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Full Length Research Paper

Anxiety, Insomnia and Excessive Daytime Sleepiness in Sleep Bruxism Patients

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Sleep bruxism is considered a sleep-related movement disorder. Bruxism is characterized by repetitive jaw-muscle activity, by grinding of the teeth and clenching the jaw. The objective of this study was to determine the association between anxiety, insomnia and excessive daytime sleepiness in a group of patients with clinical sleep bruxism. For this propose thirty-nine volunteers (14 males, 25 females) participated in this study. Participants were divided in two groups: sleep bruxism (n=20) and non-sleep bruxism(n=19) based on clinical evaluation. Beck Anxiety Inventory, Athens Insomnia Scale and Epworth Sleepiness Scale test were used to determine anxiety, insomnia and sleepiness respectively. The descriptive and inferential analysis shows that 75% of sleep bruxism participants displayed anxiety and insomnia. A positive correlation was found between anxiety and insomnia in sleep bruxism, rho=0.725, p<0.05. Excessive Daytime Sleepiness was present in 40% of the bruxers. In conclusions, the association of anxiety and insomnia with the presence of sleep bruxism is evident. These disorders induce sleep fragmentation that results in a poor quality of life.

Keywords: Sleep bruxism, anxiety, insomnia, excessive daytime sleepiness.

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List of Abbreviations

Sleep bruxism, SB; Non-sleep bruxism, non-SB; Beck Anxiety Inventory, BAI; Athens Insomnia Scale, AIS; Epworth Sleepiness Scale test, ESS

INTRODUCTION

Bruxism is defined as the repetitive jaw-muscle activity, characterized by clenching or grinding the teeth and/or grinding the teeth and clenching the jaw (Lobbezoo et al., 2013).

There are two different kinds of bruxism: sleep bruxism (SB) and awake bruxism. The awake bruxism is commonly a semi-involuntary clenching activity.SB occurs in all age groups, with similar incidence in both genders (Lavigne et al., 1999; Ohayon et al., 2001) and it has a prevalence of 12.8 ± 3.1% in adults (Manfredini et al., 2013). In 1990 SB was classified as parasomnia in the first version of the International Classification of Sleep Disorders (ICSD-1) (Thorpy 1990). However, in the revised version (2005, 2007), SB was reclassified into the new category, ‘‘sleep-related movement disorders’’ (International Classification of Sleep Disorders, 2005; International Classification of Sleep Disorders, 2012; International Classification of Sleep Disorders, 2014).

SB is diagnosed primarily by the deterioration of teeth, polishing of dental restorations, alteration in periodontal tissues, a limited mouth opening, headache after waking up in the morning, pain in the temporomandibular joint, and the neck muscles (Behr et al., 2012; Carra et al., 2012; Lavigne et al., 2007). SB is considered a multifactorial disease and is, mainly of central nervous system origin. Some factors responsible for inducing bruxism are disorders in the orofacial anatomy, alterations in the dopaminergic pathway and high levels of anxiety (Lobbezoo and Naeije, 2001; Reddy et al., 2014).

It has been shown that SB patients have higher levels of perceived stress than non-SB; consequently cortisol is increased in SB patients (Karakoulaki et al., 2005). Stressors such as daily problems, trouble at work, and physical problems have been correlated with increased teeth grinding (Giraki et al., 2010). In this sense, rodents biting on a wooden stick during restraint (stress by immobilization), significantly suppressed the increase of blood pressure and inhibited the rise in core temperature compared with rats that were only restrained (Okada et al., 2007). These results suggest that biting produces an anti-stress effect and that para-functional masticatory activity plays an important role in coping with stressful events (Tsuda et al., 1988; Hori et al., 2004; Okada et al., 2007; Gómez et al., 2010).

On the other hand, SB is associated with other disorders such as obstructive sleep apnea (Kato et al., 2013; Saito et al., 2014), restless legs syndrome, periodic limb movement (Van der Zaag et al. 2014) and oral mandibular myoclonus. It has been reported that more than 80% of episodes of SB are followed by micro-arousals, which may induce sleep fragmentation (Macaluso et al., 1998; Kato et al., 2001; Van der Zaag et al., 2014).

The association between SB and disorders like anxiety, insomnia and excessive daytime sleepiness has not been studied in detail. Therefore, the aim of this study was to determine the association between anxiety, insomnia and daytime sleepiness in a group of patients with clinical evidence of SB.

METHODS

Study design

This study was observational, cross-sectional and analytical. The participants were recruited from the Dental Clinic of Universidad Veracruzana, Medical Center of the State of Veracruz and Medical Clinic Millenium. This study complied with the ethical considerations and was authorized by the health services of the State of Veracruz (number SEI/2013/06/31 and CEMEV:39/13). All participants were informed about the details of the study and they signed an informed consent, privacy and strict confidentiality was maintained at all times.

Participants

A sample of 39 participants (14 male, 25 female) between 18 and 50 years old were included in this study. The size of the sample was not probabilistic because the low incidence of SB. Each participant was clinically evaluated. Clinical evaluation included an examination of the head, neck and oral cavity. After clinical evaluation the patients were divided in two groups: patients without bruxism (non-SB) (n=19) and SB patients (n=20). The average age of SB group was 30.45 ± 2.28 years, 70% of which were women. The control group had an average age of 27.05 ± 02.01 years; 58% of them were women.

The SB group included subjects who reported grinding or clenching of the teeth during sleep which is evidence for deterioration of dental organs, pain in the temporomandibular joint and at least one of the following clinical criteria during the dental-facial examination: polishing of dental restorations, pain in the masticatory muscle, limitation of movement or mouth opening, periodontal inflammation and/or headache after waking up in the morning (Lavigne et al., 2007; Behr et al., 2012; Carra et al., 2012).

Anxiety, insomnia and excessive daytime sleepiness were determined in all participants using the Beck Anxiety Inventory (BAI) (Osman et al., 2004; Wang and Gorenstein, 2013), Athens Insomnia Scale (AIS) (Lomelí et al., 2008; Gómez-Benito et al., 2011) and Sleepiness Scale Epworth (EES) (Murray, 1992; Sandoval-Rincón et al., 2013), respectively. All these tests have been validated in mexican populations. The specialist applied the tests immediately after clinical examination using the method face to face.

Statistical methods

The generalized linear models and a unifactorial design with Poisson distribution were used to study associations between categorical variables of SB, anxiety, insomnia, and excessive diurnal somnolence. This test was used because the data did not meet the assumptions of a normal distribution (Lee and Nelder, 1996). The Spearman correlation test was used to evaluate relationships involving ordinal variables. Values between 0.8 to 1 obtained with this test: meant high correlation; values between 0.4 and 0.79 medium correlation and values between 0.01 to 0.39 low correlation. Data were analyzed using statistical software (Statistica 7). A $p<0.05$ or lower was considered significant.

RESULTS

According to the BAI, the anxiety level in the patients with SB was higher compared to non-bruxism subjects, 75% vs 57.8%,of which 35% showed anxiety in a low degree and 40% in a moderate degree; while 26.3% did for non-SB for both categories (Figure1A). We did not find SB patients with severe degree of anxiety (Figure1A).

With regard to the assessment of insomnia, the results showed that 50 and 20% of subjects with SB experienced insomnia in both low and moderate degree, respectively, compared to 42.1 and 5.2% of non-SB subjects (Figure 1B).

The ESS data showed that only 5% of SB patients experienced daytime sleepiness in a moderate degree, 35% in a low degree, and 60% of participants did not experience somnolence (Figure 1C). Interestingly, 40% of subjects with SB reported excessive diurnal somnolence in both low and moderate degrees compared to 20.98% of non-SB subjects.

An inferential analysis between SB and non-SB groups,considering the total score for each subject in the different tests (BAI, AIS and ESS), shows significant differences for anxiety and insomnia between SB and non-SB groups (Table 1).

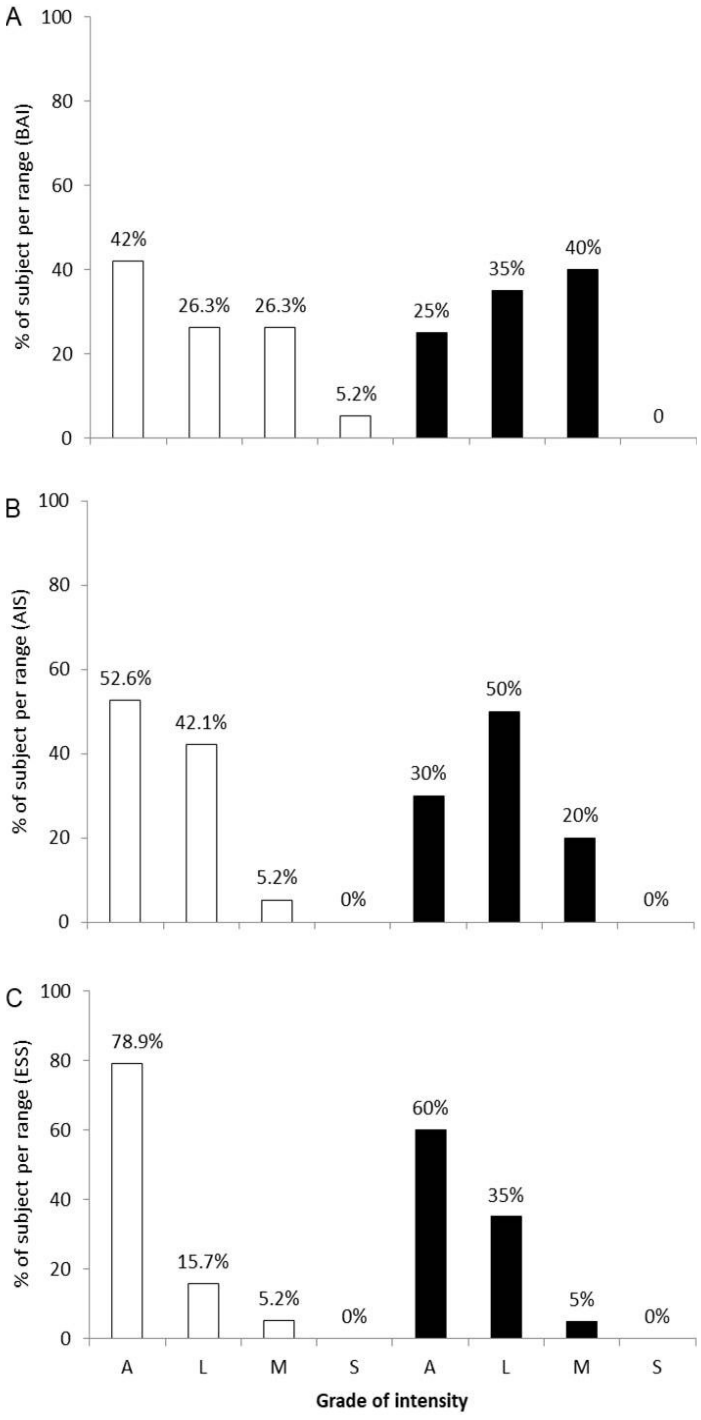

Figure 1. Percentage obtained in rates of anxiety, insomnia and excessive daytime sleepiness in sleep bruxism. White and Black bars represent non-bruxism and bruxism sleep subjects, respectively. Panel **A.** BAI=Beck Anxiety Inventory, score A=Absence 0-9, L=Low 10-18, M=Moderate 19-29, S= Severe 30-63. Panel **B.** AIS= Athens Insomnia Scale, score A=Absence 0-6, L=Low 7-12, M=Moderate 13-18, S=Severe 19-24. Panel **C.** ESS=Sleepiness Scale Epworth, score A=Absence 0-6, L=Low 7-13, M= Moderate 14-19, S=Severe 20-24.

Table 1. Score obtained in the test of anxiety, insomnia and daytime sleepiness in subjects with sleep bruxism and non-bruxism.

Test	Non-SB	SB	χ^2	p value
BAI	13.05±2.29	15.75±1.59	**4.89**	**0.026***
AIS	6.94±0.84	9.30±0.97	**6.65**	**0.009***
ESS	4.42±0.74	5.8±0.75	3.63	0.056

Mean values (± S.E.). BAI=Beck Anxiety Inventory, AIS=Athens Insomnia Scale; ESS=Epworth Sleepiness Scale. χ^2: Chi-square,

Table 2. Spearman correlation values obtained between age, anxiety, insomnia, and excessive daytime sleepiness in each group

Variable	non-Bruxism rho	Correlation non-Bruxism	Sleep Bruxism rho	Correlation Sleep Bruxism
Age vsBAI	0.111	Low	0.088	Low
Age vs AIS	0.206	Low	0.276	Low
Age vs ESS	0.284	Low	0.358	Low
BAI vs ESS	0.187	Low	0.028	Low
AIS vs ESS	0.075	Low	0.140	Low
AIS vs BAI	0.453	Low	**0.725***	**Medium**

BAI= Beck Anxiety Inventory, AIS= Athens Insomnia Scale; ESS= Epworth Sleepiness Scale. rho= Spearman correlation, *p<0.05.

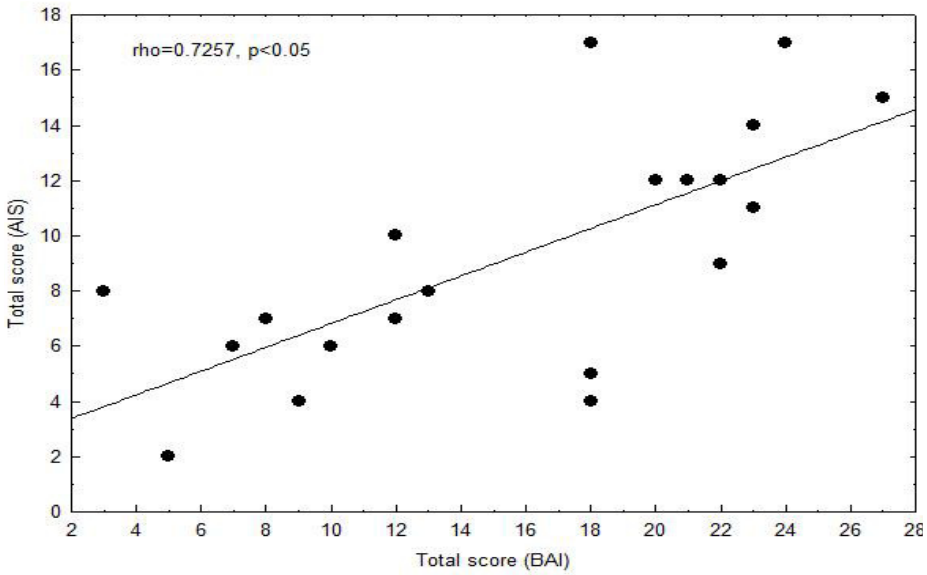

Figure 2. Interaction between anxiety and insomnia in sleep bruxism patients. These data showed a positive correlation, BAI= Beck Anxiety Inventory, AIS= Athens Insomnia Scale; rho= Spearman correlation; p<0.05

A Spearman correlation analysis between SB and non-SB groups was carried out using the total score for each subject in the different tests (BAI, AIS and ESS). A low correlation was found between anxiety, insomnia and excessive daytime sleepiness in SB patients (Table 2). Age also showed a low correlation with the result of each of these tests. Anxiety and insomnia also showed low correlation with excessive daytime sleepiness. However, medium correlation was found between anxiety and insomnia in SB patients compared with non-SB (Table 2).

The interaction between anxiety and insomnia in SB shows a positive correlation (rho=0.72, p<0.05), when anxiety increased insomnia also increased (Figure 2).

DISCUSSION

The present results showed that a higher percentage of SB patients have low and moderate anxiety levels compared to non-SB; suggesting that anxiety may be related, in part, to the mechanisms that induce bruxism events during the night. In addition, the correlation between anxiety and insomnia observed in SB patients also suggest that anxiety induces insomnia. Events such as clenching and grinding of the teeth are often observed in individuals with stress and anxiety disorders (Manfredini et al., 2005). It has been reported that stress and/or anxiety can alter the chewing function, because the emotional centers of the brain are activated as well as the facial muscle by some sympathetic stimulation (Ahlberg et al., 2003; Okeson, 2013). For example, during sleep bruxism event; both the phasic and the tonic contractions of the masticatory muscles causes micro-awakenings, which generate sleep fragmentation and/or insomnia (Macaluso et al., 1998; Kato et al., 2003). Data from this study showed that the correlation between anxiety and insomnia in sleep bruxism patients were directly proportional, when anxiety increases,insomnia also increases.

It is a well-documented that individuals with anxiety also show sleep disorders like insomnia (Bertoli et al., 2007). Insomnia reduces the amount and quality of sleep (Ahlberg et al., 2008). Our results showed that 70% of SB patients experience insomnia compared to 47.3% found in non-SB patients. In this sense, SB has been associated with other sleep disorders like restless legs syndrome, sleep apnea and snoring (Macaluso et al., 1998; Lavinge et al., 1999; Ahlberg et al., 2008). Patients with SB are more likely to have poor sleep quality compared with patients without bruxism (Ahlberg et al., 2008; Paus et al., 2011). Therefore, daytime sleepiness observed in the SB patients could be the result of sleep fragmentation induced by anxiety and/or insomnia during the night. Some studies report that the type and severity of diurnal symptoms reported by those suffering from insomnia can vary markedly (Sánchez-Ortuño et al., 2011).

The correlation between SB and anxiety suggests that anxiety is a factor associated SB and could be, therefore, responsible for the origin of the disorder. Previous reports have shown that anxiety and occurrence of bruxism in children have a close relationship (Ko et al., 2015). As mentioned before, the association between anxiety and bruxism facilitates changes in the chewing function (Oliveira et al., 2015). It has also been reported that patients with anxiety and sleep breathing disorders have a higher risk of developing SB (Ohayon et al., 2001). Additionally, these results suggest that episodes of bruxism are a manifestation of anxiety, which in turn, cause sleep fragmentation, resulting in insomnia and daytime sleepiness. Some limitations of this study should be considered, the small sample size reduces statistical power for detecting robust differences, therefore increasing the sample size and polysomnographic recording to diagnose sleep bruxism must be consider in future studies. In conclusion, SB patient show a moderate level of anxiety, which is associated with insomnia; both factors facilitate the presence of daytime sleepiness. All these factors have an effect on the quality of sleep of the patient.

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