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Frequency of Upper Cross Syndrome and Its Association with Physical Activity in Undergraduate Students

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ABSTRACT

Background: Upper Cross Syndrome is a most common postural disorder characterized by various muscle imbalances in the upper body that lead to altered alignment and potential musculoskeletal pain. As undergraduate students often face these risk factors due to long hours of studying, sedentary behaviors, and academic pressures, it is essential to investigate the frequency of Upper Cross Syndrome (UCS) in this population and explore its association with physical activity. This study aimed to determine the frequency of upper cross syndrome and to find its association with physical activity. **Methods:** This was a descriptive cross-sectional study utilizing a non-probability convenience sampling method. A total of 384 undergraduate students, aged between 18 and 25 years, were included in the study. Data collection took place at different universities in Rawalpindi and Islamabad. Postural grid assessment, inclinometer, and International physical activity questionnaire were used as diagnostic criteria. The data collected was then analyzed using SPSS version 21. **Results:** The results obtained show that there is a significant correlation between physical activity and UCS. It was revealed that 120 participants, or 31.3% of the population, had the upper cross syndrome. All the affected participants were found to be minimally or insufficiently active, making them more prone to musculoskeletal conditions such as upper cross syndrome. 13.8 were active and had no UCS, 80.7 were minimally active and had UCS, and 5.5 were insufficiently active, of which 16 had UCS. **Conclusion:** The findings of the current study concluded a significant relation between physical activity and upper cross syndrome. Students who were minimally or insufficiently active exhibited a higher prevalence of upper cross syndrome than those who were physically active. This study indicates the importance of physical activity in reducing the risk of developing musculoskeletal conditions such as upper cross syndrome. These results suggest that a sedentary lifestyle and prolonged sitting can lead to postural imbalances and increased musculoskeletal discomfort.

Keywords: Physical Activity, Upper Cross Syndrome, Undergraduate Students, Musculoskeletal Discomfort, Minimally Insufficiently Active, General Physical Health

INTRODUCTION

Upper cross syndrome (UCS) is more prevalent than ever in our technology-driven world, causing neck pain, headaches, and upper back and shoulder problems. UCS is characterized by the tightness of the levator scapulae muscle and upper trapezius muscle on dorsal sides traverse with the tightness of the pectoralis major muscle and minor muscle [1]. Weakness of the deep cervical flexors ventrally traverses through the weakness of the middle and the lower trapezius. The weakness and tightness lead to postural imbalance. This leads to postural-related problems in the upper quarter of the body. In addition to this, it creates the postural pattern of rounded shoulders, forward head posture, loss of cervical lordosis, and increased kyphosis [2]. Individuals with a sedentary lifestyle are most at risk for developing Upper Cross Syndrome. Long hours of sitting at a computer, watching television, or using a smartphone can contribute to bad posture. This syndrome got its name because it draws an "X", or cross, on the upper part of the body. One line of the cross represents muscles that are often stiff/overactive, while the other line of the cross represents muscles that are often weak/over-inhibited. The term rounded shoulder is mostly used to explain this disorder, as the shoulders and arms are essential parts of this disorder [3].

Upper cross syndrome (UCS) is a musculoskeletal imbalance disorder, and the primary cause of the syndrome is a muscular imbalance between the tonic and phasic muscles. Phasic muscles are more inclined to develop inhibition than tonic muscles, which are the muscles that are typically tight and over-facilitated most of the time [4]. People who suffer from this issue present with hyper-extension of the upper part of cervical vertebrae, forward slipping of the cervical vertebrae, increased front-to-back curve of the spine, elevation, and protraction. The most common complaints that present themselves are headaches, usually centered around the occipital region of the head; neck or cervical pain; strained muscles in the back of the neck; upper back pain and tightness; limited and somewhat restricted range of motion in the neck, cervical, or shoulders; and sensations of numbness, tingling, and pain in the upper limbs [5]. UCS is common among students at the bachelor's level, and it can be because of extensive study time, a lazy lifestyle, and educational stress. The weakness and tightness of many parts of the body, such as the cervical, shoulders, and upper back that cross between the upper and the lower sides of the body, have a direct relation with restrictions in bodily movements [2, 6].

Considering the global prevalence of upper cross syndrome, a study states that the prevalence rate varies depending on the line of work; among many other professions who spend a lot of time slouching, IT professionals have a prevalence of 67%, students have a prevalence of 37.1%, and laundry workers have a prevalence of 28%. Between 11% and 60% of people in different civilizations and at various ages are afflicted by this condition [6]. To find the prevalence of upper cross syndrome in Pakistan among computer users, a study states that Upper back discomfort affected 66.04% and neck pain affected 73.72% of computer users. 40.23% of people with neck and upper back discomfort reported pain when moving or using computers often. In addition, 61.16% of respondents had a forward head position, and 34.88% had greater thoracic curvature [7]. While considering the prevalence of upper cross syndrome in Pakistani physical therapists, a study states that 51.7% had forward head posture while 49.3% of physiotherapists suffered from upper cross syndrome [8].

Furthermore, the importance of understanding the prevalence of Upper Cross Syndrome (UCS) and its link to physical activity in undergraduate students lies in its impact on several key areas, including musculoskeletal health. UCS is associated with various issues, such as neck pain, headaches, shoulder discomfort, and restricted mobility, all of which can affect students' overall well-being. Identifying its frequency in undergraduate students is important for addressing these problems at a young age to prevent long-term issues. Examining the prevalence of upper cross syndrome (UCS) in undergraduate students and its relationship with physical activity is crucial to understanding its impact on musculoskeletal health, academic performance, and overall quality of life [7, 8]. This research can offer valuable insights to inform targeted interventions and health promotion strategies for this population. Despite the growing interest in addressing UCS, there remains a lack of high-quality studies that identify the most effective physiotherapy interventions or care plans. The rationale for this study stems from the increasing sedentary lifestyles and physical inactivity among students, which may contribute to musculoskeletal imbalances. Addressing this research gap, the study aims to explore the clinical significance of UCS and develop evidence-based strategies to manage and prevent its progression.

MATERIALS AND METHODS

A cross-sectional study was conducted on undergraduate students in Rawalpindi and Islamabad. The study was completed in a duration of 6 months from January 2024 to May 2024. Written informed consent was obtained from the participants, who were fully briefed about the purpose of the study. The ethical clearance certificate for the study was obtained from the Institute Ethical Committee. Three hundred eighty-four students of the age group 18-25 were selected using non-probability convenience sampling techniques according to the inclusion criteria and exclusion criteria.

Furthermore, they were asked to fill out a short form of an International physical activity questionnaire to assess their activity over the previous 7 days. Total METs were calculated. Participants were evaluated based on Craniovertebral angles, increased thoracic kyphosis, and posture evaluation using the Postural grid. The CV angle value less than 48° was considered FHP. An inclinometer was used to diagnose the upper cross syndrome. An inclinometer measures thoracic kyphosis. The thoracic kyphosis angle is calculated by the angle recorded by the inclinometer placed over T1 and T2 and the angle recorded by the inclinometer placed over T12. If the range of motion is more than 40 degrees, it is considered as increased thoracic kyphosis. IPAQ was used to measure the physical activity of participants. The data was collected after the synopsis was approved. The data was collected physically through a self-administered demographic questionnaire, IPAQ, and inclinometer and then distributed and analysed using SPSS version 21. The continuous or quantitative variables, for instance, age, were shown using mean and standard deviation tables and graphically through a histogram. In contrast, ordinal or qualitative variables, such as physical status, IPAQ score, and UCS, were shown using frequency tables and graphically using a bar chart. The association between physical activity and upper cross syndrome was evaluated using a chi-square test. The level of significance was $p < 0.05$.

DATA COLLECTION PROCEDURE

Data collection involved administering a self-administered demographic questionnaire and the International Physical Activity Questionnaire (IPAQ) to assess physical activity over the past week. Measurements were taken for craniovertebral angle (CV angle) using a Postural Grid, with a value <48° indicating forward head posture (FHP). Thoracic kyphosis was assessed using an inclinometer, with angles >40° classified as increased thoracic kyphosis. The inclinometer readings for T1-T2 and T12 determined the kyphosis angle.

STATISTICAL ANALYSIS

Descriptive statistics were used to summarize the demographic data, including the mean and standard deviation of age (21.42 ± 2.182). Frequency distribution analysis was conducted to evaluate the prevalence of upper cross syndrome (UCS) and activity levels based on the International Physical Activity Questionnaire (IPAQ). A chi-square test was performed to assess the association between physical activity levels (IPAQ categories) and UCS. The results revealed a significant correlation ($p = 0.001$), indicating that participants who were minimally or insufficiently active were more likely to have UCS. The Statistical Package of Social Sciences SPSS version 25 was used to analyse the data.

RESULTS

Figure 1 shows the percentage of age. 8.59% were of 18 years, 12.50% were of 19 years, 19.79% were of 20 years, 15.89% were of 21 years, 7.81% were of 22 years, 13,28% were of 23 years, 9.90% were of 24 years and 12.24% were of 25 years. Table 1 shows the percentage of active and inactive status concerning the physical condition of participants. Table 2 shows a physically active status concerning the IPAQ questionnaire. Fifty-three people (13.8%) were active, 310 participants (80.7%) were minimally active, and 21 participants (5.5%) were insufficiently active. Table 3 shows that there is a significant correlation between IPAQ and UCS. The significance or p-value was .001. 120 participants, or 31.3% of the population, had the upper cross syndrome. All the affected participants were found to be minimally or insufficiently active, making them more prone to muscle disturbances such as upper cross syndrome. Fifty-three people were active but had no UCS, 101 were minimally active and had UCS, and 19 were insufficiently active and had UCS. Analysis shows that the mean age of participants in the study was 21.42, and the standard deviation was 2.182. (21.42 ± 2.182).

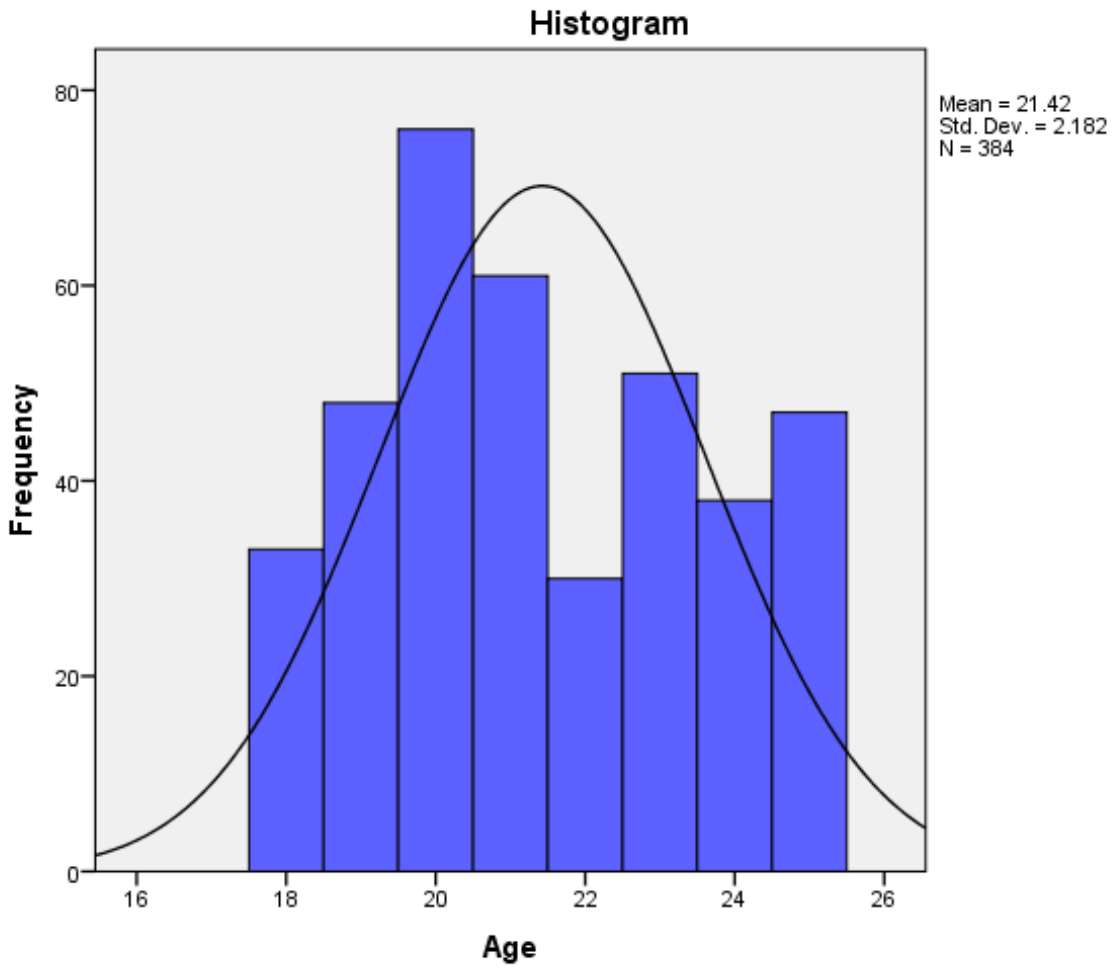

Figure 1: Histogram showing descriptive statistics of age

Table 1: Frequency Distribution Analysis of UCS

		Frequency	Per cent
UCS	Yes	264	68.8
	No	120	31.3
	Total	384	100

Analysis revealed that 68.8% of participants were not affected by upper cross syndrome, but the other 31.3% were affected by UCS.

Table 2: Descriptive statistics of IPAQ

		Frequency	Per cent
IPAQ	Insufficiently Active	21	5.5
	Minimally Active	310	80.7
	Active	53	13.8
	Total	384	100

Analysis revealed that 5.5% of participants were insufficiently active, 80.7% were minimally active, and 13.8% were active.

Table 3: Chi-Square Test for Association between UCS and IPAQ

		UCS			
		No	Yes	Total	P-Value
IPAQ	Insufficiently Active	5	16	21	0.00
	Count % within IPAQ	23.8%	76.2%	100.0%	
	Minimally Active	206	104	310	
	Count % within IPAQ	66.4%	33.5%	100.0%	
	Active Count % within IPAQ	53	0	53	
		100.0%	0.0%	100.0%	
Total Count % within IPAQ		264	120	384	
		68.8%	31.3%	100.0%	

The findings of the study revealed that 120 participants, or 31.3% of the population, had the upper cross syndrome. All the affected participants were found to be minimally or insufficiently active, making them more prone to muscle disturbances such as upper cross syndrome.

DISCUSSION

The primary objective of this study was to determine the frequency of upper cross syndrome and its association with physical activity in undergraduate students. The findings of the study revealed that 31.3% of the population had the upper cross syndrome. All the affected participants were found to be minimally or insufficiently active, making them more prone to muscle disturbances such as upper cross syndrome. Similar results were obtained in a study conducted by Sana Touqeer et al. in 2022 in Lahore, Pakistan. The study aimed to find the frequency of upper cross syndrome and its association with a sedentary lifestyle, such as sitting for longer times in the young population. The results of this study determined that there is a significant association between longer periods of sitting and the functional status of upper limbs, as these are directly proportional to each other. An increase in sitting causes increased and drastic changes in posture. Based on these results, it was determined that sitting for long periods was associated with upper extremity pain, also known as UCS and changes in upper limb function. Hence, some ideas or positioning can be beneficial for offices or people who must sit for long periods [7, 9, 10]. A study was done among laundry workers in 2019 in which people with mild cervical issues were four, medium eleven, and no problems thirty-five [11]. Our study found 31.5 per cent upper cross syndrome among undergraduate students. The prevalence rate of minimal internet addiction was sixty-seven per cent, 42.2 per cent medium, and 24.8 per cent extreme internet addiction. This was done in an educational institute in China, and it showed the danger of upper cross syndrome [11, 12]. Our study concluded that thirty-one point two five per cent upper cross syndrome was found among students concerning physical condition. A self-made Performa was used in research back in 2022, and it was concluded that 36.07 per cent of distress in the cervical region is a result of using gadgets and devices for long hours in the same posture [12]. In our study, we found thirty-one point two five per cent upper cross syndrome in undergraduate students of Rawalpindi and Islamabad. The New York Test was used to check the occurrence rate of the upper cross syndrome, and it was found that MSK issues for the cervical region are fifty-three per cent, the upper back was forty-one per cent, the lower trunk was thirty-nine per cent, the occurrence rate of upper cross disorder was forty-three per cent. The conclusion of this study presented a noticeable association between muscular and skeletal system issues with the upper cross syndrome. Our study supported this and found a mild presence of upper cross syndrome in students at educational institutes with age groups between eighteen and twenty-five. The occurrence rate of cervical problems in people working in workstations was thirty-point one per cent, and it was found with the help of scales such as IPAQ [13, 14]. Our study concluded

that thirty-one point two-five per cent of students suffer from Upper Cross syndrome with p<.000. There was a response bias in self-reported questionnaires as participants may have provided socially desirable answers rather than providing accurate physical activity levels.

LIMITATIONS AND RECOMMENDATIONS

This study had multiple limitations, including the use of non-probability convenience sampling, which may limit the generalizability of the findings to a broader population. Additionally, self-reported data from the IPAQ questionnaire might be subject to recall bias. The cross-sectional design restricts causal inferences between physical activity levels and upper cross syndrome. Future research should employ larger, randomized samples and longitudinal designs to better understand the causal relationships. Incorporating advanced diagnostic tools and interventions to evaluate and mitigate UCS in diverse populations is also recommended.

CONCLUSION

The findings of the current study concluded a significant relation between physical activity and upper cross syndrome. Students who were minimally or insufficiently active exhibited a higher prevalence of upper cross syndrome than those who were physically active. This study indicates the importance of physical activity in reducing the risk of developing musculoskeletal imbalances such as upper cross syndrome. These results suggest that a sedentary lifestyle and prolonged sitting can lead to postural issues and increased musculoskeletal discomfort. We recommend using other tools for evaluation, like the Modified Oswestry Neck Disability Index (MONDI) and the Upper Limb Functional Index (ULFI). The age limit should be extended as well. The sample size should be expanded as well. The sample should be taken outside Rawalpindi and Islamabad.

CONFLICT OF INTEREST

The authors declared no conflict of interest.

AUTHOR CONTRIBUTION

Muhammad Sufyan Ahmed Khan conceptualized the study, reviewed the literature, performed data analysis, and drafted the manuscript. Attiq Ur Rehman contributed to the study design, data collection, and critical review of the manuscript. Ali Danish Rajput assisted in data extraction and statistical analysis. Jamal Shahzad contributed to results interpretation and manuscript refinement, while Nayef Abdullah provided support in data analysis and critical review for intellectual content.

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