

Examining the Impact of Orthodontic Interventions on Temporomandibular Joint (TMJ) Disorders.

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ABSTRACT:

Background: Temporomandibular Joint (TMJ) disorders, commonly referred to as TMD, encompass a range of conditions characterized by symptoms such as pain, clicking, grating in the jaw joint, and difficulties with chewing or opening the jaw. The objective of the present study was to evaluate the role of orthodontics in addressing TMJ disorders.

Methods: The current study involved 172 patients, encompassing both genders, who presented with complaints of Temporomandibular Joint (TMJ) disorders. Various TMJ disorders, including myositis, capsulitis, fibromyalgia, disc displacement, and MPDS, were taken into consideration. As part of the intervention, all patients were prescribed stabilization splints to be worn for 6 hours daily over a period of 4 months. Regular follow-up appointments were conducted, during which improvements were assessed using the Visual Analog Scale (VAS).

Results: Among the 172 patients included in the study, there were 72 males and 100 females. The prevalence of common Temporomandibular Disorders (TMDs) varied between the genders. Specifically, myositis was observed in 12 males and 12 females, capsulitis in 18 males and 20 females, fibromyalgia in 10 males and 16 females, disc displacement in 16 males and 24 females, and MPDS in 20 males and 28 females. The observed differences between males and females in the occurrence of these TMDs were statistically significant ($P < 0.05$). This suggests a gender-related variation in the prevalence of specific TMJ disorders within the studied population.

Conclusion:

The authors of the study concluded that stabilizing splints proved to be beneficial in the management of patients with Temporomandibular Disorders (TMDs). This suggests that the prescribed use of stabilization splints, worn for six hours a day over a four-month period, led to improvements in the symptoms and conditions associated with TMDs in the studied patient population.

Keywords: Myositis, temporomandibular joint, symptoms

INTRODUCTION:

Temporomandibular Disorders (TMDs) comprise a group of conditions affecting the temporomandibular joint (TMJ) and the surrounding muscles, nerves, and tissues. These disorders manifest with symptoms such as pain and discomfort in the jaw, face, and neck, along with difficulties in performing jaw movements, speaking, and chewing. TMDs are prevalent, estimated to affect 5%-12% of the general population.¹ While the precise causes are not fully understood, they are believed to be multifactorial. Contributing factors include trauma to the jaw or TMJ, teeth grinding or clenching, malocclusion, and stress. The treatment options for TMDs vary based on the severity and type of the disorder.

Approaches may include medication, physical therapy, dental devices, or, in rare cases, surgical intervention. The choice of treatment is tailored to the individual's specific condition and symptoms. The temporomandibular joint (TMJ), situated between the lower jaw and the base of the skull, can be susceptible to a range of disorders collectively referred to as Temporomandibular Disorders (TMD).² These disorders encompass a spectrum of symptoms, including but not limited to pain, clicking, and grating sensations in the jaw joint, as well as difficulties in the processes of chewing or opening the jaw. TMD is also known as craniomandibular disorders (CMD), and it frequently manifests as a significant cause of facial pain-related issues. TMD is a prevalent condition,

affecting a substantial portion of the general population, with estimates ranging from 50 to 70%.³ Despite this widespread prevalence, only 40% of those affected are consciously aware of its presence, and a relatively small percentage, ranging from 3 to 14%, actively seek treatment. The principal signs and symptoms of TMD emanate from the intricate functioning of various muscular and joint components within the masticatory system. Patients often experience pain and detectable joint sounds during mouth movement or mastication.⁴ Moreover, these symptoms may originate from or coexist with a loss of function, such as challenges in holding prolonged sounds, singing, or simple activities like mouth opening. Beyond these primary indicators, TMD may present with a spectrum of additional symptoms, including joint pains, headaches, neck pains, and occlusal discomfort, particularly noticeable upon waking. The multifaceted nature of TMD symptoms underscores the complexity of this condition, requiring a comprehensive understanding for accurate diagnosis and effective management.^{5,6} As TMD can significantly impact an individual's quality of life, it necessitates a tailored approach to address both the primary symptoms and associated secondary manifestations. As per the American Academy of Orofacial Pain, the term temporomandibular disorder (TMD) encompasses a spectrum of clinical issues affecting the masticatory musculature, the temporomandibular joint (TMJ), and associated structures. Recognized as a primary cause of non-dental pain in the orofacial region, TMD is categorized within the realm of musculoskeletal disorders. Signs and symptoms indicating abnormalities in the TMJ include alterations in mandibular movement, restrictions in mouth opening, joint pain during mandibular function, functional limitations, joint noises, asymptomatic radiographic changes of the TMJ, and jaw locking—both with an open and closed mouth. Pain, typically located in the masticatory muscles, pre-auricular area, and/or temporomandibular joint, is the most prevalent symptom associated with TMD. This pain is often exacerbated by activities such as chewing or other functional movements.⁷ Patients with TMD commonly report limitations in mouth opening and movement, along with the presence of joint noises. These symptoms collectively contribute to the clinical presentation of temporomandibular disorders, emphasizing the significance of a comprehensive understanding and evaluation for accurate diagnosis and appropriate management. Stabilization splints are dental devices that can be customized to provide either full or partial occlusal coverage, depending on the specific needs of a given case. These splints are typically worn predominantly at night and are designed with

several objectives in mind. One primary function is to stabilize and redistribute the forces exerted between the upper and lower dental arches during various jaw movements.⁸ By doing so, they aim to alleviate excessive pressure on certain dental structures and mitigate potential issues such as abrasion. Furthermore, stabilization splints play a role in decompressing the temporomandibular joint (TMJ). This decompression is intended to reduce strain on the TMJ, potentially alleviating symptoms associated with Temporomandibular Disorders (TMD). Additionally, these splints are designed to stimulate a contraction inhibition reflex by providing anterior guidance. This reflex aims to influence the way the jaw muscles function, promoting a more balanced and harmonious interaction between the upper and lower jaws. The current study seeks to assess the role of orthodontics in the context of TMJ disorders. Orthodontic interventions, which may include the use of stabilization splints, are likely being investigated to understand their impact on occlusal forces, TMJ decompression, and the broader management of individuals experiencing issues related to the temporomandibular joint. By exploring the influence of orthodontics in this context, the study aims to contribute valuable insights into the effectiveness of these interventions in addressing the complexities associated with TMJ disorders.

MATERIALS AND METHODS:

The research was conducted within the Department of Orthodontics, involving a comprehensive study of 172 patients, spanning both genders, who presented with complaints related to Temporomandibular Joint (TMJ) disorders. To ensure ethical standards and compliance, all participants were thoroughly informed about the study, and written consent was diligently obtained. Additionally, the study received ethical clearance prior to commencement. Patient data, including crucial details such as name, age, and gender, were systematically recorded, providing a foundation for a thorough examination. The clinical evaluation was designed to explore various TMJ disorders, ranging from myositis and capsulitis to fibromyalgia, disc displacement, and MPDS. As part of the intervention strategy, all enrolled patients were prescribed stabilization splints with specific instructions to wear them for six hours daily over a period of four months. Regular follow-up appointments were scheduled to track progress, and the improvements noted were quantified using the Visual Analog Scale (VAS), a reliable metric for assessing subjective experiences of pain and discomfort. The amassed results from these assessments underwent rigorous statistical analysis,

employing a significance level with a P value less than 0.05. This meticulous approach ensures robust data interpretation and meaningful insights into the effectiveness of stabilization splints in managing a spectrum of TMJ disorders. By adopting this systematic methodology, the study aims to contribute valuable knowledge to the field of orthodontics, potentially influencing treatment

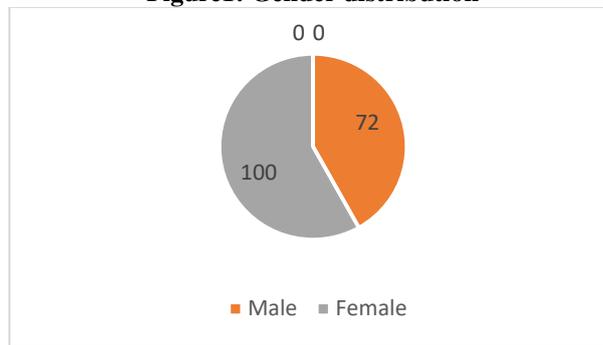
paradigms for individuals grappling with TMJ disorders. This research not only addresses the immediate concerns of the patient cohort but also holds the potential to inform broader orthodontic practices and strategies for the management of TMJ-related issues.

RESULTS:

Table I: Distribution of patients

| Gender | Number |
|--------|--------|
| Male | 72 |
| Female | 100 |

Figure 1: Gender distribution

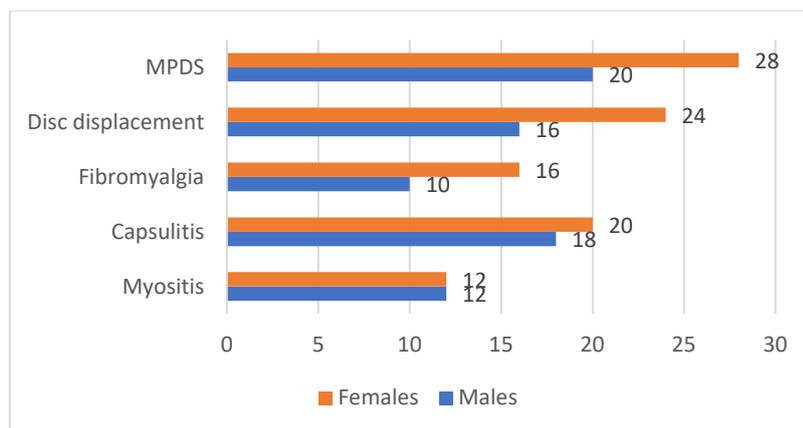


The presented data provides a straightforward representation of the distribution of gender within a given context. The table indicates that there are 72 individuals identified as male and 100 individuals identified as female. This binary breakdown offers a basic overview of the gender composition within the specified group or population. Such gender demographics can be pertinent in various fields, including healthcare, social sciences, and demographics research, helping to understand the composition of a sample or population. Further analysis and interpretation would benefit from additional context, such as the purpose of the study, the characteristics of the population, or any associated variables that may influence or interact with gender distribution.

Table II Type of TMDs in patients

| TMD | Males | Females | P value |
|-------------------|-------|---------|---------|
| Myositis | 12 | 12 | 0.05 |
| Capsulitis | 18 | 20 | |
| Fibromyalgia | 10 | 16 | |
| Disc displacement | 16 | 24 | |
| MPDS | 20 | 28 | |

Figure 2: Type of TMDs in patients



This table illustrates the distribution of TMD cases among males and females across various TMD conditions. For instance, myositis is equally prevalent in both genders, each accounting for 12 cases. Capsulitis shows a slightly higher incidence in females (20 cases) compared to males (18 cases). Fibromyalgia, disc displacement, and MPDS also exhibit variations in prevalence between males and females. This detailed breakdown is valuable for understanding the gender-specific distribution of different TMD conditions, providing insights that may contribute to tailored diagnostic and therapeutic approaches in the context of temporomandibular disorders. Further interpretation would benefit from additional information about the study design, population characteristics, and any potential implications for clinical practice.

DISCUSSION:

The designation Temporomandibular Disorder (TMD) encapsulates a complex array of signs and symptoms affecting the muscular, temporomandibular joint (TMJ), and skeletal components within the masticatory system. These manifestations, whether occurring independently or in combination, include notable features such as pain localized in areas like the pre-auricular, auricular, jugal, or temporal regions, constraints on the range of mandibular movements, and varying degrees of audible noises emanating from the temporomandibular joint during its functioning. TMDs extend their influence beyond mere disruptions in routine activities such as mastication, swallowing, phonation, and facial expressions.^{9,10} The impact can be profound, encompassing a spectrum of daily life functions and, in instances of severe pain, extending to hinder patients' engagement in family dynamics, professional pursuits, and participation in social activities. In the realm of medicine, the distinction between "signs" and "symptoms" is crucial, with "signs" representing the observable manifestations discerned by practitioners, while "symptoms"

encapsulate the subjective experiences and clinical manifestations as perceived and reported by the patients themselves.¹¹ Motivated by a recognition of the intricate nature of TMD and its far-reaching consequences, the present study was conducted to delve into the role of orthodontics in addressing Temporomandibular Disorders. By scrutinizing the impact of orthodontic interventions on TMD, the study aspires to contribute nuanced insights into the management of this multifaceted condition. Understanding the implications of orthodontic strategies on TMD not only offers potential avenues for symptom alleviation but also sheds light on the broader dimensions of patient well-being, acknowledging the intricate interplay between oral health, musculoskeletal function, and overall quality of life. The study underscores the imperative for clinicians to regard Temporomandibular Disorder (TMD) as a potential complication arising from orthodontic treatment and advocates for vigilant monitoring of patients in this context.¹² This recognition is pivotal in clinical practice as it draws attention to the need for a comprehensive understanding of the relationship between orthodontic interventions and TMD, fostering a proactive approach in managing potential complications. The insights garnered from this study have far-reaching implications for clinical practice within orthodontics. The findings shed light on critical aspects, including the impact of orthodontic treatment on the occurrence of TMD, the prevalence of TMDs among orthodontic patients, and the psychological dimensions associated with TMDs. Such comprehensive understanding is paramount for clinicians, researchers, and policymakers, enabling them to make informed decisions regarding the management of TMDs in individuals undergoing orthodontic treatment. Moreover, the age range of participants in the studies is a noteworthy consideration, as TMD can manifest across diverse age groups.¹³ Adolescents undergoing orthodontic treatment, for instance, may be more susceptible to TMD due to the presence of braces or other orthodontic devices, which could potentially

exacerbate the condition. Conversely, TMD prevalence in older adults may be influenced by age-related changes in the jaw and surrounding structures. This recognition emphasizes the importance of considering age-related factors in diagnosing and treating TMD, contributing to a nuanced understanding of its impact on orthodontic management across different age cohorts. Professor Helkimo has made significant contributions to the field of Temporo-Mandibular Disorder (TMD) assessment by pioneering the development of indices aimed at measuring the severity of TMD symptoms and pain in the temporomandibular joint (TMJ). In an epidemiological study, he introduced an index that comprises three main components: anamnesis, clinical evaluation, and occlusal dysfunction. The primary objective of this index was to identify, both at an individual and population level, the prevalence and severity of TMD, pain, and occlusal instability. The protocol for determining this index encompasses ten parameters that provide a comprehensive evaluation of TMD-related factors.¹⁵ These parameters include emotional stress, parafunctional habits, mouth opening, lateralization of the jaw, joint sounds, TMJ tenderness, palpation of the posterior muscles of the neck, palpation of masticatory muscles, maxillomandibular relationship, and headaches. The Helkimo anamnesis index (AI) is structured as a questionnaire wherein individuals self-report the presence of TMD symptoms. The results of this index categorize individuals into three levels of dysfunction: those with no symptoms, those with mild symptoms, and those with moderate to severe symptoms.¹⁴⁻¹⁶ On the other hand, the Helkimo clinical index (CI) focuses on the functional evaluation of the stomatognathic system, providing a more objective assessment of TMD through clinical examinations. These indices developed by Professor Helkimo have become valuable tools in the assessment of TMD, offering a structured and systematic approach to understanding the prevalence and severity of TMD symptoms and their impact on the overall functioning of the stomatognathic system. The literature review encompasses various studies, all of which consistently report that orthodontic treatment does not pose a risk to the development of signs and symptoms associated with Temporo-Mandibular Disorder (TMD). These findings remain consistent irrespective of the specific technique employed for orthodontic treatment, whether premolar extractions were performed, or the type of malocclusion initially presented by the patient. Importantly, the consensus across these studies suggests that orthodontic interventions do not contribute to the onset or exacerbation of TMD-related manifestations. Furthermore, some long-

term studies have gone a step further, concluding that orthodontic treatment should not be regarded as a preventive or therapeutic modality for TMD. Henrikson and Nilner,¹⁷ in particular, advocate for a conservative and reversible approach in the treatment of TMD. This perspective aligns with the guidelines set forth by the American Academy of Orofacial Pain, emphasizing the importance of adopting a cautious and non-invasive strategy in managing TMD, given the fluctuating nature of its signs and symptoms. In essence, the collective evidence presented in these studies supports the notion that orthodontic treatment does not contribute to the development or worsening of TMD. The recommendation for a conservative and reversible approach underscores the complexity of TMD and the importance of tailored, patient-specific strategies in its management. Treatment for Temporo-Mandibular Disorder (TMD) encompasses a diverse array of options tailored to address the specific needs and symptoms of individuals. Reassurance plays a vital role, emphasizing patient education, self-care practices, and behavior therapy to empower patients in managing their condition actively. Physiotherapy introduces various modalities, including ultrasound, megapulse, acupuncture, shortwave diathermy, laser therapy, heat exercises, and biofeedback, aiming to alleviate symptoms and enhance jaw function. Splint therapy utilizes oral appliances to stabilize the jaw joint and correct issues like teeth grinding or malocclusion.¹⁸ Drug therapy, involving medications such as muscle relaxants and pain relievers, targets pain and inflammation associated with TMD. Occlusal adjustment focuses on refining the alignment and contact of teeth to achieve a more harmonious bite. Surgical intervention becomes an option in severe cases or when conservative measures prove insufficient. The multidisciplinary approach of combined treatment integrates different therapeutic modalities tailored to individual needs. Notably, conservative approaches are emphasized, with some practitioners favoring 'low tech' treatments, highlighting that invasive interventions may not necessarily yield superior results. This patient-centered strategy recognizes the variability of TMD and the potential success of less invasive measures in improving patient outcomes.

CONCLUSION:

The results derived from this investigation present a significant overall effect, indicating a potential association between undergoing orthodontic treatment, specifically getting braces, and an increased likelihood of developing Temporo-Mandibular Disorder (TMD). Notably, the data further suggested that individuals with TMD had a

higher probability of experiencing orthodontic problems compared to those without TMD. A subgroup analysis within the study revealed a noteworthy finding: orthodontic therapy might have adverse effects on the psychological health of TMD patients, even though it did not appear to impact the prevalence of the condition itself. This nuanced insight emphasizes the importance of considering not only the physical implications but also the psychological well-being of individuals undergoing orthodontic treatment, particularly those with pre-existing TMD. The outcomes of this study underscore the necessity for additional research endeavors aimed at elucidating the underlying mechanisms of the observed associations. Furthermore, there is a call for identifying and implementing effective strategies to mitigate the incidence of TMD in individuals undergoing orthodontic treatment. This dual focus on understanding the intricacies of the relationship and devising targeted interventions is essential for optimizing the outcomes and overall well-being of patients undergoing orthodontic therapy. The authors of the study concluded that stabilizing splints are effective in the management of patients with Temporomandibular Disorders (TMDs). Stabilizing splints, also known as occlusal splints or bite guards, are oral appliances designed to stabilize the jaw joint and improve the alignment of the teeth. This finding suggests that the use of these splints can be a beneficial therapeutic approach for individuals experiencing TMD-related symptoms. Stabilizing splints may help alleviate pain, reduce muscle tension, and improve the overall function of the temporomandibular joint, contributing to a positive impact on the management of TMDs.

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