Mental health conditions such as depression and psychosis are prevalent ranging from 15%–25% of the population. Hence, a significant proportion of dental patients could suffer from comorbid mental health diseases and dentists may be their first point of contact in community and hospital settings. Patients with mental health conditions have a higher risk of poor oral hygiene, which is increased with the chronic use of antipsychotics, antidepressants and mood stabilisers. Several oral conditions such as bruxism could be due to a mental health condition or a result of psychotropic medication adverse effects with evidence that patients with schizophrenia are more vulnerable to the development of temporomandibular dysfunction (TMD) signs such as bruxism, while there is a clear relationship between selective serotonin reuptake inhibitor (SSRI) use and the risk of bruxism, and nocturnal bruxism has been reported with venlafaxine.

TMD is described as pain and dysfunction of the masticatory musculature and/or the temporomandibular joint (TMJ) (joints connecting the mandible to the skull) and associated structures. There is no clear single aetiology but multifactorial aetiologies have been suggested, including anatomical, neuromuscular, psychological, trauma and general diseases. Patients suffering with TMD problems may present with pain, limited range of jaw motion, clicking noises, dislocation with occlusal changes, deviation of the jaw to the side, forward protrusion of the mandible, difficulty swallowing, mouth drooling, difficulty chewing and articulating. These clinical symptoms may also be associated with tooth wear and functional habits. TMJ dislocation is usually unilateral, although reports show that the mechanical energy derived from oromandibular dystonia could cause bilateral dislocations.

Bruxism is a common problem with worldwide prevalence of 5% to 40%. This prevalence is high in children and adolescents with mental health conditions (~30.0%) or developmental disabilities (25% to 69%). Bruxism is a motor disorder involving a repetitive jaw-muscle activity, an involuntary act of clenching or grinding one’s teeth, either while awake or asleep, in an occasional to constant manner. Sleep bruxism, which is more common, is characterised by a rhythmic activity of the temporomandibular muscles causing forced contact between dental surfaces, and is accompanied by tooth clenching or grinding with anxiety and stress as established risk factors. Bruxism has been implicated in tooth wear, where tooth attrition (a gradual loss of hard tooth substance from occlusal contacts with opposing dentition or restoration)
may be accelerated by parafunional habits of bruxism.\textsuperscript{19} Bruxism could lead to jaw-muscle hypertrophy and fracture or failure of teeth restorations or implants.\textsuperscript{20} The International Classification of Sleep Disorders suggests the following criteria for sleep bruxism:\textsuperscript{21} 
1. presence of teeth grinding during sleep, and
2. at least one associated feature:
   - abnormal tooth wear,
   - muscular discomfort, or
   - sound associated with teeth grinding.

Methods
For this review, we searched the published literature for an association between antipsychotics and bruxism (National Library of Medicine’s PubMed and PsycINFO databases) to identify research papers describing a link between antipsychotics and bruxism published between January 1980 and February 2017 using keywords ‘oral diseases’ and ‘bruxism’ in association with one of the following: ‘antipsychotics’; ‘stimulants’; ‘dopaminergic’ or ‘psychotropic medications’.

Furthermore, a search using the term bruxism was carried out on the weekly journal Reactions, which deals with the side-effects of drugs, and the VigiAccess database through Uppsala monitoring centre for drug side-effects to detect relevant information regarding the association between bruxism and dopamine-related medications.

Pharmacology of psychotropic medications and bruxism aetiology
Neuropharmacological studies in animals described the striatum as the brain structure involved in gnawing/biting behaviour\textsuperscript{22} and suggested oral motor activities could be striatum as the brain structure involved in gnawing/biting neuropharmacological studies in animals described the link between antipsychotics and bruxism published between January 1980 and February 2017 using keywords ‘oral diseases’ and ‘bruxism’ in association with one of the following: ‘antipsychotics’; ‘stimulants’; ‘dopaminergic’ or ‘psychotropic medications’.

Long-term use of antipsychotics, especially first-generation drugs, may cause extrapyramidal side-effects (dystonia/dyskinesia) due to DA receptor blockade in the basal ganglia leading to slowness, stiffness, tremor and tardive dyskinesia;\textsuperscript{23} involuntary hyperkinetic motor disorders such as bruxism affect the orofacial region.\textsuperscript{30} Oral dyskinesia could cause TMJ degenerative changes, mucosal lesions, damage to teeth and dental prostheses, while oromandibular dystonia produces involuntary and excessive contractions of tongue, lip and jaw muscles.\textsuperscript{31} Second-generation antipsychotics (SGA) such as clozapine, olanzapine and quetiapine could ameliorate the negative symptoms of schizophrenia and have a relatively low affinity for D2 receptors with effects on oral health, although to a lower extent. Other dental complications associated with psychotropic medications include xerostomia\textsuperscript{32} and rabbit syndrome.\textsuperscript{33} Risperidone was more associated with tardive dyskinesia compared with clozapine, olanzapine and quetiapine.\textsuperscript{34} SGA have a higher incidence of metabolic dysfunction, weight gain; when associated with poor oral hygiene, they may cause other oral diseases such as dental caries.\textsuperscript{35} Stimulants such as amphetamine, 3,4-methylenedioxymethamphetamine (MDMA, ecstasy) and cocaine exert their effects by enhancing norepinephrine and/or dopamine.\textsuperscript{36} Amphetamine-related oral health complications\textsuperscript{37} include broken or missing teeth, bruxism, xerostomia\textsuperscript{38} and increased risk of gingival enlargement.\textsuperscript{39} Ecstasy is also associated with bruxism, periodontitis and xerostomia.\textsuperscript{40,41}

Bruxism and antipsychotics medications
Several clinical studies showed higher TMD signs among psychiatric patients, especially those with schizophrenia.\textsuperscript{2,3,42} Factors associated with bruxism studied in 389 children with developmental disabilities showed that individuals with reported involuntary movements had a greater chance of exhibiting bruxism with psychotropic drugs use.\textsuperscript{43} In 339 institutionalised patients compared with matched-control subjects, the prevalence of TMD signs, severe tooth wear and bruxism were significantly higher.\textsuperscript{42} Abnormal attrition was evident in 46.8% of the psychiatric patients compared with just 20% in the control group with...
significant differences in mean muscle sensitivity to palpation, joint sensitivity to palpation and range of mouth opening. Abnormal attrition involves both enamel and dentine with extensive hard tissue loss that cannot be easily restored. A case report described the successful management of antipsychotic induced bruxism upon switching to clozapine, while another report presented two cases of acute bruxism and akathisia as early side-effects of antipsychotics, which were relieved by adding propranolol. Eight cases of bruxism following long-term treatment with haloperidol were described.

Pain perception in schizophrenia
As there are few controlled studies, there is a debate regarding sensation threshold, pain threshold and pain tolerance. Patients suffering from psychotic disorders may not be reliable in reporting the pain due to their psychiatric disorder. For example, schizophrenia could impair communication and social skills, while psychotropics may affect pain perception. Several psychiatric reports confirmed the insensitivity to pain with possible affective and sensory abnormalities. For schizophrenia patients, behavioural pain activity and self-reported responses to pain are reduced. This could lead to delays in diagnosis and treatment, for example long-term bruxism may cause the transition of pain from an acute to a chronic phase, causing disability and psychological distress.

Bruxism in patients on psychostimulants
Psychostimulants may seriously damage the oral environment and cause bruxism by deregulating the DA mesocortical pathway. Methylphenidate, commonly used in the treatment of attention deficit hyperactivity disorder (ADHD), could induce sleep bruxism as highlighted in a case report of two ADHD children who developed dyskinesia and bruxism. Long-term drug abuse led to a high prevalence of oral motor behaviour, and signs/symptoms of TMD. Amphetamine users displayed typical, continuous chewing or tooth grinding movements and bruxism and a large cohort study confirmed methamphetamine association with bruxism. A case study reported three patients suffering from awake bruxism after chronic MDMA consumption and in a study on the subjective experience/psychological and behaviour sequel of the intake of MDMA, 30% of the patients reported bruxism as an adverse effect. Among cocaine users, severe bruxism symptoms were reported and several reports confirmed the detrimental effects of cocaine misuse on oral health. Repeated stimulation of the dopaminergic systems with apomorphine and cocaine increased non-functional masticatory movements and mandibular incisors attrition rate in rats.

Discussion
Oral health is of primary importance for patients with mental health disorders as it can influence social interactions and exacerbate psychosocial aspects. TMD involves the masticatory musculature and/or the temporomandibular joint and associated structures and is often associated with pain and/or parafunctional activities, such as bruxism, with the long-term use of psychotropic medications acting as a possible culprit. A meta-analysis showed that antidepressants such as duloxetine, paroxetine and venlafaxine were associated with sleep bruxism, however, no clear association between valproate, carbamazepine or benzodiazepines and bruxism was found (low overall quality of evidence).

Schizophrenia is a severe and debilitating condition that influences an individual’s quality of life, especially through lack of perception of general and oral health. Patients with schizophrenia could present with only a small number of remaining teeth, non-functional teeth with excessive mobility and advanced stages of periodontitis. They are more prone to TMD signs and severe tooth wear due to psychotropic medications’ antagonist activity on the DA receptors. Furthermore, some typical antipsychotics have strong anticholinergic activities similar to tricyclic antidepressants, with further detrimental effects on oral hygiene such as reduced saliva secretion resulting in dry mouth with occasional swallowing difficulties, increased risk of caries, gingivitis, periodontitis and candidiasis.
A search carried out in the weekly journal Reactions, which deals with medication side effects, and VigiAccess database (Table 1 and Figure 1) confirmed bruxism as an oral side-effect associated with psychostimulants and antipsychotics, including chlorpromazine, trifluoperazine, haloperidol and aripiprazole. There were 58 hits for bruxism as an oral side-effect in Reactions, however, there are limitations regarding the available information on numbers of individuals exposed to each drug and the likely risk of polypharmacy.

The available evidence suggests a relationship between tooth wear, psychiatric disorders and administration of certain drugs. Poor oral hygiene and extensive unmet needs for dental treatment can be significant among psychiatric patients with increased incidence of TMJ disorders due to the psychiatric illness or psychotropic medication side-effects, as well as lifestyle differences. The risk of bruxism is higher in special populations such as children and older people. More research is needed to draw definite conclusions concerning how substances affecting the dopaminergic, serotonergic and adrenergic systems could ameliorate or exacerbate bruxism in humans. The awareness of patients, psychiatrists, dentists, general practitioners and nurses that many psychotropic drugs cause side-effects related to oral health could remarkably improve early detection and patient management. Extra precautions are needed, especially for patients with more than one comorbid mental health issue with the possibilities of polypharmacy, including combinations of antipsychotics and antidepressants. Furthermore, precautions must also be taken when performing surgery or prescribing analgesics, antibiotics or sedative agents due to adverse interactions with psychiatric medications. Bruxism treatment is not necessary in some cases; however, if severe, options include dental approaches such as oral appliances, psychological therapies and switching psychotropic medications to an alternative with a lower risk of bruxism.

Key points
• Several clinical studies showed higher incidence of bruxism among psychiatric patients, especially those with schizophrenia
• Bruxism could result from peripheral morphological alterations such as malocclusion or multifactorial aetiology including a centrally mediated condition, modulated by drugs acting on CNS neurotransmitters
• Psychostimulants may seriously damage the oral environment and cause bruxism by deregulating the DA mesocortical pathway
• BMS management include dental approaches such as oral appliances, psychological therapies and switching psychotropic medications to an alternative with lower risk of bruxism.

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Declaration of interests
No conflicts of interest were declared.

References


