

Relationship between Lower Cervical and Upper Thoracic Spine in Temporomandibular Disorders

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Author's Contribution

²Conception and design, ³⁻⁵Collection and assembly of data, ^{1,2,6,7}Analysis and interpretation of the data, Statistical expertise, ³drafting of article, ⁴Critical revision of the article for important intellectual content, ¹⁻⁶Final approval and guarantor of the article..

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A B S T R A C T

Background: Temporomandibular patients frequently feel discomfort in other areas as well. It is believed that temporomandibular dysfunction (TMD) is linked to whole body imbalance including lower cervical and upper thoracic spine.

Objective: To determine the relationship between lower cervical and upper thoracic spine with TMJ disorders.

Methodology: This study was conducted on bilateral temporomandibular disorder patients of Multan. It included both males and females of age group between 20 to 50 years. People with history of trauma and fracture of face, patients with any spine abnormality and systemic disease such as rheumatoid were excluded. Helkimo index, neck disability scale and Oswestry scale was used to assess TMJ, cervical spine and thoracic spine.

Results: In the current study total of 82 participants participated with a mean age of 31.19. In this study, 31(37.8%) males and 51(62.2%) females participated for the study. Result showed that there are 32 (39%) with mild dysfunction, 28 (34.1%) with moderate dysfunction and 22 (26.8%) with severe dysfunction of TMJ. Neck disability scale results showed that around 21 (25.6%) had no disability, 25 (30.5%) had mild disability, 19 (23.2%) had moderate, 16 (19.5%) had severe and only 1 (1.2%) had total disability of neck and Oswestry disability index results showed that the 53 (64.6%) had mild thoracic spine disability, 16 (19.5%) had moderate thoracic spine disability and 13 (15.9%) had severe thoracic spine disability of thoracic spine. Association was found between TMJ dysfunctions with both cervical spine and thoracic spine ($P < 0.05$).

Conclusion: The result of this study concluded that there is an association between TMJ disorder with lower cervical and upper thoracic spine.

Keywords: Lower cervical spine, Temporomandibular disorder, Upper thoracic spine.

Introduction

Temporomandibular disorders (TMD) are defined as a condition that involves a variety of clinical issues, including the masticatory muscles, the temporomandibular joints (TMJs), and their related tissues. The main symptoms of this disorder, particularly affect eating, swallowing, speaking, clicking sounds, limited range of motion, and deviation of the mandible.¹ TMD usually affects the surrounding muscles and ligaments along with the jaw joint. Its symptoms include headache, facial pain, earache and tenderness of the jaw. Difficulty in opening

and closing of the jaw is its most common sign.² The second most prevalent musculoskeletal disease that causes pain and disability is TMD. TMD caused by pain can affect a person's everyday life, psychosocial functioning, and quality of life. Without accounting for imaging, the total cost of TMD management in the USA has increased by half over the past ten years to \$4 billion.³ Teenagers are more likely to have TMD 9.0% to 48.7% of the time.⁴ TMD pain is frequently thought to be most common among young adult women. For many medical illnesses, there is evidence of social and racial disparities in pain experiences; however, these differences in

TMD patients have not been widely studied.⁵ The cervical spine and the masticatory system have strong connections, according to anatomical and physiological evidence. This relationship has been explained by the theory that the trigeminal and cervical sensory-motor systems are interdependent.¹ The neuroanatomical convergence of nociceptive neurons that receive trigeminal and neck sensory inputs provided an explanation for the link between the TMJ and the cervical spine.

It is brought on by the trigeminal caudate nucleus' topographic design, which enables communication between the spinal and trigeminal neurons. Hence, neck pain may result from stimulation of trigeminal nerve-innervated tissues, and vice versa.⁶ Numerous investigations have shown that the sternocleidomastoid and upper trapezius muscles in the neck, as well as other cervical and shoulder muscles, are sensitive in TMD patients.⁷ Inframandibular muscle, inferior lateral pterygoid, digastrics, supra and infrahyoid, as well as other muscles involved in opening, pull the jaw downward, which causes the cervical posterior muscle to operate as a stabilising muscle. The posterior cranial muscles masseter, medial pterygoid, and superior lateral pterygoid group also help with elevation.⁸ Movement of the later protrusion involves the medial, lateral, and temporalis muscles. Its tendency can alter the connection between the maxilla and the mandible, as well as psychological variables and teeth clenching. The movement of the mandible is influenced by the movement of the head and neck muscles since the TMJ and upper spine are connected. An inappropriate jaw contact can lead to biomechanical stress, which requires all active parts to be compensated for.⁹ A physiological connection between the TMJ and the vertebral joint is made by the trapezius, platysma, sternocleidomastoid, digastrics, longus capitis, infra, and supra hyoid muscles. When this link is interrupted, related structures may also be disturbed.¹⁰ TMD and the thoracic spine are connected, in addition to the cervical spine. Vertebral discomfort is a significant problem in today's life researches. Back pain has many different root causes and can come from nearby areas or even from a distance. Temporomandibular disorder (TMD) and back pain are complex, and patients frequently experience postural issues. The temporomandibular disorders (TMD) are a collection of symptoms brought on by stomatognathic system problems. TMD affects different tissue structures and results in a variety of symptoms that radiate from different structures. For assessing temporomandibular disorder cervical spine is often assessed. It was seen that cervical spine issues commonly affect both TMJ issues and thoracic issues due to its close anatomical ties. Yet, there is no evidence linking TMJ disorder to the cervical and thoracic region, despite the orofacial region and upper thoracic spine having established neuroanatomical

and neurophysiological relationship. Previous researches have shown that posture problem in the upper region often cause cervical issues. It was seen that upper thoracic issues such as stiffness often lead towards cervical spine issue. This cervical spine issue often cause muscle weakness which ultimately targets the TMJ muscles. So it was seen that TMJ is not directly associated with thoracic spine but indirectly thoracic spine symptoms does affect TMJ joint.¹¹

The objective of this research is to address the shortage of evidence on the association of lower cervical and upper thoracic pain with TMJ disorders which will help in treating problems of TMJ disorders on a broader aspect. This will ultimately help in eliminating other causes of TMJ pain and will improve patient related outcome.

Methodology

This cross-sectional study involved 82 participants, and the sample size was determined using a convenience sampling technique. Data were collected in Multan, Pakistan. Patients meeting the inclusion and exclusion criteria established beforehand were included in this study. Inclusion criteria encompassed individuals of both genders within the age range of 20 to 50 years. Exclusion criteria comprised individuals with a history of facial trauma and fractures, those with any spinal abnormalities, and those diagnosed with systemic diseases such as rheumatoid arthritis. Helkimo index, neck disability scale and Oswestry scale was used to assess TMJ, cervical spine and thoracic spine. There were 31 (37.8%) males and 51 (62.2%) females who participated for the study Data was collected from Family Health Care and Maternity Home, Nishtar Hospital and Bakhtawar Amin Hospital. Ethical Approval also taken (Ref no: **PT/2021/REC/IRB/022**) The participants were divided into four categories based on the sum of the points calculated by asking questions from the Helkimo index questionnaire: TMD-free (0 to 15 points), mild TMD (20 to 40 points), moderate TMD (45 to 60 points), and severe TMD (70 to 100). The ten sections of the neck disability scale were graded from zero to five.¹² The Oswestry Index was also divided into ten sections, which were on the basis of score further classified as mild, moderate, and severe. All sections have a total score of 50 and are further divided into 5 classifications based on score no disability, mild disability, moderate disability, severe disability, and total or complete disability.¹³ Clicking was observed among the history of the symptoms, which included discomfort and tenderness. By applying forceful pressure unilaterally or bilaterally to the anatomical regions, the tenderness was tested, and the trigger reflex was seen. Using a non-probability convenient sampling strategy, sample size was determined. All patients provided

written consent, and prior to completing the surveys, the importance of the study was discussed.

Results

On analyzing data, the results showed that the mean and SD of age were 31.1951 ± 6.48158 and the male had frequency of 31 with percentage 37.8% and female with frequency of 51% and percentage 62.2%. By using quantitative total score of all three questionnaires (Helkimo, neck disability and Oswestry index) results were calculated which showed that there are 32 (39%) patients with mild dysfunction, 28 (34.1%) patients with moderate dysfunction and 22 (26.8%) patients with severe dysfunction of TMJ out of 82 patients in Helkimo index, neck disability scale results showed that around 21 (25.6%) patients had no disability, 25 (30.5%) had mild disability, 19 (23.2%) had moderate, 16 (19.5%) had severe and only 1 (1.2%) patient had total disability of neck out of all 82 patients and oswestry disability index results showed that the 53 (64.6%) patients had mild thoracic spine disability, 16 (19.5%) patients had moderate thoracic spine disability and 13 (15.9%) patients had severe thoracic spine disability of thoracic spine. Association was found by applying chi square between TMJ dysfunctions with both cervical spine and thoracic spine with p value calculated to be less than 0.05 significant value ($p = 0.000$) hence an association was found between TMJ dysfunction with lower cervical and upper cervical spine.

Results in table I shows that more the TMJ dysfunction more is the cervical disability. The results showed that the associative statistic between neck disability and TMJ dysfunction with a p value of less than 0.05.

Results in table II shows that more the TMJ dysfunction more is the thoracic disability. The results showed

that the associative statistics of TMJ dysfunction and oswestry scale (thoracic issues) with a p value of less than 0.05.

Discussion

The analysis of the data from this study showed several important findings regarding Temporomandibular Joint (TMJ) dysfunction, neck disability, and thoracic spine disability among the participants. The most significant finding of the study was the strong statistical association between TMJ dysfunction and cervical spine (neck) problems, as well as thoracic spine issues. The p-value of less than 0.05 ($p = 0.000$) demonstrated a significant relationship between these conditions. This suggests that individuals with TMJ dysfunction are more likely to experience issues in both their cervical and thoracic spine areas. The study sheds light on the prevalence of TMJ dysfunction, neck disability, and thoracic spine disability in the studied population. It also highlights the interconnectedness of these conditions, emphasizing the importance of comprehensive assessment and treatment strategies for patients experiencing these health issues.

Studies have shown many conflicting debates related this topic. According to a study done in 2012 by Susan Armijo-Olivo et al on 154 patients, it was determined that TMD patients typically had cervical muscle weakness, demonstrating the connection between TMD and the neck.¹⁴ In 2014 Packer, et al draw similar findings stating that neck and TMD is related¹⁵ Similar findings were seen in this study where there were a 32 patients with mild dysfunction, 28 patients with moderate dysfunction and 22 patients with severe dysfunction of TMJ and neck disability scale results showed that around 21 patients had no disability, 25 had mild disability, 19 had moderate, 16 had severe and only 1 patient had total disability. Both of these variable showed relationship with each other. Result shows that

Table I: Relationship between Cervical spine and Temporomandibular disorder.

		Neck Disability					Total	P Value
		No Disability	Mild Disability	Moderate Disability	Severe Disability	Total Disability		
Helkimo Classification	Mild Dysfunction	17	13	2	0	0	32	0.000
	Moderate Dysfunction	4	10	14	0	0	28	
	Severe Dysfunction	0	2	3	16	1	22	
Total		21	25	19	16	1	82	

Table II: Relationship between Thoracic spine and Temporomandibular disorder.

		Oswestry Scale			Total	P Value
		Mild Disability	Moderate Disability	Severe Disability		
Helkimo Classification	Mild Dysfunction	27	5	0	32	0.000
	Moderate Dysfunction	21	7	0	28	
	Severe Dysfunction	5	4	13	22	
Total		53	16	13	82	

more the TMJ dysfunction more is the cervical disability ($P < 0.05$).

TMJ typically affects the muscles and jaw joint. This is due to the fact that the muscles in the neck and mouth are interconnected, and any strain in the jaw will create pain, spasms, flexibility, or tension in the neck.¹⁶ Similar to this, Ramón Fuentes Fernández et al. did study on 78 participants and came to the conclusion that there is a link between poor body posture and TMJ issues since the muscles that control posture and the TMJ are interconnected.⁸ Javier González-Iglesias et al. did a study on 15 participants in which they came to the conclusion that the condition of the subjects with TMD was improved by mobilisation with movement, thoracic spine manipulation, and dry needling. TMJ improvement was observed in this study as a result of thoracic mobilisation, demonstrating a connection between the TMJ and thoracic spine. Due to a lack of evidence, this study could not reach a firm conclusion.¹⁷ On the contrary, in our study it was seen that the associative statistics of TMJ dysfunction and Oswestry scale (thoracic issues) with a p value of less than 0.05. Result shows that more the TMJ dysfunction more is the thoracic disability. Mild dysfunction of the TMJ was seen to be 27 cases in mild disability, 5 in moderate disability and 0 in severe disability of thoracic spine. Moderate dysfunction of the TMJ was seen to be 21 cases in mild disability, 7 in moderate disability and 0 in severe disability of thoracic spine. Severe dysfunction of the TMJ was seen to be 5 cases in mild disability, 4 in moderate disability and 12 in severe disability of thoracic spine. Our study states that thoracic spine and TMJ disorder shows significant relation between them. ($P < 0.05$).

Hence all previous researches and this research shows association with p value of 0.000 which concludes that there is an association between TMD with lower cervical and upper thoracic which can be due to interrelated muscles attachment and movement pattern or posture relation.

Conclusion

High levels of muscle tenderness in the jaw were related with thoracic and neck disabilities. On the basis of the results, it was concluded that there is an association between TMJ disorder with lower cervical and upper thoracic spine.

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