% to 67.8% for neck complaints.[4] A study carried out among physiotherapy students of Mumbai also showed 39.3% prevalence of musculoskeletal problem's due to smartphone usage mostly affecting neck with 24% of prevalence[10]. This condition is a growing health concern and has the potential to affect millions of people all over the world.

Also, there are lot of studies available on of musculoskeletal disorders in students using computers. There are studies done on visual display terminal (VDT) syndrome experienced by middle and high school students. However, in the current scenario, students use smartphones for longer periods and more than computers because they are small, easily portable, and accessible. Despite this, there is not much literature available on the musculoskeletal problems in smartphone users in this population.[4] According to a study only 35% of the populations have heard about text neck syndrome, only 21% knew about the prevention[4]. Thus, we have come across limited amount of literature showing impact of smartphone addiction on forward head posture and

neck disability among students. So, the present study was aimed to find out the prevalence of smart phone addiction and to further find its correlation with forward head posture and neck disability among the physiotherapy students.

Procedure

The study is a cross sectional study carried out among 199 physiotherapy students at Dr Ulhas Patil College of Physiotherapy who had access to smartphone on daily basis. The purpose of the study was explained and informed consent was obtained. The subjects who had any pre-presenting musculoskeletal neck problem such as PIVD, cervical spondylosis or any other congenital neurological problems related to neck like torticollis were excluded. The 199 subjects who fulfilled the inclusion criteria were further asked to filled structured interview questionnaire, smartphone addiction scale and neck disability index. For objective analysis of forward head posture measurement of craniovertebral angle was done using photographic method with reliability >0.972.

Structured Interview Questionnaire

Structured interview questionnaire included questions regarding inclusion and exclusion criteria, duration of smartphone use, duration of study, and posture while studying.

Smartphone Addiction Scale-SV (SAS-SV)

The Smartphone Addiction Scale-Short Version is a 6 point Likert scale (1:''strongly disagree'' to 6:''strongly agree'') with 10 questions regarding smartphone use based on self-reporting[2]. The possible score of the scale ranges from minimum 10 to maximum 60 points with 31 & 33 being the cut off value for possible smartphone addiction in boys & girls respectively.

Neck Disability Index (NDI)

The Neck Disability Index (NDI) involves a 10-item, 50-point questionnaire that assesses the effects of neck pain and symptoms during a range of functional activities. Of the 10 items, four relate to subjective symptoms (pain intensity, headache, concentration, sleeping), four activities of daily living (lifting, work, driving, recreation) and two discretionary activities of daily living (personal care, reading) Each item is scored on a 0 to 5 rating scale, in which zero means No pain and 5 means Worst imaginable pain. The test was interpreted as a raw score, with a maximum score of 50 and the subjects were classified into 5 groups as No (0-4), mild (5-14), moderate (15-24), severe (25-34) & complete (>35) disability. This index is the most widely used and most strongly validated instrument for assessing self-rated disability in patients with neck pain.

Photographic Posture Analysis of Forward Head Posture

A digital imaging technique was used to evaluate head and neck posture in sitting position. Samsung galaxy A50 mobile phone camera was placed at a distance of 150 cm on a tripod stand which was fixed and height was adjusted according to the level of the subject's shoulder. The subject was asked to sit facing sideways on the stool in front of camera and their C7 spinous process were marked, they were asked to face straight and gaze at the point at their eye level. The photo was clicked, and transferred to laptop and then opened in to jpg format. The MB ruler software was used for calculating the CVA, which was measured by placing the points of the MB ruler on the C7 spinous process which was marked. The line was drawn from spinous process to tragus of ear and the angle was measured. (measuring of the craniovertebral angle: intersection of a horizontal line passing through C7 spinous process and the line joining the midpoint of the tragus of ear is identified as craniovertebral angle.). Normal craniovertebral angle is 49.9 degrees. Smaller the craniovertebral angle more is the forward head posture.

RESULT

The study included higher proportion of females (75.88%) than males (24.12%). The overall prevalence of smartphone addiction among physiotherapy students was found to be 58.79%. When categorized individually it was found that males are more prevalent for smartphone addiction i.e. 62.50% and in females the prevalence of smartphone addiction was about 57.62%. It was also found out that the smartphone addiction was found out to be more in subjects who use their smartphones for about 4-6 hours daily with 47.00% followed by below 3 hours 32.42% and finally above 7 hours with 20.51%. Table 1, 2

Table 1: Prevalence of Smartphone addiction

Groups	Frequency	Percentage
Males	30	62.50%
Female	87	57.62%

Table 2: Smartphone addiction according to smartphone use

Groups	Frequency(n=199)	Percentage
Below 3	38	32.42%
4-6	55	47.00%
Above 7	24	20.51%

The results showed that there was higher prevalence (88.8%) of forward head posture in population with smartphone addiction. Also, the forward head posture was found to be slightly more prevalent among females (91.95%) than male (80%). The results regarding neck disability concludes that the total smartphone addicted population experience either of the one neck disability with majority of the people experiencing moderate type of disability by 81.19% according to NDI. Table 3,4

Table 3: Prevalence of forward head posture among smartphone addicted population

Groups	Frequency	Percentage
Males	24	80%
Female	80	91.95%

Table 4: Prevalence of neck disability among smartphone addicted population

Variable	Groups	Score	Frequency	Percentage
Neck Disability	No	0-4	0	0.00%
	Mild	5-14	05	4.27%
	Moderate	15-24	95	81.19%
	Severe	25-34	17	14.52%
	Complete	35 & above	**0**	**0.00%**

The study showed a strong positive correlation between smartphone addiction and neck disability with r value as 0.79 and p value as 0.00 which means that as smartphone addiction increases neck disability increases and thus it was found that the subjects with smartphone addiction were more prone for developing neck disability. Table 5, Fig 1

Table 5: Smart phone addiction with Neck Disability

Correlation	0.79
p value	0.00*

(* p value <0.05 hence significant)

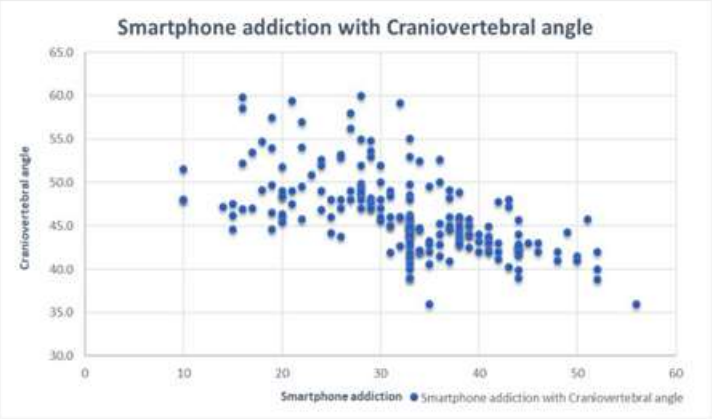


Fig 1: Smart phone addiction with Neck Disability

The study also showed a strong negative correlation between smartphone addiction and craniovertebral angle with r value as -0.59 and p value as 0.00 which means that as smartphone addiction increases craniovertebral angle decreases leading to FHP. Further when neck disability and craniovertebral angle were correlated it was found that there is a strong negative correlation between craniovertebral angle and neck disability with r value as -0.57 and p value as 0.00 which means that as craniovertebral angle decreases there is increase in neck disability which in turn states that in patients with FHP where craniovertebral angle decreases there will be increased neck disability.Table 6,7. Fig 2, 3

Table 6: Smart phone addiction with Craniovertebral angle

Correlation	- 59
p value	0.00*

(* p value <0.05 hence significant)

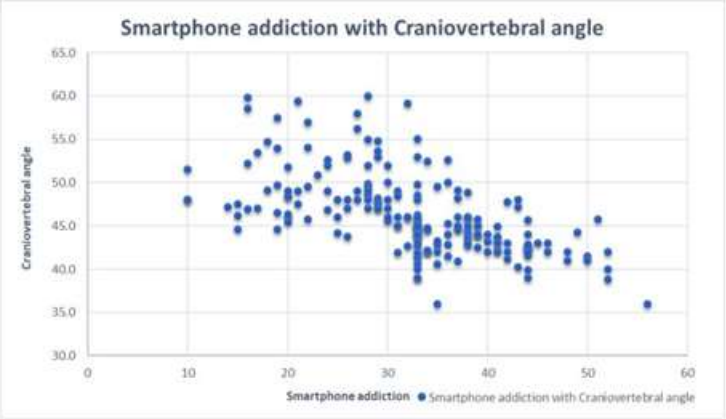


Fig 2: Smart phone addiction with Craniovertebral angle

Table 7: Craniovertebral angle with Neck Disability

Correlation	-0.57
p value	**0.00***

(* p value <0.05 hence significant)

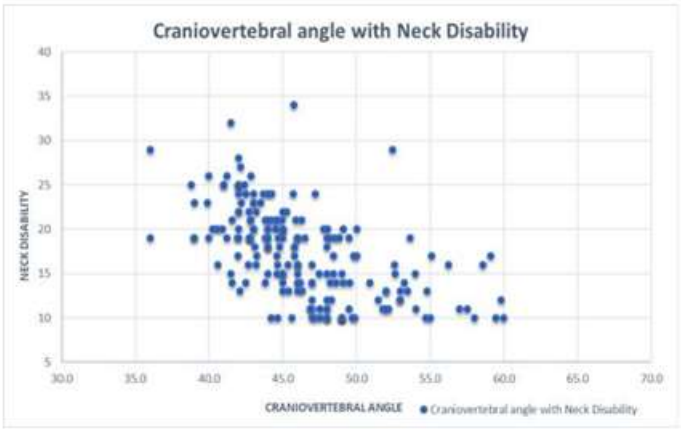


Fig 3: Craniovertebral angle with Neck Disability

DISCUSSION

In this study, we found out that there is a significant correlation between smartphone addiction and forward head posture and smartphone addiction and neck disability index along with a very high prevalence of FHP in smartphone addicted people with 88.88%. This may occur as texting on mobile phones is activity which involves looking onto the mobile screen in a flexed position of the neck. And if this posture is maintained over long time, the center of weight for the head is pushed forward this imbalance causes constant contraction of musculature giving rise to text neck syndrome with symptoms such as neck pain, shoulder pain, upper back pain, forward head posture, muscle spasm etc.[4]

Priyal Shah et al (2018) in their study assessed the level of self-reported smartphone addiction and correlated its relationship with MSD's in neck as well as in hand in young healthy students and showed a significant positive correlation[2]. The neck disability among smartphone users might be related to frequent neck flexion posture, which changes the natural curve of the cervical spine and increases the amount of stress on the cervical spine, leading to irritation and spasm in the surrounding skeletal structures and ligaments[3]. Excessive use of smartphones can lead to habitual repetitive and continuous movements of the head and neck toward the screen throughout the day[12]. Such movements are associated with a high risk of chronic neck pain and may explain the strong association between SAS and NDI scores in the present study.

The percentage of participants addicted to smartphone in the study was higher than those who were not also the subjects who use their smart phone for 4-6 hours daily were more prone for addiction. This may be as result of increased demand for smartphone use and also due to the vast amount of changes and advancements in the smartphones. Severin et al (2015) found out the significant predictors of smartphone addiction are longer duration of smartphone use on a typical day, shorter time period until the first smartphone use in the morning and indicating social networking as the most personally relevant smartphone function.

There was a high prevalence of FHP in smartphone addicted people it may be, because most smart phone tasks require users to stare sharply downwards or to hold their arms out in front of them to read the screen[11]. This causes the cervical vertebrae to form a forward curve so that position of the head tends to be in forward position to maintain the balance of the body[13]. Cesar et al reported that FHP usually results in shortening of not only the cervical extensor muscles including the splenii and upper trapezius but also sternocleidomastoid muscle[14]. In addition FHP causes weakness of cervical flexor muscles as well as scapular retractors such as middle trapezius.[13] Severin et al and Fahad et al noted that smartphone addiction invariably results in the decrease in CVA. Moreover, they also noted that a large amount of population had FHP and some degree of postural abnormality in cervical or shoulder region

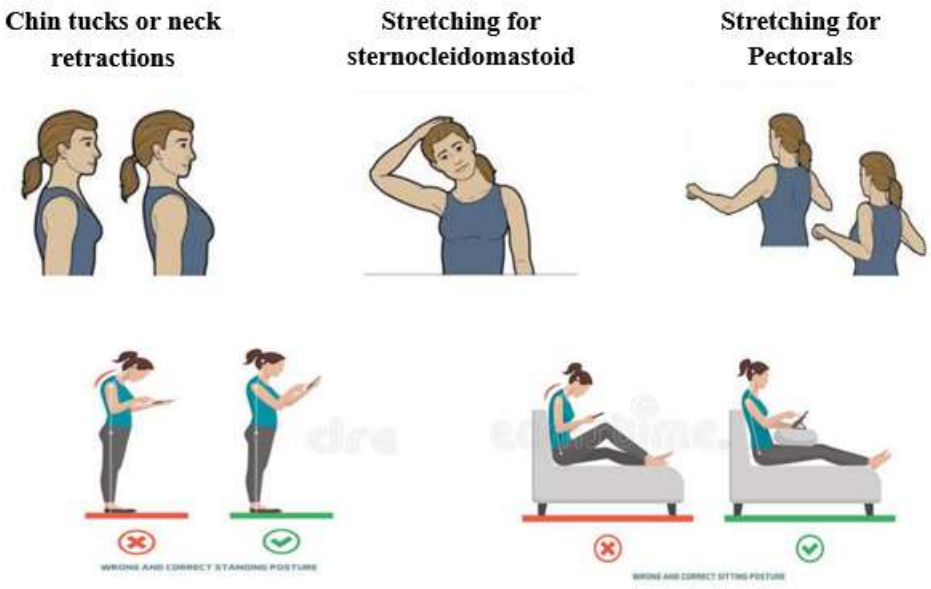
A study by Hansraj states that normally our head weighs between 10-20lbs. While texting as the cervical flexion increases the effective weight on our neck increases the maximum being 60lbs at 60 degrees. Whereas at 15 degrees the forces on the neck surge to 27lbs, at 30 degrees 40lbs, at 45 degrees 49lbs leading to increased stress on the musculature surrounding the cervical spine and finally to neck disability[5].



Similar conclusions were given by Eva Gustaffson et al who showed that the physical exposure while text messaging on a mobile phone consists of low physical load, repetitive thumb movements and excessive neck flexion, causing neck pain and soreness, also concluded prospective association were found between text messaging on mobile phones and MSDs. Hakala et al also reported that frequent use of mobile phone increases the risk of neck shoulder and lower back pain in adolescents. Ashiyat K et al concluded that undergraduates are susceptible to smartphone addiction. This can result in decrease CVA, which in turn leads to forward head posture that invariably causes an increase in scapular dyskinesis in young adults[11].

Clinical Implications

- Education about proper posture during smartphone use, i.e. the smartphone should be at the eye level during using it rather than bending and looking down.
- Reducing the duration of smartphone use as it was found out that higher the duration of use causes more smartphone addiction.
- Exercise and Stretching for correction of forward head posture.



CONCLUSIONS

The study concludes that there is higher prevalence of smartphone addiction among physiotherapy students between the age group of 18-25 years which when correlated with neck disability found a strong positive correlation. This means that as smartphone addiction increases neck disability also increases.

Smartphone addiction was also correlated with craniovertebral angle which showed a strong negative correlation which means that as smartphone addiction increases craniovertebral angle decreases leading to FHP as smaller degree of craniovertebral angle leads to FHP.

This craniovertebral angle was further correlated with neck disability which also showed a strong negative correlation which means in persons with FHP where craniovertebral angle is less neck disability is found to be more.

REFERENCES

1. Shah PP, Sheth MS. Correlation of smart phone use addiction with text neck syndrome and SMS thumb in physiotherapy students. Int J Commun Med Public Health. 2018 June;5(6):2512-6. doi: 10.18203/2394-6040.ijcmph20182187.
2. Kwon M, Kim DJ, Cho H, Yang S. The smartphone addiction: development and validation of a short version for adolescents. PLOS ONE. 2013;8(12):e83558. doi: 10.1371/journal.pone.0083558, PMID 24391787.
3. AlAbdulwahab SS, Kachanathu SJ, AlMotairi MS. Smart phone use addiction can cause neck disability. Musculoskelet Care. 2017;15(1):10-2. doi: 10.1002/msc.1170, PMID 28105706.
4. Samani PP, Athavale NA, Shyam A, Sancheti PK. Awareness of text neck syndrome in young adult population. Int J Commun Med Public Health. 2018 Aug;5(8):3335-9. doi: 10.18203/2394-6040.ijcmph20183057.
5. Neupane S, Ali U, Mathew A. Text neck syndrome- Systemic review. Imperial J Interdiscipl Res. 2017;3(7):141-8.
6. Hae Jung Lee Neck pain and functioning in daily activities associated with smartphone usage. J KorPhysTher. 2016;28(3):183-8.
7. Pugh S. Investigating the relationship between: smartphone Addiction, Social Anxiety, Self-Esteem, Age and Gender.
8. Worlikar AN, Shah Dr MR. Incidence of forward head posture and associated problems in desktop users. Int J Health Sci Res 96;9(2, February).
9. Kim M-O, Kim H, Kim K, Ju Sejin, Choi J, Yu M. Smartphone addiction: (focused depression, aggression and impulsion) among college students. Indian J Sci Technol. October 2015;8(25). doi: 10.17485/ijst/2015/v8i25/80215.
10. Sneha Sameer Ganu and Shruti Nair prevalence of musculoskeletal pain in physiotherapy students using smartphone. Int J Med Health Prof Res. 2017;4(1):23-6.
11. Akodu AK, Akinbo SR, Young QO. Correlation among smartphone addiction, craniovertebral angle, scapular dyskinesis and selected anthropometric variables in physiotherapy undergraduates. J Taibah Univ Med Sci. 2018;13(6):528-34. doi: 10.1016/j.jtumed.2018.09.001, PMID 31435373.
12. Shanthi Dr C, Madhavi Dr K, Yamuna Dr A, Triveni Dr T, Saddam Dr S. the impact of smartphone addiction among young people on the neck posture in college students,2455-295X, vol 4. isu 9, sep 2018.
13. Lee K-J, Han H-Y, CHeon S-H, Park SH, Yong MS. The effect of forward head posture on muscle activity during neck protraction and retraction. J Phys Ther Sci. 2015;27(3):977-9. doi: 10.1589/jpts.27.977, PMID 25931773.

14. Fernández-de-las-Peñas C, Alonso-Blanco C, Cuadrado ML, Gerwin RD, Pareja JA. Trigger points in the suboccipital muscles and forward head posture in tensiontype headache. Headache. 2006;46(3):454-60. doi: 10.1111/j.1526-4610.2006.00288.x, PMID 16618263.
15. Thiyagarajan S, Telegbal SV. Text neck: is it a new term for physiotherapist? IJMHS. 2015;02 (02):119-121
16. Sengupta A, Grabiner S, Kothari P, Martinez G. Ergonomic aspects of personal digital assistant (PDA) and laptop use. Book of abstracts, PREMUS Conference, Sixth International Scientific Conference on Prevention of Work –related Musculoskeletal Disorders, Boston, USA;2007. Vol. 17; 2007.
17. Chany AM, Marras WS, Burr DL. The effect of phone design on upper extremity discomfort and muscle fatigue. Hum Factors. 2007;49(4):602-18. doi: 10.1518/001872007X215683, PMID 17702212.
18. Gustafsson E, Thomée S, Grimby-Ekman A, Hagberg M. Texting on mobile phones and musculoskeletal disorders in young adults: a five year cohort study. Appl Ergon. 2017;58:208-14. doi: 10.1016/j.apergo.2016.06.012.
19. Sharan D, Mohondass M, Rangnathan R, Jose J. Muskuloskeletal Disorders of Upper extremities due to extensive usage of hand held devices. Ann Occup Environ Med. 2014;26:22.
20. Lau KT, Cheung KY, Chan KB, Chan MH, Lo KY, Chiu TTW. Relationships between sagittal postures of thoracic and cervical spine presence of neck pain, neck pain severity and disability. Man Ther. 2010;15(5):457-62. doi: 10.1016/j.math.2010.03.009, PMID 20430685.
21. Kwon M, Lee JY, Won WY, Park JW, Min JA, Hahn C, Gu X, Choi JH, Kim DJ. Development and validation of a Smartphone Addiction Scale (SAS). PLOS ONE. 2013;8(2):e56936. doi: 10.1371/journal.pone.0056936, PMID 23468893.
22. Ching SM, Yee A, Ramachandran V, Sazlly Lim SM, Wan Sulaiman WA, Foo YL, Hoo FK. Validation of a Malay version of the Smartphone Addiction Scale among medical students in Malaysia. PLOS ONE. 2015;10(10):e0139337. doi: 10.1371/journal.pone.0139337, PMID 26431511.
23. Vernon H, Mior S. The Neck Disability Index: A study of reliability and validity. J Manipulative Physiol Ther. 1991;14(7):409-15. PMID 1834753.
24. Kumar LR, Chii KD, Way LC, Jetly Y, Rajendaran V. Awareness of mobile phone hazards among university students in a Malaysian medical school. Health. 2011;03(7):406-15. doi: 10.4236/health.2011.37068.
25. 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(A):132-42. doi: 10.1016/j.apergo.2016.08.020, PMID 27890121.
26. Vate U. Lan P. Text neck epidemic: a growing problem for smart phone users in Thailand. Int J Comput Internet Manag. IJCIM. 2015;23(3):55.1-6.
27. Lee JI, Song HS. The correlation analysis between hours of smartphone use and neck pain in the Gachon University students. The Acupuncture. 2014;31(2):99-109. doi: 10.13045/acupunct.2014028.
28. Kim MS. Influence of neck pain on cervical movement in the sagittal plane during smartphone use. J Phys Ther Sci. 2015;27(1):15-7. doi: 10.1589/jpts.27.15, PMID 25642027.
29. Kim HJ, DH, Kim JS. The relationship between smartphone use and subjective musculoskeletal symptoms and university students. J Phys Ther Sci. 2015;27(3):575-9. doi: 10.1589/jpts.27.575, PMID 25931684.
30. AlZarea BK, Patil SR. Mobile phone head and neck pain syndrome: proposal of a new entity. OHDM Headache. 2015;14(5):313-7.
31. Malik A, Pasha MU, Khalid S, Ahmad A, Gilani SA. Prevalence of neck pain among Undergraduate students of Lahore. Int J Sci Eng Res. 2017;8(10):569-76.
32. Kim MS. Influence of neck pain on cervical movement in the sagittal plane during smartphone use. J Phys Ther Sci. 2015;27(1):15-7. doi: 10.1589/jpts.27.15, PMID 25642027.

How to cite this article: Shivani Patil, Surbhi Hindocha, Jaywant Nagulkar. Prevalence of Smartphone Addiction and its Correlation with Forward Head Posture and Neck Disability among Physiotherapy Students. Int J of Allied Med Sci and Clin Res 2020; 8(3): 659-666.

Source of Support: Nil. **Conflict of Interest:** None declared.