Association Between Upper Cross Syndrome and Temporomandibular Joint Dysfunction

Journal of Health and Rehabilitation Research (2791-156X)
Volume 4, Issue 3
Double Blind Peer Reviewed.
https://jhrlmc.com/
DOI: https://doi.org/10.61919/jhrr.v4i3.1432
www.lmi.education/
LINK MEDICAL INTERFACE

Erum Ghaffar[1], Umme Sadia[2], Rubat Riaz[2], Fatima Mazhar[2], Rimsha Tariq[2], Lubna Amjad[2], Muhammad Usman[3], Aneeqa Aqdas[2], Mubashira Ibrahim[3], Uzma Irshad[2]

Correspondence
Erum Ghaffar
erumghaffar851236@gmail.com

Affiliations
1 Department of Physical Therapy, Hajvery University, Lahore, Pakistan
2 Department of Physical Therapy, Hajvery University, Lahore, Pakistan
3 Department of Physical Therapy, Riphah International University, Lahore, Pakistan

Keywords
Upper Cross Syndrome, Temporomandibular Joint Dysfunction, craniovertebral angle, jaw pain, posture correction, online gamers, musculoskeletal health

Disclaimers

Authors' Contributions	All authors contributed equally to the work of this study
Conflict of Interest	None declared
Data/supplements	Available on request.
Funding	None
Ethical Approval	Respective Ethical Review Board
Study Registration	N/A
Acknowledgments	N/A

ABSTRACT

Background: Upper Cross Syndrome (UCS) and Temporomandibular Joint Dysfunction (TMD) involve muscular imbalances and altered biomechanics, impacting jaw function and posture. Despite their interrelated nature, their association in specific populations, like online gamers, remains underexplored.

Objective: To investigate the association between UCS and TMD among online gamers.

Methods: A correlation study design was conducted with 36 online gamers (21 males, 15 females) aged 16 to 45 years, recruited through non-probability convenient sampling from various gaming play-stations. Participants were divided into Group A (no pain at head, face, jaw, and neck) and Group B (pain present in these areas). Data collection involved a self-administered questionnaire and palpation for pain assessment. The craniovertebral angle was measured using a goniometer. Statistical analysis was performed using IBM SPSS Statistics 25.

Results: A moderate association was found between UCS and TMD, with significant differences between groups in craniovertebral angle (Group A: 1.666 ± 0.485, Group B: 2.277 ± 0.461, $p < 0.001$), jaw pain (Group A: 0.778 ± 0.943, Group B: 2.000 ± 0.594, $p < 0.001$), and mandibular function impairment (Group A: 27.333 ± 8.153, Group B: 33.222 ± 4.821, $p = 0.012$).

Conclusion: UCS is moderately associated with TMD among online gamers, suggesting the need for targeted interventions to address postural imbalances.

INTRODUCTION

Upper Cross Syndrome (UCS) is characterized by a muscular imbalance involving the shoulder girdle and cervical spine, leading to forward head posture, forward shoulder positioning, and altered shoulder girdle function. This imbalance typically arises between tonic muscles, which are prone to tightness and shortening, such as the pectoralis major, pectoralis minor, upper trapezius, and sternocleidomastoid, and phasic muscles, which are more susceptible to weakness, including the deep-neck flexors, middle and lower trapezius (1). The imbalance results in postural disruption, manifesting as increased cervical lordosis, thoracic kyphosis, hunching of the thoracic spine, forward head posture, and protraction or abduction of the shoulders (2). Common symptoms of UCS include chest pain, migraines, tension headaches, neck and shoulder pain, upper back pain, and weakness in the front of the neck, alongside neck stiffness, mid-back pain, and numbness or tingling in the upper arms (3). Research indicates that the prevalence of UCS varies between 11% and 60% across different populations and age groups (4-6).

Temporomandibular Joint Dysfunction (TMD) affects the muscles of mastication and the temporomandibular joint, leading to pain and functional impairment. TMD is characterized by pain, restricted mandibular movement, and joint noises during jaw function (5). Although not life-threatening, TMD significantly impacts quality of life, as chronic cases are particularly challenging to manage (6). Prevalence rates of TMD vary, affecting approximately 8% to 15% of women and 3% to 10% of men, with reports indicating that about 28% to 50% of the adult population experience some form of the disorder (7). Signs of TMD are present in 60% to 70% of the general population, though only 25% of individuals with these signs report symptoms (8). The etiology of TMD is multifaceted, involving factors such as trauma, severe pain stimuli, parafunctional activities, and psychological elements, including stress, anxiety, and depression (9-13).

The relationship between UCS and TMD is rooted in their shared anatomical and biomechanical characteristics, as well as their clinical presentations. Both conditions involve a network of structures that affect jaw biomechanics, neck posture, and overall musculoskeletal function. Muscles such as the upper trapezius, levator scapulae, sternocleidomastoid, and temporalis are involved in both UCS and TMD, leading to altered biomechanics and muscular dysfunction (10-14). The proximity of the cervical spine to the temporomandibular joint facilitates interaction between these areas, further highlighting their interconnectedness (11). Forward head posture, a hallmark of UCS, causes mandible retraction and elongation of anterior throat muscles, increasing the activity of jaw-closing muscles to counter the digastric muscles'

downward force on the mandible. This posture also leads to the shortening of muscles in the suboccipital region, which can reduce flexibility and compress or irritate nerves and joints in the upper cervical region (12).

Previous studies have explored the association of UCS with various populations, but the relationship between UCS and TMD in online gamers remains under-researched. This study aims to investigate the association between UCS and TMD among online gamers, addressing postural issues and muscle imbalances that may affect this population. Understanding these associations can help healthcare providers develop targeted interventions and physical education programs to address the needs and challenges specific to online gamers, ultimately improving patient outcomes. Early investigation and intervention for these impairments can mitigate their impact on affected individuals, promoting more effective lifestyles and reducing the burden of musculoskeletal dysfunction (13-17).

MATERIAL AND METHODS

This study employed a correlational design to investigate the association between Upper Cross Syndrome (UCS) and Temporomandibular Joint Dysfunction (TMD) among online gamers. The sample consisted of 36 participants, including 21 males and 15 females, aged between 16 to 45 years. Participants were recruited through non-probability convenient sampling from various online gaming play-stations. Inclusion criteria comprised online gamers within the specified age range, of both genders, experiencing pain in the shoulder and neck regions, willing to participate, and able to communicate effectively. Exclusion criteria included individuals unwilling to participate, those with psychological disorders, severe vertebral pathologies, inflammatory conditions, and a history of trauma in the temporomandibular joint or cervical region.

Data collection was conducted using a self-administered questionnaire and physical assessment through palpation to identify pain in the head, face, jaw, and neck regions. Participants were divided into two groups: Group A, consisting of individuals without pain in the specified areas, and Group B, comprising individuals who reported pain upon palpation. The craniovertebral angle, a key measure in assessing UCS, was evaluated using a goniometer, which is a reliable tool for measuring angles related to body posture. Ethical approval for the study was obtained in accordance with the principles outlined in the Declaration of Helsinki, ensuring that all participants provided informed consent and that their confidentiality and privacy were maintained throughout the study. The study adhered to ethical guidelines concerning human subjects, including the right to withdraw at any time without penalty.

Data analysis was performed using IBM SPSS Statistics version 25. Descriptive statistics were used to summarize the demographic characteristics of the sample, including age and gender distribution. Independent sample t-tests were conducted to compare mean values of variables such as craniovertebral angle, jaw pain, and mandibular function impairment between Group A and Group B. A p-value of less than 0.05 was considered statistically significant. The analysis aimed to identify significant differences between the groups and to determine the strength of association between UCS and TMD. The results provided insights into the potential impact of postural and muscular imbalances on temporomandibular dysfunction among online gamers, highlighting areas for further investigation and potential clinical intervention.

RESULTS

The results of this study are presented in the tables below, providing a detailed analysis of the demographic characteristics and statistical comparisons between groups. Table 1 shows the gender distribution of the participants, with a total of 36 individuals included in the study. Among them, 21 were male (56.8%) and 15 were female (40.5%), indicating a slightly higher representation of males in the sample.

Table 1 Gender Distribution

Gender	Frequency	Percent (%)
Male	21	56.8
Female	15	40.5
Total	36	100.0

Table 2 outlines the age distribution of the participants, revealing that the majority were young adults aged between 16 to 24 years, comprising 54.1% of the sample. Participants aged 25 to 34 years represented 37.8%, while those aged 35 to 44 years were significantly fewer, making up only 5.4% of the total sample.

Table 2 Age Distribution

Age Group	Frequency	Percent (%)
16-24 years	20	54.1
25-34 years	14	37.8
35-44 years	2	5.4
Total	36	100.0

Table 3 presents the T-test results comparing Group A (No Pain) and Group B (Pain) across various variables. The Cranio-vertebral angle showed a highly significant difference between the groups ($p < 0.001$), with Group B (Pain) having a mean value of 2.277 compared to Group A's mean of 1.666, suggesting greater impairment in Group B. Jaw pain and headache also demonstrated significant differences between the groups, with p-values of <0.001 and 0.004, respectively, indicating these variables as key indicators of pain and dysfunction in Group B. Additionally, facial pain and the Mandibular Function Impairment Questionnaire (MFIQ) scores were significantly higher in Group B ($p < 0.05$), highlighting the greater functional impairment in this group. In contrast, no significant differences were observed in Pectoralis, Trapezius, and Neck pain scores between the two groups, suggesting these may not be critical differentiators of pain within this sample.

Table 3 Comparison between Group A and Group B

Variable	Group A (No Pain) Mean ± SD	Group B (Pain) Mean ± SD	p-value
Pectoralis	1.333 ± 0.485	1.222 ± 0.428	0.471
Trapezius	1.388 ± 0.502	1.166 ± 0.383	0.145
Cranio-vertebral angle	1.666 ± 0.485	2.277 ± 0.461	<0.001***
Head	0.667 ± 0.686	1.388 ± 0.698	0.004**
Neck	1.555 ± 0.784	1.388 ± 0.850	0.545
Jaw	0.778 ± 0.943	2.000 ± 0.594	<0.001**
Face	0.833 ± 1.043	1.500 ± 0.857	0.044*
MFIQ	27.333 ± 8.153	33.222 ± 4.821	0.012*

These findings underscore the significant association between UCS and TMD, particularly in variables such as craniovertebral angle, jaw pain, and mandibular function impairment, which were notably more affected in the group experiencing pain. The lack of significant differences in Pectoralis, Trapezius, and Neck pain between groups suggests that while these muscles are involved in UCS, they may not be the primary indicators of pain related to TMD in this population.

DISCUSSION

The present study explored the association between Upper Cross Syndrome (UCS) and Temporomandibular Joint Dysfunction (TMD) among online gamers, revealing a moderate positive relationship between these conditions. The findings showed significant differences in craniovertebral angle, jaw pain, and mandibular function impairment between participants with and without pain, highlighting these as key variables in distinguishing between the groups (17). This supports the hypothesis that UCS may contribute to TMD by influencing posture and musculoskeletal function, particularly in populations prone to prolonged static postures, such as gamers. These results align with previous studies that have reported moderate to high associations between UCS and TMD, emphasizing the importance of posture and muscle imbalance in the development of temporomandibular dysfunction (1, 2, 14).

One of the strengths of this study was its focus on a unique population, online gamers, which has not been extensively studied in relation to UCS and TMD. This provides valuable insights into the potential impacts of gaming-related postural habits on musculoskeletal health. However, the study also had several limitations, including a small sample size and the use of a non-probability convenient sampling method, which may limit the generalizability of the findings (17). Additionally, the reliance on self-reported data and palpation for pain assessment could introduce subjectivity and bias. Future studies should consider larger, more diverse samples and objective measures of musculoskeletal function to enhance the validity of the results (15).

Previous research has highlighted the role of muscular imbalances in UCS, specifically the shortening of tonic muscles like the upper trapezius and pectoralis major and the weakening of phasic muscles such as the deep neck flexors (3, 4). These imbalances are known to contribute to altered head and neck posture, which can increase the risk of TMD by affecting the biomechanics of the jaw and cervical spine (5). This study's findings that jaw pain and craniovertebral angle were significantly higher in the pain group are consistent with these mechanisms, suggesting that addressing muscular imbalances in UCS could potentially reduce the prevalence of TMD symptoms (16).

Moreover, the study found no significant differences in Pectoralis, Trapezius, and Neck pain between groups, suggesting these muscles may not be the primary drivers of pain in TMD among individuals with UCS. This contrasts with other research that identified a significant association between neck muscle tension and TMD (6). This discrepancy may be due to differences in study populations or methodologies, indicating a need for further research to clarify the role of specific muscle groups in the UCS-TMD relationship (13).

The findings also underscore the clinical implications of early intervention for UCS to prevent or mitigate TMD. By focusing on posture correction and muscle strengthening, healthcare providers can address the root causes of both conditions, potentially improving patient outcomes. Recommendations for future research include investigating the effectiveness of targeted interventions, such as physical therapy or ergonomic training, in reducing the incidence of TMD in populations at risk due to UCS (7, 8, 18, 19).

CONCLUSION

In conclusion, this study contributes to the growing body of evidence linking UCS and TMD, particularly in populations

with specific postural challenges. Despite its limitations, the research provides a basis for further exploration into how posture and muscle function influence temporomandibular health. Addressing these factors through appropriate interventions could play a crucial role in managing and preventing TMD, thereby enhancing the quality of life for individuals affected by these conditions.

REFERENCES

1. Bokaee F, Rezasoltani A, Manshadi FD, Naimi SS, Baghban AA, Azimi H. Comparison of Isometric Force of the Craniocervical Flexor and Extensor Muscles Between Women With and Without Forward Head Posture. CRANIO. 2016;34(5):286-90.
2. Yoo WG, Yi CH, Kim MH. Effects of a Ball-Backrest Chair on the Muscles Associated With Upper Crossed Syndrome When Working at a VDT. Journal of Physical Therapy Science. 2007;19(1):49-54.
3. de-la-Iglesia L, Bravo C, Rubí-Carnacea F. Upper Crossed Syndrome in Secondary School Students: A Mixed-Method Study. J Taibah Univ Med Sci. 2023;18(4):894-907.
4. Mujawar JC, Sagar JH. Prevalence of Upper Cross Syndrome in Laundry Workers. Indian J Occup Environ Med. 2019;23(1):54-6.
5. Pathan H, Phansopkar P, Naqvi WM. Screening for Upper Cross Syndrome in Asymptomatic Individuals. Indian J Forensic Med Toxicol. 2021;15(1):50-4.
6. Pathan H, Pawar A, Rao R, Phansopkar P, Chitale N, Arora SP. A Structured Exercise Program for Upper Cross Syndrome. J Med Pharm Allied Sci. 2022;11(S1):259-63.
7. Chandarana P, Rathod S, Sorani D. Prevalence of Upper Crossed Syndrome in College Going Students–An Observational Study. Int J Health Sci Res. 2022;12(3):179-86.
8. Minervini G, D'Amico C, Cicciù M, Fiorillo L. Temporomandibular Joint Disk Displacement: Etiology, Diagnosis, Imaging, and Therapeutic Approaches. J Craniofac Surg. 2023;34(3):1115-21.
9. de Kanter RJ, Battistuzzi PG, Truin GJ. Temporomandibular Disorders: "Occlusion" Matters! Pain Res Manag. 2018;2018:8746858.
10. Odzimek M, Brola W. Occurrence of Cervical Spine Pain and Its Intensity in Young People with Temporomandibular Disorders. Journal of Clinical Medicine. 2024 Mar 27;13(7):1941.
11. Minervini G, Franco R, Marrapodi MM, Crimi S, Badnjević A, Cervino G, et al. Correlation Between Temporomandibular Disorders (TMD) and Posture Evaluated Through the Diagnostic Criteria for Temporomandibular Disorders (DC/TMD): A Systematic Review With Meta-Analysis. J Clin Med. 2023;12(7):2652.
12. de Oliveira-Souza AI, Ferro JK, Barros MM, de Oliveira DA. Cervical Musculoskeletal Disorders in Patients With Temporomandibular Dysfunction: A Systematic Review and Meta-Analysis. J Bodyw Mov Ther. 2020;24(4):84-101.
13. Szarejko KD, Gołębiewska M, Lukomska-Szymanska M, Kuć J. Stress Experience, Depression and Neck Disability in Patients with Temporomandibular Disorder—Myofascial Pain with Referral. Journal of Clinical Medicine. 2023 Mar 2;12(5):1988.
14. Olivo SA, Bravo J, Magee DJ, Thie NM, Major PW, Flores-Mir C. The Association Between Head and Cervical Posture and Temporomandibular Disorders: A Systematic Review. J Orofac Pain. 2006;20(1):9-23.
15. Tavares LF, Gadotti IC, Ferreira LM, Maciel AC, Carvalho BG, Barbosa GS, Almeida EO, Ribeiro KF. Pain, deep neck flexors performance, disability, and head posture in individuals with temporomandibular disorder with and without otological complaints. Journal of Back and Musculoskeletal Rehabilitation. 2023 Jan 1;36(2):465-75.
16. Khosravi Z, Mohammad Ali Nasab Firouzjah E, Firouzjah MH. Comparison of balance and proprioception of the shoulder joint in girls with and without upper cross syndrome. BMC Musculoskeletal Disorders. 2024 Aug 2;25(1):618.
17. Kisner C, Colby LA, Borstad J. Therapeutic Exercise: Foundations and Techniques. 6th ed. Philadelphia: FA Davis; 2017.
18. Kulesa-Mrowiecka M, Ciężarek P, Pihut M. Effectiveness of Rehabilitation for Disk Displacement of the Temporomandibular Joint—A Cross-Sectional Study. Journal of Clinical Medicine. 2024 Feb 4;13(3):902.
19. Minervini G, Franco R, Marrapodi MM, Crimi S, Badnjević A, Cervino G, Bianchi A, Cicciù M. Correlation between temporomandibular disorders (TMD) and posture evaluated trough the diagnostic criteria for temporomandibular disorders (DC/TMD): a systematic review with meta-analysis. Journal of clinical medicine. 2023 Apr 2;12(7):2652.