Common mental disorders and bruxism in adults: a birth cohort study

Mateus de Azevedo Kinalski[a], Mariana Gonzalez Cadermatori[a], Bernardo Lessa Horta[b],
Marcos Britto Correa[a], Flavio Fernando Demarco[a], Tatiana Pereira-Cenci[a,*]

[a] Graduate Program in Dentistry, Federal University of Pelotas, Gonçalves Chaves St, 457, 96015-560, Pelotas, RS, Brazil
[b] Graduate Program in Epidemiology, Federal University of Pelotas, Marechal Deodoro St, 1160, 96020-220, Pelotas, RS, Brazil

ABSTRACT

Objectives: This study aimed to assess the prevalence of bruxism and its relationship with common mental disorders (CMD) during the life course of individuals.
Materials and methods: A representative sample (n = 537) of all 5914 births occurring in Pelotas in 1982 were prospectively investigated regarding their oral health. The CMD screening was assessed through *Self-Reported Questionnaire-20* (SRQ-20) at ages 22 and 30. Bruxism information was collected in the oral health survey at the age 31. Exploratory variables included demographic and socio-economic, mental health and unhealthy behaviours. Multivariate Poisson Regression analysis was used to estimate the association between bruxism and CMD.
Results: Bruxism prevalence was 41.1% at 31 years old. Presence of bruxism was positively associated with females (p = 0.003), lower school level (p = 0.001), and smoking habits (p = 0.021). CMD episodes were associated with bruxism (p < 0.001). Individuals presenting CMD at age of 30 years presented a 57% higher prevalence (PR 1.57; 95%CI 1.14–2.15) of bruxism, while in those individuals who presented CMD in both follow-ups (at 22 and 30 years old) the bruxism prevalence was 70% higher (PR 1.70; 95%CI 1.28–2.25).
Conclusion: Subjects presenting signals and symptoms of common mental disorders during their life course presented higher prevalence of bruxism.
Clinical significance: The presence of common mental disorders during life course impacts in the presence of bruxism in the adulthood. In addition, more episodes of common mental disorders were associated with higher prevalence of bruxism.

1. Introduction

Bruxism is a common health problem, occurring throughout life, with a prevalence ranging from 9 to 31% among adults [1,2]. This common muscle disorder characterized by tooth grinding or clenching that can occur when awake or during sleep [3] is considered multi-factorial with potential influences of the central nervous system. Bruxers have poorer sleep quality, excessive daytime sleepiness affecting both oral health-related and general quality of life of individuals [4].

Although signs and symptoms of bruxism are well known and can be often recognized, its etiology remains uncertain [5]. Several risk factors have been associated with bruxism, such as smoking, alcohol consumption, sleep disorders, gastro-esophageal reflux disease, and the presence of sleep bruxism in childhood [6–9]. Mental health status could influence oral health conditions [10]. In the last years, a possible association between mental health and bruxism has been investigated,

since psychological factors as anxiety and stress have also been described within the onset of bruxism [11]. Authors have highlighted bruxism as a central-regulated condition and, therefore, probably to have an intrinsic relationship with mental disorders. Presence of mental disorders could act as a trigger point to bruxism once they cause changes in the regulation of the central nervous system [12,13].

Common mental disorders (CMD) are a branch of mental health disorders described as non-psychotic conditions commonly represented by the two major conditions of depression and anxiety, irritability and somatic complaints [14]. These CMDs are also highly prevalent in adults often presenting comorbidities resulting in considerable disabilities and social impairments [15,16]. A systematic review showed that 29.2% of individuals have experienced a CMD in a certain occasion during their lifetime. Women had higher rates of mood and anxiety disorders and men had higher rates of substance use disorders [16]. Mental disorders have also been accounted for 9.5% of the causes of disabilities, with the highest proportion occurring in adulthood and in

* Corresponding author at: Graduate Program in Dentistry, Federal University of Pelotas, Rua Gonçalves Chaves, 457, 96015-560, Pelotas, RS, Brazil.
E-mail addresses: mateus_kinalsk@hotmail.com (M.d.A. Kinalski), marianacadermatori@gmail.com (M.G. Cadermatori), blhorta@gmail.com (B.L. Horta),
marcosbrittocorrea@hotmail.com (M.B. Correa), ffdemarco@gmail.com (F.F. Demarco), tatiana.cenci@ufpel.tche.br (T. Pereira-Cenci).

females. In addition, depressive and anxiety disorders were the most prevalent among the mental disorders investigated [17] and are expected to be the most prevalent chronic condition by the year 2050 [18].

Although studies have drawn attention to a contribution of CMD to bruxism, this issue is still uncertain [12,19]. As bruxism and CMD cause negative impacts in the quality of life of the general population, as aforementioned and considering the lack of consensus about a possible relationship between these two centrally regulated conditions, a study that investigates this issue is of great importance. There is none longitudinal study that investigated the association between CMD and bruxism occurrence. Cohort study are the best methodological approach to study life course epidemiology and to investigate if a determined exposure could influence the occurrence of an outcome [20]. This study aimed to investigate a possible association between common mental disorders and bruxism at age 31 in a birth cohort study.

2. Methods

This study was carried out in the 1982 Pelotas (Brazil) Birth Cohort Study [21]. Pelotas is a medium-sized city is located in the south of Brazil with a current population of around 344,000 inhabitants [22]. The 1982 Pelotas birth cohort is considered one of the largest and longest-running birth cohorts in low and middle-income countries. The Ethics Committee of the Federal University of Pelotas approved this study. Written informed consent was obtained from all enrolled individuals. The STROBE Statement for Epidemiological Studies was followed [23].

In the year 1982, 5914 children that born in one of the three maternity hospitals of Pelotas and whose families lived in the urban area of the city were included in this cohort. At birth, the liveborn were examined and their mothers were interviewed. Until the year 2018, twelve follow-ups of these individuals were performed, of which 3 follow-ups were specifically related to oral health. All interviews performed in the follow-ups covered aspects on socioeconomic conditions, habits related to health (such as dietary habits and alcohol consumption) and health conditions (including mental health). More details about methodology of follows-up in this cohort are available elsewhere [21].

The Oral Health Study (OHS) was performed in 1997 (OHS-97), at the age of 15, in which 900 of the 5914 participants were randomly selected. From these 900 participants, 888 individuals (98.7%) were dentally examined. The second OHS was performed in 2006 (OHS-2006), at 24 years old, where a total of 720 (81.1%) individuals were followed-up. In 2013, at age 31, the participants of the OHS-97 were again invited for the third OHS, in which 541 (61.0%) participants were examined. Data related to oral health used in this study comes from the OHS-2013 study. The OHS-2013 was composed by a questionnaire (including oral health hygiene habits, dental service use and bruxism) and a clinical examination (dental caries, periodontal disease, dental restorations, soft tissue lesions). The clinical examination was carried out for 8 dentists calibrated for each condition, while the questionnaire was applied by trained dental students. The follow-ups of 1982 Pelotas Birth Cohort is show in Fig. 1.

Bruxism was assessed at the age 31 using a validated questionnaire [24]. This tool consists of six questions as follows: a) "Has anyone heard you grinding your teeth at night?"; b) "Is your jaw ever fatigued or sore on awakening in the morning?"; c) "Are your teeth or gums ever sore on awakening in the morning?"; d) "Do you ever experience temporal headaches on awakening in the morning?"; d) "Are you ever aware of grinding your teeth during the day?"; e) "Are you ever aware of clenching your teeth during the day?". All questions present yes or no as answer categories. Individuals that positively answered two or more questions were classified as bruxers.

Common mental disorder (CMD) was the independent variable of interest considered. The *Self-Reported Questionnaire-20* (SRQ-20) [25], a

screening tool to evaluate CMD containing twenty items (alternatives yes or no), was applied at age 22 and at age 30. The authors considered a cut-off of 7/8 [26], where who answered more than eight questions positively was defined as with "presence of CMD". Finally, considering an accumulation-of-risk model, a CMD variable was created considering the number of episodes of CMD in the adulthood with the following categories: a) CMD absent; b) CMD present at the 22 age; c) CMD at the 30 age; d) CMD at both ages.

Demographic and socioeconomic characteristics and harmful health behaviors were collected as co-variates, as following: gender, family income (divided into quintiles) and schooling (until eight years of study and nine years or more). These variables were collected at age 30.

Smoking habit and alcohol use were the variables considered as harmful health behaviors. For the smoking habit, smokers were those subjects who smoked more than one cigarette per week. A variable named "Smoking trajectory" was created considering this habit throughout the 30 years of the individual's life. This variable was categorized as follows: a) never smoked; b) smoked until 22 years of age; c) always smoked. The alcohol use was evaluated at 30 years of age using the Alcohol Use Disorders Identification Test (AUDIT) [27]. The AUDIT is a validated tool recommended by the WHO for initial screening of pattern of alcohol use detecting people with probable alcohol problems of any type. This instrument is composed of twelve questions related to alcohol consumption in the last year with alternatives of responses on a 5-point *likert* scale. The overall score ranges from zero to 40 points, from zero to seven points classified as moderate intake, from eight to 15 points classified as a drinking pattern of risk, from 16 to 19 points classified as harmful use of alcohol, and from 20 to 40 points indicates possible dependence on alcohol. Answer were categorized as follows: a) non-drinker; b) moderate use; c) harmful use (including risk pattern, harmful use and dependence on alcohol categories).

Statistical analysis was performed using Stata Software 14.0 (Stata Corporation, College Station, TX, USA). A descriptive analysis was performed of the total sample and of those participants who were identified as non-bruxers and as bruxers according to covariates. Bivariate analysis was performed to test association between outcome (bruxism) and variables of interest using Chi-square test. Association between CMD and bruxism was assessed using Crude and Adjusted Poisson regression models with robust variance. The final model was adjusted by gender, education and harmful health behaviors (smoking trajectory and alcohol use), considered as confounders according to the Diagram Acyclic Graph (Fig. 2). Magnitudes of associations between CMD and Bruxism was estimated by Prevalence Ratio (PR) and 95% confidence intervals (CI). A significant level of 0.05 was adopted.

3. Results

Of the 888 participants of the OHS-97, 539 individuals were interviewed in 2013 (61% of OHS-97). Of these, two participants ignored the questions related to the bruxism assessment and, therefore, were considered as missing and the final sample was composed by 537 individuals. The flowchart of the 1982 Pelotas Birth Cohort is displayed in Fig. 1. Table S1 shows the comparison between the original sample cohort at birth and at 30 years of age and the sample assessed in the present study regarding sociodemographic variables. It is possible to observe that the sample of OHS-13 is comparable to the original cohort. The prevalence of bruxism at age 31 was 41.1% (n = 221). The prevalence of CMD at age 22 was 23.7% (n = 120) and at age 30 was 20.6% (n = 101) (data not shown).

Table 1 shows the distribution of sample stratified by the outcome (bruxism) considering interest variables. Most of participants was composed by men and by married individuals, had more than eight years of study, and reported a family income ranging from 1367 to 2115 American dollars per month. Considering financial support, more than 70% of participants started working at age 16 or older, working
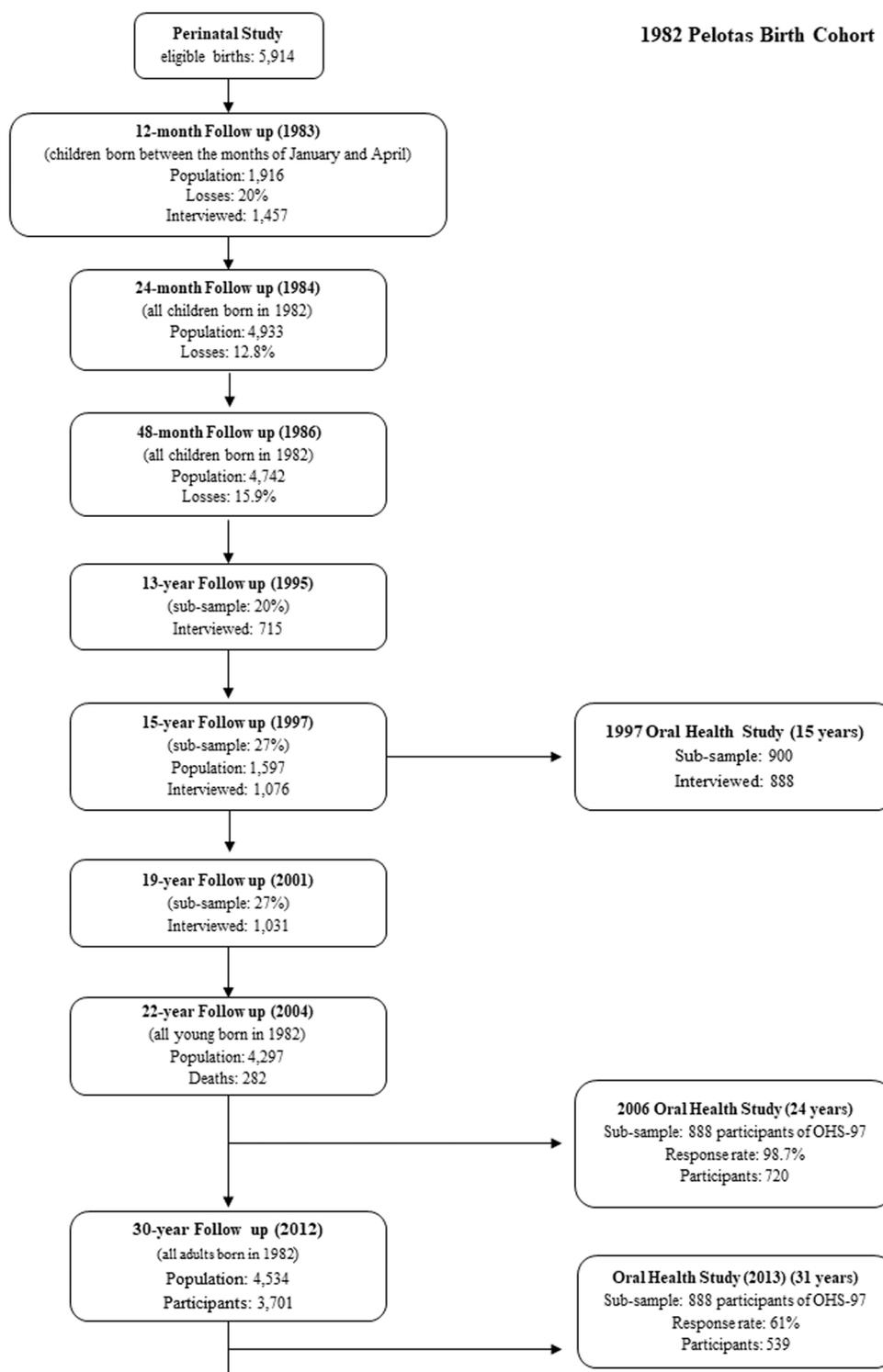
Fig. 1. The follow-ups of 1982 Pelotas Birth Cohort.

eight hours or less per day and reported living by their own salary. In addition, most participants never smoked and presented a moderate use of alcohol. About 14.7% of participants presented signals or symptoms of CMD in the two points of time (at 22 and 30 years of age).

Bivariate analysis is presented in Table 1. Bruxism was associated with gender where females presented higher prevalence of bruxism than male (p = 0.003), individuals who studied less than 8 years showed higher prevalence compared to those who studied more than eight years (p = 0.001) and individuals who smoked until 22 years old or always smoked presented higher prevalence of bruxism compared

with those who never smoked (p < 0.021). No relationship was found for alcohol use (p < 0.806) with the presence of bruxism.

The association between bruxism and episodes of CMD is presented in Table 2. In crude analysis, CMD episodes were associated with occurrence of bruxism (p < 0.001), remaining after adjustments. Individuals presenting episode of CMD at 30 years of age presented 57% higher prevalence of bruxism at age 31 (PR 1.57; 95%CI 1.14–2.15) compared to absence of CMD episodes. When those individuals who presented CMD in both follow-ups were considered (at age 22 and at age 30 years), an increase in prevalence of bruxism was found (PR 1.70;
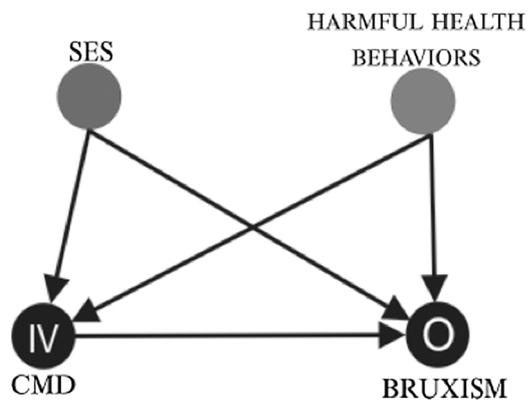
Fig. 2. Diagram acyclic graph.

95%CI 1.28–2.25).

4. Discussion

This is a population-based study evaluating the association between CMD and bruxism in individuals at 31 years of age. Overall, our findings showed a strong association between CMD occurrence and bruxism, with an increase in prevalence of bruxism as higher the number of episodes of CMD in adulthood. To the best of our knowledge, this is the first study that investigated the association between CMD and bruxism in a life-course perspective, using a population-based birth cohort.

According to recent defined criteria, a "possible bruxism" can be defined based on self-reported assessment, like a screening tool. Although a more predictable diagnosis should consider a further investigation using instrumental and clinical evaluation to improve this definition [3], self-reported assessment of bruxism has been recommended in literature as a useful diagnosis tool [24,28,29]. The self-reported tool could not specifically identify the intensity and duration of bruxism and the diagnosis often relies in the patient or a bed partner [30] and self-reported tools of bruxism present a limitation. Still, the present study is nested in a birth cohort with a large sample, and there are recommendations for the use of self-reported questionnaires on these circumstances aiming to assess bruxism and continues to be the primary tool to assess bruxism in this research field [24] as it may be the most feasible method to evaluate this condition in epidemiological studies once it represents a low-cost, easy-applicable and predictable tool for bruxism.

The cohort design provide reliable data collection throughout individuals' life, avoiding memory bias, and it allows the use of life course epidemiology approach, allowing the evaluation of expositions happening during the life course in the occurrence of some condition in different periods of the lifetime. In our study the main exposition tested was the presence of CMD symptoms, which was assessed two-times (at the ages 22 and 30) using SRQ-20 [25]. Our results demonstrated that individuals presenting CMD at least in one period had higher prevalence of bruxism compared to those individuals that had never experienced CMD. Also, those individuals presenting CMD in the two time points evaluated had a higher prevalence of bruxism compared to the individuals without CMD. In the life course epidemiology, the accumulation-of-risk model explains that individuals presenting more expositions of a determined risk factor would increase their odds of having a determined condition. For example, in this same birth cohort, individuals presenting more episodes of poverty during their life course were more prone to have unhealthy teeth at the early adult life [31] and these findings reinforce that when individuals have to deal with more episodes of CMD, these showed higher prevalence of bruxism. Thus, mental disorders are chronic conditions and these individuals presenting them for more periods of time could negatively impact their general health [14,16,32] and the same could be true for the oral health

Table 1

Descriptive analysis stratified by bruxism, considering socioeconomic and demographic characteristics, mental health, health behavior and financial support: 1982 Pelotas Birth Cohort (1982–2013, Brazil; n = 537).

Variables	Total sample n (%) [95%CI]	Non-bruxer n (%) [95%CI]	Bruxer n (%) [95%CI]	P value[*]
Demographic and socioeconomic characteristics				
Gender				0.003*
Male	272 (50.6) [46.3-54.9]	177 (65.1) [59.1-70.7]	95 (34.9) [29.2-40.9]	
Female	265 (49.4) [45.0-53.6]	139 (52.4) [46.2-58.5]	126 (47.6) [41.4- 53.7]	
Family income				0.597
1º quintil	91 (19.4) [15.9-23.2]	58 (63.7) [52.9-73.5]	33 (36.3) [26.4-47.0]	
2º quintil	94 (20) [16.5-23.9]	50 (53.2) [42.6-63.5]	44 (46.8) [36.4-57.3]	
3º quintil	94 (20) [16.5-23.9]	58 (61.7) [51.1-71.5]	36 (38.3) [28.4-48.8]	
4º quintil	97 (20.7) [17.1-24.6]	60 (61.9) [51.4-71.5]	37 (38.1) [28.4-48.5]	
5º quintil	93 (19.9) [16.3-23.7]	58 (62.4) [51.7-72.2]	35 (37.6) [27.7-48.2]	
Schooling				0.001*
> 8 years	379 (77.2) [73.2-80.8]	243 (64.1) [59.1-68.9]	136 (35.9) [31.0-40.9]	
≤8 years of studies	112 (22.8) [19.1-26.7]	53 (47.3) [37.8-56.9]	59 (52.7) [43.0-62.1]	
Mental health				
CMD episodes				< 0.001*
Absent	286 (61) [64.0-72.6]	196 (68.5) [62.8-73.8]	90 (31.5) [26.1-37.1]	
CMD at one point (22 years)	61 (13.0) [10.1-16.3]	31 (50.8) [37.6-63.8]	30 (49.2) [36.1-62.3]	
CMD at one point (30 years)	53 (11.3) [8.58-14.51]	26 (49.1) [35.0-63.1]	27 (50.9) [36.8-64.9]	
CMD at two points	69 (14.7) [11.63-18.24]	27 (39.1) [27.5-51.6]	42 (60.9) [48.3-72.4]	
Harmful health behaviors				
Smoking trajectory				0.021*
Never smoked	314 (64) [59.5-68.2]	203 (64.6) [59.1-69.9]	111 (35.4) [30.1-40.9]	
Smoked until 22 years of age	82 (16.7) [13.5-20.2]	46 (56.1) [44.6-67.0]	36 (43.9) [32.9-55.3]	
Always smoked	95 (19.3) [15.9-23.1]	47 (49.5) [39.1-59.9]	48 (50.5) [40.1-60.9]	
Alcohol use				0.806
Non drinker	17 (3.5) [2.0-5.4]	11 (64.7) [38.3-85.7]	6 (35.3) [14.2-61.6]	
Moderate use	374 (76.3) [72.3-80.0]	223 (59.6) [54.4-64.6]	151 (40.4) [35.3-45.5]	
Harmful use	99 (20.2) [16.7-24.0]	62 (62.6) [52.3-72.1]	37 (37.4) [27.8-47.6]	

Bivariate analysis using Chi-squared test.

  * p value ≤0.005.

Table 2

Crude and adjusted Prevalence Ratio (PR) for association between sleep bruxism and CMD trajectory considering socioeconomic and demographic characteristics, mental health, health behavior and financial support in individuals age 31: 1982 Pelotas Birth Cohort, 1982–2013, Brazil (n = 468).

Variable/Category	Crude analysis PR [c] (95% CI)	P value[*]	Adjusted analysis PR[a] (95% CI)	P value[*]
CMD		< 0.001		< 0.001
CMD absent	1.00		1.00	
CMD at the age 22	1.56 (1.14-2.12)		1.41 (1.01-1.97)	
CMD at the age 30	1.62 (1.18-2.21)		1.57 (1.14-2.15)	
CMD at the age 22 and 30	1.93 (1.49- 2.49)		1.70 (1.28-2.25)	
−2 log likelihood	706.81		664.13	
	(Empty model)			

Poisson Regression. Multivariate analysis was adjusted for gender, education, family income, smoking trajectory and alcohol use.

 * p value ≤0.005.

[10]. As evidenced for our findings more periods of mental disorders symptoms seem to have a cumulative effect on the bruxism occurrence.

In the past few years, bruxism etiology has changed from a peripheral to a central-regulated condition [13]. In general, some characteristics originated from this system has been described as potential factors associated with the increase or bruxism triggering, as psychological factors, neurochemical network and medications that can act centrally [33–35]. CMD was strongly associated with bruxism considering important confounders patterns in the analysis. Interestingly, individuals who showed more episodes of CMD had higher prevalence of bruxism compared to those who had shown one episode of CMD (22 or 30 years old). In this perspective, it may be hypothesized that there is a complex social environment in which all subjects are involved directly, and when a person presents more episodes of CMD through his/her life course is expected that this person lives a higher amount of time exposed to these mental health effects being more prone to present an important risk factor for bruxism in this trajectory. Also, psychological factors influencing bruxism during lifetime are reported since childhood [36] and has been observed that the presence of depression, anxiety symptoms and stressful events occurring in mothers could influence the presence of sleep bruxism in their offspring [7]. Thus, as a centrally regulated condition, it may be said that those common mental disorders occurring through life and the number of episodes may be directly associated to the development of bruxism.

Moreover, it has been hypothesized that bruxism and CMD conditions could be associated [11,37]. The etiology of common mental disorders is multifactorial and must consider psychological, biological and social factors [14,15,32]. Importance should be given to the fact that risk factors related to CMD are influenced by poverty, unemployment, alcohol/drugs use and physical illness [18]. In similarity, bruxism has a mechanism that appears to be close to CMD's etiology and a reasonable consideration about bruxism as a multifactorial condition must be evidenced. A recent systematic review showed that the highest prevalence of bruxism occurs during 30–40 years old and there is a trend of reducing prevalence during ageing [2]. In the present study individuals were evaluated for bruxism at 31 years old, stage of life where bruxism presents the higher occurrence and, for this reason, assessment of risk factors considering this condition become rather important. Once prevalence of CMD is around 29.2% through life and individuals may experience some CMD during lifetime [16] the risk of bruxism across this trajectory becomes a potential fact. Although bruxism could not represent a risk factor for damages by itself, if there is an association with different conditions [30], as CMD, bruxism must be considered as a negative health outcome. Noteworthy, the association between common mental disorders and bruxism affected negatively these individuals, once they can produce suffering and increase the risk of damages during their life course.

Few studies have evaluated longitudinally the relationship between mental disorders and oral health. In the present study, CMD were evaluated using the SRQ-20 [25], applied in two different periods of life, considering early adulthood and adulthood at 22 and 30 years old respectively. In a recent systematic review, SRQ-20 presented the strongest psychometric properties and has been highly recommended as a screening method for CMD in low and middle-income countries [38]. The present study considered this longitudinal characteristic of CMD during individual´s life and impacts of these disorders related to the presence of bruxism at 31 years old. This aspect is important and should be considered that subjects life trajectory, e.g. behavior characteristics, socioeconomic profile and psychological properties must be considered especially when bruxism is evaluated. For this reason, importance should be given to the fact that this was one of the few studies to consider the impact of mental health and presence of bruxism, although individuals were not evaluated during childhood and CMD were evaluated in two periods of life. These results should be interpreted with caution while it is suggested that other longitudinal studies are performed in order to clarify the real relationship between CMD and the occurrence of bruxism during life.

5. Conclusion

Based on the results of this study, it may be concluded that subjects presenting signals and symptoms of common mental disorders during their life course presented higher prevalence of bruxism.

Declaration of interest

The authors declare no conflict of interest.

Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.jdent.2019.02.003.

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