

NON-CARIOUS NECK LESIONS ASSOCIATED WITH PSYCHOLOGICAL DISORDERS: POST COVID-19 PANDEMIC

Edilma Silva Lopes

Jaciara Ferreira Marques

Antonione Santos Bezerra Pinto
Orientador

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Abstract: The impact of the pandemic transcended the sphere of physical health and extended to the psychological well-being of the global population. This is due to the sudden changes that have become mandatory, such as social isolation, the obligation to wear masks and the fear of contamination, among other factors. The aim of this study is to investigate the causes of non-carious neck lesions (NCLs) resulting from psychological disorders after the COVID-19 pandemic. This research is bibliographic in nature, for which several renowned scientific databases were explored, including Google Scholar, PubMed and SCIELO, in order to ensure a broad and up-to-date survey of the available literature on the subject. In the field of psychological knowledge, a direct consequence was the reported significant increase in cases of bruxism, which is nothing more than a parafunctional habit associated with states of anxiety and stress. In this context, the scientific literature indicates that bruxism is directly related to NCCLs, which consist of non-carious lesions in the cervical region of the teeth. However, there is still a gap in the understanding of how psychological disorders, exacerbated by the context of the pandemic, can influence the development and progression of NCCLs.

Keywords: non-carious neck lesions; stress; anxiety; bruxism; COVID-19 pandemic.

INTRODUCTION

Non-carious cervical lesions (NCLs) are characterized by the gradual irreversible loss of mineralized tissue near the cemento-amel junction, without any bacterial involvement, and is one of the factors related to dentin hypersensitivity (DH), characterized by acute, provoked and short-lived pain (Costa *et al.*, 2018). However, these lesions are currently being designated because people are suffering from some psychological disorder, such as stress and anxiety arising from the COVID-19 pandemic (Santos, 2021).

This has led to the appearance of patients with similar symptoms, but who have not been diagnosed with an emotional disorder, as well as a certain amount of resistance on their part when approaching the subject. Therefore, Soares (p. 184, 2023) says that, “although much neglected, mental health is as indispensable as physical and social health, and directly interferes with the well-being of individuals, societies and countries.

People with mental illness, particularly severe mental illness, are at greater risk of oral health problems due to poor nutrition and oral hygiene; heavy consumption of sugary drinks; misuse of comorbid substances, including tobacco, alcohol or psychostimulants; and financial or other barriers to accessing dental care. (Macedo; Passos, 2023)

The increase in psychological symptoms and mental disorders during the pandemic can occur for various reasons. These include the direct action of the COVID-19 virus on the central nervous system, traumatic experiences associated with infection or the death of close people, stress induced by the change in routine due to social distancing measures or the economic consequences, work routine or affective relationships and, finally, the interruption of treatment due to difficult access (Brazil, 2022).

Although NSCLCs are multifactorial in origin, bruxism has been one of the recurring causes of these injuries and is directly linked to the emotional repercussions caused by the health crisis, since both dilemmas have psychological factors as one of the causative elements, consequently there has been a substantial change in people’s habits, with social isolation (Silva, 2023).

Due to these factors, other pathologies that correlate with NCCLs, also triggered by bruxism, is temporomandibular dysfunction (TMD), characterized by symptoms of pain, headache, as well as joint disorders (Brasil, 2022).

Bruxism is considered a significant clinical habit and has been highlighted in the literature due to the increase in the incidence of cases, especially after the COVID-19 pandemic and due to its marked characteristics of muscle overload among other structures of the stomatognathic system that end up affecting the quality of life of individuals. The severity of the consequences varies according to the resistance of the structures that have been affected, the time and general condition of the affected individual. The most common complications are: hypertrophy of the masticatory muscles, mechanical wear of the teeth, fractures and failures of restorations and implants, hypersensitivity or painful teeth, as well as indentations in the tongue or linea alba in the jugal mucosa. Fatigue of the masticatory muscles, joint pain, limited jaw movement and, finally, being a risk factor for TMD can also occur (Barbosa, 2023 p. 14).

Temporomandibular dysfunction (TMD) is the term used to designate a condition of neuromuscular disorganization identified by the presence of chronic headaches, sounds in the temporomandibular joint (TMJ), restrictions in jaw movements, hyperesthesia and pain in the muscles of mastication, the head and the neck (Cruz, 2023).

It is prevalent in young adults between 20 and 40 years of age and is more prevalent in females¹⁻⁴. TMD has a multifactorial etiology, as it is the result of anatomical, neuromuscular, psychological and occlusal factors, which can lead to dysfunctional alterations in the head and neck regions. It may also be associated with non-functional habits such as stress, trauma, emotional, systemic and hereditary factors (Cruz, 2023).

TMD and bruxism are prevalent in the adult population in general, with more than 50% of the population having some sign of TMD. Epidemiological studies show that the prevalence of SB in adults can vary from 10%

to 13%, while in cases of BV this variation is 22% to 30% (Martins, *et al.* 2023).

This literature review research is imperative given the need to understand and mitigate the adverse impacts of the pandemic on the population's oral health. By investigating NCCLs in relation to post-pandemic psychological disorders, we hope to contribute to the advancement of clinical knowledge and promote more effective intervention strategies for this specific condition.

Therefore, this research aims to thoroughly investigate the mechanisms underlying this relationship, offering not only innovative insights, but also contributing to the formulation of more effective preventive and therapeutic strategies, thus promoting a holistic and integral approach to oral health in a current post-pandemic context.

OBJECTIVES

GENERAL

To investigate the causes of non-carious cervical lesions resulting from psychological disorders after the COVID-19 pandemic.

SPECIFIC

To detect the main factors that contributed to the significant increase in patients presenting with NCCLs in the post-pandemic context;

To explore how psychological changes influence the oral cavity, triggering or exacerbating NCCLs;

Disseminate the causes of NCCLs related to the post-pandemic period of COVID-19, promoting a broader understanding and a more effective approach to the treatment and prevention of these lesions.

THEORETICAL REVIEW

COVID-19 PANDEMIC AND ITS INFLUENCE ON PSYCHOLOGICAL DISORDERS

The coronavirus (SARS-COV-2) is responsible for the disease called COVID-19. According to the World Health Organization (WHO), the virus first appeared on December 31, 2019, in China. However, in Brazil, the first case to be confirmed was diagnosed on February 25, 2020, after which the virus spread rapidly around the world, leading the WHO, on March 11, 2020, to declare a global pandemic outbreak (WHO, 2020).

Thus, in March 2020, the pandemic was declared, the population had to go through changes in their routines, starting with the mandatory use of masks, the closure of establishments, the prohibition of events in which there would be agglomeration, continuous use of hand sanitizer, the lifestyle of people around the world has completely changed. In addition, there was social isolation, in which many people went days without seeing their own family, friends and acquaintances, in order to avoid contracting the virus (Almeida *et al.*, 2022).

As a result, even after the pandemic has ended, it is still causing problems. In addition to the pathophysiological consequences, there are also problems related to mental health in the population. Studies show that mental illness occurs despite socioeconomic status (Martins *et al.*, 2023). “Depression, insomnia, stress, indirect trauma and anxiety are the most prevalent mental illnesses in society” (Martins *et al.*, 2023, p. 2). The WHO states that anxiety and depression are predominant post-pandemic morbidities, especially in the young and female population (Martins *et al.*, 2023).

However, the number of cases of mental disorders after the pandemic, especially depression and anxiety, has been increasing, even after the reduction and control of COVID-19 cases. Therefore, there is a need for studies on this subject, with the aim of understanding the consequences of post-pandemic anxiety. To facilitate plans and actions with protective factors to prevent mental health illness (Martins *et al.*, 2023).

BIOLOGICAL MECHANISMS: STRESS AND BRUXISM

Chronic stress and anxiety have profound effects on the central nervous system, directly influencing behaviors such as bruxism, which is the parafunctional activity of grinding or clenching teeth. Bruxism, in turn, is a significant risk factor for the development of Non-Carious Cervical Lesions (NCCLs) (Silva, 2023).

The autonomic nervous system, made up of the sympathetic and parasympathetic systems, is particularly affected by stress. Under conditions of chronic stress, the sympathetic system is continuously activated, resulting in high levels of cortisol and adrenaline. These stress hormones can increase muscle activity, including the masticatory muscles, leading to bruxism (Araújo, 2022, p. 10).

In addition, chronic stress can affect sleep quality, resulting in episodes of nocturnal bruxism. The sleep-wake cycle is regulated by complex neurophysiological mechanisms that can be disrupted by stress and anxiety, further exacerbating bruxism (Almeida *et al.*, 2022).

These combined factors contribute to tooth wear and the formation of LCNCs, which are lesions at the cemento-enamel junction of teeth caused by mechanical forces unrelated to caries. Studies show that individuals with high levels of stress and anxiety have a higher prevalence of NCCLs, confirming the link between psychological disorders and dental health (Cabrita, 2021).

BRUXISM AS A RISK FACTOR FOR NECK INJURIES

Bruxism is a disorder in which a person clenches, slides or bangs their teeth, especially during sleep. It happens involuntarily, i.e. without the person wanting to.

In this sense, Cabrita *et al.* (p. 34, 2021) say:

Bruxism is a motor disorder that originates in the central nervous system and can cause various types of physical effects in the bruxer, such as tooth wear, damage to supporting structures, TMD, pain, joint noises (crackling), vertigo, pulp sensitivity, occlusal sounds, transient periodontitis and functional limitation of the physiological movements of the components of the stomatognathic apparatus.

Thus, because it has a neurological cause, many researchers have developed studies that seek to associate stress and events that cause anxiety with the development of bruxism and its crises. One of these hypotheses assumes that when a stressful situation or environment triggers, the body triggers this stereotype as a way of reacting to the emotional strain and returning to a state of equilibrium (Cabrita, 2021).

The causes of bruxism have not yet been fully clarified, but its multifactorial nature indicates the involvement of pathophysiological, psychosocial, hereditary and genetic factors. In addition, some studies suggest that its presence is associated with lifestyle, anxiety, concentration, stress caused by daily routines such as family responsibilities and/or pressure at work.

As described by Fraga (2021, p.754):

as a result of stress, the loss of dental tissue in the cervical region has been understood for various reasons, such as the occlusal factor, which causes flexion in the cervical region, proving the association of the lesion with bruxism, clenching and premature contact, and the patient's psychological state, such as frustration and anxiety, which is closely related to bruxism.

Because of this, the perspective has shifted to biomechanical theory, which highlights the progressive damage to mineralized tissue in the cervical region due to forces generated during parafunctional movements, such as bruxism. Current studies suggest this prevalence in these patients (Silva, 2020).

The physiological movement of the jaw generates three types of force on the dental units: compression, traction and shear. The composition of enamel and dentin provides support for the compressive force, but not for traction. The repetition of this force caused by bruxism, clenching or the concentration of this force on just one dental unit, such as premature contact, breaks the bonds between hydroxyapatite crystals, causing non-carious cervical lesions (Pinheiro *et al.*, 2023 p. 105).

The mechanisms that cause LCNCs are divided into three main factors: accumulation of tension, also called “abfraction”, is understood as a superficial abrasion of the tooth surface in conjunction with occlusal forces; friction, which is a concept attributed to the wearing away of a substance or structure through an abnormal mechanical process; and biocorrosion, which is the most appropriate term for what was previously known as “erosion”, as it encompasses all forms of degradation: chemical, biochemical and electrochemical (Alves, 2022).



Figure 1: abrasion lesion

Source: Alves (2022, p. 33)



Figure 2: abfraction lesion

Source: Alves (2022, p. 31)



Figure 3: erosion lesion

Source: Alves (2022, p. 22)

It is clear that various treatments have been proposed for bruxism, but there is no consensus on which method is the most effective. Despite the systemic use of medication and occlusal devices, the patient's awareness of their own problems seems to be the most relevant treatment tool in the clinical approach to patients with bruxism (Jardim *et al.*, 2021, p. 27449).

In short, there has been an increase in patients who show characteristics of wear on their teeth, attributed to teeth grinding and clenching. Studies have increasingly shown that levels of bruxism and temporomandibular disorders have increased in those suffering from an aggravated psycho-emotional state. This means that levels of anxiety and psychological changes increase at the same rate in a given population. "There may be a development in this same population of

parafunctional habits which, associated with other factors, may lead to an increase in the involvement of non-carious cervical lesions" (Araújo, 2022, p. 10).

PREVENTION AND TREATMENT STRATEGIES FOR NSCLC IN PATIENTS WITH PSYCHOLOGICAL DISORDERS

There are several treatment options for NCCLs, as well as to reduce the symptoms of CDH (cervical dentin hypersensitivity). As several factors influence the appearance of NCCLs, the dental surgeon continues the treatment, and the literature indicates procedures such as: occlusal adjustments; restorative treatments; palliative desensitizing treatments for CDH and periodontal surgical techniques. In many cases, this is accompanied by multi-disciplinary teams made up of psychologists, physiotherapists and sometimes psychiatrists (Jardim *et al.*, 2021).

It is reaffirmed that the etiology of NCCLs is multifactorial, in which genetic and environmental factors are involved in the progression of the disease. The interaction of various mechanisms, such as biocorrosion of tooth enamel due to chemicals, biochemical and electrochemical degradation, leading to stress and mechanical loss of tooth structure (abfraction) and abrasion (wear caused by friction) result in the appearance of this specific phenotype. Determining the precise etiology of LNCs is important in order to prevent further loss of tooth structure, designate the best treatment and prevent new lesions (Lima; Daltro; Costa, 2023).

The treatment for these lesions is defined after a detailed anamnesis and clinical examination, which guide us to reach an accurate diagnosis and which can be modified from one patient to another, depending on the etiology. "Thus, therapy can range from guidance on diet, brushing, anxiety control with psy-

chological support to occlusal adjustment or restorative treatment in composite resin” (Almeida *et al.*, 2020, p. 191).

In addition,

Another method of restorative treatment is the use of glass ionomer cement (GIC). This material, in addition to having the ability to chemically bond to the tooth structure, has a coefficient of thermal expansion similar to the tooth and a modulus of elasticity that compensates for the wear caused by the tensile forces suffered in the cervical region (Almeida *et al.* 2020, p. 191).

In addition, it is undeniable that physical exercise is an excellent way of releasing the stress of everyday life. When not released, the state of tension and stress can lead to increased muscle tone/craniocervical tension, hypertension, asthma, cardiac arrhythmias and the development of parafunctions (Navarro, 2018).

Effective treatment requires multidisciplinary intervention. Thus, dental work is just one of the facets that make up the framework of professionals who can assist in the process. In situations of erosion of an exogenous nature, it is necessary to indicate dietary adequacy. On the other hand, in situations of an endogenous nature, underlying medical treatment may be essential, as well as referral for psychological support (Almeida *et al.*, 2020).

Therefore, treatments for cases of NCCLs include the removal of etiological factors, psychological support for emotional control, and the use of restorative materials to reestablish tooth structure. Examples of materials include glass ionomer cement and composite resin (Almeida *et al.*, 2020).

METHODOLOGY

The following electronic databases were used to carry out this review: PubMed, Google Scholar, SCIELO and Web of Science. The search was conducted using a combination of keywords and specific search terms to identify relevant studies on the relationship between psychological disorders and non-carious cervical lesions (NCLs) in the post-COVID-19 pandemic context.

The keywords used in the search were: “COVID-19”, “psychological disorders”, “anxiety”, “depression”, “bruxism”, “non-carious neck lesions”, “NCLs”, “pandemic”, “stress”, “mental health”. In addition, filters were applied to select studies published between 2020 and 2023 to ensure the temporal relevance of the data.

The inclusion criteria for selecting the studies were:

- Studies published in English or Portuguese.
- Studies investigating the relationship between psychological disorders and NCCLs.
- Human studies.
- Studies with clear and robust methodology, including systematic reviews, meta-analyses, clinical trials and observational studies.

The exclusion criteria were:

- Studies published before 2020.
- Studies that did not directly address the relationship between psychological disorders and NCCLs.
- Animal studies.
- Studies with small samples or inadequate methodology.

The selection of studies was carried out in three stages: reading the titles and abstracts to identify potentially relevant studies, reading the full texts to confirm eligibility and including the studies that met all the established criteria.

DISCUSSION

Social isolation has increased the population's stress levels. In addition to this, the rapid increase in the volume of information, which is sometimes dubious, the fear of contracting COVID-19 or livelihood difficulties have aggravated the development of anxiety and depression in people, making them more vulnerable to oral problems related to physical and psychological stress (Rocha *et al.*, 2021).

According to Pontes *et al.* (2021), with the stress generated by everyday life, which raises levels of pressure and anxiety, it is natural that some people are more vulnerable and that their psycho-emotional state is linked to NCCLs and that these patients who suffer from emotional imbalance find it easier to acquire parafunctional habits, subjecting their teeth to occlusal overloads.

Still in the context of post-pandemic psychological variations, this implies that as anxiety levels and psychological changes increase in a population, "there may be a development in that same population of parafunctional habits which, associated with other factors, may lead to an increase in the involvement of non-cariious cervical lesions" (Silva, 2022, p. 10).

In addition, Silva (2022) emphasizes that when a pandemic was declared in 2020, the disease caused by the Covid-19 coronavirus raised attention to mental health disorders, including anxiety and depression, a fact also reported in the work of Carrillo-Diaz *et al.* (2021), who associated social isolation with sedentary lifestyles and excessive use of social networks, resulting in a significant increase in anxiety levels in young people.

Santos and Conforte (2022, p. 2166) also explain that:

It is well known that we live in the digital age, which generates constant physical and emotional pressure and we are increasingly plagued by anxiety, stress, depression (aggravated by the Covid-19 pandemic), wrong eating habits (fads and crazy diets). Previously, concern centered on caries and periodontal diseases as harmful causes to the oral health of the population, however, over the years, new pathologies have been included as responsible for the premature aging of teeth, among them: attrition, abfraction, abrasion and erosion, thus making up the LCNs, dental hypersensitivity can also be included.

In fact, Pontes *et al.* (2021) reaffirm that another factor constantly presented as the etiology of NSCLs is psycho-emotional factors such as anxiety and depression. In this context, the changing lifestyle and professionalism of today's society, with the stress generated by modern daily life, which raises pressure and anxiety levels, it is plausible to believe that some people are more vulnerable than others and that the psycho-emotional state is linked to the appearance of non-cariious cervical lesions, especially abfraction lesions. Patients who suffer from diseases of the nervous system or chronic emotional imbalances are more likely to develop parafunctional habits and subject their teeth to occlusal overload, in addition to other gastric complications such as bulimia and reflux (Pontes, 2021). That said, patients with this psychological condition should always be suspicious of the presence of these lesions.

In this sense, Pontes *et al.* (2021) also add that there are studies that show a link between panic disorder (PD), characterized as a mental disorder, and gastroesophageal reflux, which is also characterized as an endogenous source of erosion. "PT is also linked to anxiety attacks, as it can often be an evolution of these" (Pontes *et al.*, 2021 p. 3).

By the way, not only bruxism, but the patient's psycho-emotional state must be taken into account.

Bulimia nervosa is an eating disorder that has, among other characteristics, recurrent episodes of periodic compulsions, with the induction of vomiting being one of the main characteristics of the disease. The compulsions are associated with dysphoric mood states, such as depression, negative or stress-provoking situations, as well as being associated with anxiety disorders (Pontes *et al.*, 2021, p. 2).

In this way, there is a link between diseases related to anxiety disorders, such as bulimia nervosa, and LCNC erosion, so that the induction of vomiting is characterized as an endogenous source of the lesion.

This understanding is reinforced by the fact that emotions can play a role in intensifying NCCLs. In this context, the COVID-19 pandemic has exacerbated anxiety, depression and stress, triggering nervous symptoms such as decreased salivation, worry, restlessness and nervousness, among others. This can have intense repercussions on oral health by causing bruxism in patients, and consequently tooth fractures and wear (Santos; Conforte, 2022).

At the same time, studies show that the development of parafunctional habits is directly linked to psychological disorders such as stress, excessive fear and anxiety (Lima *et al.*, 2021).

Finally, the management of non-carious lesions and, above all, their prevention is a challenge for the modern dental surgeon, who must keep up to date and seek training in their conduct. More than just restoring or covering lesions, adjusting occlusion, or prescribing the use of myorelaxing plates, the professional must pay attention to the quality of the anamnesis and the tireless search for early signs and associated risk factors. Conduct and multi-professional follow-up is essential in

these cases. Aging healthily is also aging with all your teeth in your mouth and functioning.

FINAL CONSIDERATIONS

This literature review is relevant given the need to understand and reduce the adverse impacts that the COVID-19 pandemic has had on the population's oral health. By investigating the causes of NCCL in relation to post-pandemic psychological disorders, contributing to the advancement of clinical knowledge and promoting more effective multidisciplinary intervention strategies for this specific condition.

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Authors	Objective	Study population	Consequences of anxiety and mental health after the pandemic
Abbas; Athar; Jilani, 2023	Assessing the impact of COVID-19 on physical and mental health of school-age children.	School-age children (5-18 years)	As a result of the pandemic, there has been an increase in other mental health challenges other than anxiety, such as school absences, substance abuse, sleep disorders and eating disorders.
Florek, 2023	Identify the links between anxiety, aggression and the level of alcohol consumption over a period of more than 2 years since the first case of COVID-19 was diagnosed in Poland	349 women and 136 men from various regions of Poland answered an <i>online</i> questionnaire	The COVID-19 pandemic has eliminated the link between anxiety and alcohol consumption. Women showed associations between anxiety, aggression and hostility, while men showed moderate correlations with aggression and anger, as well as a strong correlation with hostility. There was also a negative correlation between alcohol consumption and verbal aggression.
Korkut et al, 2022	Assessing coronavirus anxiety, generalized anxiety disorder (GAD) and post-traumatic stress symptoms (PTSS) and also determine quality of life (QoL) and coping styles in survivors, comparing them with uninfected controls	339 survivors who were confirmed with COVID-19 through clinical trials in the last 3 months and 321 patients who had not been infected with COVID-19.	Survivors had higher levels of coronavirus-related anxiety, generalized anxiety and post-traumatic stress symptoms, as well as quality of life reduced. Among the survivors, 59.3% presented Anxiety Disorder Generalized and 25.7% showed anxiety specific to the coronavirus. Furthermore, most survivors described the intensity of anxiety as moderate to severe, and approximately two-thirds of them reported a moderate to severe psychological impact resulting from the pandemic.
Lueger Schuster; Zrnić, Lotzin, 2022	Gain insights into the dynamics of mental health and coping, considering different characteristics of the pandemic in different waves of assessment.	243 adults from the population.	The highest levels of anxiety and depression were observed in the analysis after the pandemic. A significant increase in the proportion of participants at risk for probable depression in the post-pandemic analysis, as well as a substantial increase in the prevalence of generalized anxiety disorder.
Osses-Anguita et al, 2023	Assess the impact of the COVID-19 pandemic on the possible prevalence of awake and sleep bruxism and on the psychological factors associated with bruxism, comparing pre-pandemic, pandemic/confinement and post pandemic samples of year.	274 Dental Dentistry University of Barcelona	The group that went through the post-pandemic phase had a more significant impact of the conditions generated by the pandemic on their psychological variables, showing higher levels of anxiety. Acute resulting from daily social interactions may have contributed to increased anxiety levels and led to a higher incidence of bruxism during the waking observed in both the pre-pandemic and post-pandemic groups.
Shpakou et al, 2022	Evaluating self-assessment of physical activity, life satisfaction, perceived stress, choice of coping strategies and their correlations between student athletes from two neighboring countries who different anti-pandemic strategies	600 Physical Education and Sports universities in Belarus (n = 333) and Poland (n=267)	Most of those surveyed avoided serious mental health effects during the pandemic. Higher levels of anxiety as a trait were linked to higher levels of anxiety as a state, especially in women. Those with higher physical activity showed lower anxiety. This highlights the relationship between physical activity, life satisfaction and anxiety.

Chart 1 - Presentation of studies on the consequences of anxiety and mental health in the post-pandemic period.

Source: Martins *et al.* (p. 5, 2023).

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