ASSOCIATION BETWEEN SLEEP BRUXISM AND ALCOHOL, CAFFEINE, TOBACCO, AND DRUG ABUSE
A SYSTEMATIC REVIEW

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BRUXISM is defined as "repetitive jaw-muscle activity characterised by clenching or grinding of the teeth and/or by bracing or thrusting of the mandible."1 Bruxism has 2 distinct circadian manifestations: it can occur during sleep (sleep bruxism [SB]) or during wakefulness (awake bruxism).2 Investigators in systematic reviews (SRs) have postulated an estimated prevalence of bruxism from 8% to 31.4%.3,4 SB decreases over time, from an estimated prevalence of 14% in children5 to approximately 13% in adults3 and 3% in the elderly population.3

The International Classification of Sleep Disorders Third Edition6 has classified SB as a movement disorder associated with sleep, and it can be related to several consequences such as tooth wear, tooth fractures, toothaches, periodontal problems, muscle fatigue, and headaches.7,8 Although SB has been linked to intrinsic factors such as stress level and genetic factors, the etiology and risk factors for SB are not understood fully from the available evidence.9

BACKGROUND. The aim of this systematic review was to answer the focused question, "In adults, is there any association between sleep bruxism (SB) and alcohol, caffeine, tobacco, or drug abuse?"

TYPES OF STUDIES REVIEWED. This systematic review included studies in which the investigators assessed SB diagnosis by using questionnaires, clinical assessment, or polysomnography and evaluated its association with alcohol, caffeine, tobacco, or drug abuse. The authors graded SB as possible, probable, or definitive. The authors developed specific search strategies for Latin American and Caribbean Health Sciences Literature, PsycINFO, PubMed, ScienceDirect, and Web of Science. The authors searched the gray literature by using Google Scholar and ProQuest. The authors evaluated the methodological quality of the included studies by using the Meta-Analysis of Statistics Assessment and Review Instrument.

RESULTS. From among 818 studies, the authors selected 7 for inclusion in which samples ranged from 51 through 10,229 participants. SB was associated highly with alcohol and tobacco use. In 1 study, the investigators noted a positive and weak association for heavy coffee drinkers. The odds for SB seem to increase almost 2 times for those who drank alcohol, almost 1.5 times for those who drank more than 8 cups of coffee per day, and more than 2 times for those who were current smokers. The abuse of methylenedioxymethamphetamine associated with SB remained without sufficient evidence.

CONCLUSIONS AND PRACTICAL IMPLICATIONS. On the basis of limited evidence, SB was associated positively with alcohol, caffeine, and tobacco. The association between the studied drugs could not be discredited; however, there is still a need for stronger evidence based on studies with greater methodological rigor.

KEY WORDS. Alcohol abuse; caffeine; tobacco smoking; drug abuse; bruxism; review literature.

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Study results have suggested an association between SB and drugs such as caffeine, alcohol, and illegal drugs such as methylenedioxymethamphetamine (MDMA), also known as ecstasy. Nevertheless, consistent evidence regarding these actual associations is scarce. Also, we could not identify SRs involving this topic. Thus, the purpose of this SR was to answer the following focused question, "In adults, is there any association between SB and alcohol, caffeine, tobacco, or drug abuse?"

**METHODS**

**Protocol and registration.** We performed this SR by adhering to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Checklist. We registered the SR protocol on the Prospective Register of Systematic Reviews (Centre for Reviews and Dissemination, University of York, Heslington, York, United Kingdom; and the National Institute for Health Research, London, United Kingdom) under the number CRD42015024078.

**Inclusion and exclusion criteria.** We selected observational studies conducted in adults in which the investigators evaluated the association between SB and alcohol, caffeine, tobacco, or drug abuse. We applied no language or time restrictions. We accepted professionally determined or self-reported use, including illegal drugs, caffeine, alcohol, and tobacco (smoked or not). SB diagnosis had to be made with the aid of questionnaires, clinical assessment, or polysomnography (PSG). For the classification of SB in each of the selected studies, we used the diagnostic grading system Lobbezoo and colleagues proposed. This grading system suggested that possible SB should be based on self-report by means of questionnaires or the anamnestic part of a clinical examination. Probable SB should be based on self-report and the results of the inspection part of a clinical examination. Definite SB should be based on self-report, clinical examination results, and a PSG recording, likely along with audio or video recordings. We excluded studies according to the following criteria: reviews, letters, conference abstracts, and personal opinions; studies in which the sample included children or adolescents who could not be discerned from adult samples; studies in which the sample included diagnosed craniofacial genetic syndromes or neuromuscular diseases; studies in which the sample included patients taking medicines; and studies with the same sample reported in another included study.

**Information sources.** With the help of a health sciences librarian, we selected appropriate truncation and word combinations and adapted them for these databases: Latin American and Caribbean Health Sciences Literature, PsycINFO, PubMed, ScienceDirect, and Web of Science. In addition, we performed a partial gray literature search by using Google Scholar and ProQuest. We limited the Google Scholar search to the first 15 result pages. eTable 1 (available online at the end of this article) provides more information about the search strategies. We also hand searched the reference lists of relevant articles, and we consulted experts to identify any studies that could have been missed in the electronic database searches.

**Search.** We managed the references and removed the duplicates by using reference manager software (EndNote Basic, Thomson Reuters). We conducted the database search on May 20, 2015, and updated it on April 20, 2016.

**Study selection.** We selected the final studies according to a 2-phase process. In phase 1, 3 reviewers (E.B.S., C.M.K., I.P.T.) independently evaluated the titles and abstracts of all identified electronic database citations. They discarded any studies that did not appear to fulfill the inclusion criteria. In phase 2, they applied the same selection criteria to the full articles to confirm their eligibility. Disagreements were solved in either phase by means of discussion and mutual agreement. A fourth author (A.L.P.) was involved when we did not reach a consensus required to make a final decision.

**Data collection process and data items.** We performed the data collection process independently (E.B.S., C.M.K., I.P.T.) and cross-checked all information to ascertain the completeness of the retrieved data. From all included studies, we recorded author, year of publication, country, sample size, demographic features of the sample, and results concerning the association between SB and alcohol, caffeine, tobacco, or drug abuse. If the required data were not included in articles, we tried to contact the authors to retrieve the missing information.

**Risk of bias within the studies.** Two independent reviewers (E.B.S., I.P.T.) evaluated the quality of the included studies by using the Meta-Analysis of Statistics Assessment and Review Instrument (MAStARI). We used different MAStARI questionnaires according to the design of the included studies: cross-sectional or descriptive studies and cohort or case-control studies. Both questionnaires consist of 9 questions that were answered with yes, no, unclear, or not applicable, enabling assessment of the studies as having a high, moderate, or low risk of bias according to the score obtained. We categorized the risk of bias as high when the study reached a yes score of 49% or less, moderate when the study reached a yes score of 50% to 69%, and low when the study reached a yes score of 70% or more.

Summary measures.
We considered any outcome measurements that the investigators used in the publications to evaluate the association between SB and alcohol, caffeine, tobacco, or drug abuse. These included risk ratio, odds ratio (OR), or risk difference for dichotomous outcomes and mean difference or standardized mean difference for continuous outcomes.

Synthesis of results.
We performed a descriptive analysis of the results. We planned a meta-analysis with a group of studies in which the investigators had reported enough data; however, we found that the methodological heterogeneity was too high to find reliable results. Dividing studies into categories according to drugs left us with a scarce quantity for a proper meta-analysis, so we did not conduct a meta-analysis.

RESULTS

Study selection. We identified 649 articles across the 5 databases. We removed the duplicates and obtained 471 citations. Also, we identified 141 studies from Google Scholar and 12 from ProQuest. The search update on April 20, 2016, retrieved 194 new citations, making a total of 818 studies to be analyzed in phase 1. After title and abstract reading, we acquired 29 potentially useful studies for phase 2. Thereafter, we excluded 22 for various reasons (eTable 2, available online at the end of this article). In the end, we included only 7 articles in the qualitative synthesis; we initially identified all of them from the main electronic search. The figure shows a flow chart describing the process of identification, inclusion, and exclusion of studies.

Study characteristics. Among the 7 selected studies, participants' ages ranged from 18 through 55 years. Sample sizes ranged from 51 through 10,229 participants. The criteria we used for SB classification in the studies were questionnaire, questionnaire with clinical assessment, questionnaire with electromyography (EMG), and questionnaire with PSG. Questionnaires were the most widely used form of classification across the selected studies. We graded SB as possible in 4 studies, probable in 2 studies, and definite in 1 study.
<table>
<thead>
<tr>
<th>GROUP</th>
<th>STUDY, COUNTRY</th>
<th>NO. OF CASES/NO. OF CONTROLS</th>
<th>AGE, Y*</th>
<th>SB DIAGNOSTIC METHODS, GRADE²</th>
<th>ASSOCIATION, WHEN PRESENT</th>
<th>FINDINGS, WHEN PRESENT</th>
<th>STATISTICAL ANALYSIS AND FINDINGS</th>
<th>STUDY TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol</td>
<td>Hojo and colleagues, 2007, 10 Japan</td>
<td>23/28</td>
<td>23 (1.9)</td>
<td>Questionnaire and EMG, prob SB</td>
<td>Mean (standard deviation) muscle activity duration calculated at EMG with alcohol consumption (35.2 [14.6]) and without alcohol consumption (30.3 [22.9])</td>
<td>Coefficient = 0.51; 95% CI, 0.20-0.82; R = 0.60; adjusted R² = 0.33</td>
<td>Linear regression analysis: positive correlation between ethanol and masseter muscle activity duration (P = .003)</td>
<td>Cross-sectional</td>
</tr>
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<td></td>
<td>Rintakoski and Kaprio, 2013, 11 Finland</td>
<td>2,906/7,323</td>
<td>44 (7.79)</td>
<td>Questionnaire, possible SB</td>
<td>Binge drinking*: 6%** (n = 2,791)</td>
<td>Binge drinking: OR, 1.8; 95% CI, 1.36-2.39</td>
<td>Multinomial logistic regression analysis: independent association of alcohol consumption with SB (P = .017)</td>
<td>Cohort</td>
</tr>
<tr>
<td>Caffeine</td>
<td>Rintakoski and Kaprio, 2013, 11 Finland</td>
<td>2,906/7,323</td>
<td>44 (7.79)</td>
<td>Questionnaire, possible SB</td>
<td>High caffeine consumption**: 7%** (n = 943)</td>
<td>Moderate caffeine consumption**: 4%** (n = 5,924)</td>
<td>Model OR: 1.9; 95% CI, 1.38-2.66</td>
<td>Multinomial logistic regression analysis: independent association of coffee consumption with SB (P = .017)</td>
</tr>
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* Data are the mean (standard deviation) or age range.
† SB: Sleep bruxism.
‡ The authors used the grading system from Lobbezoo and colleagues. ¹
§ EMG: Electromyography.
¶ CI: Confidence interval.
# Binge drinking is drinking more than 1 bottle of wine, one-half of a bottle of spirits, or the equivalent amount of other alcoholic beverages on the same occasion at least once a month.
** Weekly bruxism compared with never bruxism in model I, adjusted for age and sex.
†† Light alcohol consumption is 1 to 2 glasses per week.
‡‡ Moderate alcohol consumption is 3 or more glasses per week.
§§ Heavy alcohol consumption is more than 7 glasses per week for women or more than 14 glasses per week for men.
‖‖ OR: Odds ratio.
### High caffeine consumption is 6 or more cups per day.
***** Moderate caffeine consumption is 3 to 5 cups per day.
##### Light caffeine consumption is 1 to 2 cups per day.
MODEL I: adjusted for age and sex; model II: adjusted for age, sex, and smoking status.
MDMA: Methyleneidoxymethamphetamine.
NA: Not applicable.
Values calculated by the authors.
M: Male.
F: Female.
Heavy tobacco smoker indicates more than 20 cigarettes per day.
Light tobacco smoker indicates fewer than 10 cigarettes, daily or not.

Investigators in 4 studies ¹⁰,¹⁷,¹⁹,²¹ focused on the association of SB and tobacco, investigators in 2 studies ¹²,²⁰ examined the effect of alcohol, investigators in 1 study ¹¹ examined the effect of caffeine, and investigators in another 2 studies ¹⁶,²⁸ looked at the effects of MDMA. Investigators in 1 of the studies ¹¹ appraised 3 drugs simultaneously: alcohol, caffeine, and tobacco. Despite our intention of evaluating the association of SB and other drugs of abuse such as methamphetamine, cocaine, heroin, and marijuana, we did not identify any studies that met the
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<tr>
<td>Drug Abuse (MDMA)</td>
<td>Peroutka and colleagues, 1988, Canada</td>
<td>100/NA</td>
<td>18-25</td>
<td>Questionnaire, possible SB</td>
<td>Acute reported bruxism or tooth grinding: 65% (n = 100)</td>
<td>NA</td>
<td>Analysis by means of percentage: no significant association between MDMA consumption and prolonged occurrence of bruxism</td>
<td>Descriptive</td>
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<td></td>
<td>Cohen, 1995, United States</td>
<td>500/NA</td>
<td>18-25</td>
<td>Questionnaire, possible SB</td>
<td>Acute reported bruxism or tooth grinding: 54% (n = 270***)</td>
<td>NA</td>
<td>Analysis by means of percentage: no significant association between MDMA consumption and prolonged occurrence of bruxism</td>
<td>Descriptive</td>
</tr>
<tr>
<td>Tobacco</td>
<td>Lavigne and colleagues, 1997, Canada</td>
<td>682/1,192</td>
<td>Smokers with SB: 24.5 (4.7)</td>
<td>Questionnaire and polysomnography, definite SB</td>
<td>SB: 12% (n = 82)</td>
<td>OR, 1.9; 95% CI, 1.37-2.63</td>
<td>Cross-sectional analysis: tooth grinding prevalence, in SB compared groups, significantly higher for smokers than for nonsmokers (P &lt; .001)</td>
<td>Cohort</td>
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<td>Ahlberg and colleagues, 2004, Finland</td>
<td>131/74</td>
<td>46 (6)</td>
<td>Questionnaire and clinical examination, probable SB</td>
<td></td>
<td>OR, 2.9; 95% CI, 2.26-3.61</td>
<td>Logistic regression model analysis: SB significantly more prevalent among smokers (P = .005)</td>
<td>Cohort</td>
</tr>
<tr>
<td></td>
<td>Rintakoski and colleagues, 2010, Finland</td>
<td>1,003/2,121</td>
<td>24 (23-27)</td>
<td>Questionnaire, possible SB</td>
<td>Weekly SB: Former tobacco smoker: 7.6% (M***); 8.2% (F††††) Heavy tobacco smoker‡‡‡‡; 10.3% (M), 16.3% (F) Light tobacco smoker§§§§; 6.3% (M), 11.1% (F) Never smoker: 6.1% (M), 7.8% (F) Rarely SB: Former tobacco smoker: 21.6% (M), 22.6% (F) Heavy tobacco smoker: 28.2% (M), 23.4% (F) Light tobacco smoker: 24.2% (M), 24.1% (F) Never smoker: 20.8% (M), 20.5% (F)</td>
<td>Heavy tobacco smoker: OR, 2.45; 95% CI, 1.75-3.44</td>
<td>Multinomial logistic regression analysis: heavy smokers were more than twice-weekly bruxers (P &lt; .001)</td>
<td>Cohort</td>
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<tr>
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<td>Rintakoski and Kaprio, 2013, Finland</td>
<td>2,906/7,323</td>
<td>44 (7.79)</td>
<td>Questionnaire, possible SB</td>
<td>Current tobacco smoker: 7%** (n = 2,623) Former tobacco smoker: 3%** (n = 2,296) Light tobacco smoker§§§§: 1%** (n = 332)</td>
<td>Current tobacco smoker: OR, 2.9; 95% CI, 2.26-3.61</td>
<td>Multinomial logistic regression analysis: no significant association between tobacco consumption and SB</td>
<td>Cohort</td>
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</table>
adopted eligibility criteria. The table summarizes the descriptive characteristics of the included studies.

**Risk of bias within studies.** Even though none of the studies fulfilled all MAStARI methodological criteria, approximately 60% of the studies had scores higher than 65%. Three studies had a low risk of bias according to the score obtained. Two studies had a moderate risk of bias, and another two studies had high risk of bias. eTables 3 and 4 (available online at the end of this article) provide more information about the MAStARI scores.

**Results of individual studies. Alcohol.** Hojo and colleagues performed a study to determine whether the amount of alcohol intake was associated with masseter muscle activity recorded during sleep in 51 participants. For this article, we graded SB as probable. The study revealed that the mean (standard deviation) duration of muscle activity was 35.2 (14.6) seconds in alcohol consumers and 30.3 (22.9) seconds in those who did not use alcohol. Linear regression analysis revealed a positive correlation between alcohol and maseter muscle activity duration (coefficient = 0.51; 95% confidence interval [CI], 0.20-0.82; R = 0.60; adjusted R² = 0.33; P = .003).

Rintakoski and Kaprio studied multiple drugs as risk factors for SB, using a sample from the longitudinal Finnish twin cohort study. The 10,229 participants answered a questionnaire regarding bruxism habits and the use of legal psychoactive substances. For this article, we graded SB as possible. The authors found that both binge drinking (OR, 1.8; 95% CI, 1.36-2.39) and heavy drinking (OR, 1.7; 95% CI, 1.11-2.67) were associated with SB.

**Caffeine.** Rintakoski and Kaprio also found that consumption of more than 8 cups of coffee per day was associated with weekly (frequent) bruxism regardless of smoking status. This association occurred in model I, adjusted for age and sex, and model II, adjusted for sex, age, and smoking status (model I: OR, 1.9; 95% CI, 1.38-2.66; model II: OR, 1.4; 95% CI, 1.01-1.98).

**Tobacco.** According to the same study, Rintakoski and Kaprio found that current smoking remained an independent risk factor for SB in all models (OR, 2.9; 95% CI, 2.26-3.61; P < .001). Ahlberg and colleagues analyzed questionnaires from frequent and nonfrequent smokers. Among the 131 participants in the low-bruxer group, 24.4% were smokers; among the 74 participants in the high-bruxer group, 43.2% were smokers. The authors found that probable SB was more frequent in the smoker group (P = .005) than in nonsmokers. In addition, smokers were 1.2 to 4.9 times more likely to report frequent bruxism than were nonsmokers (OR, 2.4; 95% CI, 1.2-2.4; P = .01). Lavigne and colleagues tested tobacco smoking as an exacerbating or risk factor for definitive SB. SB prevalence was significantly higher for smoking bruxers (12.0%; 82 of 682 participants) than for nonsmoking bruxers (6.7%; 80 of 1,192 participants; P < .001). The odds of smoking participants reporting tooth grinding was higher (OR, 1.9; 95% CI, 1.37-2.63), and there were 5 times more grinding episodes in smoking bruxers (mean, 35) than in nonsmoking bruxers (mean, 7).

Rintakoski and colleagues reported that weekly (frequent) and rarely (nonfrequent) possible SB was more associated with tobacco smokers than nonsmokers. Heavy smokers were more than twice as likely to be weekly bruxers than were those who had never smoked (OR, 2.45; 95% CI, 1.75-3.44; P < .001). We found no significant interactions for the association between alcohol, caffeine, and tobacco in the study in which the investigators appraised these 3 drugs, thus, indicating possible independent effects of the study variables on SB.

**Drug abuse (MDMA).** Cohen and colleagues conducted a descriptive study in 1995, with subjective reports on the effects of the use of MDMA. All 500 participants had taken MDMA on at least 1 occasion. Fifty-four percent of the participants related bruxism as an immediate physical effect, and none of the participants reported bruxism as a long-term or recurring physical effect. Peroutka and colleagues reported subjective effects for MDMA. All 100 participants admitted using the drug. The frequency of use ranged from 1 to 38 doses of the drug. Sixty-five percent of participants related bruxism as an acute effect of MDMA. A day after drug ingestion, no reports of bruxism were registered (subacute effects), although 2% (2 of 100) reported long-term effects; 1 claimed a tendency to clench his teeth when anxious for months after 2 separate doses, and a second attributed increased emotionality to the effects of 3 separate doses. For both MDMA studies, we graded SB as possible.

**Synthesis of results.** Alcohol, caffeine, tobacco, drug abuse (MDMA). Both binge drinking and heavy drinking increased the odds (almost 2 times) for probable or possible SB (Hojo and colleagues, Rintakoski and Kaprio). Consumption of more than 8 cups of coffee per day slightly increased the odds (almost 1.5 times) for possible SB (Rintakoski and Kaprio). Current smoking increased the odds (more than 2 times) for possible, probable, and definite SB (Rintakoski and Kaprio, Ahlberg and colleagues, Lavigne and colleagues, and Rintakoski and colleagues). The abuse of MDMA associated with SB remained without sufficient evidence. We could not assess other drugs through the included studies.

**Risk of bias across studies.** The main concern about the studies included was the representativeness of the samples. We could not find homogeneity for question 1 ("was the study based on a random or pseudorandom sample?") for cross-sectional studies and questions 1 ("was the sample representative of patients in the population as a whole?") and 7 ("were the outcomes of people who withdrew described and included in the analysis?") for cohort studies.

**DISCUSSION**

In this SR, we investigated the association between SB and alcohol, caffeine, tobacco, or drug abuse. Although
the first studies with results supporting this argument date back to more than 45 years ago, and results from some studies have suggested these associations before. Conclusive evidence has not been found until now. Our SR results indicate that SB seems to be associated with use of alcohol, caffeine, and tobacco, but there is not enough scientific evidence to confirm or discredit the association between SB and drug abuse.

Investigators in a previous review pointed out that controlled clinical experiments on the effects of drugs on the central nervous system (CNS) are difficult to conduct because of their effects on the participants’ mental and physical health and their ethical implications. The authors stated that the issues regarding drug mechanisms and their association with SB were beyond the limitations of the review and that there were insufficient evidence-based data to draw definitive conclusions.

Alcohol can disrupt sleep consolidation and affect sleep stage distribution, causing an acute increase in the local concentration of serotonin, opioids, and dopamine in the brain. In another study, the investigators estimated alcohol raised the risk of experiencing masseter muscle activity when ingested at bedtime, increasing EMG duration by more than 5 seconds. This increase of muscular activity suggests an increase in SB events. Accordingly, the authors pointed out binge drinking, passing out because of excessive alcohol consumption, and drinking alcohol at bedtime as important risk factors for SB. The intake of large quantities of alcohol in a short period results in toxic effects on the brain and also may be related to the CNS disturbance that could set off or exacerbate SB.

Caffeine is a CNS stimulant, and it is the world’s most widely consumed psychoactive drug. Investigators have assessed it frequently in the literature. Consumption of a high quantity of coffee raised the risk of occurrence of SB. However, these findings remain controversial. Investigators found significant associations between caffeine use and SB, but only when caffeine was consumed in a high quantity.

Tobacco is used widely because of its psychoactive effect. Lavigne and colleagues reported that there were 5 times more grinding episodes in smokers than in non-smokers. However, the authors point to limitations of their study; they did not take the lack of control of nicotine dose, the smoking habit duration, and the degree of dependence into account. In addition, in the study conducted by Ahlberg and colleagues, probable SB was significantly more prevalent among smokers. Possible explanations were that nicotine may affect the smoker’s pain response centrally or that tobacco use may reduce the blood supply to tissues. Results from longitudinal studies based on questionnaires and large samples also indicated that possible SB was significantly more common among smokers. In studies with twins, participants with more unhealthy habits combined (heavy coffee consumption, heavy alcohol consumption, and heavy smoking) were more likely to experience SB.

In descriptive studies based on subjective reports of the effects of MDMA, bruxism was 1 of the reported symptoms. Nevertheless, the association of SB and MDMA has not been studied, leaving this association unclear. Furthermore, the authors did not specify what type of bruxism was being studied, suggesting that the effect may be that of tooth grinding as an acute effect. Investigators in studies involving MDMA commonly attribute episodes of bruxism as an usual symptom and even rate it as 1 of the most disturbing side effects. However, these studies are based primarily on small samples, case reports, narrative reviews, and anecdotal presuppositions.

Findings from a 2015 study indicated that dentists should focus on insightful clinical interviewing of their patients because results revealed that screening patients for SB by using American Academy of Sleep Medicine criteria is effective, especially in the presence of muscle fatigue and temporal headaches, considered as good tools with which to screen patients with SB. Effective screening can increase the likelihood of more appropriate selection of patients to refer for PSG. It is important to establish the criteria proposed by the American Academy of Sleep Medicine for the correct diagnosis of SB.

The diagnosis of SB may be considered difficult because of the requirement of several SB diagnostic criteria and the fact that the most affordable ways to assess SB are through the use of questionnaires and clinical examinations. In addition to these methods, there are more effective—but costly—clinical diagnostic tests that use EMG or PSG. These methods are considered the most accurate tests and are the criterion standard for SB assessment. Despite an abundance of techniques, valid diagnostic tools that could be used widely are still scarce. To avoid different diagnostic criteria that could lead to questionable conclusions, we suggest that health care professionals and researchers apply the grading system proposed by Lobbezoo and colleagues until widely available, cost-effective, and reliable diagnostic tools are developed.

Because results of our SR indicated that there is some available evidence of the possible association between SB and alcohol, caffeine, and tobacco, dentists should be aware of this possibility during the first dental appointment. It is important to include in the anamnesis questions regarding the use of these substances, and the dose taken, to take management precautions in these patients and improve outcomes. This knowledge also may aid in the diagnosis of SB. Dentists should advise their patients to reduce or eliminate the excessive use of alcohol, caffeine, and tobacco and also may refer patients to an addiction specialist if needed. The limitations regarding ethics when studying drugs of abuse make it considerably
more difficult to conduct studies and find relevant results and to implement a reasonable and appropriate study design.

CONCLUSIONS

There is not enough scientific evidence to confirm or discredit the association between SB and drugs. On the basis of the limited available evidence, SB was associated positively with alcohol, tobacco, and caffeine. It seems that the odds for SB increase almost 2 times for those who drink alcohol, almost 1.5 times for those who drink more than 8 cups of coffee per day, and more than 2 times for those who are current smokers. Further studies are required to shed more light on these possible associations.

SUPPLEMENTAL DATA

Supplemental data related to this article can be found at http://dx.doi.org/10.1016/j.adaj.2016.06.014.

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