International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2020): 7.803

Occlusal Factors Association with Temporomandibular Joint Tenderness and Dysfunction

An Original Article

Dr. Ahmad A. AlShare, BDS[1], Zaid Bassam Shhabat, BDS[2], Mohammed Suleiman Al Olaimat, BDS[3], Ali Hussain Shibli, BDS[4], Murad Adnan Al-Ghazawi, BDS[5]

[1]Oral and Maxillofacial Surgeon, Royal Medical Services of Jordan Armed Forces
Correspondence and reprint requests: *dr.ahmadshare[at]yahoo.com*

[2]Orthodontist, Royal Medical Services of Jordan Armed Forces

[3]Oral and Maxillofacial Surgeon, Royal Medical Services of Jordan Armed Forces

[4]Endodontist, Royal Medical Services of Jordan Armed Forces

[5]Conservative Dentistry, Royal Medical Services of Jordan Armed Forces

Abstract: ***Objective: The aim of this cross-sectional study was to identify the degree of association between observable signs and symptoms of TMD and occlusal variables in a sample of patients in north of Jordan. Materials and methods: The present study was a cross-sectional, case control study. It was conducted in two major hospitals in the north of Jordan. It was carried out with 83 subjects in the case-group, and 77 subjected in the control-group. The case group (n=83) included 32 males and 51 females aged from 13 to 69 years, and the control group (n=77) included 26 males and 51 females and aged from 13 to 67 years. 83 consecutive pts in the case group complaining from TMD were assessed and examined jointly by an oral and maxillofacial surgeon and the orthodontist, and then compared to age-matched controls who didn't suffer any TMD. The prevalence for each occlusal factor in the case-group was found and compared to that in the control group, and the risk ratio (RR) and 95% confidence interval (CI) were calculated for each occlusal variable. Results: Eight patients (2 females, 6 males) were excluded from the case group, one case suffering scleroderma and 7 cases were under current or previous orthodontic treatment. A total of 75 patients were included in the case-group with a mean age 24.6 years (SD 11.9 y), and 77 patients in the control-group with mean age 24.6 years (SD 11.5y). The most prevalent TMD was myofascial pain and tenderness (65%), followed by abnormal joint clicking and crepitation (59%). The values indicating no statistically difference between the two groups, except for reduced overjet and spacing that were more prevalent in the control group. Conclusion: The present study didn't show statistically significant difference between the TMD and non-TMD groups in regard to occlusal characteristics, and so supports the weak correlation between occlusion and TMD.***

Keywords: occlusion, temporomandibular joint dysfunction

1. Introduction

Temporomandibular disorder (TMD) can be defined as the variety of signs and symptoms confined to the temporomandibular joint (TMJ) and its related structures.[1] These signs and symptoms could include joint clicking, tenderness of muscles of mastication, headache, TMJ pain, facial and neck pain, limitation of mouth opening, jaw locking, wear of dentition, parafunctional habits and otalgia.[1] TMD does not have a clear-cut etiology and there are many competing theories to be considered.[2] J.R.C. Mew noted that most existing theories appear to identify 'predisposing' rather than initiating factors for TMD. He explained eleven theories that claimed to explain the etiology of TMD, however, it was doubtful whether any single theory fit all the complex features of this condition.[2] Etiology of TMDs includes structural abnormalities, stress-induced muscle hyperactivity, and overloading from trauma.[3] The role of occlusal factors remains unclear, perhaps because of varying adaptive capacity among individuals. Occlusal interferences benign to one individual may, if combined with other factors, be noxious for another.[3]

The aim of this cross-sectional study was to identify the degree of association between observable signs and symptoms of TMD and occlusal variables in a sample of patients in north of Jordan. This study was approved by the ethical committee of Jordanian Royal Medical services.

2. Materials and Methods

The present study was a cross-sectional, case control study. It was conducted in two major hospitals in the north of Jordan. It was carried out with 83 subjects in the case-group, and 77 subjected in the control-group. The case group (n=83) included 32 males and 51 females aged from 13 to 69 years, and the control group (n=77) included 26 males and 51 females and aged from 13 to 67 years. 83 consecutive pts in the case group complaining from TMD were assessed and examined jointly by an oral and Maxillofacial surgeon and the orthodontist, and then compared to age-matched controls who didn't suffer any TMD.

Signs and symptoms related to TMD were recorded and included:

a) Tenderness of the masticatory muscles as recorded by the pt. during palpation.
b) Tenderness of the TMJ as recorded by the pt. during palpation, and during opening and closing the mouth
c) TMJ sounds were reported if clicking or crepitation could be heard or felt during active opening and closing of the mouth.
d) Recordings were made for maximal mouth opening (interinscisal distance), maximal lateral movements to the right and left and any deviation of the mandible on maximal mouth opening and closing.

Evaluation of occlusion was carried out by measurements and observations of morph - skeletal characteristics and included:

a) Number of missing teeth (excluding third molar)
b) Overjet and overbite measured with the use of millimeter ruler and using a dry point compress, Edge to edge bite was considered in cases of no overjet and overbite. The negative overjet was obtained by the distance between the end of the incisal edge of lower incisors and the anterior surface of the maxillary incisors. Overjet of 2-3 m and overbite of 2-4 mm were considered normal
c) Presence of open bite (negative over bite)
d) Presence of posterior / anterior cross bite (unilateral or bilateral)
e) Presence of crowding or spacing
f) Centric relation (CR) discrepancies to maximal intercuspal position (MIP), CR was obtained by the unforceful manipulation of the chin. Discrepancies between the two points were measured.
g) Skeletal classification as class I, II, and III

Subjects who had worn Occlusal splint or under orthodontic treatment were excluded from this study. In addition, subjects with any history of facial trauma, systemic disease, TMJ arthritis, cleft lip / palate and other craniofacial anomaly, or drugs that may reflect muscle activity were not included in order to obtain a homogenous sample with similar characteristics. The prevalence for each occlusal factor in the case-group was found and compared to that in the control group. The risk ratio (RR) and 95% confidence interval (CI) was calculated for each occlusal variable.

3. Result

Eight patients (2 females, 6 males) were excluded from the case group, one case suffering scleroderma and 7 cases were under current or previous orthodontic treatment. A total of 75 patients were included in the case-group with a mean age 24.6 years (SD 11.9 y), and 77 patients in the control-group with mean age 24.6 years (SD 11.5y).

The most prevalent TMD was myofascial pain and tenderness (65%), followed by abnormal joint clicking and crepitation (59%) (Table 1).

Percentage distributions of occlusal characteristics in the case and control groups are shown in (table 2). The values indicating no statistically difference between the two groups, except for reduced overjet and spacing that were more prevalent in the control group. No significant difference was found in RR among the different skeletal relations. RR class I, II, and III skeletal relations were 0.91, 1.03, and 0.60, respectively. Class III subjects were more in the control group. There was little difference of risk in anterior crossbite with more in the case group, and the RR for posterior cross bite was one. Reduced over jet was noticed to be less in the case-group, and the RR for increased overjet was close to one. Increased overbite/deep bite showed slightly high RR. RR for missing teeth was close to one. No significant difference was found in RR of crowding, however, spacing was much less in the case group.

4. Discussion

The present study was a cross-sectional descriptive study. Percentage distribution of occlusal characteristics in a case group having TMD was compared to those in a control group. In this regard, no significant differences were found between the two groups. Of interest, spacing and reduced overjet were found to be higher in the control group. In this study, contrary to other studies, authors searched for the presence of certain morpho-skeletal characteristics of occlusion in a population suffering TMD, other studies usually search for the association and prevalence of TMD in patients with certain occlusion.

There are conflicting data on the prevalence of signs and symptoms of TMD. Some authors reported a high prevalence in patients with dentofacial deformity, varying from 40.8% to 97%. Other studies reported a lower rate, ranging from 14% to 26.5%.[1] Efforts have been made to evaluate the possible etiological importance of occlusal factors for the development of TMD.[4] Although occlusion has been recognized as an important etiologic or perpetuating cofactor, the degree to which it plays a role has not been definitely delineated.[5,6] A longitudinal study by Egermark et al. suggested that correlation between signs and symptoms of TMD and various malocclusions are generally nonexistent or weak. However, they cannot totally neglect the importance of occlusal factors in the complex and controversial concept of TMD etiology because weak associations were found between long term development of TMD and some malocclusions, such as a lateral forced bite between RCP and ICP and/or a unilateral crossbite.[4] In a sample of young adults, Farella et al. found lack of association between TMJ disk displacement and posterior cross bite.[7] T. Henrikson and M. Nilner in a prospective study analyzed and compared three age-matched groups; class II subjects received orthodontic fixed treatment, class II subjects who didn't receive treatment, and subjects with normal occlusion. All the groups in their study showed a similar increase in the prevalence of TMJ clicking over the two years.[8] Pellizoni et al. found no definite association between cross bite and TMDs and there were no significant difference between the posterior cross bite group and the control group for disk displacement.[5] A recent prospective study evaluated the association between posterior crossbite, overjet, overbite, and TMJ clicking in a population of 903 people with a 30-year follow-up reported that these factors were not associated to a greater risk of TMJ clicking.[9] In a large scale population-based study conducted by Gesch et al., multivariate logistic regression methods were used to determine whether associations exist between malocclusions

(and possibly confounding functional occlusion factors) and signs and symptoms of TMD. It showed that these variables proved not to be significant when entered simultaneously with other variables into the multivariate logistic regression.[10] In contrast, upon review of the available literature, many studies suggest a positive association between occlusion and TMD. In their meta-analysis, E.A. Al-Moraissi et al. found a much higher prevalence of TMD in patients with dentofacial deformity prior to treatment than in controls. Of equal interest, is the finding that once patients were treated with orthodontics/orthognathic surgery, the prevalence of TMD was not statistically different than in controls.[1] Some gross malocclusions, such as a large overjet, anterior open bite, posterior crossbite, and deep bite have been suggested to increase the risk of TMDs.[6,11] Among the different malocclusions, posterior crossbite (especially unilateral) is thought to have a strong impact on the correct functioning of the masticatory system, however, this relationship has been questioned by many studies.[7] A.G.Pullinger et al., studied 11 types of malocclusions in adults and found that patients with unilateral crossbites were more likely to have disk displacement with or without reduction, osteoarthrosis with disk displacement history, and primary osteoarthrosis.[12] H.A. Gremillion in a multiple logistic regression analysis found that occlusal factors were related to TMD in only 15% of cases. These occlusal features that were identified to be potentially related included anterior open bite, overjet greater than 6 mm, centric relation/intercuspal positon slide greater than 4 mm, unilateral lingual crossbite, and 5 or more missing posterior teeth.[6] The reviewed literature on adolescent samples supports in part the association of TMJ disk displacement with a shorter posterior facial height, a shorter mandibular length, clockwise rotation, and retruded mandible position, namely a skeletal class II profile with shorter mandibular corpus and ramus. A possible explanation of such findings is the poor reciprocal fitting of the articular surface of such joints, and they are potentially at risk of developing disk position abnormalities because of joint instability.[11]

It is mandatory that clinician considers the dynamic nature of the masticatory system. While it may be said that the manner in which teeth fit is important, what the individual does with his or her teeth may be more important when discussed in the context of relationship with TMD.[6] Malocclusion by itself may not cause TMDs but might do so if the malocclusion induces buxism or parafunctional habits.[1,6] TMDs have a multifactorial etiology, with several risk factors interacting differently at the individual level.[13,14,11,15] the role of occlusion in the etiology of TMD has not been clearly addressed and therefore shouldn't be overstated, considering that in some cases occlusal changes could be the consequence rather than a cause for TMDs.[15] Further, anatomically correct occlusion is present in subjects with and without clinically relevant signs and symptoms of TMD, and the same is correct for malocclusion.

5. Conclusion

The present study was a cross-sectional observational study, which enables to assess representative associations and prevalence but criticized to be theoretically incorrect for a cause-effect analysis, as the cause must precede the effect and need not necessarily be present at the same time as the effect.[16] To date, the relationship between occlusal conditions and TMD has not been confirmed, although there is current trend toward making a weak correlation between certain occlusal interferences and TMDs.[1] The present study didn't show statistically significant difference between the TMD and non-TMD groups in regard to occlusal characteristics, and so supports the weak correlation between occlusion and TMD.

References

[1] Al-Moraissi EA, Perez D, Ellis E 3rd. Do patients with malocclusion have a higher prevalence of temporomandibular disorders than controls both before and after orthognathic surgery? A systematic review and meta-analysis. J Craniomaxillofac Surg. 2017 Oct;45(10):1716-23
[2] Mew JR. The aetiology of temporomandibular disorders: a philosophical overview. Eur J Orthod. 1997 Jun;19(3):249-58
[3] Pullinger AG, Seligman DA, Solberg WK. Temporomandibular disorders. Part II: Occlusal factors associated with temporomandibular joint tenderness and dysfunction. J Prosthet Dent. 1988 Mar;59(3):363-7
[4] Egermark I, Magnusson T, Carlsson GE. A 20-year follow-up of signs and symptoms of temporomandibular disorders and malocclusions in subjects with and without orthodontic treatment in childhood. Angle Orthod. 2003 Apr;73(2):109-15
[5] Pellizoni SE, Salioni MA, Juliano Y, Guimarães AS, Alonso LG. Temporomandibular joint disc position and configuration in children with functional unilateral posterior crossbite: a magnetic resonance imaging evaluation. Am J Orthod Dentofacial Orthop. 2006 Jun;129(6):785-93
[6] Gremillion HA. The relationship between occlusion and TMD: an evidence-based discussion. J Evid Based Dent Pract. 2006 Mar;6(1):43-7
[7] Farella M, Michelotti A, Iodice G, Milani S, Martina R. Unilateral posterior crossbite is not associated with TMJ clicking in young adolescents. J Dent Res. 2007 Feb;86(2):137-41
[8] Henrikson T, Nilner M. Temporomandibular disorders, occlusion and orthodontic treatment. J Orthod. 2003 Jun;30(2):129-37
[9] Olliver SJ, Broadbent JM, Thomson WM, Farella M. Occlusal features and TMJ clicking: a 30-year evaluation from a cohort study. J Dent Res 2020; 99(11):1245-51
[10] Gesch D, Bernhardt O, Alte D, Kocher T, John U, Hensel E. Malocclusions and clinical signs or subjective symptoms of temporomandibular disorders (TMD) in adults. Results of the population-based Study of Health in Pomerania (SHIP). J Orofac Orthop. 2004 Mar;65(2):88-103
[11] Manfredini D, Segù M, Arveda N, Lombardo L, Siciliani G, Alessandro Rossi, Guarda-Nardini L. Temporomandibular Joint Disorders in Patients With Different Facial Morphology. A Systematic Review of the Literature. J Oral Maxillofac Surg. 2016 Jan;74(1):29-46

[12] Pullinger AG, Seligman DA, Gornbein JA. A multiple logistic regression analysis of the risk and relative odds of temporomandibular disorders as a function of common occlusal features. J Dent Res. 1993 Jun;72(6):968-79
[13] Paunonen J, Helminen M, Sipilä K, Peltomäki T. Temporomandibular disorders in Class II malocclusion patients after surgical mandibular advancement treatment as compared to non-treated patients. J Oral Rehabil. 2019 Jul;46(7):605-610
[14] Pahkala R, Qvarnström M. Can temporomandibular dysfunction signs be predicted by early morphological or functional variables? Eur J Orthod. 2004 Aug;26(4):367-73
[15] Michelotti A, Rongo R, D'Antò V, Bucci R. Occlusion, orthodontics, and temporomandibular disorders: Cutting edge of the current evidence. J World Fed Orthod. 2020 Oct;9(3S):S15-S18
[16] Pahkala RH, Laine-Alava MT. Do early signs of orofacial dysfunctions and occlusal variables predict development of TMD in adolescence? J Oral Rehabil. 2002 Aug;29(8):737-43

Table 1: Prevalence (%) of clinical signs and symptoms of TMD in the case group (n=75)

Clinical signs and symptoms of TMD	Prevalence (%)
Masticatory muscle pain/ tenderness	65
TMJ pain/tenderness	52
TMJ clicking/crepitation	59
Limited mouth opening	17
Headache	6
Subluxation	1

Table 2: Percentage distribution of occlusal characteristics in the case group (n=75) and the control group (n=77), and the risk ratio (RR) and 95% confidence interval (CI) for each occlusal factor

Occlusal factors	% in case group	% in control group	Risk Ratio (RR)	Confidence Interval (CI) for (RR)
Skeletal relation				
Class 1	41	45	0.91	0.36-1.82
Class 2	41	40	1.03	0.46-2.50
Class 3	8	14	0.6	0.04-2.45
Cross bite				
Anterior	9	5	1.8	0.25-60.00
posterior	21	21	1.00	0.26-3.89
Overjet				
Increased	18	19	0.95	0.20-3.89
Reduced	17	34	0.50	0.05-0.79
Overbite				
Increased or deep bite	19	14	1.36	0.40-10.23
Reduced or open bite	13	19	0.68	0.08-2.00
Missing teeth				
Single	10	8	1.25	0.17-16.60
multiple	27	25	1.08	0.36-3.98
Crowding	67	60	1.12	0.76-2.19
Spacing	1	10	0.10	0.0-0.58