Received: 15 January 2022 | Revised: 30 October 2022 | Accepted: 13 January 2023

DOI: 10.1111/joor.13427

JOURNAL OF ORAL REHABILITATION WILEY

ORIGINAL ARTICLE

Prevalence of oral behaviours in general dental patients attending a university clinic in Italy

Bachar Reda[1] | Frank Lobbezoo[2] | Luca Contardo[1] | Abbass El-Outa[3] | Luca Moro[1] | Matteo Pollis[4] | Ghizlane Aarab[2] | Daniele Manfredini[4]

[1]Department of Medical, Surgical and Health Sciences, School of Dentistry, University of Trieste, Trieste, Italy

[2]Department of Orofacial Pain and Dysfunction, Academic Centre for Dentistry Amsterdam (ACTA), University of Amsterdam and Vrije Universiteit Amsterdam, Amsterdam, The Netherlands

[3]American University of Beirut Medical Center, Beirut, Lebanon

[4]Department of Biomedical Technologies, School of Dentistry, University of Siena, Siena, Italy

Correspondence
Bachar Reda, Department of Medical, Surgical and Health Sciences, School of Dentistry, University of Trieste, Trieste, Italy.
Email: bachar.reda@libero.it

Abstract

Background: Oral behaviors represent a diverse array of habits beyond the physiological behaviors of the stomatognathic system.

Objective: To describe the prevalence of different oral behaviors, as reported with the Oral Behavior Checklist (OBC-21), in a convenience sample of patients attending an Italian university clinic for routine dental cares.

Methods: In this study, charts of adult patients presenting to the dental department of a regional hospital in Trieste, Italy, from January 2018 and January 2019 were reviewed. Patients with complete files were retrieved, and those with orofacial pain complaints were excluded. OBC-21 scores and grades (score of 0 corresponding to no risk, 1-24 to low risk, and higher than 24 to high risk) were analyzed and stratified according to age and sex.

Results: Data from a total of 1424 patients were reported. The overall mean OBC score was 13.3 ± 9.9, with 6.7% no-risk grade, 79.6% low-risk grade, and 13.7% high-risk grade. In general, mean OBC scores decreased with increasing age. Females showed a higher frequency of high-risk grade than males. Most frequent prevalent habits included yawning (73.1%), eating between meals (66.9%) and chewing food on one side only (63.3%). Other behaviors were also highly prevalent, including pressing, touching, or holding teeth together other than while eating (52.7%) and awake clenching (47.5%).

Conclusion: A low-risk grade of oral behaviors has been found to be frequent in our sample. Future studies are warranted to confirm these findings in larger, representative general populations and to assess if any of these habits are linked to negative effects on the stomatognathic system.

KEYWORDS
bruxism, oral behaviour, temporomandibular disorders

1 | INTRODUCTION

Oral behaviours are a group of activities that may occur beyond physiological function of the stomatognathic system.[1] Oral behaviours can occur during wakefulness or during sleep. Since their objective detection can be difficult at times, focusing on self-recognition of oral behaviours is useful.[2] The Oral Behaviors Checklist (OBC) is a validated, self-reported tool that allows for the collection of data on the presence and frequency of oral behaviours.[3,4] The OBC provides a comprehensive and wide-spectrum tool to report oral behaviours, and it has become an important part of the Diagnostic Criteria for Temporomandibular Disorders (DC/TMD), which is a dual-axis diagnostic system for the assessment and diagnosis of temporomandibular disorders, with a biological axis (Axis I) and a psychosocial axis (Axis II).[4] Despite the fact that the OBC is part of the widely used DC/TMD Axis II, there is still a paucity of large-scale studies establishing normative values as a standpoint for comparison with patient populations.

Few studies have reported on the frequency of oral behaviours in TMD and TMD-free population, suggesting that some behaviours are frequent even in individuals without TMDs.[5–7] To our knowledge, the main investigation on the prevalence of oral behaviours in large samples is part of the OPPERA study, which was reported by Ohrbach et al. and found that very few people reported no such behaviours, with many people reporting some low level of these behaviours.[8] Nonetheless, there is not a lot of available data beyond that investigation. Additionally, the focus of clinical research on oral behaviours was more on their association with possible risk or comorbid factors and consequences (e.g. anxiety and TMD)[9,10] than their frequency at the population level. Besides, some works only reported the prevalence of some selected oral behaviours, due to the use of short versions of the OBC or the adoption of non-validated instruments.[11] In such context, the use of the full version of the OBC (i.e. the OBC-21) allows collecting data on the report of a wide spectrum of oral habits, which may be useful for both clinical and research purposes.

Hence, although oral behaviours might play an important role in, for example, the development of TMD symptoms, their reported frequency among asymptomatic individuals remains to be fully appraised. The collection of data on the report of oral habits in large asymptomatic samples would help the potential identification of normative ranges as well as a better categorisation of the oral health risk associated with each behaviour. In particular, there are no large-scale studies on oral behaviours, as reported by the OBC-21.

Based on the above premises, the working hypothesis for this study was that oral behaviours are reported frequently also in asymptomatic individuals. To test such hypothesis, we recruited a convenience sample of patients attending a University Clinic for general dental care, who completed the full version of the OBC instrument (OBC-21).

2 | MATERIALS AND METHODS

This was a cross-sectional, retrospective study based on the assessment of all medical records stored in the dental department's outpatient database of a tertiary-care hospital in Trieste, Italy (Clinica di Chirurgia Maxillofacciale e Odontostomatologica di Trieste). According to the clinic's protocol, prior to their first examination all patients were required to complete in the Italian 21-item version of the Oral Behavior Checklist (OBC-21).[5] Files of individuals coming for routine dental procedures (e.g. restorative treatments, hygiene and prophylaxis) between January 2018 and January 2019 were retrieved manually. All patients aged over 18 years and having a complete OBC-21 in their files were included in the study, with the exception of patients whose chief complaint was related to any orofacial pain condition (e.g. facial pain, limited mouth opening, acute onset of jaw pain, jaw/face soreness and jaw lock), to create a convenience sample of asymptomatic individuals who were in search for routine dental care. Subsequently, all OBC questionnaires were reviewed, and the scores of each question were entered in a database. Data entry was performed by dual entry method. Two independent experts performed data entry and repeated it in 2-week period. The results obtained then were compared in terms of consistency (intra-rater consistency) and showed high intra-class correlation coefficients (0.93 for first professional and 0.95 for second professional).

The OBC questionnaire is included among the tools for the evaluation of Axis II of the DC/TMD, with the aim of collecting data on the report and the frequency of oral behaviours. The OBC has originally been developed and validated in English,[3,4] and it was then translated and culturally adapted in other languages (e.g. Portuguese, Italian, Dutch, German and Malaysian).[5,12–14] Oral behaviours included in the OBC are divided into 21 items and split into sleep-time behaviours (i.e. two items regarding teeth clenching and grinding [Q1] and sleeping position [Q2]) and awake-time behaviours (19 items [Q3-21]). Each item is scored on a 5-point rating scale (from 0 to 4), with different response options, based on the frequency of reported behaviour over the past month, for sleep-time and wake-time behaviours. For the sleep-time behaviours, the options are none of the time, <1 night/month, 1–3 nights/month, 1–3 nights/week and 4–7 nights/week, while for wake-time behaviours the options are none of the time, a little of the time, some of the time, most of the time and all of the time. The total sum score ranges from 0 to 84 and, based on the suggested interpretation, is divided into three risk grades: 'No risk' with a total score of 0, 'Low risk' with scores ranging from 1 to 24 and 'High risk' with scores ranging from 25 to 84.[15]

Data were analysed using SPSS version 24.0 (Armonk, NY: IBM Corp). The distributions of continuous and categorical variables were presented as mean ± standard deviation and frequency/percentages, respectively. The prevalence of each behaviour, as indicated by the report of at least 1 day/month (for sleep-time behaviours) or a little of the time (for wake-time behaviours), was assessed. The total score was then categorised as no risk, low risk and high risk, as per the above description. Comparative analysis of results was conducted among age groups and sex. Chi-squared test, Student *t*-test and one-way ANOVA were used to evaluate differences between score/grade and age, age groups and sex. Furthermore, linear (sum score as dependent variable) and binary logistic regression (grades dichotomised into low-risk grade: 0–24; and high-risk grade: >24) analyses were performed to evaluate the

independent variables (age and sex) as predictors of OBC score and risk grade. Statistical significance was set at $p < .05$ for all analyses.

3 | RESULTS

Based on the inclusion criteria, data were available from 1424 participants (age range 18 to 89 years, mean 49.7 ± 17.6 years; 833 [58.5%] females).

The mean score for OBC was 13.3 ± 9.9, with 95 having a no-risk (6.7%), 1134 a low-risk grade (79.6%) and 195 a high-risk grade (13.7%).

The mean score in females was 14.1 ± 0.4, while in males, it was 12.2 ± 0.4. As for the risk grade, only 6.4% of females and 6.9% of males scored no risk grade, while 77.3% of females and 82.9% of males scored low-risk grade; 16.2% of females; and 10.1% of males reported high-risk grade. Table 1 shows the frequency of the different answers for all behaviours, expressed as the number and percentage of participants.

As for age, the average total OBC sum scores per age group were 17.5 ± 10.2 (18–29 years), 17.2 ± 10.2 (30–39 years), 13.5 ± 9.1 (40–49 years), 12.5 ± 9.4 (50–59 years), 10.7 ± 8.6 (60–69 years) and 8.8 ± 8.9 (>70 years), respectively (Figure 1).

The most prevalent oral behaviour was yawning, which was reported by 73.1% of participants, followed by eating between meals

TABLE 1 Descriptive summary of OBC-21 survey answers as number (percentage) of participants

How often do you do each of the following activities, based on the last month? If the frequency of the activity varies, choose the higher option						
	None of the time 0	<1 Night / Month 1	1–3 Nights / Month 2	1–3 Nights / Week 3	4–7 Nights / Week 4	Positive score
Questions / Scale	**Number of patients with behaviour (Percentage)**					
Q1 Clench or grind teeth when asleep	956 (67.1)	132 (9.3)	141 (9.9)	89 (6.3)	106 (7.4)	468 (32.9)
Q2 Sleep in a position that puts pressure on the jaw	1023 (71.9)	116 (8.1)	100 (7.0)	86 (6.0)	99 (7.0)	401 (28.2)
	None of the time 0	**A little of the time 1**	**Some of the time 2**	**Most of the time 3**	**All of the time 4**	**Positive score**
Q3 Grind teeth together during waking hours	1053 (74)	234 (16.4)	100 (7.0)	28 (2.0)	9 (0.6)	371 (26.1)
Q4 Clench teeth together during waking hours	748 (52.2)	460 (32.3)	143 (10.0)	60 (4.2)	13 (0.9)	676 (47.5)
Q5 Press, touch or hold teeth together other than while eating (i.e. contact between upper and lower teeth)	673 (47.3)	466 (32.7)	188 (13.2)	77 (5.4)	20 (1.4)	751 (52.7)
Q6 Hold, tighten or tense muscles without clenching	951 (66.8)	296 (20.8)	131 (9.2)	38 (2.7)	8 (0.6)	473 (33.2)
Q7 Hold or jut jaw forward or to the side	1085 (76.19)	236 (16.6)	74 (5.2)	24 (1.7)	5 (0.4)	339 (23.8)
Q8 Press tongue forcibly against teeth	1036 (72.8)	257 (18.0)	90 (6.3)	33 (2.3)	8 (0.6)	388 (27.2)
Q9 Place tongue between teeth	1029 (72.3)	269 (18.9)	79 (5.5)	38 (2.7)	9 (0.6)	395 (27.7)
Q10 Bite, chew, or play with your tongue, cheeks or lips	854 (60.0)	353 (24.8)	150 (10.5)	51 (3.6)	16 (1.1)	570 (40)
Q11 Hold jaw in rigid or tense position	1139 (80.0)	175 (12.3)	76 (5.3)	27 (1.9)	7 (0.5)	285 (20)
Q12 Hold between the teeth or bite objects	1001 (70.3)	275 (19.3)	102 (7.2)	35 (2.5)	11 (0.8)	423 (29.7)
Q13 Use chewing gum	809 (56.8)	414 (29.1)	160 (11.2)	34 (2.4)	7 (0.5)	615 (43.2)
Q14 Play musical instrument that involves use of mouth or jaw	1377 (96.7)	28 (2.0)	11 (0.8)	8 (0.6)	0	47 (3.3)
Q15 Lean with your hand on the jaw	676 (47.5)	480 (33.7)	216 (15.2)	42 (2.9)	9 (0.6)	748 (52.5)
Q16 Chew food on one side only	523 (36.7)	397 (27.9)	251 (17.6)	196 (13.8)	57 (4.0)	910 (63.3)
Q17 Eating between meals	472 (33.1)	490 (34.4)	292 (20.5)	130 (9.1)	40 (2.8)	952 (66.9)
Q18 Sustained talking	667 (46.8)	355 (24.9)	199 (14.0)	157 (11.0)	46 (3.2)	757 (53.2)
Q19 Singing	831 (58.4)	408 (28.7)	147 (10.3)	27 (1.9)	11 (0.8)	593 (41.6)
Q20 Yawning	383 (26.9)	759 (53.3)	240 (16.9)	31 (2.2)	11 (0.8)	1041 (73.1)
Q21 Hold telephone between your head and shoulders	917 (64.4)	347 (24.4)	120 (8.4)	29 (2.0)	11 (0.8)	507 (35.6)

Note: Total *N* = 1424 patient.

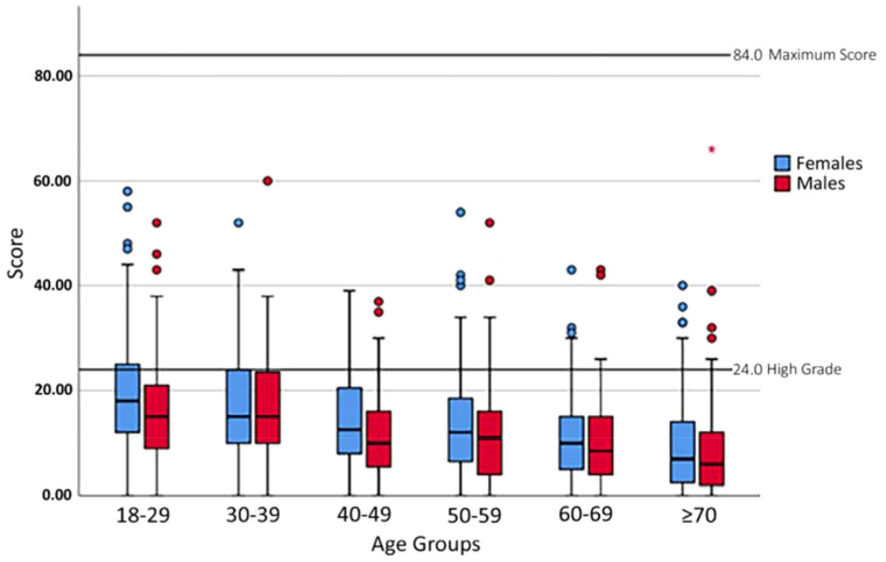

FIGURE 1 Boxplot of total OBC sum scores by age groups and across sexes

(66.9%) and chew food on one side only (63.3%). Other frequent behaviours included singing (53.2%) and leaning with hand on jaw (52.5%). Press, touch or hold teeth together other than while eating (i.e. contact between upper and lower teeth) (52.7%) and awake clenching (47.5%) were also frequent.

One-way ANOVA test revealed significant differences between OBC sum scores among the age groups [F (2619.55, 89.67) = 29.22, $p < .0001$]; Tukey post hoc analysis revealed that the age groups 18–29 and 30–39 years had similar sum scores, which were significantly higher than sum scores of all older age groups ($p < .001$; mean difference in scores ranging from 3.67 to 8.61). Moreover, age appeared to be a significant factor for the total OBC score, as linear regression analysis of age (adjusted for sex) against OBC score revealed that each 1-year increase in age corresponded to a 0.172 decrease in OBC score ($R^2 = 0.101$, B = −0.172, $p < .001$, CI [−0.2; −0.144]). Furthermore, all behaviours except item 3 (grind teeth together during waking hours) showed negative correlations with age, suggesting a trend of decreasing behaviours with aging.

Sex appeared a significant factor for the OBC high-risk grade, as binary logistic regression of OBC grade (high/low) against sex-adjusted for age revealed that females were at significantly higher odds of suffering from high-grade OBC than males (Cox & Snell $R^2 = 0.07$, $p < .001$, aOR = 1.72; 95% CI [1.231; 2.389]).

4 | DISCUSSION

The present study assessed the prevalence of oral behaviours in a convenience large sample of patients attending a general dentistry clinic in Italy, using the full version of the Oral Behaviors Checklist (OBC-21). The instrument was first developed by Ohrbach and colleagues to evaluate wake-time oral behaviours and was then reshaped into its current form.[2] Since many studies hypothesised that certain oral behaviours may be associated with an increased risk for TMD,[10,11,16–19] a thorough understanding of the prevalence and frequency of oral behaviours in asymptomatic individuals is important to delve deeper into their possible clinical relevance.

Our results show that oral behaviours are quite frequent in the studied population, with very few participants reporting no such behaviours (6.7%). Most of the subjects had a low-risk grade (79.6%), with an overall mean OBC score of 13.3 ± 9.9. There was a predominance of the high-risk category in females. Higher OBC scores were found in younger individuals, with a significant decrease in scores with increasing age. Considering the single items, grinding teeth during awakening was the only behaviour that did not show a negative correlation with age; this is in line with previous literature, such as that of Helkimo et al.[20]

Despite the original scoring ranges for OBC grades ('No risk': 0, 'Low risk': 1–24 and 'High risk': 25–84), recent evidence suggests the usefulness of re-categorisation of grades according to the following scores: 'No risk': 0–16, 'Low risk': 17–24; and 'High risk': ≥25.[7,21] The need of re-categorisation may be supported by the fact that the majority of our participants would be reclassified into the group with no-risk grade (68.4%). These considerations are in line with the hypothesis that a certain frequency of self-reported oral behaviours is quite frequent in asymptomatic individuals. Nevertheless, further research is needed to validate this new categorisation and to reveal its clinical implications.

The association of oral behaviours with anxiety, TMD and facial pain has been studied previously.[9,10] In addition, some authors reported a considerable frequency of oral behaviours at the general population level.[6,8] This suggests that oral behaviours do not necessarily carry the risk for oral health consequences as well as that there is a need to establish a range of values as a standpoint for comparison. A study conducted by Barbosa et al.,[12] who validated the Portuguese version of the OBC-21, showed that in TMD-free participants the mean total OBC sum score was 17.7 ± 4.9, which is slightly higher than the sum score in the general population recruited for our study (13.3 ± 9.9), while the mean total OBC sum scores in both studies correspond to a low-risk grade of the OBC. Moreover,

Fillingim et al.[6] reported a mean total OBC sum score of 20±9 in TMD-free participants, corresponding to a low-risk grade of oral behaviours as well, along with a mean score of 24±10 in individuals with first onset of TMD and a mean score of 33±11 in chronic TMD patients. Hence, a low-risk grade of the OBC seems to be frequent in TMD-free populations, while higher OBC scores are frequently found in TMD patient populations. Nevertheless, only few literature works dealt with this topic, and special attention should be given to whether the used outcome measures were obtained with different versions of the OBC, that is not in full or not the latest version (OBC-21).

In our study, the most frequent wake-time oral behaviours (i.e. reported at least 'little of the time') were as follows: yawning (73.1%), eating between meals (66.9%), chew food on one side only (63.3%), singing (53.2%) and leaning with hand on jaw (52.5%). Interestingly, pressing, touching or holding teeth together other than while eating (i.e. contact between upper and lower teeth) (52.7%) and awake clenching (47.5%), which are traditionally related with TMD, were also quite frequently reported in our sample. Câmara-Souza et al.[22] studied awake bruxism frequency in college students by means of both the wake-time behaviours part of the OBC (19 questions) and a smartphone-based ecological momentary assessment. In line with our findings, they also observed that 'pressing, touching, or holding teeth together other than while eating (that is, contact between upper and lower teeth)' and 'holding, tightening, or tensing muscles without clenching' were the most frequent behaviours. In addition, they found a statistically significant correlation between total awake bruxism frequency and both clenching and 'pressing, touching or holding teeth together other than while eating (i.e. contact between upper and lower teeth)'.[22] Some authors also showed that higher level of awake bruxism occurred more frequently in females than in males (females showed 1.5 times more awake bruxism than males).[18] A possible explanation for such findings is that females may be more sensitive to stress and functional manifestations.[22,23] Although we have not assessed, and by no means intended to assess, awake bruxism as a whole using the OBC-21 only, but only elements of the OBC-21 associated with bruxism as per the international consensus,[24] this finding may be in line with our result that females are at higher odds of having a high-risk level of OBC than males; nevertheless, explaining such predilection is beyond the scope and the potential of this study. Hence, future studies may be designed to tackle such female predisposition.

Other studies that used OBC-21 to investigate prevalence and frequency of some oral behaviours include the work by Leketas et al.,[19] who added three further questions to the checklist (scuba diving, facial grimaces and irregular head positions) and studied oral behaviours in TMD and TMD-free participants. The authors addressed TMD as a diagnosis in general, that is without specifying the type. The most frequent behaviours in both TMD and TMD-free populations included yawning, leaning with hand on jaw, chewing food on one side only and sleeping in a position that puts pressure on jaw.[19] Nonetheless, among the 24 oral behaviours under investigation, 10 occurred more often in TMD patients than in TMD-free individuals, the most frequent behaviour being holding, tightening or tensing muscles without clenching. Specifically, the behaviour of holding, tightening or tensing jaw muscles without clenching was associated with up to 10.8 times increase in risk of TMD, grinding teeth during waking hours was associated with up to 4.9 times increase, and sustained talking with up to 2.6 times increase. On the contrary, Perrotta et al.[10] asserted that some oral behaviours, such as yawning (OR = 0.5) and chewing gum (OR = 0.8), seemed significantly less frequent in TMD patients compared with TMD-free controls, hence having a possible protective effect against TMD, or their low prevalence being a consequence of TMDs, viz., TMD patients may tend to avoid certain behaviours that may elicit pain.

Additionally, tinnitus—as measured by tinnitus handicap inventory severity—has been shown to exhibit a significant correlation with OBC scores. In particular, a higher frequency of wake-time oral behaviours was associated with more severe tinnitus.(25%) Moreover, non-zero scores of OBC as well as TMD scores were reported among senior and junior dentistry students, with mean OBC scores of 15.9±12.0 and 14.0±11.7, respectively, which were very similar to those in our study and indicative of a low-risk grade of the OBC.[25] Hence, a low-risk grade of oral behaviours may be quite frequent among different populations, as shown by the 79.6% of participants in our study that fit into that category.[7,8]

A limitation of the present investigation lies in the self-reported and hence subjective nature of the oral behaviours as collected with the OBC. This highlights the need to assess the validity of data obtained by any self-reported tool, which may be assessed by studies on the patients' comprehension of the content. Furthermore, our sample includes patients presenting to the outpatient dental department for general dental treatments at a regional tertiary-care university hospital; despite we excluded patients with orofacial pain complaints to limit the sample to asymptomatic individuals, it must be noticed that this does not resemble a general population. Since probability-based sampling is not possible in such cases, our sample supposedly represents the population served by this university hospital. Therefore, future larger-scale studies need to cover different states of Italy to better represent the actual Italian general population prevalence of oral behaviours. Additionally, the prevalence of oral behaviours may be affected by local culture, so that investigations are needed to compare people from different countries, and with different cultures, ethnic and social behaviours to map the report of oral habits across general populations worldwide. Such studies would also allow further comparison with our data.

5 | CONCLUSION

Our results support the hypothesis that a frequent prevalence, with low-grade report of oral behaviour, is present in a group of general dental patients. Future studies are needed to assess the consequences of such finding on the stomatognathic system, if any. This study provided a potential large sample standpoint for future comparisons with specific populations of individuals showing possible risk factors, comorbid conditions and consequences.

AUTHOR CONTRIBUTIONS

BR conceived and prepared the study design, helped in data collecting and drafted the manuscript. FL manuscript's critical review and check. LC and GA contributed to the manuscript revision. AEO performed the data analysis and contributed to the writing of the manuscript. LM collected the data. MP contributed to the revision of the drafting. DM contributed to the manuscript's critical review and overall check.

FUNDING INFORMATION

Open Access Funding provided by Universita degli Studi di Trieste within the CRUI-CARE Agreement.

ACKNOWLEDGEMENT

Open Access Funding provided by Universita degli Studi di Trieste within the CRUI-CARE Agreement.

CONFLICT OF INTEREST

All authors declare that they have no conflict of interest.

PEER REVIEW

The peer review history for this article is available at https://publons.com/publon/10.1111/joor.13427.

ORCID

Bachar Reda https://orcid.org/0000-0002-7793-4552
Frank Lobbezoo https://orcid.org/0000-0001-9877-7640
Ghizlane Aarab https://orcid.org/0000-0002-6677-7897
Daniele Manfredini https://orcid.org/0000-0002-4352-3085

REFERENCES

1. van der Meulen MJ, Lobbezoo F, Aartman IHA, Naeije M. Self-reported oral parafunctions and pain intensity in temporomandibular disorder patients. *J Orofac Pain*. 2006;20(1):31-35.
2. Ohrbach R, Markiewicz MR, McCall WD. Waking-state oral parafunctional behaviors: specificity and validity as assessed by electromyography. *Eur J Oral Sci*. 2008;116(5):438-444.
3. Van Der Meulen MJ, Lobbezoo F, Aartman IHA, Naeije M. Validity of the Oral Behaviours checklist: correlations between OBC scores and intensity of facial pain. *J Oral Rehabil*. 2014;41(2):115-121.
4. Schiffman E, Ohrbach R, Truelove E, et al. Diagnostic criteria for temporomandibular disorders (DC/TMD) for clinical and research applications: recommendations of the international RDC/TMD consortium network* and orofacial pain special interest group†. *J Oral Facial Pain Headache*. 2014;28(1):6-27.
5. Donnarumma V, Cioffi I, Michelotti A, Cimino R, Vollaro S, Amato M. Analysis of the reliability of the Italian version of the oral behaviours checklist and the relationship between oral behaviours and trait anxiety in healthy individuals. *J Oral Rehabil*. 2018;45(4):317-322.
6. Fillingim RB, Slade GD, Greenspan JD, et al. Long-term changes in biopsychosocial characteristics related to temporomandibular disorder: findings from the OPPERA study. *Pain*. 2018;159(11):2403-2413.
7. Ohrbach R, Bair E, Fillingim RB, et al. Clinical orofacial characteristics associated with risk of first-onset TMD: the OPPERA prospective cohort study. *J Pain*. 2013;14(12 SUPPL):T33-T50. doi:10.1016/j.jpain.2013.07.018
8. Dubner R, Slade GD, Ohrbach R, et al. Painful temporomandibular disorder: decade of discovery from OPPERA studies. *J Dent Res*. 2016;95(10):1084-1092.
9. Chow JC, Cioffi I. Effects of trait anxiety, somatosensory amplification, and facial pain on self-reported oral behaviors. *Clin Oral Investig*. 2019;23(4):1653-1661. doi:10.1007/s00784-018-2600-1
10. Perrotta S, Bucci R, Simeon V, Martina S, Michelotti A, Valletta R. Prevalence of malocclusion, oral parafunctions and temporomandibular disorder-pain in Italian schoolchildren: an epidemiological study. *J Oral Rehabil*. 2019;46:611-616.
11. Chatzopoulos GS, Sanchez M, Cisneros A, Wolff LF. Prevalence of temporomandibular symptoms and parafunctional habits in a university dental clinic and association with gender, age, and missing teeth. *Cranio*. 2017;37:1-9. doi:10.1080/08869634.2017.1399649
12. Barbosa C, Manso MC, Reis T, Soares T, Gavinha S, Ohrbach R. Cultural equivalence, reliability and utility of the Portuguese version of the oral behaviours checklist. *J Oral Rehabil*. 2018;45(12):924-931.
13. John MT, Hirsch C, Reiber T, Dworkin SF. Translating the research diagnostic criteria for temporomandibular disorders into German: evaluation of content and process. *J Orofac Pain*. 2006;20(1):43-52.
14. Michelotti A, Segu M, Wrenn C, Rongo R. 2017. Diagnostic Criteria for Temporomandibular Disorders: Assessment Instruments (Italian).
15. Ohrbach R, Knibbe W. 2016. Diagnostic Criteria for Temporomandibular Disorders: Scoring Manual for Self-Report Instruments.
16. Kalaykova S, Lobbezoo F, Naeije M. Risk factors for anterior disc displacement with reduction and intermittent locking in adolescents. *J Orofac Pain*. 2011;25(2):153-160.
17. Liu F, Steinkeler A. Epidemiology, diagnosis, and treatment of temporomandibular disorders. *Dent Clin N Am*. 2013;57(3):465-479.
18. Kaplan S, Ohrbach R. Self-report of waking-state oral parafunctional behaviors in the natural environment. *J Oral Facial Pain Headache*. 2016;30:107-119.
19. Leketas M, Šāferis V, Kubilius R, Cervino G, Bramanti E, Cicciù M. Oral behaviors and parafunctions: comparison of temporomandibular dysfunction patients and controls. *J Craniofac Surg*. 2017;28(8):1933-1938.
20. Helkimo M. Studies on function and dysfunction of the masticatory system. *Acta Odontol Scand*. 1974;32(4):255-267.
21. Ohrbach R, Fillingim RB, Mulkey F, et al. Clinical findings and pain symptoms as potential risk factors for chronic TMD: descriptive data and empirically identified domains from the OPPERA case-control study. *J Pain*. 2011;12(11):T27-T45.
22. Câmara-Souza MB, Carvalho AG, Figueredo MC, et al. Awake bruxism frequency and psychosocial factors in college preparatory students. *Cranio*. 2020;1-7.
23. Seo D, Ahluwalia A, Potenza MN, Sinha R. Gender differences in neural correlates of stress-induced anxiety. *J Neurosci Res*. 2017;95(1–2):115-125.
24. Lobbezoo F, Ahlberg J, Raphael KG, et al. International consensus on the assessment of bruxism: report of a work in progress. *J Oral Rehabil*. 2018;45(11):837-844.
25. Cimino R, Bucci R, Ambrosio A, et al. Temporomandibular disorders, neck disability, and oral parafunctions in tinnitus patients: a cross-sectional epidemiological study from southern Italy. *Cranio*. 2020;40(6):485-493.

How to cite this article: Reda B, Lobbezoo F, Contardo L, et al. Prevalence of oral behaviours in general dental patients attending a university clinic in Italy. *J Oral Rehabil*. 2023;50:370-375. doi:10.1111/joor.13427