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Association of smartphone addiction on scapular Index, BMI, Upper Cross syndrome in college going student: A cross-sectional study

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Abstract
Backgrounfd: With the widespread use of the internet, smartphones have become essential communication tools. However, their excessive use has raised concerns about posture-related issues, particularly the scapula position. The present study explores the relationship between smartphone addiction, BMI and Upper Cross Syndrome (UCS). Previous research (Toscano *et al*., 2018) has established a positive correlation between smartphone addiction and a higher BMI, suggesting that individuals addicted to smartphones may be at greater risk for weight-related issues.
Materials and Methods: This study involved 100 college students aged 18–25. The Smartphone Addiction Scale-Short Version (SAS-SV) was used to assess smartphone addiction. A Spearman's correlation test was conducted to evaluate the relationship between smartphone addiction, scapular index, BMI, and UCS prevalence among students.
Result: The findings revealed that 65% of participants had smartphone addiction, while 48% exhibited UCS. A significant correlation was found between smartphone addiction and UCS, indicating that prolonged smartphone use and poor posture contribute to the syndrome. However, no significant correlation was observed between smartphone addiction and BMI.
Conclusion: The study highlights a 48% prevalence of UCS among college students and its significant correlation with smartphone addiction. Prolonged sitting in an improper posture appears to be a major risk factor for UCS development. Although smartphone addiction is associated with postural issues, no link was found between smartphone addiction and BMI. These findings emphasize the need for postural awareness and preventive measures among college students.

Keywords: Smartphone Addiction, Scapular Index, BMI, Upper Cross Syndrome, College Students

Introduction

Since the internet has become so popular, smartphones have developed into the most sophisticated and important communication tool available today. As of April 2021, there were 3.8 billion smartphone users worldwide, making up 48.33% of the world's population, according to data from BankMyCell. This is in contrast to 2016 [1]. Mobile phone use has become a commonplace aspect of our daily lives since Motorola introduced the first cell phone in 1973 and Apple released the iPhone [2]. A smartphone can be used for a variety of fascinating purposes, such as communicating with people who live far away or receiving the most recent information from websites and social media [3]. The scapula is sometimes referred to as the shoulder blade. There is a glenoid cavity in the superolateral lateral angle of the scapula. To form the glenohumeral joint (shoulder joint), the humerus' head is received by the glenoid cavity. The formula to calculate the scapular index is (anatomical scapular breadth X100)/anatomical scapular length X100/Scapular Index [4]. They become so dependent on their phones that they even begin to believe they are ringing when they are not. It is important to educate mobile phone users about the potential for postural distortions and the measures taken to promote appropriate corrections [5]. Inadequate relationships between bodily parts lead to bad posture. These interactions lead to discomfort and improper joint mobility by causing muscle tension and shortening [6].

One rationale is that using a smartphone excessively might result in unhealthy eating habits and less physical exercise, which raises BMI values [7]. This implies that poor lifestyle choices tend to group together, increasing the likelihood of obesity [8]. Nowadays, addiction to smartphones is a problem in many nations. Smartphone addiction and internet addiction, which has been classified as a non-substance-related addictive illness, have many behavioural traits. Tolerance, withdrawal, functional impairment, and compulsive phone use are the four basic components of smartphone addiction. These traits are comparable to those of an online addiction [9]. UCS is a comprehensive condition that is characterized by weakness of all the deep muscles of the neck (cervical) flexors, lower trapezius, and rhomboids muscles, as well as an abnormal pattern of upper limb movements brought on by tightness of the levator scapulae, upper trapezius, and pectoralis minor muscles, and occasionally tightness of the pectoralis major muscle [10]. UCS include pain, decreased physical function, and the possibility of long work absences [11].

The alterations can be represented by the letter X in the body's upper quadrant41. This situation, called upper cross, occurs when the weak group of muscles lengthens and becomes inhibited, while the tight group of muscles becomes shortened and overactivated, preventing either group from carrying out its function effectively [12].

Among the negative consequences of UCS include early tiredness, shoulder, neck, and back pain, increased residual volume and lower respiratory capacity, decreased aerobic endurance, an unsightly look, and spinal fractures [14]. Among the residual volume and lower respiratory capacity, decreased aerobic endurance, an unsightly look, and spinal fractures [14]. Elevated negative consequences of UCS include early tiredness, shoulder, neck, and back pain, increased shoulders and scapulae winging may also result

from specific postural abnormalities brought on by the UCS that reduce glenohumeral stability. The levator scapula and upper trapezius must therefore be activated more to compensate for the loss of glenohumeral centration [15].

Aims of the study

The purpose of this research study is to examine the relationship between smartphone addiction and its effects on college-bound students' scapular index, BMI, and UCS prevalence. The study aims to assess the effects of excessive smartphone use on postural changes, namely in the scapular area, and its possible association with BMI fluctuations and musculoskeletal imbalances that are diagnostic of UCS by a cross-sectional analysis. The results of this study could assist students create awareness and preventive actions by shedding light on the health and postural effects of prolonged smartphone use.

Materials & methods

Data was collected from college going student, this was a cross-sectional study, 100 sample was collected by Convenient sampling method. The study included Students with either side of dominance with age between 18 to 25 years, both male and female students who are willing to participate in the study, Students who attend the college at least 4 days in a week. Students who fall into any BMI criteria and excluded Students with any neck pain, Students with cervical spine surgery, Postural abnormality like sever kyphosis or scoliosis, any pathology related to cervical spine, Malignancy, Congenital shoulder and neck deformities, Students who are going to gym. Procedure of the study FIRST, each student was asked to complete the upper cross syndrome examination. This examination consists of following section 1) Demographic data 2) Consent Form. SECOND, each student was examined with the muscle tightness to check upper cross syndrome. THIRD, check for BMI to measure height & weight by using stadiometer & weighing machine. FOURTH, check for scapular index at anterior & posterior side by using vernier callipers. This examination consists of following section:

Pectoralis Major Tightness: • The student lies supine with the glenohumeral joint that is being tested at the edge of the table. • The corresponding scapula should be supported on the table. • Therapist stands on the side of the shoulder being tested, facing the student. • Therapist places his/her forearm on the student's sternum to stabilize the thorax during the test. • The different portions of the pectoralis major are tested separately. • Therapist is able to target the specific portions by changing the of shoulder abduction.

Pectoralis Minor Tightness: • Participants were requested to lie supine on the plinth and adopt their natural relaxed posture. • Distance of the acromion process from the plinth was measured using measuring tape on both left and right side.

Trapezius Tightness: • Student lies in supine with the hips and knee bent to relax the paraspinals. • Therapist stands at the head of the table, facing the patient. • Therapist depresses the shoulder girdle on the tested side by applying caudal pressure on the acromion and clavicle.

Levator Scapulae Tightness: • Student lies in supine with the hips and knees bent to relax the paraspinals. • Therapist stands at the head of the table, facing the patient. • Therapist positions the student head the same way it is positioned for the upper trapezius muscle length test. • However, for this test the head is rotated to the side being tested and stabilized and compares the resistance from side to side.

Scapular Retractors: • Students were asked to lie in prone lying position with shoulder in 90° abduction and elbow in 90° flexion. • Then the subject was asked to lift the arm till the midrange. • Hand held dynamometer was placed over lower aspect of the posterior arm. • Maximum force generated by the subject at that point was noted down.

Neck Flexors: • Students were asked to lie in Supine lying position on plinth. • Hand held dynamometer was placed on the mandible. • Students were instructed to nod their head such that their jaw pushed down onto the handheld dynamometer and to hold the resistance in the craniocervical flexion direction against the handheld dynamometer. • Maximum force generated by the subject at that point was noted down • The process was repeated for 3 times & average of 3 repetitions was used for analysis [16].

BMI: Here's how we calculated BMI, we taken Weight and height of the volunteers. BMI was calculated using this formula. BMI = Weight (kg)/Height (m^2) [17].

Scapular Index Measurement: The resting position of the scapula was determined by measuring the distance from the midpoint of the sternal notch (SN) to the medial aspect of the coracoid process (CP) and the horizontal distance from the posterolateral angle of the acromion (PLA) to the thoracic spine (TS). All measurements were performed using a digital vernier caliper with the students in the upright position. Static scapular measurements, particularly the SN-to-CP distance, have demonstrated high correlation with PM muscle length, reflecting postural impairment. The scapular index was calculated using the equation. (SN to CP / PLA to TS) 100] to capture the transverse plane orientation of the scapula [18].

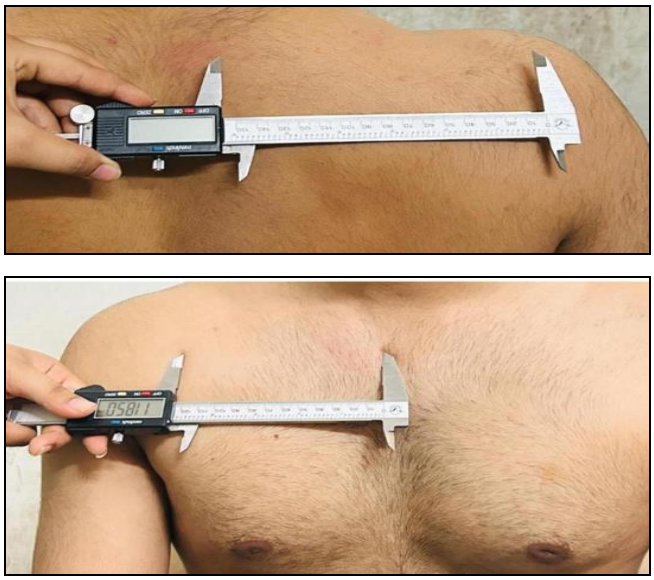


Figure: Scapular index measurement. (A) Posterolateral angle of scapula to thoracic spine distance. (B) Sternal notch to coracoid process distance.

Result

In the present study, 100 male and female Student participated. They were of average aged 20-25 years. Table 1 shows the number of male and female participants included in this study. Table 2 shows the Descriptive characteristic of college going student participants. The prevalence of Upper Cross Syndrome in college going student is presented in table 5. Table 3 is about Smart phone Use Day/ Night.

Table 1: Number of Male and Female Participants

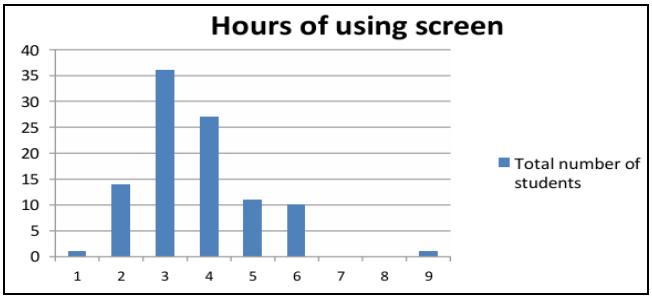
GENDER	NO. OF STUDENTS
MALE	20
FEMALE	80

Table 2: Descriptive characteristics of college going students

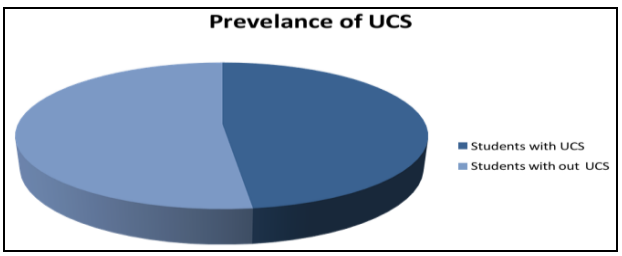
	Number of participants	Mean±SD
Age(year)	100	21.13±1.68
Hours of using smartphone	100	3.69±1.29
BMI (Kg/m²)	100	21.21±3.74
Scapular index	100	(Rt)94.74±11.19 (Lt)94.72±10.26
Upper cross syndrome		
Scapular retractors	100	(Rt) 11.95±3.60 (Lt) 12.10±3.28
Neck flexors	100	8.97±1.76
Pectoralis minor	100	(Rt) 8.82±1.52 (Lt) 8.76±1.42
SAS-SV	100	25.47±8.84

Table 3: Smartphone use in Day / Night

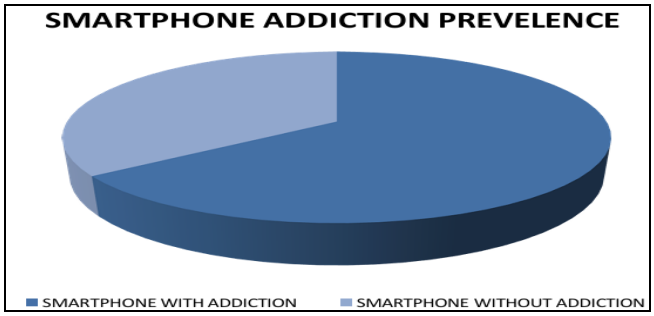
	No. of Students
DAY	20
NIGHT	80



Graph 1: Depicts Hours of using smartphone among college going student



Graph 2: Showing prevalence of UCS



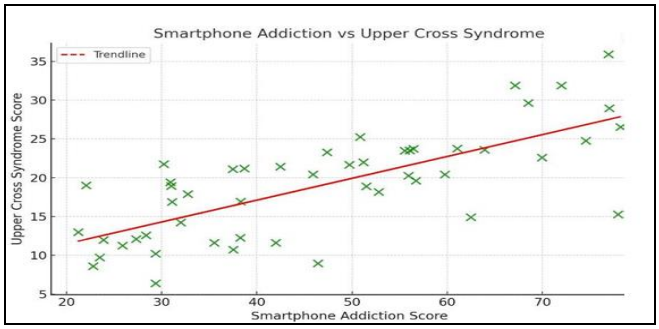
Graph 3: Showing prevalence of Smartphone addiction

Before applying association test, we have to check that data follows normal distribution or not. If data follows normal distribution; we can apply Pearson's association, otherwise Spearman's Rank correlation. To know whether the data follows normal distribution or not, Kolmogorov Smirnov test was applied. From this, it was concluded that data was not following normal distribution. As every variable was not following normal distribution, non-parametric statistics (Spearman's Rank correlation) was used.

Table 4: Table of p-value of correlation of smartphone

		(Rho value) p-value	p-value
Smartphone addiction	Scapular index	0.6	0.001**
	BMI	0.05	0.75
	UCS	0.25	0.045*

The p-value of 0.001** is well below the typical threshold of 0.05, which indicates strong evidence against the null hypothesis. This suggests that there is a statistically significant relationship between smartphone addiction and scapular index. Interpretation of BMI: The p-value of 0.75 is much higher than the typical significance level (0.05), indicating that the relationship between BMI and students is not statistically significant. There is insufficient evidence to suggest a meaningful connection. Interpretation of UCS: The p- value of 0.045* is less than 0.05, indicating a statistically significant relationship between UCS and the measured variable. This suggests a notable correlation or effect between UCS and the other factor being measured.



Graph 4: Showing p-value of correlation with smartphone

Discussion

The purpose of this research study is to examine the relationship between smartphone addiction and its effects on college-going students' scapular index, BMI, and UCS prevalence. The study aims to assess the effects of excessive smartphone use on postural changes, namely in the scapular

area, and its possible association with BMI fluctuations and musculoskeletal imbalances that are diagnostic of UCS by a cross-sectional analysis. The results of this study could assist students create awareness and preventive actions by shedding light on the health and postural effects of prolonged smartphone use.

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The data revealed that 65% of the participants were classified as having smartphone addiction, while 35% were without addiction, indicating a higher prevalence of addiction among college students. The results revealed a significant association between smartphone addiction and scapular index (p-value = 0.001), indicating that prolonged smartphone usage contributes to scapular instability and altered posture, which may increase the risk of musculoskeletal dysfunction. Similarly, A statistically significant association was observed between smartphone addiction and UCS (p-value = 0.045), suggesting that excessive smartphone use is linked to muscle imbalances, rounded shoulders, and forward-head posture, common symptoms of UCS. However, the association between smartphone addiction and BMI was not statistically significant (p- value = 0.75), indicating that while smartphone addiction may lead to sedentary behavior, it does not have an immediate or direct impact on BMI in this sample. in their study, found a significant positive correlation between Smartphone addiction and scapular dyskinesis and also inferred that the high rate of Smartphone use by young people likely predisposes them to develop abnormalities in the scapular region.[5] Present study was undertaken to assess the association between smartphone addiction and BMI among dental students. Based on the cutoff value for SAS–SV by Kwon *et al*., in the present study 52% of the students were addicted to smartphone, higher than the study conducted by Davey *et al*. where it was 44%, this could be attributed to the sudden transition in the Indian Telecom Industry and mobile data usage plans which drastically changed at the end of 2016 leading to the overall increase in mobile data usage.[20]

The results showed that severe IA was significantly and independently associated with a higher risk of UCS, even after adjusting for potential confounding factors. A plausible explanation for the association between IA and UCS is the prolonged abnormal posture holding during prolonged internet or smartphone use. Studies have shown that such prolonged use can result in rounded shoulders and a hunched back, as well as a forward head posture, and abnormal scapular dynamics have been observed in the upper limb activity of individuals with IA.[21]

Limitation of study

This Study is done with a smaller sample size. This study is limited only to young adults of the 18-25 age group and students studying only in South Gujarat.

Future recommendation

Future research should consider including a larger sample size to enhance the generalizability of findings. Additionally, studies can be conducted across diverse geographic regions and populations to explore broader trends and variations. Expanding the scope of research will provide deeper insights into the relationship between smartphone addiction, postural health, and quality of life.

Conclusion

The study concludes that smartphone addiction significantly impairs the quality of life in college students, with a notable 48% prevalence of Upper Cross Syndrome (UCS), highlighting the risk of postural imbalances associated with excessive smartphone use; furthermore, a negative correlation between BMI and smartphone addiction, alongside a positive correlation between the scapular index and UCS, underscores the multifaceted impact of smartphone addiction on both physical and behavioral health.

References

1. Ye Z, Zhang T, Peng Y, Rao W, Yao J. Effects of physical activity on smart phone addiction in college students-chain mediation of self-control and stress perception. Research Square, 2024.
2. Loleska S, Pop-Jordanova N. Is smartphone addiction in the younger population a public health problem. Prilozi,2021:42(3):29–36.
3. Arumugam N, Selvanayagam S, Sathiyasenan S. The Effects of Smartphone Usage on University Students. International Journal of Academic Research in Progressive Education and Development, 2020, 9.
4. Shrestha A, Khan G, Gautam A, Shakya S. Determination of Scapular Index in Human Scapula. Journal of Chitwan Medical College, 2022, 12.
5. Umunnah J, Okoro J, Oke I, Oghumu S, Okonkwo A. Correlation of mobile phone addiction scale and the scapular index in a sample of.
6. Hernandez AJ. Analysis of Possible Disorders Related to Inadequate Mobile Phone Usage Among Health Sciences Students. Curso – Julio,2015-2016:30–67.
7. Weir CB, Jan A. BMI classification percentile and cut off points.
8. Toscano CV, Carvalho LB, Ferrari GL. Smartphone addiction associated with subjective sleep quality in Brazilian adolescents. Psychiatry Research,2018:270:97–102.
9. Hanphitakphong P, Keeratisiroj O, Thawinchai N. Smartphone addiction and its association with upper body musculoskeletal symptoms among university students classified by age and gender. Journal of Physical Therapy Science,2021:33(5):394–400.
10. Kaluskar R, Kad R, Pawar P, Kulkarni S. The Relationship Between Addiction to Smartphone Usage and Disability of Neck and Upper Limb Among Adults in Covid 19 Pandemic: A Cross-Sectional Study. Turkish Journal of Physiotherapy and Rehabilitation, 2022, 32(3).

11. Zhang C, Zhang J, Yang G. Association between internet addiction and the risk of upper cross syndrome in Chinese college students: A cross-sectional study. Medicine,2023:102(30):e34273.
12. Seshan DSJ, Sundaram IU. To analyze the frequency of upper crossed syndrome and the extent of neck disability among IT professionals. International Journal of Pharmaceutical Research and Applications,2020:5:524–531.
13. Karimian R, Rahnama N, Ghasemi G, Lenjannejadian S. Photogrammetric Analysis of Upper Cross Syndrome among Teachers and the Effects of National Academy of Sports Medicine Exercises with Ergonomic Intervention on the Syndrome. Journal of Research in Health Sciences,2019:19(3):e00450.
14. Sepehri S, Sheikhhoseini R, Piri H, Sayyadi P. The effect of various therapeutic exercises on forward head posture, rounded shoulder, and hyperkyphosis among people with upper crossed syndrome: a systematic review and meta-analysis. BMC Musculoskeletal Disorders,2024:25:105.
15. Yaghoubitajani Z, Gheitasi M, Bayattork M, Andersen LL. Online supervised versus workplace corrective exercises for upper crossed syndrome: a protocol for a randomized controlled trial. Trials,2021:22:907.
16. Thakkar K. Prevalence of Upper Cross Syndrome and Its Association with Chest Wall Expansion and Aerobic Capacity: A Cross-Sectional Study. International Journal of Advanced Research in Engineering and Science Management, 2024, 12(2).
17. Cohen E, Margalit I, Shochat T, Goldberg E, Krause I. Markers of Chronic Inflammation in Overweight and Obese Individuals and the Role of Gender: A Cross-Sectional Study of a Large Cohort. Journal of Inflammation Research,2021:14:567–573.
18. Hodgins JL. Pectoralis Minor Contracture in Throwing Shoulders of Asymptomatic Adolescent Baseball Players. Orthopedic Journal of Sports Medicine, 2017, 5(9).
19. Subramani P, Mohan A. Association between Smartphone Addiction and Body Mass Index amongst Dental Students. Journal of Oral Health and Community Dentistry,2019:13(3):73–76.
20. Zhang C, Zhang J, Yang G. Association between internet addiction and the risk of upper cross syndrome in Chinese college students: A cross-sectional study. Medicine,2023:102(30):e34273.