

# Retrospective Analysis of the Correlation between TMD, Headache and Bruxism

Audrey Morris, Patricia Grabowski, Tanya Al Talib, Neamat Hassan Abubakr\*

School of Dental Medicine, University of Nevada, Las Vegas, Nevada, USA

Email: \*neamat.hassan@unlv.edu

**How to cite this paper:** Morris, A., Grabowski, P., Al Talib, T. and Abubakr, N.H. (2023) Retrospective Analysis of the Correlation between TMD, Headache and Bruxism. *Open Journal of Stomatology*, 13, 125-133.

<https://doi.org/10.4236/ojst.2023.134010>

**Received:** March 14, 2023

**Accepted:** April 11, 2023

**Published:** April 14, 2023

Copyright © 2023 by author(s) and Scientific Research Publishing Inc. This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).

<http://creativecommons.org/licenses/by/4.0/>



Open Access

## Abstract

**Aims:** To evaluate the association between bruxism, headaches, and temporomandibular disorder (TMD). **Methods:** A keyword search of the clinical notes of patients' charts in AxiUm™ was performed using the search terms "TMD", "headache", and "sleep bruxism" to identify these patients. The inclusion criteria were patients with partial or full dentition, aged 18 to 65 years old who attended the UNLV School of Dental Medicine clinics between January 2014 and September 2018. Patients with incomplete records and those who were completely edentulous formed the exclusion criteria. Data were analyzed using the Pearson Correlation Coefficient. **Results:** The final sample was made up of 529 patients. The highest percentage of study subjects were in the age range of 29 - 34 (17.9%), with a statistically significant correlation to pain on opening ( $P = 0.0403$ ). Females showed a statistically significant correlation to TMJ clicking ( $P = 0.0033$ ). Caucasians also had a statistically significant correlation to TMJ clicking ( $P = 0.0001$ ). In addition, a statistically significant correlation between pain on opening or chewing and headaches was also observed ( $P = 0.0081$ ). **Conclusion:** Within the limitations of the present study, Caucasians, and females presented with more TMJ clicking than the other study subjects. Young adults, in particular, experienced more pain on opening or chewing.

## Keywords

TMD, Bruxism, Headaches, TMJ Clicking, Pain

## 1. Introduction

Temporomandibular joint (TMJ) is one of the most functionally and structurally intricate joints in the human body. [1] Patients most commonly seek help in the dental practice for orofacial pain. A common source of pain is a disease which

can be treated with restorations or endodontics. Another source of orofacial pain is temporomandibular disorder (TMD) [2] which is characterized by TMJ pain, TMJ clicking or crepitation sounds, pain preauricular regional area of the face, and headache, restriction of the range of mandibular opening, and pain. [3]

TMD is the most common condition contributing to orofacial pain. [4] Overloading the masticatory structures due to bruxing and clenching can be a causative factor of TMD-related pain. [2] Bruxism is a repetitive jaw movement characterized by grinding or clenching of the teeth. [5] Bruxism can lead to tooth sensitivity and destruction of dentition, leading to difficulty chewing. [5] Bruxism can lead to the failure of dental restoration and implants. Sleep bruxism leads to cervical muscle pain, jaw tenderness, TMJ pain, and limitation of jaw movement. [3] Bruxism is reported in approximately 8% of the adult population. [5] Some of the treatment options for TMD include Anterior positioning splint, hot and cold therapy, behavioral therapy, and Photobiomodulation (Low Level Laser Therapy). [6]

Epidemiological studies from several countries indicated that the prevalence of TMD among adolescents ranged from 10.2% - 56.6%, most of the reported evaluations used one of the following criteria—the Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) and/or the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) [7] [8] [9] [10] It was reported that the estrogen hormone levels in women might be the possible reason why more female suffers from TMD pain. [11] [12] TMD may have a more significant number of progesterone and estrogen receptors in the temporomandibular joint. [12] Women may be more sensitive to pain than men. [13] The specific causal link between TMD and its etiologic factors is yet to be established. [5]

Women and patients under sixty have a higher prevalence of bruxism. [14] It has been reported that there is a positive and significant correlation between the frequency of facial pain, morning headaches and bruxism. [15]

Adults with sleep bruxism seem to be more susceptible to headaches. [15] Since sleep bruxism has been found to trigger TMD, patients with both conditions tend to have more painful TMD. [16] Women report both bruxism and TMD more frequently than men. [16] Inadequate sleep can lead to headaches, and patients with sleep bruxism report three times as many headaches as non-bruxing patients. [17]

Memmedova *et al.* found morning headaches to be present in most patients with TMD and bruxism. [4] Headache is considered as a leading disease for job disability and loss. [4] The quality of life of patients suffering from chronic headaches is usually affected by the increased hospital admissions and treatment costs. [4] Studies have shown that painful TMD, migraine, and tension-type headaches have a significant relationship. [4] The null hypothesis of the present study was to examine if there is no correlation between TMD, sleep bruxism, and headaches. The aim of the present investigation was to assess the correlation between bruxism, headaches, and TMD in the studied patient population.

## 2. Material and Methods

### 2.1. Approval

The study was approved by the University of Nevada, Las Vegas (UNLV) Biomedical Institutional Review Board and was given exempt status (IRB no. 1298810-1 on the September 27<sup>th</sup>, 2018).

### 2.2. Patient Sample and Data Collection

A retrospective search was conducted in AxiUm<sup>TM</sup> (Dental Practice Software) using a keyword search of the clinical notes of patients' charts in axiUm<sup>TM</sup> was performed using the search terms "TMD", "headache", and "sleep bruxism" to identify these patients. The inclusion criteria were patients with full or partial dentition within the age range of 18 to 65 years old, who attended the UNLV School of Dental Medicine clinics, between January 2014 and September 2018. The exclusion criteria were: patients with incomplete records and those who were completely edentulous; patients with a history of previous TMJ trauma or surgery; patients with a history of head and neck radiotherapy or chemotherapy; patients with systemic inflammatory joint disease or with a TMJ pathological lesion; patients suffering from rheumatoid arthritis; patients with congenital disturbances such as hypoplasia of the joint or congenital craniofacial syndrome.

The initial search showed results of 874 entries after removing duplicates and patients with incomplete records and those who were completely edentulous (exclusion criteria) were excluded. The final number of patients that fulfilled our search criteria was 529, all of whom had been considered as bruxers with TMD symptoms recorded such as clicking and or pain on opening or while chewing.

### 2.3. Statistical Analysis

Data was collected and tabulated in an Excel sheet and analyzed using the SPSS, 24.0 (IBM, Inc: Armonk, New York, 2017) utilizing the Pearson Correlation.

## 3. Results

Among the 529 patients, there were 64.65% females, 33.58%, and 28.84% for Caucasians and Hispanics/Latinos respectively (**Table 1**).

There was a statistically significant correlation between gender and TMJ clicking specifically females ( $P = 0.0033$ ), and Caucasians also had a statistically significant correlation to TMJ clicking ( $P = 0.0001$ ) (**Table 2**).

The correlations of bruxism, headache, and TMD showed statistical significance between ethnicity and TMJ clicking, also between pain on opening or chewing and headaches (**Table 2**).

The highest percentage of study subjects was in the age range of 29 - 34 (17.9%) (**Figure 1**). There was a statistically significant correlation between age and pain on opening ( $P = 0.0403$ ) (**Table 2**).

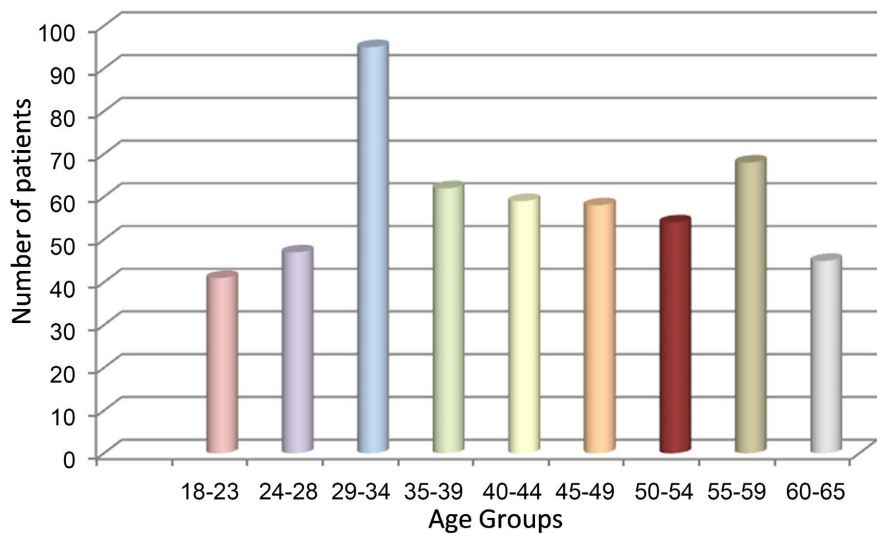
**Table 1.** Distribution of the TMD sample according to gender and ethnicity.

| Females                          | Males  |
|----------------------------------|--------|
| 64.65%                           | 35.35% |
| Ethnicity                        |        |
| Hispanic or Latino               | 28.84% |
| Caucasian                        | 33.58% |
| Black or African American        | 20.68% |
| Asian                            | 2.27%  |
| Mixed                            | 14.42% |
| American Indian or Alaska Native | 0.19%  |

**Table 2.** Correlations of patient demographic data with bruxism, headache and TMD.

| Variables Compared                     | Coefficient r | 95% Confidence Interval | P-Value |
|--|---------------|-------------------------|---------|
| Age & Pain on Opening and Chewing      | -0.07612      | -0.1604 to 0.009276     | 0.0403* |
| Gender & TMJ Clicking                  | -0.1183       | -0.2016 to -0.03328     | 0.0033* |
| Ethnicity & TMJ Clicking               | 0.1590        | 0.07472 to 0.2409       | 0.001*  |
| Pain on Opening or Chewing & Headaches | -0.1047       | -0.1883 to -0.01950     | 0.0081* |

\*P < 0.05.



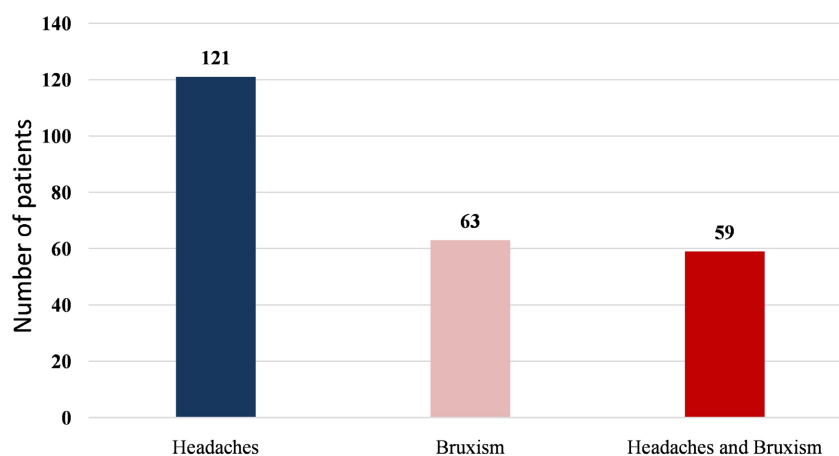
**Figure 1.** Age range distribution of the patients.

In addition, a statistically significant correlation between pain on opening or chewing and headaches was also observed (P = 0.0081) (Table 2). The clinical notes of the patients indicated that the majority of TMD patients presented with headache only 22.87%, followed by bruxism (11.9%), and headache and bruxism at the same time 11.15% (Figure 2).

Table 3 illustrates the presence and the type of headache among the examined patients who presented with TMD symptoms; the majority of patients did not report the site of the headache, while 5.1% had a temporal headache (Table 3).

**Table 3.** Reported headache site of the TMD patients.

| Headaches                    | %      |
|------------------------------|--------|
| No Headaches                 | 11.53% |
| Headache Temporal            | 5.10%  |
| Headache Frontal             | 0.38%  |
| Headache Region Not Reported | 82.60% |
| Headache occipital           | 0.38%  |

**Figure 2.** TMD patients who presented with headache and/or bruxism.

#### 4. Discussion

The hypothesis of the existence of a correlation between bruxism, TMD and headaches was accepted. The present retrospective study aimed to examine a correlation between patients with TMD, bruxism, and headache through subjective data obtained from questionnaires. The majority of the populations in this study were females at 64.65%. The fact that the majority of our study populations were women could have influenced the results to some degree.

According to Alkhudhairy *et al.*, women present with TMD signs and symptoms more times than men. [18] Caucasians were the majority at 33.58% in our study. According to Hasselbacher *et al.*, sleep bruxism is more common in Caucasians than in Hispanics and African Americans. [19]

The present investigation has shown that females demonstrated more TMJ clicking or TMJ noises during function, which is considered as one of the most common signs of TMD. [20] TMJ sounds are often indicative of mechanical interferences with the joint and had no correlation with gender and TMJ sounds. [20] Other studies have found TMJ sounds to be significantly more common in girls than boys, so the data is conflicting. [21] [22] [23] Women report more bruxism and TMD. It has been suggested that estrogen hormone levels in women may have been associated with TMD pain. [13] Menopausal women are more likely to have TMD than non-menopausal women. [13] Women suffering from TMD may have more progesterone and estrogen receptors in their TMJ. [13] Adults aged 29 - 34 had more pain on opening than other age groups evaluated.

Women have a peak in bruxism and the prevalence of bruxism has been shown to decrease with age. [13]

Caucasians had more TMJ clicking. TMD pain is a symptom of TMD that requires special attention and Caucasians are more likely to report pain than African Americans and Asians. [3] This study found a correlation between pain on opening and chewing and headaches. Restricted mouth opening is a symptom of TMD. [23] Adults with TMD also frequently report impaired mastication due to fatigue in the TMJ and muscular dysfunction. [23] This can impact the patients' chewing ability and which will lead them to modify their diet to softer options impacting their quality of life. [24]

Headaches and TMD are always related to each other in most reported cases. [18] In most cases, headaches and TMD are both due to the pathophysiology cause. [18] An increased central sensitization to pain is determined by headaches, and exacerbation of the pain symptoms in the craniocervical-mandibular joint. [25] Our data agree to support Nilsson & List's study who observed that those with TMD reported more headaches than those without TMD. [26] [27] The patients in our study that we examined with TMD symptoms also presented with headache in the majority of patients. TMD and headache usually occur hand in hand due to the pathophysiology of the disease. [18] Tension type headaches are the most common type of headaches patients with TMD experience. [18] Out of 184 patients with TMD symptoms, 121 of the patients also had headaches. Out of the 184 patients with TMD symptoms, 63 of the patients also presented with bruxism. Out of those 63 patients, 59 of them also presented with headaches.

Using the program AxiUm, students would question the patients and ask about their medical history. 82.60% of the patients stated they had a headache and did not report the region. This could be due to the student not asking the patient which region the headache was or simply because the patient needed to know where the headache was located. Of the patients who did report the region, temporal was the most common region at 5%. Only 11.53% of the patients did not have a headache. Previously, it was reported that those who reported headaches in the temporal area were more likely to have pain or stiffness in the jaw upon awakening. [18] [28] Those with pain in the temporal region also had pain upon chewing and opening. [17] [27] Those who clenched and bruxed had more incidence of headaches. [18] In future studies, students can be more diligent about asking which region of the head the patient has a headache. The limitation of the present study was that it included only complete files; several patients who were bruxers and had signs of TMD and headache were excluded due to incomplete files; also, there is a future specification to pay attention to the type of bruxism since recent research indicated that the type of bruxism, either awake or sleep bruxism, was associated with TMD pain compliance. [29] [30]

## 5. Conclusion

Within the limitations of the present study, there was an association between

bruxism, headaches, and temporomandibular disorder. Caucasians and females presented with more TMJ clicking than the other study subjects. Young adults, in particular, experienced more pain on opening or chewing. There was significance between ethnicity and TMJ clicking, also between pain on opening or chewing and headaches.

### Acknowledgements

The authors would like to thank Dr. David Cappelli, and Dr. Anthony J. Fusco for their time, guidance, and contributions.

### Author Contributions

**AM:** carried out the data collection and analysis in addition to drafting the manuscript; **PG:** carried out the data collection and analysis; **TA:** participated in the conception and participated in the viewing of the manuscript; **NHA:** participated in the conception, performed the analysis and interpretation of data and preparation and revision of the manuscript.

All authors read and approved the final manuscript.

### Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

### References

- [1] Hylander, W.L. (2006) Functional Anatomy and Biomechanics of the Masticatory Apparatus. In: Laskin, D.M., Greene, C.S., Hylander, W.L., Eds., *Temporomandibular Disorders: An Evidenced Approach to Diagnosis and Treatment*, Quintessence Publishing Company, Ltd., New York, 3-4.
- [2] Muzaley, K., van Selms, M.K. and Lobbezoo, F. (2018) No Dose-Response Association between Self-Reported Bruxism and Pain-Related Temporomandibular Disorders: A Retrospective Study. *Journal of Oral & Facial Pain and Headache*, **32**, 375-380. <https://doi.org/10.11607/ofph.2090>
- [3] Dimitroulis, G. (2018) Management of Temporomandibular Joint Disorders: A Surgeon's Perspective. *Australian Dental Journal*, **63**, S79-S90. <https://doi.org/10.1111/adj.12593>
- [4] Memmedova, F., Emre, U., Özgür Yalın, O., and Doğan, O.C. (2021) Evaluation of Temporomandibular Joint Disorder in Headache Patients. *Neurological Sciences*, **42**, 4503-4509. <https://doi.org/10.1007/s10072-021-05119-z>
- [5] Chien, Y.C., Seferovic, D., Holland, J.N., Walji, M.F. and Adibi, S.S. (2020) When Should Sleep Bruxism Be Considered in the Diagnosis of Temporomandibular Disorders? *Oral Surgery, Oral Medicine, Oral Pathology and Oral Radiology*, **130**, 645-650. <https://doi.org/10.1016/j.oooo.2020.08.029>
- [6] Abdel-Gawwad, E.A., Abdullah, A.A., Farhat, M.Y. and Helal, M.A. (2021) Effect of Using Photobiomodulation, Stabilization, and Anterior Repositioning Splints on the Pain Level of Subjects with Temporomandibular Joint Disc Displacement with Reduction. *Brazilian Dental Science*, **24**, 1-8. <https://doi.org/10.4322/bds.2021.e2670>

- [7] Bertoli, F.M., Bruzamolín, C.D., Pizzatto, E., Losso, E.M., Brancher, J.A. and de Souza, J.F. (2018) Prevalence of Diagnosed Temporomandibular Disorders: A Cross-Sectional Study in Brazilian Adolescents. *PLOS ONE*, **13**, e0192254. <https://doi.org/10.1371/journal.pone.0192254>
- [8] Al-Khotani, A., Naimi-Akbar, A., Albadawi, E., Ernberg, M., Hedenberg-Magnusson, B. and Christidis, N. (2016) Prevalence of Diagnosed Temporomandibular Disorders among Saudi Arabian Children and Adolescents. *The Journal of Headache and Pain*, **17**, Article No. 41. <https://doi.org/10.1186/s10194-016-0642-9>
- [9] Aravena, P.C., Arias, R., Aravena-Torres, R. and Seguel-Galdames, F. (2015) Prevalence of Temporomandibular Disorders in Adolescents of Southern Chile in 2015. *Revista Clínica de Periodoncia, Implantología y Rehabilitación Oral*, **9**, 244-252. <https://doi.org/10.1016/j.piro.2016.09.005>
- [10] Nguyen, M.S., Jagomägi, T., Nguyen, T., Saag, M. and Voog-Oras, Ü. (2017) Symptoms and Signs of Temporomandibular Disorders among Elderly Vietnamese. *Proceedings of Singapore Healthcare*, **26**, 211-216. <https://doi.org/10.1177/2010105817694907>
- [11] Bagis, B., Ayaz, E.A., Turgut, S., Durkan, R. and Özcan, M. (2012) Gender Difference in Prevalence of Signs and Symptoms of Temporomandibular Joint Disorders: A Retrospective Study on 243 Consecutive Patients. *International Journal of Medical Sciences*, **9**, 539-544. <https://doi.org/10.7150/ijms.4474>
- [12] Warren, M.P. and Fried, J.L. (2001) Temporomandibular Disorders and Hormones in Women. *Cells Tissues Organs*, **169**, 187-192. <https://doi.org/10.1159/000047881>
- [13] Ekman, A., Rousu, J., Näpänkangas, R., Kuoppala, R., Raustia, A. and Sipilä, K. (2020) Association of Self-Reported Bruxism with Temporomandibular Disorders-Northern Finland Birth Cohort (NFBC) 1966 Study. *The Journal of Craniomandibular & Sleep Practice Latest Articles*, 1-6. <https://doi.org/10.1080/08869634.2020.1853306>
- [14] Blanco, A.A., Gonzalez, L.L., Blanco, A.E., et al. (2014) Relationship between Self-Reported Sleep Bruxism and Pain in Patients with Temporomandibular Disorders. *Journal of Oral Rehabilitation*, **41**, 564-572. <https://doi.org/10.1111/joor.12172>
- [15] Vieira, K., Folchini, C., Heyde, M., Stuginski-Barbosa, J., Kowacs, P. and Piovesan, E. (2020) Wake-Up Headache Is Associated with Sleep Bruxism. *The Journal of Head and Face Pain*, **60**, 974-980. <https://doi.org/10.1111/head.13816>
- [16] Fernandes, G., de Siqueira, J.T.T., de Godoi Gonçalves, D.A. and Camparis, C.M. (2014) Association between Painful Temporomandibular Disorders, Sleep Bruxism and Tinnitus. *Brazilian Oral Research*, **28**, Article 3. <https://doi.org/10.1590/1807-3107BOR-2014.vol28.0003>
- [17] Carra, M.C. (2019) Obstructive Sleep Disordered Breathing, Sleep Bruxism and Periodontal Diseases. *Orthodontie Française*, **90**, 301-310. <https://doi.org/10.1684/orthodfr.2019.190023>
- [18] Ramel, F., Jader, G., Saegh, L., Hadad, A., Alalwan, T., Shaikh, D. and Bandar, M. (2018) A Self-Reported Association between Temporomandibular Joint Disorders, Headaches, and Stress. *Journal of International Society of Preventive and Community Dentistry*, **8**, 371-380. [https://doi.org/10.4103/jispcd.JISPCD\\_177\\_18](https://doi.org/10.4103/jispcd.JISPCD_177_18)
- [19] Hesselbacher, S., Subramanian, S., Rao, S., Casturi, L. and Surani, S. (2014) Self-Reported Sleep Bruxism and Nocturnal Gastroesophageal Reflux Disease in Patients with Obstructive Sleep Apnea: Relationship to Gender and Ethnicity. *The*



- Open Respiratory Medicine Journal*, **8**, 34-40.  
<https://doi.org/10.2174/1874306401408010034>
- [20] Feteih, R.M. (2006) Signs and Symptoms of Temporomandibular Disorders and Oral Parafunctions in Urban Saudi Arabian Adolescents: A Research Report. *Head & Face Medicine*, **2**, Article No. 25. <https://doi.org/10.1186/1746-160X-2-25>
- [21] Farsi, N. (2003) Symptoms and Signs of Temporomandibular Disorders and Oral Parafunctions among Saudi Children. *Journal of Oral Rehabilitation*, **30**, 1200-1208. <https://doi.org/10.1111/j.1365-2842.2003.01187.x>
- [22] Egermark-Eriksson, I., Carlsson, G.E. and Ingervall, B. (1981) Prevalence of Mandibular Dysfunction and Orofacial Parafunction in 7-, 11- and 15-Year-Old Swedish Children. *The European Journal of Orthodontics*, **3**, 163-172. <https://doi.org/10.1093/ejo/3.3.163>
- [23] Solberg, W.K., Woo, M.W. and Houston, J.B. (1979) Prevalence of Mandibular Dysfunction in Young Adults. *The Journal of the American Dental Association*, **98**, 25-34. <https://doi.org/10.14219/jada.archive.1979.0008>
- [24] Gilheaney, Ó., Stassen, L.F. and Walshe, M. (2020) The Epidemiology, Nature, and Impact of Eating and Swallowing Problems in Adults Presenting with Temporomandibular Disorders. *Cranio*, **40**, 476-484.
- [25] de Melo Júnior, P.C., Lins Aroucha, J.M.C.N., Arnaud, M., de Souza Lima, M.G., Gomes, S.G.F., Ximenes, R., Rosenblatt, A. and de França Caldas, A. (2019) Prevalence of TMD and Level of Chronic Pain in a Group of Brazilian Adolescents. *PLOS ONE*, **14**, e0205874. <https://doi.org/10.1371/journal.pone.0205874>
- [26] Ing-Marie, N. and List, T. (2020) Does Adolescent Self-Reported TMD Pain Persist into Early Adulthood? A Longitudinal Study. *Acta Odontologica Scandinavica*, **78**, 377-383. <https://doi.org/10.1080/00016357.2020.1730000>
- [27] Bevilaqua-Grossi, D., Chaves, T.C., de Oliveira, A.S. and Monteiro-Pedro, V. Anamnestic Index Severity and Signs and Symptoms of TMD. *The Journal of Craniomandibular & Sleep Practice*, **24**, 112-118. <https://doi.org/10.1179/crn.2006.018>
- [28] Ohlmann, B., Waldecker, M., Leckel, M., Bömicke, W., Behnisch, R., Rammelsberg, P. and Schmitter, M. (2020) Correlations between Sleep Bruxism and Temporomandibular Disorders. *Journal of Clinical Medicine*, **9**, Article 611. <https://doi.org/10.3390/jcm9020611>
- [29] Khayat, N., Winocur, E., Emodi, P.A., Friedman-Rubin, P., Gafni, Y. and Shpack, N. (2021) The Prevalence of Posterior Crossbite, Deep Bite, and Sleep or Awake Bruxism in Temporomandibular Disorder (TMD) Patients Compared to a Non-TMD Population: A Retrospective Study. *The Journal of Craniomandibular & Sleep Practice*, **39**, 398-404. <https://doi.org/10.1080/08869634.2019.1650217>
- [30] Boscato, N., Nascimento, G.G., Leite, F.R., Horta, B.L., Svensson, P. and Demarco, F.F. (2021) Role of Occlusal Factors on Probable Bruxism and Orofacial Pain: Data from the 1982 Pelotas Birth Cohort Study. *Journal of Dentistry*, **113**, Article 103788. <https://doi.org/10.1016/j.jdent.2021.103788>