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# Association between Bipolar Affective Disorder and Periodontal Diseases

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## Abstract

Periodontitis, an inflammatory disease of periodontal tissues, is characterized by the progressive loss of support tissue and the insertion of teeth. It derives from the infection and interaction of specific bacterial species with host response components in susceptible individuals. A growing number of observational and epidemiological studies have been published, in the last decades, pointing to a possible association between stress, anxiety, and depression with the development and progression of periodontal diseases. One of the possible mechanisms of influence of stress and of the psychosocial factors, in the periodontal conditions, is the modification of the individual's behavior. The studies that assessed the association between stress, depression, and periodontal disease are numerous in different types of design, yet their data are still conflicting. Another recurrent serious condition of mental health, frequently associated with high rates of morbidity and mortality, is the bipolar affective disorder (BPAD). Although little investigated and with conflicting data, BPAD is a behavioral factor associated to the periodontal disease. In addition, little is known about its interference with the microbial and immunological response to periodontitis. The aim of this chapter is to describe the main scientific evidence of the association between BPAD and periodontitis.

**Keywords:** periodontal disease, bipolar affective disorder, tooth loss

## 1. Introduction

Periodontitis, an inflammatory disease of periodontal tissues, is characterized by the progressive loss of support tissue and the insertion of teeth (**Figure 1**). It derives from the infection and interaction of specific bacterial species with host response components in susceptible individuals [1].

A growing number of observational and epidemiological studies have been published, in the last decades, pointing to a possible association between stress, anxiety, and depression with the development and progression of periodontal diseases [2–4].

One of the possible mechanisms of influence of stress and of the psychosocial factors, in the periodontal conditions, is the modification of the individual's behavior. Individuals with high levels of stress tend to assume behaviors and habits which increase the risk of developing of several diseases, including periodontitis.

Individuals, in these conditions, tend to be more negligent in their oral hygiene, perhaps start or intensify the habit of smoking, or modify their nutritional habits with deleterious reflexes in the functions of their immunological system. Such conditions would entail predisposition to a greater gravity of periodontitis [3, 4].

It is known that the primary etiology of periodontitis is related to the accumulation of bacterial biofilm, given that certain bacterial species and their virulence factors are directly related to susceptibility, installation, and progression of the periodontitis [5]. Socransky et al. [6] analyzed the grouping of bacterial species in subgingival biofilms and determined six “bacterial complexes” grouped and classified by color (Figure 2). From these, the pathogens of red complex *Porphyromonas*

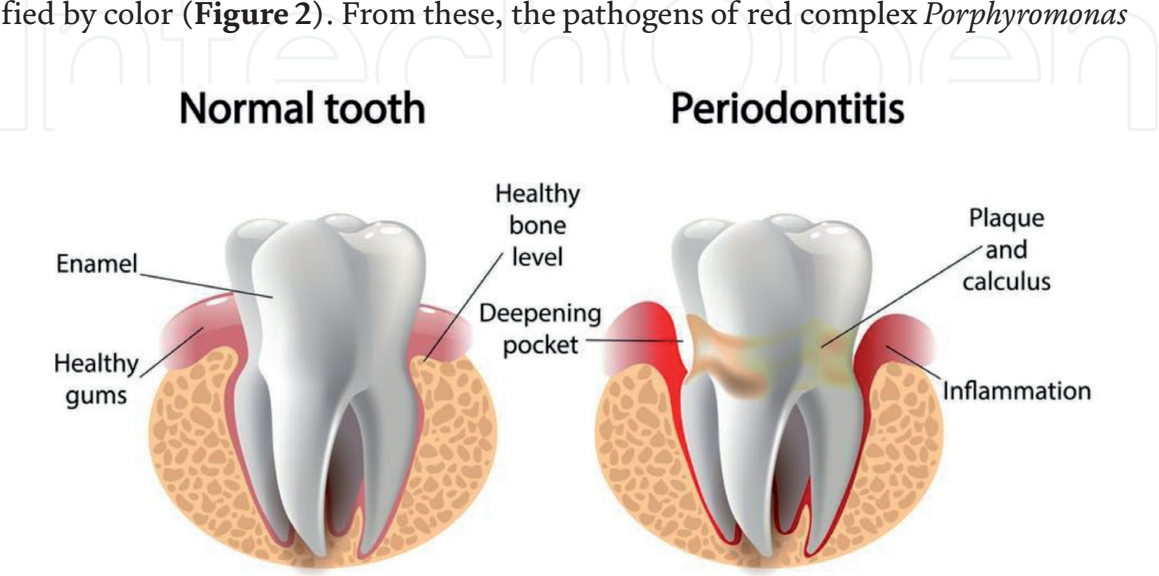


Figure 1.  
Normal tooth x periodontitis.

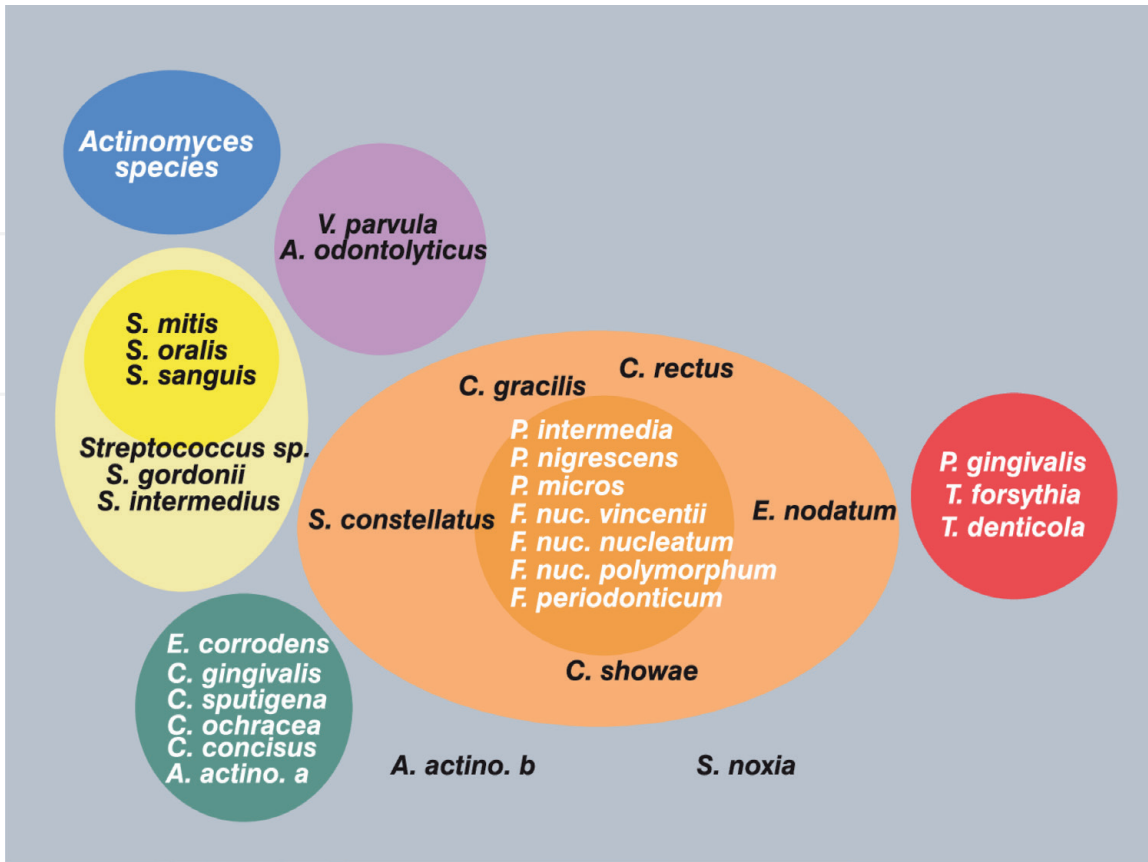
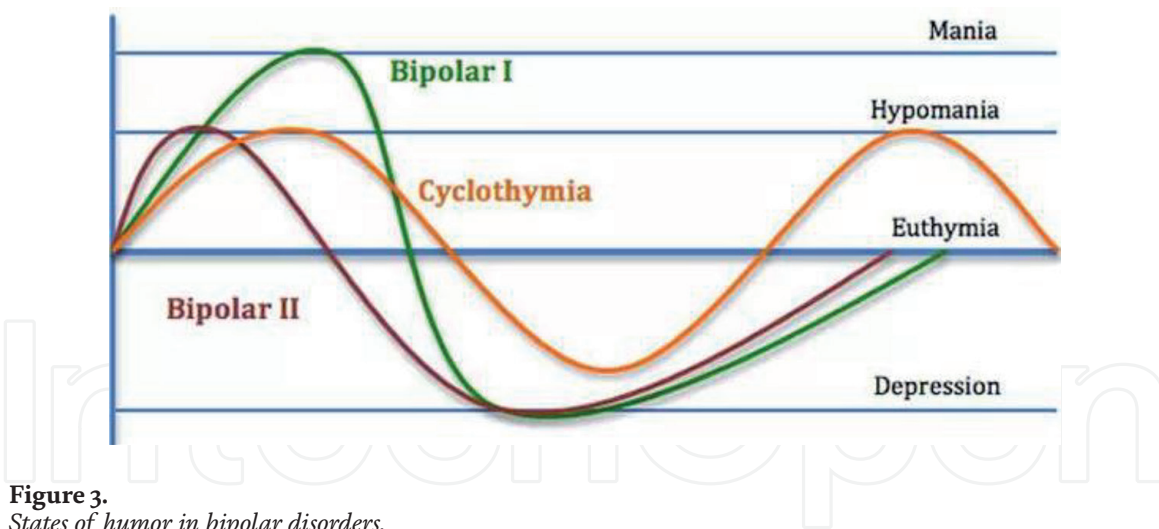


Figure 2.  
Subgingival microbial complexes.



**Figure 3.**  
 States of humor in bipolar disorders.

*gingivalis*, *Treponema denticola*, and *Tannerella forsythia* have had an important association with periodontitis and *Aggregatibacter actinomycetemcomitans* which have been presented with a direct association with the type, gravity, and progression of periodontitis [5, 7]. Additionally, the bacteria of the red complex were also related to bigger depth of probing and bleeding on probing [6].

The studies that assessed the association between stress, depression, and periodontal disease are numerous in different types of design, yet their data are still conflicting [2–4, 8–17]. Another recurrent serious condition of mental health, frequently associated with high rates of morbidity and mortality, is the bipolar affective disorder (BPAD). The state of balance of mood, in the BPAD, is named euthymia. The term “thymia” comes from the ancient conception that the thymus, a gland located in the chest, would be responsible for the mood. Following this nomenclature, it is said that the mood (thymia), in a person with BPAD, suffers oscillations throughout the time. The normality is called euthymia, but when the mood is abnormally low, it is called depression, and when it is abnormally high, it is called mania. When the oscillations of mood are very marked with alternation of cycles, and go from great happiness to profound sadness, it is called cyclothymia. The alternation phases of depression with phases of mania characterize the BPAD, even though higher predominance and chronicity on stages of depression are observed [18, 19] (**Figure 3**).

Although little investigated and with conflicting data, bipolar affective disorder is a behavioral factor associated to the periodontal disease. In addition, little is known about its interference with the microbial and immunological response to periodontitis.

The aim of this chapter is to describe the main scientific evidence of the association between bipolar affective disorder and periodontitis.

## 2. Psychosocial factors and periodontal disease

The relationship between psychiatric disorders, negative emotional states, stress, and periodontal disease has been proposed since the 1950s. One of the pioneering studies of armed forces recruits has shown that the psychological stress resulting from such recruitment has increased the prevalence of necrotizing ulcerative gingivitis (GUN) in these individuals [20].

Some authors found that the severity of periodontal disease was greater in psychiatric subjects than in controls and that this severity was even greater among individuals with higher anxiety levels [21].



With the improvement of the laboratory techniques, some studies sought to measure corticoid levels in the urine, relating them to GUN episodes. Shannon et al. [22] found, in individuals with GUN, higher levels of corticosteroids than in controls, but this difference was not statistically significant. Maupin and Bell [23] found significantly elevated levels of corticosteroids during the course of GUN than after disease. Although these works provided a scientific basis for the relationships between emotional states and periodontal diseases, understanding of the time was limited. It was not yet known that some factors could interfere with emotional states, such as sports and social support, and periodontal disease, such as smoking and diabetes. Even the objective instruments of stress measurement were beginning to be elaborated. In the area of dentistry, it took some time for research to re-examine the association of psychosocial factors with periodontal disease.

One of the first studies that evaluated the possible association of stressful events with gingivitis and periodontitis was developed by Green et al. [24]. This study evaluated war veterans between the ages of 23 and 74 who sought emergency or routine care at the Brooklyn Veterans Dental Clinic. These individuals had somatic symptoms, probably from stressful situations. Self-report questionnaires were used to quantify the number of stressful events (Life Experiences Survey) and the number of somatic symptoms (Brief Symptom Inventory), with the objective of perceiving organic dysfunctions, including cardiovascular, respiratory, and intestinal symptoms, among others. According to the authors, gingivitis and periodontitis were found in more severe levels in individuals with high stress scores. It was concluded that there may be a correlation of the severity of gingivitis and periodontitis with the number of negative life events.

Freeman and Goss [25] retrospectively investigated some aspects of occupational stress on periodontal health using the Occupational Stress Indicator [26]. This instrument consists of a series of questions that measure the following aspects: personality type, job satisfaction, mental illness, and perception of physical illnesses. Among the advantages of this instrument is the access to the results of acute and chronic stress parameters, associated with life at work, as well as the possibility of relating these parameters to physical and mental well-being. After applying a regression model, there was a significant association of the increase in depth on probing with high levels of occupational stress (perception of physical stress symptoms) as well as the maintenance of a better periodontal health status in those who had positive behaviors and general health.

One study examined the association between occupational stress and the progression of periodontitis in employed adults. Individuals, regular dental followers ( $n = 23$ ), were examined in two occasions (baseline and 5 years after the initial examination). Clinical measurements of periodontal condition, including clinical attachment loss, were made at four proximal sites on all teeth. A questionnaire, the Occupational Stress Indicator, was used to evaluate the stress retrospectively. The mean change in clinical attachment loss was 3 mm between the assessment periods. Multiple regression analysis was used to explore the relationship between clinical attachment loss, occupational stress measures, and sociodemographic data. In the final regression model, an increase in clinical attachment loss was significantly associated with increased age, lower socioeconomic status, and job dissatisfaction. According to the authors, the results suggest that occupational stress may have a relationship with the progression of periodontitis [27].

Monteiro da Silva et al. [28] verified the influence of psychosocial variables on individuals with periodontitis with rapid progression, adult periodontitis, and individuals without periodontal destruction. Psychological measures consisted of a life events scale, a University of California, Los Angeles (UCLA) solitude scale, and a somatization scale. The results showed an association between the symptoms

of depression and the level of loneliness with periodontitis with rapid progression. Despite this, there was no association with adult periodontitis, currently classified as chronic periodontitis.

Araujo et al. [29] carried out a systematic review and meta-analysis, aiming to assess the scientific evidence on the association between depression and periodontitis. After selecting the studies, 15 were included in the systematic review (8 cross-sectional, 6 case–controls, and 1 cohort study). Six studies reported that depression was associated with periodontitis, whereas nine studies did not. The majority of studies had low risk of bias by methodological quality assessment. Meta-analysis of seven cross-sectional studies showed no significant association between depression and periodontitis (OR = 1.03, 95%, CI = 0.75–1.41). Findings from the present systematic review showed great heterogeneity among the studies, and the summary effect measure of the meta-analysis cannot affirm an association between depression and periodontitis. According to the authors, future studies with different designs in distinct populations should be conducted to investigate this association.

### **3. Bipolar affective disorder and periodontal disease**

BPAD affects 1% of the population of the United States. These people suffer from episodes of extreme euphoria, followed by long periods of depression. A study was carried out in 40 individuals with BPAD diagnosis. They were submitted to oral health assessments regarding the presence of cavities, plaque index, and number of missing teeth. Poor oral hygiene, supra- and subgingival calculus accumulation, extensive dental caries, and numerous missing teeth were commonly identified in these individuals [30].

Chronic mental illness, and its treatment, carries inherent risks for important oral diseases. One of these groups is composed of individuals with BPAD. Through a combination of psychotherapy, pharmacotherapy, life adjustment, and multidisciplinary counseling, these individuals are better able to understand and deal with the underlying mood changes that characterize the condition and in turn interact more positively and progressively within society as a whole. Individuals with BPAD may exhibit various oral changes. These include the formation of root caries and periodontal disease [30, 31]. These diseases are related to the frequent neglect of oral hygiene care and the use of medications, especially lithium, which is related to side effects such as xerostomia. During the manic phase of BPAD (hyperactivity, euphoria), individuals tend to exacerbate oral hygiene care, predisposing to the appearance of abrasive lesions on the teeth, as well as gingival recessions. The knowledge by the dentists of this mental health disorder is essential for the establishment of correct management in the prevention and treatment of oral alterations commonly found in this group of individuals [31, 32].

A prevalence study of systemic diseases was carried out in individuals from a dental school, where 508 individuals were selected and answered a questionnaire for psychiatric evaluation. One hundred thirty-six individuals (26.77%) reported having at least one mental disorder. Of all the systemic disorders, depression was in second place in frequency, behind only hypertension. Drug abuse, anxiety, anorexia, bulimia, insomnia, bipolar affective disorder, and posttraumatic stress were also well reported. It was concluded that there is a need for training for dentistry students, with the aim of recognizing signs of psychiatric disorders in their individuals. The curriculum of dentistry should include this knowledge [33].

Caries and periodontal disease are common findings in individuals with BPAD. These changes have a negative impact on the quality of life and, often, on the response to psychiatric treatment [34].

The prevalence of psychiatric disorders was determined in adults undergoing dental treatment. Four hundred twenty-two subjects were selected in a college of dentistry through the evaluation of histories of psychiatric conditions. The most common disorder was depression. Other disorders included anxiety, bipolar affective disorder, attention deficit disorder, and schizophrenia. More than one disorder was found in 50% of men and 37% of women, and the most common condition was depression, along with anxiety. Seventy-seven percent of the women and 69% of the men, under these conditions, were under active treatment. The most common medications prescribed were serotonin reuptake inhibitors, benzodiazepines, lithium, and tricyclic antidepressants. Twenty individuals reported using more than one medication. It was concluded that a significant number of individuals, under dental care, present psychiatric disorders. These disorders can affect the response of individuals to dental treatment, requiring modifications in these treatments. The side effects of the drugs commonly used by these individuals may make it difficult to control oral hygiene of the same [35].

The prevalence of periodontal disease is generally higher because of poor oral hygiene and drug-induced xerostomia used by individuals with BPAD. Preventive dentistry education, saliva substitutes, and anti-caries agents are indicated. To avoid adverse drug interactions with commonly prescribed psychiatric medications, special precautions should be taken when administering certain antibiotics, analgesics, and sedatives [36].

Cunha et al. [37] evaluated the periodontal clinical condition and epidemiological and microbiological aspects of individuals with bipolar affective disorder. A convenience sample consisting of 156 participants with a diagnosis of BPAD, of both genders, was selected and submitted to complete and microbiological periodontal examination. Bleeding on probing (BOP), probing depth (PD), and clinical insertion level (CAL) on all teeth present were collected. Quantification of bacterial total charge and *Aggregatibacter actinomycetemcomitans*, *Treponema denticola*, *Tannerella forsythia*, and *Porphyromonas gingivalis* was performed by means of qPCR. The results showed a high prevalence of periodontitis (56.8%),

Study group	Phase of BPAD			P
	Mania	Euthymia	Depression	
Periodontitis				
No (n = 64; 43.2%)	20 (71.4%)	42 (46.2%)	2 (5.4%)	<0.001 <sup>A</sup>
Yes (n = 92; 56.8%)	8 (28.6%)	49 (53.8%)	35 (94.6%)	
Total 156	28	91	37	
Severity				
Moderate (n = 83; 90.2%)	7 (87.5%)	43 (87.8%)	33 (94.3%)	0.483 <sup>B</sup>
Advanced (n = 9; 9.8%)	1 (12.5%)	6 (12.2%)	2 (5.7%)	
Total 156	8	49	35	
Extension				
Localized (n = 75; 81.5%)	8 (100.0%)	40 (91.6%)	27 (77.1%)	0.439 <sup>B</sup>
Generalized (n = 17; 18.5%)	0 (0.0%)	9 (18.4%)	8 (22.9%)	
Total 156	8	49	35	

<sup>A</sup>Cunha et al. Chi-square test.

<sup>B</sup>Cunha et al. Fisher's exact test.

**Table 1.**  
Diagnosis, extent, and severity of periodontitis, related to phase of the BPAD.



the majority of which were chronic (90.2%) and localized (81.5%). The depressive phase in individuals with BPAD was strongly associated with the occurrence of periodontitis ( $p < 0.001$ ). The specific bacterial count of *Treponema denticola*, *Tannerella forsythia*, *Porphyromonas gingivalis*, and red complex was significantly higher in individuals with BPAD and periodontitis, compared to the group with BPAD and without periodontitis. The percentage of sites with BOP and PD  $\geq 4$  mm showed a significant and positive correlation with the count of *Porphyromonas gingivalis*, *Treponema denticola*, and *Tannerella forsythia*. The final multivariate logistic regression model revealed that the probability of an individual with BPAD having periodontitis was higher in the depression phase (OR = 28.94, 95%, CI = 4.44–177.27,  $p < 0.001$ ) than in the mania phase (OR = 1.91, 95%, CI = 1.0–1.99,  $p < 0.001$ ) and the presence of a higher total bacterial load (OR = 1.91). It was concluded that individuals with BPAD presented a high prevalence of periodontitis and a higher frequency of periodontal diseases studied, confirming the importance of the need for prevention, diagnosis, and treatment of periodontitis, suggesting that this is a comorbidity associated with BPAD (Table 1).

#### 4. Final considerations

BPAD is a complex psychiatric disorder characterized by the alternance of phases of mania and depression. It is frequently associated with metabolic and endocrinology disorders, and thus it must not be considered a disease that “only” affects the mood [31–34]. As the BPAD and the periodontitis are chronic diseases, presenting a big impact on the health and quality of life of individuals [1, 4, 7, 8], the present study aimed at evaluating the main aspects of association between these two important diseases.

This factor has great relevance because several studies [9, 11, 13, 36–38] that evaluated the association between psychosocial factors and periodontitis utilized retrospective data obtained from medical records or individuals without medical clinic experience to obtain the diagnosis of psychiatric disorders. In these studies [11, 13, 38], many times, the researcher himself (dental surgeon) applied the test/questionnaire of depressive-maniac symptoms in the selected sample, through a quantitative analysis (scores), and the diagnosis of mental health was determined. This strategy to sampling may affect, sensibly, the correct diagnosis of mental health of individuals and, consequently, the analysis, results, and conclusions of the research.

The literature presents few studies that evaluated dental health condition and BPAD [20–22, 24]. Cavity and periodontal disease were commonly found in groups of individuals with BPAD that had gone through dental evaluations [20–24]. Poor oral hygiene related to the behavioral profile of individuals with BPAD and the xerostomia induced by medicines with lithium are mentioned as possible factors associated with a worse condition of oral and periodontal health in this group of individuals [20, 21].

To date, only a scientific study [29] has compared the frequency of periodontopathogens in individuals with and without bipolar affective disorder with periodontitis. The results demonstrated an influence of the periodontitis in the count of the total bacterial load. Individuals with BPAD and periodontitis showed an expressive and significantly higher count than individuals with BPD and without periodontitis, both in relation to the presence of *P. gingivalis*, *T. denticola*, *T. forsythia*, *A. actinomycetemcomitans*, and red complex but also in the total bacterial load. Data from different studies corroborate our findings [5–7].



Individuals in the depression phase were the ones who presented the highest percentage of periodontitis (94,6%) in comparison with individuals in the mania phase (28,6%). Additionally, in the global sample, a bigger bacterial total load, higher levels of *T. denticola*, and red complex in individuals in the depression phase in comparison with the individuals in the euthymia and mania phases were observed. In the multivariate model, the evaluation of the reason of chance revealed that the individuals in the depression phase had 28,04 more chance of having periodontitis than an individual in the mania phase [29].

Besides that, we can hypothetically assume that during depressive episodes, individuals with BPAD may present a decline in the level of oral hygiene. On the other hand, during the periods of mania, there can be an exacerbation in oral hygiene care. According to Friedlander and Birch [21], the mania phase is associated with an increase in the incidence and gravity of cervical abrasive lesions and gingival lacerations. According to Croucher et al. [38], poor oral hygiene, the accumulation of supra- and subgingival calculus, extensive dental cavities, and numerous lost teeth were commonly identified in the depressed individuals. In this line of thinking, individuals with BPAD with exacerbation of the mania phase could increase oral hygiene care in comparison with individuals in the exacerbated depression phase and thus impact positively the periodontal clinical parameters. However, one study [29] with a transversal design cannot confirm these findings because our results refer to the moment of the exam and must not be extrapolated to long-term conditions. In this sense, additional studies with representative samples and longitudinal monitoring are necessary to confirm if the different phases of the mental state present in the BPAD could influence the present and progression of the periodontitis.


In this sense, we indicate that patients with BPAD have an unsatisfactory oral condition, characterized mainly by the presence of periodontal diseases and tooth loss. These poor oral conditions negatively impact the quality of life of these patients. Dentists should alert psychiatrists, nurses, social workers, and caregivers to the need for good oral hygiene, including proper brushing, flossing, and use of coadjuvants such as oral irrigators and interdental brushes. Thus, it is necessary to carry out actions in oral health, preventive and curative, for this vulnerable population. In addition, it is important to regularly visit the dentist and establish a good oral health program aimed at improving the quality of life of the population suffering from mental and behavioral disorders.

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