Self-reported bruxism and temporomandibular disorders: findings from two specialised centres

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SUMMARY The aims of this investigation were to report the frequency of temporomandibular disorders (TMD) diagnoses and the prevalence of self-reported awake and sleep bruxism as well as to describe the possible differences between findings of two specialised centres as a basis to suggest recommendations for future improvements in diagnostic homogeneity and accuracy. A standardised Research Diagnostic Criteria for TMD (RDC/TMD) assessment was performed on patients attending both TMD Clinics, viz., at the University of Padova, Italy (n = 219; 74% women) and at the University of Tel Aviv, Israel (n = 397; 79% women), to assign axis I physical diagnoses and to record data on self-reported awake and sleep bruxism. Significant differences were shown between the two clinic samples as for the frequency of TMD diagnoses (chi-square, $P < 0{\cdot}001$) and the prevalence of at least one positive response to bruxism items (chi-square, $P < 0{\cdot}001$). The more widespread use of TMJ imaging techniques in one clinic sample led to a higher prevalence of multiple diagnoses, and the higher prevalence of self-reported bruxism in patients with myofascial pain alone described in the other clinic sample was not replicated, suggesting that the different adoption of clinical and imaging criteria to diagnose TMD may influence also reports on their association with bruxism. From this investigation, it emerged that the features of the study samples as well as the different interpretation of the same diagnostic guidelines may have strong influence on epidemiological reports on bruxism and TMD prevalence and on the association between the two disorders.

KEYWORDS: temporomandibular disorders, Research Diagnostic Criteria/temporomandibular disorders, bruxism, temporomandibular disorders

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Introduction

Bruxism is commonly considered a major risk factor for temporomandibular disorders (TMD), but there are still many unsolved issues concerning the diagnosis of both disorders and their relationship (1, 2). The design of scientifically sound studies is complicated by difficulties in diagnosing clinical bruxism, as well as by the unclear relationship between instrumentally detected bruxism on the one hand and clinically diagnosed or self-perceived bruxism on the other hand (3, 4). These difficulties also affect investigations on bruxism aetiology and treatment (5, 6), and a recent systematic review of the literature pointed out that inconsistent findings on the bruxism-TMD relationship may depend upon the adoption of non-homogeneous diagnostic techniques among studies (7).

Works on self-reported or clinical bruxism diagnosis commonly showed a positive association with TMD pain (8–11), while, on the contrary, such positive association was not always confirmed with studies using instrumental bruxism detection, viz., by means of

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polysomnography (PSG) and/or electromyography (EMG) (12, 13). Also, the studies on the bruxism-TMD relationship rarely relied on standardised TMD diagnoses. A possible strategy to ease the comparison of findings is to adopt standardised and reproducible diagnostic procedures for both TMD and bruxism. Such purpose could be achieved with the diffusion of information gained over the years with the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD), which provides diagnostic guidelines for temporomandibular disorders as well as an anamnestic investigation of awake and sleep bruxism (14). To the best of our knowledge, no studies addressed the issues of the prevalence of TMD and bruxism by relying on the RDC/TMD for diagnosing both disorders.

In this investigation, a retrospective analysis of data gathered at two highly specialised centres for the treatment of bruxism, TMD and orofacial pain was performed with the aims: 1. to report the frequency of TMD diagnoses and prevalence of self-reported awake and sleep bruxism in patient populations recruited at two highly specialised clinics and 2. to describe the possible differences between findings of the two centres as a basis to suggest recommendations for future improvements in diagnostic homogeneity and accuracy.

Materials and methods

The clinical records of two samples of patients seeking treatment for TMD, recruited according to the modalities described below, were examined. All participants underwent a thorough assessment in accordance with the RDC/TMD version 1·0 guidelines (14). The Italian and Hebrew language versions of the RDC/TMD, as available on the International RDC/TMD Consortium website (http://www.rdc-tmdinternational.org), were adopted in the Padova and Tel Aviv samples, respectively, to assign the following axis I diagnoses: myofascial pain, either with or without limited mouth opening; disc displacement, with or without reduction; and inflammatory-degenerative disorders. The RDC/TMD's standardised history taking was used to record data on self-reported awake and sleep bruxism, on the basis of the patients' answers to questions 15c ('Do you clench or grind your teeth during sleep?') and 15d ('Do you clench or grind your teeth while awake?'). For a detailed description of the diagnostic criteria, readers are referred to the original RDC/TMD publication (14) and to the successive studies (15), some of which have raised concerns that should be taken into consideration when revising the current RDC/TMD guidelines (16–19).

Data were retrieved from databases of adult patient populations attending either the TMD Clinic, University of Padova, Italy, during the period from 1 January 2009 to 31 June 2009 (n = 219; 74·4% women; mean age 42·9 ± 16·1, range 18–81 years), or the Orofacial Pain Clinic, University of Tel Aviv, Israel, during the period from 1 January 2001 to 31 December 2004 (n = 397; 79·6% women; mean age 35·6 ± 14·7, range 18–84 years) to seek treatment for TMD. Both centres serve as reference clinics for patients' referral from vast areas around their location, and investigators responsible for the RDC/TMD assessments have been involved in previous publications on RDC/TMD-related epidemiological and diagnostic issues (20–23). In both clinics, several examiners were involved in the diagnostic process, data gathering and treatment planning, but the final supervision for each single patient's RDC/TMD diagnosis belonged to the clinicians who were responsible for the project [D.M., L.G.N. (Padova), E.W. (Tel Aviv)].

For the two clinic samples, the prevalence of each of the single and multiple RDC/TMD axis I diagnoses was assessed, as well as the frequency of positive answers to the questions on self-reported bruxism. The different combinations of clinical TMD diagnoses (no diagnoses; myofascial pain; disc displacement; inflammatory-degenerative joint disorders; myofascial pain and disc displacement; myofascial pain and inflammatory-degenerative joint disorders; disc displacement and inflammatory-degenerative joint disorders; myofascial pain, disc displacement and inflammatory-degenerative joint disorders) and anamnestical bruxism reports (no reported bruxism; reported awake clenching/grinding; reported sleep clenching/grinding; reported awake and sleep clenching/grinding) were compared between the two centres.

Results

Significant differences were shown between the two clinic samples as for the frequency of TMD diagnoses, with myofascial pain alone being the most prevalent diagnosis in the Tel Aviv sample (36·8%) and myofascial pain combined with inflammatory-degenerative disorders in Padova (27·4%) (chi-square, $P < 0·001$) (Table 1). Myofascial pain alone was also the commonest

Table 1. Frequency of different RDC/TMD diagnoses in the two clinic samples (chi-square, $P < 0{\cdot}001$)

	Padova, Italy ($n = 219$)	Tel Aviv, Israel ($n = 397$)
No TMD	2·3	5·5
MP alone	9·6	36·8
DD alone	4·6	19·4
IDD alone	14·6	4·8
MP + DD	4·1	18·6
MP + IDD	27·4	8·8
DD + IDD	16·4	3·5
MP + DD + IDD	21	2·5
Total	100	100

MP, myofascial pain; DD, disc displacement; IDD, inflammatory-degenerative disorders; RDC, Research Diagnostic Criteria; TMD, temporomandibular disorders.
Values are expressed in % and refer to the total of the clinic samples.

diagnosis in the Tel Aviv women (38·3%), while men showed predominantly a disc displacement alone diagnosis (35·8%). In the Padova sample, both genders were characterised by a majority of multiple diagnoses, which accounted for up to 58·9% of men and 82·4% of female patients.

Positive endorsement to the questions 15c ('sleep clenching/grinding') and/or 15d ('awake clenching/grinding') was recorded by 62·5% of the Tel Aviv sample and by 46·1% of the Padova sample (chi-square, $P < 0{\cdot}001$) (Table 2). Sex-related differences were not significant in the Tel Aviv samples (women 63%, men 60·5%), while men in the Padova sample endorsed a significantly higher prevalence of positive responses to questions on sleep and awake bruxism (53·6%) with respect to women (43·6%) (chi-square, $P < 0{\cdot}01$).

Table 2. Prevalence of self-reported awake and sleep bruxism diagnosis in the two clinic samples (chi-square, $P < 0{\cdot}001$)

	Padova, Italy ($n = 219$)	Tel Aviv, Israel ($n = 397$)
No SRbr	53·9	37·5
Only Awake	11·4	10·8
Only Sleep	13·7	19·1
Aw + Sl	21	32·5
Total	100	100

SR, self-reported; RDC, Research Diagnostic Criteria; TMD, temporomandibular disorders.
Values are expressed in % and refer to the total of the clinic samples.

Table 3. Cross-tabulation of RDC/TMD diagnoses and self-reported bruxism diagnosis in the Padova sample ($n = 219$)

	No SR bruxism	Awake	Sleep	Awake and sleep
No TMD	80	0	0	20
MP alone	38·1	23·8	9·5	28·5
DD alone	60	20	0	20
IDD alone	62·5	9·5	12·3	15·7
MP + DD	33·3	0	33·3	33·3
MP + IDD	48·3	13·5	16·7	21·5
DD + IDD	66·6	2·7	13·8	21·9
MP + DD + IDD	52·1	13	13	21·9

MP, myofascial pain; DD, disc displacement; IDD, inflammatory-degenerative disorders; SR, self-report; RDC, Research Diagnostic Criteria; TMD, temporomandibular disorders.
Values are expressed in % and refer to the total of the patients receiving each specific diagnosis.

Table 4. Cross-tabulation of RDC/TMD diagnoses and self-reported bruxism diagnosis in the Tel Aviv sample ($n = 397$)

	No SR bruxism	Awake	Sleep	Awake and sleep
No TMD	18·1	9·5	36·2	36·2
MP alone	27·4	7·6	18·4	46·6
DD alone	54·7	9·3	12·8	23·2
IDD alone	47·9	10·4	31·3	10·4
MP + DD	46·1	14·9	18·7	20·3
MP + IDD	31·5	22·8	20	25·7
DD + IDD	50	7·1	7·1	35·8
MP + DD + IDD	20	10	30	40

MP, myofascial pain; DD, disc displacement; IDD, inflammatory-degenerative disorders; SR, self-report; RDC, Research Diagnostic Criteria; TMD, temporomandibular disorders.
Values are expressed in % and refer to the total of the patients receiving each specific diagnosis.

In the Padova sample, the prevalence of self-reported bruxism was similar among the different TMD diagnostic groups (Table 3), while in the Tel Aviv population, patients with myofascial pain alone tended to report bruxism more frequently than patients receiving other diagnoses (Table 4).

Discussion

The present investigation attempted to discuss the findings on bruxism and TMD by taking into account all the diagnostic information that could be gathered with the adoption of the RDC/TMD guidelines, viz., a

clinical TMD diagnosis and a self-reported sleep/awake bruxism diagnosis, and to suggest recommendations for future studies in the light of diagnostic difficulties that affect both bruxism and TMD diagnoses.

A multicenter retrospective design with data recruited at two specialised centres for the treatment of TMD and orofacial pain was adopted. From a methodological viewpoint, it should be pointed out that the original RDC/TMD guidelines (14) allowed the integration of clinical diagnoses for joint disorders with the use of radiological and imaging techniques. The two centres adopted a different approach as for the use of imaging, which was seldom prescribed (less than 10% of cases) to Israeli patients and often prescribed (about 80% of cases) to the Italians. The reason for such differences could be found in the peculiarities of the national healthcare systems, with the Italian one supporting the widespread adoption of imaging techniques for routine use in contrast to the Israeli one, as well as in the features of the study samples, with the Italian one being represented mostly by patients referred to the clinic for the assessment of joint disorders and the Israeli one collecting a full spectrum of orofacial pain patients. The RDC/TMD diagnoses, as discussed below, were the resultant of the integrated clinical and radiological assessment. Thus, because of the different prescription pattern for imaging techniques between the two clinics, it should be kept in mind that the two samples were not perfectly homogeneous as for the diagnostic strategies adopted for TMD assessment. Also, recruitment of patient populations at the two centres was performed at very different times, viz., about five years apart, and over a different time span, viz., four years in one clinic and about six months in the other. The influence of these factors as potential sources of lack of diagnostic homogeneity between the two centres cannot be underestimated, even if it must be noticed that both centres used the RDC/TMD available since 1992 in the TMD literature (14). In view of the above, findings from the two centres were described separately to discuss how the strategy for diagnosing TMD could influence the resulting prevalence findings and, consequently, their relation with bruxism.

The aims of this investigation were to assess the frequency of TMD and self-reported bruxism diagnoses and to compare the findings of the two clinics to suggest recommendations for future improvements in diagnostic homogeneity and accuracy.

As expected on the basis of the different features of patient referral and use of imaging, the patient populations attending the two clinics differed regarding the distribution pattern of TMD diagnoses. In particular, there was a significantly higher prevalence of myofascial pain alone in the Israeli sample (36·8% versus 9·6%) on the one hand, and a significantly higher prevalence of multiple TMD diagnoses in the Italian sample (69·2% versus 33·4%) on the other hand. The prevalence of myofascial pain, alone or combined with other diagnoses, was similar between the two clinics' samples (Tel Aviv 66·7% versus Padova 62·1%), but the different adoption of imaging techniques, which was allowed but not mandatory in the original RDC/TMD publication and led to a significantly higher number of TMJ disorders diagnoses in the Italian sample, might have caused lack of diagnostic homogeneity, viz., an overdiagnosis of 'pure' myofascial pain patients in the Israeli sample on the one hand or an overdiagnosis of multiple myofascial/joint disorders in the Italian sample on the other hand. Thus, notwithstanding the unsolved issue of the actual clinical significance of some imaging signs in the TMD practice (20, 24), the issue of the different countries' laws and healthcare systems guidelines with respect to the adoption of TMJ imaging techniques must be taken into account as a potential bias against diagnostic homogeneity for multicenter comparisons (19). These findings must be re-appraised also in the light of recent meta-analytic data showing a high variability for the relative frequency of TMD diagnoses in patient populations (25).

The frequency of positive answers for self-reported bruxism was higher in the Israeli sample than in the Italian one (62·5% versus 46·1%). Interestingly, in both samples, the percentage of subjects responding positively to both bruxism questions almost reached 50% of those responding positively to at least one question. Such finding is open to several interpretations. First, it should be considered that patients may often be unable to discriminate between sleep and awake bruxism and are likely to consider 'bruxism' as a single entity. Second, self-reporting of bruxism may be influenced by several factors concerning individual beliefs on, for example, the causes of pain and/or tooth wear, as well as by the opinions expressed by the dentist. Third, self-reported bruxism has an unclear reliability to the actual bruxism activity, and patients may not be able to provide information about the intensity and frequency of bruxism behaviours. For those reasons, self-reporting

of bruxism is not suitable as a stand-alone strategy to diagnose bruxism, but it still remains the most suitable approach to gather data for cross-centre comparison. In view of the above considerations, patients with TMD may be prompted to report more bruxism than individuals from the general population, as suggested by literature data describing a 10·6% (26) to 31·4% (27) prevalence of self-reported bruxism at community level versus 46–58% (9, 28) in TMD patient populations.

Interestingly, the amount of self-reported sleep bruxism was slightly higher than that of awake bruxism, in contrast with findings from similar investigations performed in the general population, which usually reported a 50% more awake than sleep bruxism prevalence (D. Manfredini, E. Winocur, L. Guarda-Nardini, D. Paesani, F. Lobbezoo, unpublished data). A possible explanation for these findings may be that patients with TMD, in contrast to general population individuals, tend to identify the cause of their pain in a nighttime bruxism activity, thus being more prompt to respond positively on the sleep bruxism item. Nonetheless, it should be remembered that self-report/questionnaire-diagnosed bruxism, which still remains the most suitable approach to gather large-sample data for epidemiological reasons, is poorly specific and may introduce potential bias and confounders at the diagnostic level, because of the preconceived idea by the patients and/or the interviewing clinicians that pain in the morning is a criterion for bruxism self-recognition (7). Also, the actual bruxism activity cannot be measured by means of this approach, and more sophisticated strategies to measure it, such as sleep polysomnography and multiple channel nighttime recording of jaw muscle EMG activity (29, 30), have so far been reserved to low-sample size researches in controlled conditions. All these issues concerning the difficulties to diagnose bruxism make it difficult to realise an ideal study design to assess ongoing bruxism and its co-occurrence with TMD symptoms in large-sample investigations. One possible option might be the adoption of portable EMG recorders for full-night registrations of jaw muscle activity. Notwithstanding that, commercially available devices, which might be adopted on a relatively large scale, are currently based on single-channel recordings (31), the reliability of which with respect to sleep bruxism criteria is yet to be defined. Also, the adoption of portable EMG devices is unlikely to be the most suitable approach to awake bruxism diagnosis. For these reasons, another possible option to improve future investigations on large-scale bruxism diagnosis is refining questionnaire-based approaches. This may be accomplished, for example, by reformulating the design of the questionnaires, by adding more specific questions, by performing a complimentary personal interview to validate questionnaire findings, and/or by assessing the agreement with clinical signs attributable to bruxism (i.e. muscle hyperthrophy, 'line alba', tongue indentations, attrition). Once these new standardised measures to approach bruxism diagnosis will be available, it would be interesting to compare the actual level of bruxism in TMD patients with patient's perception of being bruxist, because such a comparison might help re-appraising the literature on the relationship between the two disorders. As a further issue for discussion, it should be pointed out that in the Israeli population, positive answers to self-reported bruxism items were more frequent in subjects with myofascial pain alone, while in the Italian sample, the prevalence of self-reported bruxism is similar in patients with different TMD diagnoses. This observation is likely to be clinically relevant and may constitute a major finding of this retrospective two-centre assessment, because it may suggest that the peculiarities of the study samples influence the observation of specific bruxism-TMD associations.

The multicenter design was a strength of this investigation with respect to previous studies with similar methods of collecting data, because it allowed comparing findings and discussing how the selection of diagnostic criteria may influence one study's findings. The two-centre comparison also allowed describing some potential shortcomings of the 1992 RDC/TMD diagnostic guidelines, because they included arbitrary options for allowing inclusion of radiological signs for diagnostic assessment, thus introducing a confounding factor when data gathered with different strategies are compared. The reproducibility and reliability of the RDC/TMD algorithms undergoing revision should thus be tested also by taking into account the need for reducing subjective interpretation of the diagnostic pathway. For example, it can be suggested to provide a clearer description of those cases for which imaging techniques are needed and to define whether clinical or radiological findings must be considered the guiding principle for diagnosing joint disorders.

Conclusions

The present investigation was a two-centre study attempting to get deeper into the frequency of TMD diagnoses and self-reported bruxism by the adoption of the RDC/TMD criteria. Some differences emerged between the two clinics' samples. The more widespread use of TMJ imaging techniques in one clinic sample led to a higher prevalence of multiple diagnoses, and the higher prevalence of self-reported bruxism in patients with myofascial pain alone described in the other clinic sample was not replicated, thus suggesting that the different adoption of clinical and imaging criteria to diagnose temporomandibular disorders may influence also reports on their association with bruxism. Very little information could be gathered on sleep and awake bruxism, because the patient's capability to discriminate between the two entities is likely low.

In conclusion, from this investigation, it emerged that the features of the study samples as well as the different interpretation of the same diagnostic guidelines may have strong influence on epidemiological reports on bruxism and TMD prevalence and the association between the two disorders.

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