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Oral and maxillofacial Stress-Related Disorders during and after the COVID-19 Pandemic: A Review of the Research

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Review Article

Abstract

Background: Stress and anxiety are psychosocial factors that can have potential effects on oral health. In addition to concerns about physical health, the COVID-19 pandemic has led to psychological disorders (including stress) in the general population. Moreover, life has not returned to normal in most parts of the world. Therefore, physicians and specialists should pay special attention to the psychological effects of COVID-19 on the onset and exacerbation of oral diseases.

Methods: A search was performed (last update in June 2021) in the Medline, Scopus, Embase, and Web of Science databases. The related keywords were bruxism, morsicatio, myofascial pain dysfunction syndrome (MPDS), temporomandibular (TMD) disorder, burning mouth syndrome (BMS), xerostomia, recurrent aphthous stomatitis (RAS), lip herpes, and oral lichen planus. Of the 510 papers found, about 206 were related to the subject, which were further analyzed. All study types, except case reports and case series, were included in the review.

Results: The current article reviewed stress-related disorders with clinical manifestations related to the oral cavity and maxillofacial disorders that have been significantly increasing during the COVID-19 pandemic. These disorders are bruxism, morsicatio, MPDS, TMD disorders, BMS, xerostomia, RAS, recurrent lip herpes, and oral lichen planus. The clinical manifestation and management of each disorder are presented in this article.

Conclusion: It can be concluded that various causes and conditions play a role in the pathology, disease course, prognosis, treatment, and recurrence rate of oral diseases., In addition to examining the psychological background of treatment in the diagnosis and treatment stages, a variety of psychotherapy methods can be used to increase the effectiveness of medical treatments. The stress caused by COVID-19 in psychologically and

medically susceptible people can intensify the pathology of these diseases in all its dimensions, and therefore, special attention should be paid to this aspect in the care and treatment of patients.

Keywords: Stomatognathic diseases; Pandemics; Psychological stress

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Introduction

Psychological disorders can affect both body and mind. These disorders have physical symptoms that are caused by mental or emotional factors. Stress, anxiety, and depression are the most common psychological disorders (Dhimole, Bhasin, Pandya, Dwivedi, & Nagarajappa, 2016). It has been shown that all diseases are caused by the interaction between biological, psychological, and social factors (Yang, Liu, Shi, & Zhang, 2018). The oral cavity is an organ that significantly impacted by psychological factors.. Some diseases that affect the oral mucosa may be the direct or indirect manifestation of emotions. Stress and anxiety are psychosocial factors that can have potential effects on oral health (Yang et al., 2018, Tripathi, Seth, Awasthi, Bhattacharya, Bajpai, Thahriani, 2018). Stress is defined as a physical, emotional, or mental response to events that cause mental or physical tension. Many researches have illustrated the role of stress in various diseases such as high blood pressure, stomach ulcers, and etc. Similar research has illustrated psychological disorders to be one of the initiating or exacerbating factors of oral lesions (Kandagal, Shenai, Chatra, Ronad, & Kumar, 2012, Tripathi et al., 2018, Malathi, Babu, Masthan, & Mukherjee, 2019). The COVID-19 pandemic, in addition to concerns about physical health, has led to psychological disorders (including stress) in the general population. Moreover, as life has not returned to normal in most parts of the world, physicians and specialists should pay special attention to the psychological effects of the disease on the onset and exacerbation of oral diseases, and correctly manage these patients through collaboration with different clinical specialists, such as dentists, oral specialists, and psychologists. In this text, we will review stress-related disorders with clinical manifestations related to the oral cavity and maxillofacial disorders that have significantly increased during the Covid-19 pandemic.

Methods

To find the studies associated with stress-related disorders in the oral cavity, a search was performed (last update in June 2021) in the Medline, Scopus, Embase, and Web of Science databases. The related keywords were bruxism, morsicatio, myofascial pain dysfunction syndrome (MPDS), temporomandibular (TMD) disorder, burning mouth syndrome (BMS), xerostomia, recurrent aphthous stomatitis (RAS), lip herpes, and oral lichen planus. Of the 510 papers found, about 206 were related to the subject, which were further analyzed. All types of study, except case reports and case series, were included in the analysis. The article selection process is illustrated in figure 1.

Bruxism: Bruxism is excessive dental grinding, which can occur during sleep or wakefulness. The main cause of bruxism is still unknown. Neurological disorders, drug use, genetics (Garrett & Hawley, 2018), stressful situations (Smardz, Martynowicz, Wojakowska, Michalek-Zrabkowska, Mazur, & Wieckiewicz, 2019), and generalized anxiety and emotional suppression (Przystanska et al., 2019) can cause bruxism in people with emotional inhibition or involvement in intra-psychological and interpersonal conflicts. Bruxism can be associated with discomfort and hypertrophy of the jaw muscles, gingivitis, headache (sometimes mistaken for migraine and sinusitis), temporomandibular joint (TMJ) pain (Aguilera, Brown, & Perico, 2017), movement problems, jaw lock, and reduced salivary flow, especially when waking up (Murali, Rangarajan, & Mounissamy, 2015). Central dopamine is thought to act through developing oral parafunctional habits or stereotypic behaviors to relieve emotional stress and reduce the effects of stress and anxiety (Gomez, Ortega, Horrillo, & Meana, 2010).

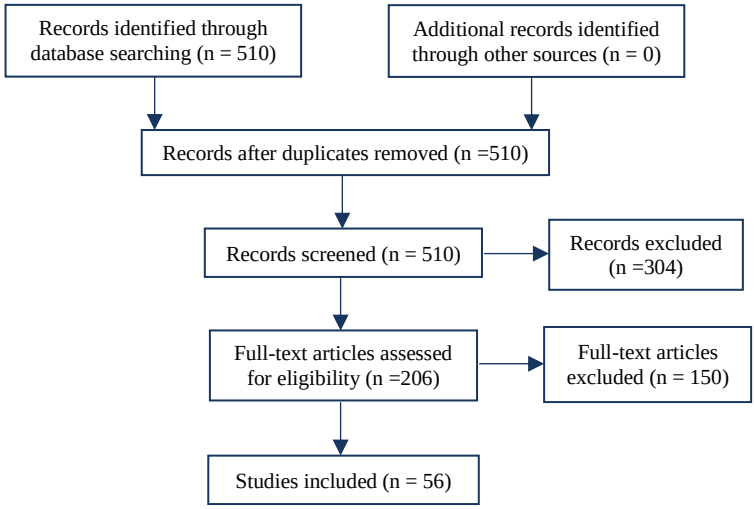

Figure 1. Article selection diagram

Accordingly, it seems evident that with the increase in stress levels in the present era, bruxism is increasing.

Morsicatio: Morsicatio is a chronic and usually harmless lesion that a person unknowingly inflicts, causing cheek bite keratosis with a clinical view of whiteness, erythema, erosion, and a painless or painful ulcer on the mucous membranes of the lips and tongue (Muller, 2019; Min & Park, 2009; Alzahem, 2017). Factors such as parasomnia, brain damage, emotional stress, and anxiety play a role in its etiology. Habitual chewing such as disorders of onychophagia, trichotillomania, dental erosion, and skin peeling are considered repetitive body-focused behaviors (BFRB) and can have harmful consequences such as pain, ulcers, infection in the affected sites, feeling of shame, and a psychosocial disorder. Although the cause of BFRB is unclear, studies suggest that reduced impulse control and difficult emotion regulation may play a role in these behaviors (Mathew, Davine, Snorrason, Houghton, Woods, & Lee, 2020).

Like other disorders discussed in this review article, onychophagia will increase as stress increases in society.

Myofascial pain dysfunction syndrome: MPDS is a chronic disorder of the stomatognathic system and the most common temporomandibular joint disorder, which includes acute and chronic muscular pain, jaw movement irregularity, and muscle spasm (Chitnis, Mistry, Puppala, & Swarup, 2020). It is characterized by limited mandibular function and activation of starting points (palpable and overly irritating nodes) in the vicinity of stretched bands of skeletal muscle fibers (MTrPs) (Kurt, Guner-Onur, Bilmenoglu, Memisoglu, & Cilingir, 2020) and may be associated with paresthesia (Lalchhuanawma & Sanghi, 2019).

The main cause of facial muscle pain is unknown. The related risk factors include occlusal interference, bruxism, systemic factors (hypothyroidism, vitamin D deficiency, and iron deficiency) (Urits et al., 2020; Galasso et al., 2020), trauma (Urits et al., 2020), ergonomic factors, structural factors (spondylosis, osteoarthritis, and scoliosis) (Urits et al., 2020; Galasso et al., 2020), and sleep deprivation (Galasso et al., 2020). Inflammatory mediators caused by muscle damage (leukotriene, etc.) and

neurogenic inflammation with central sensitization increase the sensitivity of the damaged muscles and formation of TrP, respectively (Lalchhuanawma & Sanghi, 2019; Urits et al., 2020; Tantanatip & Chang, 2022). Patients with such complaints usually report stressful events (such as cancer) as the cause of the onset, exacerbation, or persistence of pain. During stress, various parts of the central and peripheral nervous system are activated and, according to the theory of perceptual disturbance, increased sympathetic activity and epinephrine release in sympathetic terminals may directly sensitize the pain receptor or lead to abnormal perception and somatosensory enhancement. Stress and sleep disorder can play a role in the development of MPDS (Tantanatip & Chang, 2022). Currently, with the COVID-19 pandemic and the increase in stress and anxiety, the prevalence of this disorder has increased significantly.

Temporomandibular disorders: This disorder includes a set of conditions that cause TMJ dysfunction and chronic recurrent pain in the associated muscles and supporting structures of the joint (Kmeid, Nacouzi, Hallit, & Rohayem, 2020; Theroux, Stomski, Cope, Mortimer-Jones, & Maurice, 2019).

The exact cause of TMD remains unclear (Ahuja, Ranjan, Passi, & Jaiswal, 2018). The factors contributing to TMD include systemic problems, eating habits, psychological factors such as stress and anxiety, especially in occupations such as the police force and nursing, or PTSD (Oliveira, Almeida, Lelis, Tavares, & Fernandes Neto, 2015; Abu-Raisi et al., 2019), sleep quality (Oliveira et al., 2015), parafunctional habits such as bruxism (Abu-Raisi et al., 2019), chronic headaches (Kmeid et al., 2020), and neuromuscular problems (Theroux et al., 2019).

Since the molecules that mediate the stress response are similar to the molecules involved in pain regulation, stress can directly or indirectly affect pain-related biological processes (Gameiro, da Silva, Nouer, & Ferraz de Arruda Veiga, 2006). Common symptoms include a feeling of pain in the ear, neck, jaw, and facial muscles, toothache, headache (tension or migraine) (Kmeid et al., 2020), sensitivity to masticatory muscles, and jaw problems (click or cryptos, locking and deviation) (Nazeri et al., 2018).

Pandemic stress can occur in the form of oral parafunctions in the form of bruxism and tooth grinding. Finally, each of these parafunctional activities may increase muscle activity and intensity, which is an important factor in the onset of symptoms related to TMD. The prevalence of this disorder has also increased in the current stressful conditions caused by the COVID-19 pandemic.

Burning Mouth Syndrome: BMS is an intraoral burning or dysaesthesia that occurs more than 2 hours a day for 3 months. It often occurs in the 2 anterior thirds of the tongue, and in rare cases, in the buccal mucosa and floor of the mouth, with no evidence of clinical lesions. The burning sensation is almost always bilateral and symmetrical (Lopez-Jornet, Felipe, Pardo-Marin, Ceron, Pons-Fuster, & Tvarijonaviciute, 2020).

Etiopathogenically, this syndrome has been classified as neuropathic (Coculescu, Manole, Coculescu, & Purcarea, 2015). Mechanical, thermal, and chemical stimuli can activate nociceptors in BMS. Its mechanisms of pain include reduced density of epithelial nerve fibers and a degree of axonal degradation as a type of trigeminal sensory neuropathy, low levels of dopamine in the nigrostriatal pathway (similar to patients with anxiety or stress), changes in the transmission of harmful stimuli in the orofacial region, and interference and changes in the mode of transmission and modulation of pain information (Coculescu et al., 2015).

According to studies on stress, anxiety, and depression, personality traits such as reduced openness and cancer phobia, and pain-related catastrophizing are related to BMS (Matsuoka et al., 2010). With the onset of psychological stress due to the COVID-19 pandemic, therapies based on these factors have become increasingly important. During the COVID-19 pandemic, with the increase in the psychological burden on people and anxiety-related disorders and stress, we are witnessing an increase in the number of patients referring to dental clinics with BMS. In addition to the relationship of this oral manifestation with stress caused by the COVID-19 pandemic, the increase in oral manifestation in society could be related to BMS as a symptom of COVID-19 in this group of patients. The suggested mechanism of the symptom in patients with COVID-19 is the effect of this virus on the nerves. For example, the taste system change hypothesis assumes that taste stimuli affect the trigeminal inhibitory system. Therefore, hypogeusia/ageusia due to peripheral nerve degeneration in patients with COVID-19 can lead to BMS. For the cerebral cortex, this leads to a central inhibition of trigeminal pain, which leads to defective processing of information transmitted by a modified perception of pain sensitivity (increase) in the oral region (Coculescu et al., 2015). However, nerve damage due to pro-inflammatory cytokines and other mediators of the immune system is seen in some cases of COVID-19 (Aksan, Nelson, & Swedish, 2020).

Xerostomia: Lack of adequate Salivation leads to xerostomia. However, in some patients with xerostomia, saliva levels are not reduced (Min & Park, 2009). Many factors are associated with xerostomia (Greenberg, Schlosser, & Mirowski, 2017), such as some drugs, systemic diseases such as diabetes, or autoimmune diseases such as Sjogren's syndrome (Bhatia, Goyal, & Kapur, 2013), and psychological conditions such as stress (Muller, 2019), anxiety (Kang, Lee, Ro, & Lee, 2012), depression (Baig, Abid, Fatima, & Ahsan, 2018), and bulimia nervosa (Kang et al., 2012). Some viral infections such as HIV (Muller, 2019) HTLV-1, hepatitis C (Muller, 2019), and COVID-19 (Min & Park, 2009), lifestyle factors such as alcohol and smoking (Alzahem, 2017, Bhatia et al., 2013, Almutairi, Albesher, Aljohani, Alsinanni, Turkistani, & Salam, 2021), dehydration (Fatima, Abid, Baig, & Ahsan, 2019), mouth breathing (Kurapati, Pradusha, Sajjan, AV, & Nair, 2020), and upper respiratory tract infections (Millsop, Wang, & Fazel, 2017) can also cause xerostomia. A variety of emotions can reduce or enhance salivary flow. Anxiety and fear can directly affect salivary secretion through the amygdala, hypothalamus, and brainstem pathways (Gholami, Hosseini, Razzaghi, & Salah, 2017). According to the hypothesis of biogenic amines in depressed people, the salivary flow rate may be reduced as a result of the stimulation of anticholinergic mechanisms (Gholami et al., 2017). Furthermore, drugs prescribed for the treatment of psychological diseases also have an indirect effect on this condition (Ianunzio, Peres, Haag, & Peres, 2019). Psychological disorders can play an important role in the incidence of xerostomia, and due to its nature, its numerous side effects; hence, it is possible to prevent xerostomia by recognizing, controlling, and treating these psychological disorders.

Recurrent aphthous stomatitis: RAS is a common disorder characterized by small, recurrent ulcers confined to the oral mucosa with no symptoms of other systemic diseases (Preeti, Magesh, Rajkumar, & Karthik, 2011). Aphthous ulcers are more common in the non-keratinized mucosa of the lips and floor of the mouth, and can be painful to the extent that they interfere with eating and make oral hygiene difficult for the patient (Dhopte, Naidu, Singh-Makkad, Nagi, Bagde, & Jain, 2018). Despite extensive studies, its exact etiology remains unknown. The main known factors in the

development of RAS are genetic factors, stress, and hematological and nutritional defects (Bilodeau & Lalla, 2019). Stress changes the regulation of both the sympathetic and parasympathetic branches of the nervous system, resulting in changes in the hypothalamic-pituitary-adrenal (HPA) axis and hormones, and changes in immune monitoring (Chiappelli & Cajulis, 2004). Psychological stress induces immunoregulatory activity through increasing the number of leukocytes at sites of inflammation, a feature often seen in the pathogenesis of RAS (Scully, Gorsky, & Lozada-Nur, 2003). Increased levels of salivary cortisol or reactive oxygen species (a possible determinant of stress levels of an individual) in saliva following stress may lead to the onset of lesions. Moreover, stress may simply provoke self-induced trauma, and thus, initiate RAS episodes (Karthikeyan & Aswath, 2016). Increased stress changes salivary peroxidase levels, which causes imbalance in this enzyme, thus leading to mucosal damage (Kiran & Reginald, 2015). Prolonged stress leads to a continuous increase in cortisol levels, which by changing the local immune response in the oral mucosa, leads to dysregulation of various homeostatic mechanisms in the body (Vandana, Kavitha, & Sivapathasundharam, 2019). During the COVID-19 pandemic, stress, anxiety, and the subsequent, depression have become a common Struggle.

Recurrent lip herpes: The human herpesvirus (HHV) family is a group of DNA viruses that can survive latently after initial infection. The initial infection is often subclinical and manifests as gingivostomatitis. The virus can be transmitted to sensory nerve axons and remain latent in the trigeminal nerve ganglion for a long time, or it can be transmitted outside the nerve cell, such as epithelium, causing recurrence of lesions in the lips. Stimulants such as sun, trauma, emotional or menstrual stress, fever, and suppression of the immune system cause its reactivation (Ballyram, Wood, Khammissa, Lemmer, & Feller, 2016).

Psychological stress can reactivate latent herpes viruses by significantly modulating the central nervous system (CNS) and immune system (Yan et al., 2020; Chida & Mao; 2009; Khalil, Ibrahim, al Shayeb, Kuduruthullah, & Hassan, 2020). Psychological stress in humans increases corticotropin (CRF) and ACTH releasing level as a result of the stimulation of the hypothalamus and pituitary gland, respectively, and subsequently, stimulates adrenal glands to secrete epinephrine and cortisol, which modulate immune interactions (Uchakin et al., 2011). The receptors for these two major stress hormones are selectively expressed by different types of HSV-infected neurons, including sensory and autonomic neurons (Gold, Dastmalchi, & Levine, 1997). Thus, epinephrine and cortisol may impair the ability of viruses to multiply in certain nerve cell types which may affect the severity of the disease and the ability to reactivate to cause recurrent lesions (Chida & Mao, 2009; Uchakin et al., 2011).

Lichen planus: Oral lichen planus is a chronic immunological disease mediated by T cells and common in the oral cavity. It is characterized by reticular lines or white plaques. The disease mainly occurs in adulthood (50-55 years of age) and manifests more in women (Agustina, Soegyanto, Pradono, Sasanti, & Permana, 2018). Hitherto, several related factors have been suggested for this disease, including genetic background, infectious factors, certain systemic diseases, and psychosocial factors such as anxiety, stress, and depression (Vassandacoumara & Daniel, 2017). In many cases, periods of emotional instability resulting from stressful life events are associated with recurrence, exacerbation, or even onset of the disease (Cankovic, Bokor-Bratic, & Novovic, 2015). Due to the increase in stress and anxiety during the COVID-19

pandemic and the relationship between this disease and psychological conditions, and increase in the number of patients with this disease is not a misplaced prediction.

Conclusion

According to previous researches and clinical results, various causes and conditions play a role in the pathology, disease course, prognosis, treatment, and recurrence rate of oral diseases. Factors such as genetic background, underlying diseases, lifestyle and habits, and behavioral and psychological factors and diseases are among the most important factors related to this category of diseases. Of the psychological factors, we can mention personality variables, behavioral habits, mental states, and disorders such as stress, obsession, anxiety, depression, impulse control disorder, and psychodynamic causes that play an important role in the pathology, disease course, and prognosis of these diseases in such a way that these diseases can be classified as somatic symptom disorders and related disorders. In other words, in addition to examining the psychological background of treatment in the diagnosis and treatment stages, a variety of psychotherapy methods can be used to increase the effectiveness of medical treatments. The problems we are facing today, especially stress caused by COVID-19 in psychologically and medically susceptible people can intensify the pathology of these diseases in all its dimensions; therefore, special attention should be paid to this aspect in the care and treatment of patients.

Conflict of Interests

Authors have no conflict of interests.

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