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IMPACT OF SMARTPHONE ADDICTION ON MUSCULOSKELETAL PAIN IN NECK, SHOULDER, ELBOW AND HAND AMONG UNIVERSITY STUDENTS

Physiotherapy

Jaspreet Singh* Research Scholar, Department of Sports Science Punjabi University, Patiala *Corresponding Author

Dr. Ajita Professor, Department of Sports Science, Punjabi University, Patiala

ABSTRACT

Introduction: The growing number of smart phone users has raised concerns about their impact on overall health and daily life. This study aims to determine the impact of Smartphone addiction on musculoskeletal pain in neck, shoulder, elbow and hand among university students.**Methods:** This study included 200 students aged 18–25 years. Outcome measures included the Smartphone Addiction Scale–Short Form (SAS-SF), Neck Disability Index (NDI), Shoulder Pain and Disability Index (SPADI), Oxford Elbow Score (OES) and Cornell Hand Discomfort Questionnaire (CHDQ).**Results:** According to findings of this study there was high prevalence of Smartphone addiction with 59% of males and 50% of females classified as addicted and 36% of males and 43% of females at high risk. Mild neck disability was more common (38% males, 62% females) with fewer reporting moderate disability. Similarly, most students reported mild shoulder pain and disability (82% males, 88% females) while moderate symptoms were less frequent. The majority showed excellent to good elbow function, indicating minimal elbow impairment. Hand discomfort patterns varied by gender and hand region with certain areas more affected due to smart phone use.**Conclusion:** Smartphone addiction has a negative impact and is positively associated with musculoskeletal pain in the neck, shoulder, elbow and hand. Greater attention should be given to promoting proper smart phone use and increasing public awareness about its potential adverse effects.

KEYWORDS

Addiction, Musculoskeletal Pain, Students, Smartphone.

INTRODUCTION:

Smartphone's have become essential among today's youth evolving into multifunctional devices that provide real-time information, communication and diverse features. Despite their many benefits for personal and professional use, increasing dependence on smart phone has raised concerns about potential health issues. While using smart phone, individuals often maintain a prolonged downward head posture typically holding the device at waist or chest level which can reduce the natural cervical lordotic curve and increase risk of musculoskeletal problems [1]. Bending the head and neck forward while using a handheld device can increase the gravitational strain on neck muscles by approximately three to five times compared to a neutral seated position [2].

The Craniovertebral Angle (CVA) is commonly used to assess forward head posture, where lower CVA values indicate a more pronounced and severe forward head position [3]. Namwongsa et al. identified posture, muscle force and extent of muscle use as key contributors to upper limb musculoskeletal disorders with smart phone users often adopting poor postures such as slouched shoulders, excessive elbow and wrist flexion and notable neck and trunk bending. Greater deviation from neutral posture increases stress on joints, muscles, ligaments, discs and nerves potentially impairing upper limb function [4]. Beyond the cervical region, smart phone use can also affect scapular and shoulder mechanics. Greater dependence on smart phone has been linked to altered scapular movement, reduced activation of the serratus anterior and increased activity in the trapezius and anterior deltoid indicating higher shoulder loading during prolonged use [5].

"Cell phone elbow" commonly known as cubital tunnel syndrome is marked by symptoms such as pain, burning, aching and tingling sensations along the inner forearm, the little finger and the ulnar side of the ring finger. This condition arises when the elbow remains in a flexed or bent position for extended durations during smart phone use. Recent clinical observations suggest a strong link between prolonged smart phone use and increased pressure on the ulnar nerve [6]. From a biomechanical standpoint, smart phone use commonly involves shoulder flexion and slight arm elevation, particularly when the device is held at chest or lap level. This posture increases the shoulder joint's moment arm leading to greater mechanical stress on the glenohumeral joint and surrounding soft tissues [7].

Hand posture during smart phone use is a significant biomechanical factor contributing to discomfort. Many students hold the device with one hand and use the thumb for interaction, placing uneven load on the dominant hand. Research indicates that the dominant hand often experiences greater pain and fatigue due to the increased functional demand placed on it [8]. Prolonged gripping and repetitive movements during typing are major contributors to thumb-related musculoskeletal disorders, potentially leading to conditions such as wrist tendinitis and De Quervain's disease. Contributing factors include closely spaced keys, sustained pressure and excessive thumb motion while texting [9].

Frequent wrist and finger movements, particularly repeated flexion and extension can weaken the thumb and wrist over time. Continuous overuse of these joints is also a key factor in the development of carpal tunnel syndrome, which if untreated may impair hand function and overall quality of life [10]. Prolonged gripping of a smart phone can elevate pressure within the carpal tunnel, while continuous wrist and thumb movements may further reduce the space available for the median nerve. This increased pressure can lead to nerve irritation causing symptoms such as pain, tingling or numbness in the hand. These physiological changes highlight the potential risk of nerve-related musculoskeletal disorders among frequent smart phone users [11].

METHODOLOGY:

This cross-sectional study comprised 200 students (100 males and 100 females) from RIMT University, Mandi Gobindgarh, Punjab. Ethical approval was obtained from the Human Subjects Ethics Review Committee of Punjabi University, Patiala. Outcome measures included several validated tools to assess Smartphone addiction and musculoskeletal symptoms. The Smartphone Addiction Scale–Short Version (SAS-SV) is a 10-item, 6-point Likert scale with total scores ranging from 10 to 60 where higher scores indicate greater addiction risk.

The Neck Disability Index (NDI) is a reliable 10-item measure with scores from 0 to 50, reflecting the severity of neck pain and disability. Shoulder function was assessed using the Shoulder Pain and Disability Index (SPADI), a 13-item scale with pain and disability sub-domains reported as a percentage score. Elbow pain and function was evaluated using Oxford Elbow Score (OES), a 12-item Likert-based questionnaire with scores ranging from 0 to 4 per item. Hand discomfort was measured using the Cornell Hand Discomfort Questionnaire (CHDQ) which assesses pain, discomfort and functional interference. These questionnaires provided a comprehensive evaluation of upper limb musculoskeletal health.

RESULTS:

Descriptive statistics was applied for data analysis and categorical variables were expressed in terms of frequencies and percentages. The findings indicate a high prevalence of Smartphone addiction among students with a considerable proportion either addicted or at high risk. Most participants exhibited mild levels of neck (Figure 1) and shoulder disability (Figure 2) suggesting early-stage musculoskeletal involvement rather than severe impairment. Elbow function was

largely preserved as the majority of students demonstrated excellent to good scores, indicating minimal elbow-related dysfunction (Table 1). However, patterns of hand discomfort varied between genders and hand regions reflecting the impact of repetitive smart phone use on specific anatomical areas (Figure 3).

Figure 1: Distribution of students according to scoring of Neck Disability Index.

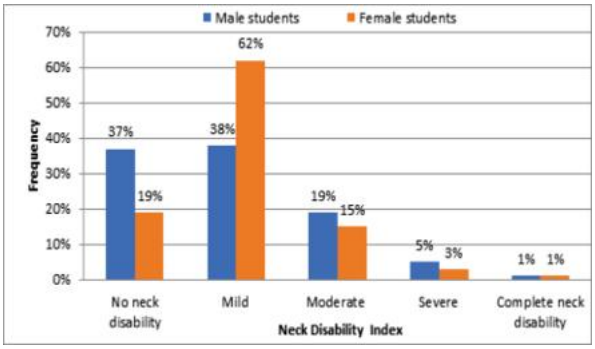


Figure 2: Distribution of students according to scoring of Shoulder pain and disability index.

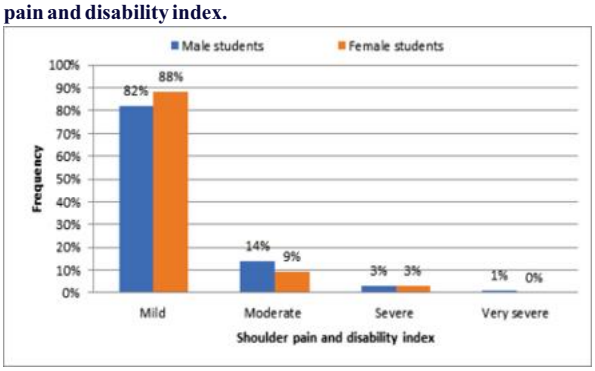
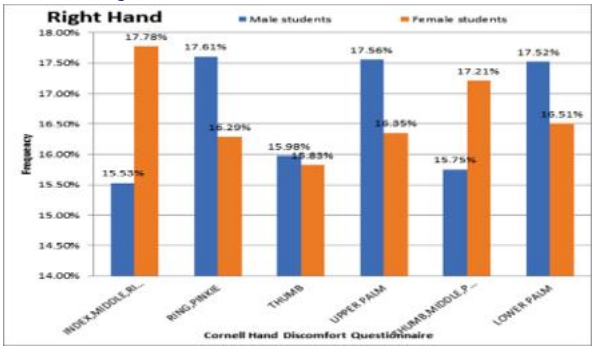


Table 1: shows distribution of students according to Oxford Elbow Score

Oxford Elbow Score Interpretation	Male students (N = 100) / %	Female students (N = 100) / %
Poor (0 – 19)	2%	2%
Fair (20 – 29)	16%	5%
Good (30 – 39)	16%	18%
Excellent (40 – 48)	66%	75%

Figure 3: Distribution of students according to Cornell Hand Discomfort Questionnaire.



DISCUSSION:

The findings of the present study showed that mild neck disability was reported in 38% of males and 62% of females, while moderate neck disability was observed in 19% of males and 15% of females. According to Smartphone addiction scores there was high prevalence of smart phone addiction among students with 59% of males and 50% of females classified as addicted, while 36% of males and 43% of females were identified as being at high risk. Prolonged smart phone use is frequently associated with neck pain as users tend to maintain a flexed neck posture while viewing their devices [12]. Several studies have demonstrated a positive correlation between the duration of smart phone use and the severity of neck pain. Research among university students suggests that prolonged use significantly increases this risk, largely due to poor posture and extended screen exposure [13].

Excessive smart phone use among students has been linked to shoulder pain, largely due to prolonged static postures and repetitive hand movements. During extended use, students often adopt a forward head posture with rounded shoulders. This position increases stress on the shoulder girdle muscles particularly the upper trapezius and deltoid leading to muscle fatigue and discomfort in the shoulder region [14]. In the present study, mild shoulder pain and disability was reported by 82% of male students and 88% of female students, while moderate symptoms were observed in 14% of males and 9% of females. These findings are consistent with previous research from Canada, which indicated that approximately 46%–52% of mobile phone users experienced shoulder-related issues [15]. Similarly, a study conducted in China among young smart phone users reported that approximately 40% of participants experienced discomfort in the neck and shoulder regions [16].

In the present study, the Oxford Elbow Score was used as the outcome measure, where lower scores indicate greater severity of elbow-related problems. The results showed that most students achieved excellent scores (40–48) including 66% of males and 75% of females. Good scores (30–39) were reported by 16% of males and 18% of females, fair scores (20–29) by 16% of males and 5% of females, while only 2% of both male and female students fell into the poor category (0–19). A study by Muhammad et al. examined the prevalence and impact of "cell phone elbow" among mobile phone users across various cities in Punjab, Pakistan. The study included 250 participants, with 33.2% reporting noticeable symptoms associated with prolonged phone use. The authors recommended reducing excessive use, limiting long calls, alternating hands and using hands-free devices or ear pods to minimize strain [17].

The Cornell Hand Discomfort Questionnaire identified distinct patterns of hand discomfort among students. In males, the right hand showed the highest discomfort in AREA-B (ring and little fingers, 17.61%) and the lowest in AREA-A (index, middle and ring fingers, 15.53%) while in the left hand, AREA-E (thumb, middle finger and palm) was most affected and AREA-D (upper palm) and AREA-F (lower palm) were least affected. Among females, the right hand exhibited the greatest discomfort in AREA-A (index, middle and ring fingers, 17.78%) and the least in AREA-C (thumb, 15.83%). In the left hand, AREA-F (lower palm) showed the highest discomfort, whereas AREA-B (ring and little fingers) was the least affected. Excessive smart phone use among students is commonly associated with hand pain and discomfort, as activities like texting, scrolling and gaming involve repetitive finger and thumb movements that place continuous stress on hand structures [18].

A major factor contributing to hand discomfort is the prolonged gripping of a smart phone. Over time, this sustained effort can lead to muscle fatigue and discomfort. As a result, persistent strain on these muscles may increase the risk of musculoskeletal problems in individuals who frequently use smart phone [19]. S. Ahmed and colleagues reported that 29.2% of physiotherapy students experienced thumb pain associated with prolonged smart phone use. Students who use smart phone for prolonged periods often engage in repetitive hand and finger movements without adequate breaks, which can irritate the tendons and cause hand discomfort. Over time, these repeated actions may reduce hand function and restrict normal movement [20].

CONCLUSION:

The findings of this study indicate that smart phone addiction is associated with increased musculoskeletal pain in the neck, shoulder, elbow and hand. Therefore, appropriate precautions and awareness are essential to ensure safe Smartphone usage.

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