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ORIGINAL ARTICLE

The Influence of Orthodontic Care on Periodontal Health in Individuals with Temporo-Mandibular Disorders (TMDS)

ABID KANJU[1], SYEDA MIDHAT BATOOL[2], TAIMUR KHAN[3], NOUSHEEN KHAN[4], MARIJ HAMEED[5], SAMAR NAZIR[6]
[1]*Assistant Prof Orthodontics, Nishtar Institute of Dentistry Multan*
[2]*Assistant Prof Periodontology, Bakhtawar Amin Medical & Dental College, Multan*
[3]*Associate Professor, Orthodontcs, Frontier Medical & Dental College Abbottabad*
[4]*Assistant Prof Periodontology, Multan Medical & Dental College Multan*
[5]*Assistant Prof Periodontology, CMH institute of Medical Sciences / CIMS Dental College Multan*
[6]*Assistant Prof Oral Medicine, CMH institute of Medical Sciences / CIMS Dental College Multan*
Correspondence to: Samar Nazir, Email: Omfsurgery_pakistan@hotmail.com, Cell: 03212562256

ABSTARCT

Background: The cause-and-effect link between orthodontic treatment and malocclusion and temporomandibular disorders (TMDs) has evolved into a hypothesis with insufficient data.

Objective: Aim of this study is to determine the outcomes of orthodontic care on periodontal health individuals with temporo-mandibular disorders (TMDs).

Methods: Total 190 patients of temporo-mandibular disorders were presented in this study. After getting informed written consent detailed demographics of enrolled cases were recorded. Patients were categorized in two groups, group I received orthodontic treatment among 95 cases and 95 cases of group II was without orthodontic treatment. In terms of their history of trauma, bruxism, forceful tooth brushing, degree of oral cleanliness, discomfort and muscle tenderness ratings, and subjective sleep quality, patients who received orthodontic treatment were compared to those who did not.

Results: There was majority males 110 (57.9%) and 80 (42.1%) were females. Patients mean age was 24.64±13.72 years. In group I 63 cases received mandibular orthodontic treatment and 32 cases received maxillary orthodontic treatment. When compared to group II, we found that orthodontic treatment was linked to better oral hygiene than bad, less sore muscles, and lower (better) Pittsburgh Sleep Quality Index (PSQI) ratings ($p < 0.002$).

Conclusion: We observed that orthodontic treatment is not linked with TMDs, even after accounting for confounding and/or mediating variables such as trauma history, parafunctional behaviors and bruxism, pain scores, muscular tenderness scores, and subjective sleep quality.

Keywords: Orthodontic treatment, TMDs, Periodontal health

INTRODUCTION

Temporomandibular disorder (TMD) is an umbrella term for a variety of clinical disorders involving the masticatory muscles, the temporomandibular joint (TMJ), or both. The most common kind of nondental orofacial discomfort is TMDs, which have a detrimental effect on many aspects of people's lives, including their ability to sleep, their oral health-related quality of life, how often they need medical treatment, and how much money society spends on overall healthcare.Although it varies by age group and population, the prevalence of TMD is higher among females. The prevalence rises with puberty, according to Christidis et al., who examined children and adolescents and found it to be between 7% and 30%. A study conducted by Valesan et al. found that the prevalence in adults and the elderly can vary between 11% and 31%.According to current theories, TMD has a complex and multi-factorial etiology that includes trauma, stress, parafunction, and an increased pain threshold.New genetic research suggests that a person's susceptibility to developing TMD is significantly influenced by their genetic composition, which in turn influences their pain perception[3]. Although not all studies have shown a link between TMD and particular malocclusions, some have shown that problems such posterior crossbite could play a part. But everyone agrees that occlusion doesn't play much of a role in TMD development.Adults all over the world suffer from PD and TMD at alarming rates. Unilateral mastication due to PD can cause structural changes and discomfort in the temporomandibular joint[5]. Clinical observational studies and other sources indicate that many conditions, such as rheumatic diseases[6] and multiple sclerosis[7], often present two symptoms simultaneously. If there is a causal relationship between PD and TMD, oral health is at stake, and treating either condition is challenging. There were still a lot of problems, even though earlier studies suggested that TMD increased the risk of PD, or that PD increased the risk of TMD. Because of potential reverse causality and unmeasured or unknown confounders, the association between exposure and outcome in observational studies could be distorted.

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One application of genetic differences in MR analysis is as instrumental variables (IVs), which help to establish a causal relationship between an exposure and its effects. Many gene variants have been found to be associated with PD, with evidence ranging from moderate to strong[8]. In addition, a large number of SNPs increase the likelihood of TMD. First, the variant must have a significant correlation with exposure; second, there must be no correlation between the variant and outcome because of confounders; and third, there must be no direct correlation between the variant and outcome, although there may be an indirect linkage through exposure for the IV to be valid [9]. We looked at PD data from the GLIDE (Gene-Lifestyle Interaction in the Dental Endpoints) study in this study. The TMD dataset originated from the consortiums at the UK Biobank (UKB) and FinnGen[10,11].

There is still a lack of clarity in the research regarding the impact of TMDs on orthodontic treatment and related aspects of patients' life. Since the exact cause of TMDs is complex and poorly understood (their occurrence in orthodontic patients), there is no obvious cause-and-effect relationship between orthodontic therapy and TMDs[7]. The complex and diverse character of TMD diagnosis and classification often leads to inconsistencies in study design and data interpretation[9]. The fact that different orthodontic treatment approaches may affect TMDs in different ways further complicates the link[10].

Using measures including trauma severity, tooth grinding frequency, aggressive tooth brushing, dental hygiene degree, pain levels, muscle tenderness, and subjective sleep quality, this study aimed to compare orthodontic treatment recipients with non-treatment recipients.

MATERIALS AND METHODS

This prospective study was conducted at CMH institute of Medical Sciences / CIMS Dental College Multan/ Nishtar Institute of Dentistry Multan from June 2023 to November 2023 and comprised of 190 patients. We excluded patients with a history of drug, alcohol, or medication abuse; those who were pregnant or lactating; those who had a coexisting mental, psychiatric, or physical disability; patients with cancer or significant medical

problems; and patients who were 18–30 years old and attending new screenings. Patients with TMD and healthy controls were both evaluated clinically and given a questionnaire to contribute to the registry's data set.

The study questioned participants about their smoking habits, orthodontic treatment history, and demographics. In addition, patients undergoing orthodontic treatment were asked about the jaw that was affected, the type of appliance used, whether they had any extractions while under treatment, and what their post-treatment retention procedure was. The presence of bruxism, which includes clenching, grinding, and forceful tooth brushing, as well as a history of trauma, teeth sensitivity, and the onset of TMJ pain following trauma were also inquired about in all participants. According to what was said earlier, the Pittsburgh Sleep Quality Index (PSQI), which is a validated Hebrew version26, was used to measure subjective sleep quality.27

Patients were categorized in two groups, group I received orthodontic treatment among 95 cases and 95 cases of group II was without orthodontic treatment. In terms of their history of trauma, bruxism, forceful tooth brushing, degree of oral cleanliness, discomfort and muscle tenderness ratings, and subjective sleep quality, patients who received orthodontic treatment were compared to those who did not. SPSS 24.0 was used to analyze all data.

RESULTS

There was majority males 110 (57.9%) and 80 (42.1%) were females. Patients mean age was 24.64±13.72 years.(table 1)

In group I 63 cases received mandibular orthodontic treatment and 47 cases received maxillary orthodontic treatment. 28 (29.5%) cases were smokers in group I and in group II 15 (15.8%) were smokers.(table 2)

When compared to group II, we found that orthodontic treatment was linked to better oral hygiene than bad, less sore muscles, and lower (better) Pittsburgh Sleep Quality Index (PSQI) ratings (p <0.002).(table 3)

Table-1: Ae and gender of all cases

Variables	Frequency (190)	Percentage
Gender		
Male	110	57.9
Female	80	42.1
Mean age (years)	24.64±13.72	

Table-2: Treatment and smoking status of both groups

Variables	Group I (95)	Group II (95)
Treatment		
Mandibular orthodontic	63 (66.3%)	-
Maxillary orthodontic	32 (33.7%)	-
Smokers		
Yes	28 (29.5%)	15 (15.8%)
No	67 (70.5%)	80 (84.2%)

Table-3: A demographic and clinical comparison of TMJ problem patients who have received orthodontic treatment with those who did not

Variables	Group I (95)	Group II (95)	P value
Good oral hygiene	78 (82.1%)	56 (8.9%)	<0.003
less sore muscles	81 (85.3%)	67 (70.5%)	<0.004
Verbal pain score (VPS)	1.41± 1.16	2.71 ± 1.81	0.014
Pittsburgh Sleep Quality Index (PSQI)	3.81± 4.7	5.52±3.48	<0.002

DISCUSSION

There is some debate in the literature over whether orthodontic therapy can cause TMD. Previous studies have had limitations, such as using inconsistent criteria to define TMD (including subtypes) and not giving enough thought to the complex etiology of TMD. Overcoming these constraints, our study thoroughly adheres to the criteria used to identify TMD, including the separation between subtypes of the disorder and a control group that does not have TMD. Additionally, we investigate a wider variety of important components. In order to reduce the likelihood of Type I error, this study used multivariate binary logistic regression and a two-step procedure for dealing with multicollinearity in its statistical analysis. None of the investigated indicators showed a statistically significant association with orthodontic treatment across the full study group, according to the multivariate analysis. Better dental hygiene, less sore muscles, and better sleep were among the positive outcomes linked to orthodontic treatment after multivariate analysis among TMDs. We found no association between orthodontic treatment and TMD diagnosis or illness features, according to our overall results from the multivariate analysis, which supports our null hypothesis.

Given the strong correlation between cigarette smoking and TMD, particularly among young individuals, it is essential to consider smoking as a possible risk factor for TMD.[12] Both the severity of discomfort and the effectiveness of treatment for TMD were significantly worse for smokers compared to non-smokers.[13] We demonstrate that the groups did not differ with respect to smoking in order to offset the possibility that one group had a higher risk of TMD due to higher rates of smokers. This data points to tobacco use as the probable cause of TMD rather than orthodontic treatment.

Although previous studies by Macfarlane et al.[14] obtained similar results, they neglected to investigate the prevalence of orthodontic treatment for various types of TMD. In their study, Manfredini et al.[15] found that orthodontic treatment was associated with a slightly increased risk of TMJ disc displacement but no connection with any of the other kinds of TMD. Our findings corroborate the current professional opinion that orthodontic therapy is not associated with TMDs. A recent meta-analysis and systematic review suggested, however, that orthodontic therapy could be associated with TMDs[16].

There were more permanent appliances on controls than TMDs, and more removable ones on controllers. There is a lack of research on the effects of fixed appliances on TMDs compared to detachable ones. Unfortunately, Macfarlane et al. found no statistically significant difference in the incidence of TMD between individuals treated with portable equipment and those treated with fixed appliances.In the years 13–16, One probable reason for our findings could be that the detachable equipment we utilized included specific characteristics that minimized the activation of muscles. These tools deliver forces on an as-needed basis and can often crack the skin. Additional research is required to ascertain the precise cause of these adverse effects, as they ought to disappear when orthodontic treatment concludes.

In their discussion of possible pathways linking orthodontic treatment with TMDs, Aldayel et al.[17] further emphasizes the importance of precise biomechanical control. Unilateral posterior crossbite (UPCB) is one kind of malocclusion that can throw off occlusal balance and cause TMDs to develop [17]. Although these malocclusions are often successful in alleviating symptoms, there may be additional factors at play when this is not always the case[17]. While therapies like intermaxillary elastics can increase TMJ strain, particularly in Class II instances, and equipment like clear aligners might increase masticatory muscle activity during early therapy, both have biomechanical implications[17]. The importance of orthodontic therapies that tackle both structural problems and neuromuscular adaptation is underscored by these results[17]. Individual variations in tactile acuity of the occlusal surfaces and the central nervous system's function in adapting to changes in the occlusal structure further demonstrate the delicate connection between mechanical and neurological factors in the vulnerability to TMDs[17]. We can better identify and manage the risks of TMDs during orthodontic treatment if we combine these perspectives together[17].

Teens often suffer from crowding, overbite, open bite, and prominent maxilla, although orthodontic treatments can help (Koaban et al., 2018). The goal of these treatments is to enhance the mouth's structure and aesthetics throughout this period.

Permanent appliances are fantastic for occlusal correction, however they do require frequent dental cleanings. However, detachable appliances are more convenient to remove as needed and work well for early interventions with younger children[19,20].

CONCLUSION

We observed that orthodontic treatment is not linked with TMDs, even after accounting for confounding and/or mediating variables such as trauma history, parafunctional behaviors and bruxism, pain scores, muscular tenderness scores, and subjective sleep quality.

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