

## ORIGINAL RESEARCH

### Association between chronic periodontitis and depression: A case control study

<sup>1</sup>Dr Snover Amin, <sup>2</sup>Dr Moin Banday, <sup>3</sup>Dr Farha Choudhary, <sup>4</sup>Dr.Isha Sharma

<sup>1</sup>MDS, Department of Periodontics and Implantology, Maharishi Markandeshwar University (deemed to be), Haryana, India

<sup>2</sup>BDS, Institute of Dental Sciences, Sehora, Jammu, Jammu and Kashmir, India

<sup>3</sup>PSC, Gazetted Officer, India

<sup>4</sup>MDS, Department of Periodontics and Implantology, Genesis Institute of Dental Sciences and Research, Ferozpur, Punjab, India

#### Correspondence:

Dr.Isha Sharma

MDS, Department of Periodontics and Implantology, Genesis Institute of Dental Sciences and Research, Ferozpur, Punjab, India

#### ABSTRACT

**Background:** There are numerous non-oral risk factors that can contribute to the development of chronic periodontitis. Depression is linked to poor oral hygiene, and another explanation suggests that disturbances in the hypothalamic-pituitary axis and hypothalamic-pituitary-thyroid systems can influence periodontal health by altering the immune system. The goal of this study was to see if there was a link between periodontal clinical parameters and depression.

**Material and Method:** A case-control study with 40 patients in each case and control group was used. Probing depth and clinical attachment loss were the periodontal parameters that were measured. Beck's depression scale was used to calculate depression. SPSS software was used to conduct the statistical analysis (SPSS Inc., Chicago, IL, USA; version 17.0 under windows 2000). The link between clinical periodontal markers and depression was determined using the Student's t-test.

**Result:** Periodontal patients had a considerably higher overall depression score than normal controls, according to self-reported depression scoring using Beck's depression inventory.

**Conclusion:** The degree of periodontal disease and the severity of depression in patients was likely to be significantly related in this study.

#### INTRODUCTION

Chronic periodontitis is a complex illness since it is caused by various factors. Periodontitis is caused by an interaction between the immune system and oral bacteria, which can cause oxidative stress and trigger an inflammatory cascade that destroys the oral structure.<sup>1</sup> Plaque is a biofilm that contains certain periodontal bacteria and can be treated as the primary cause of chronic periodontitis.<sup>2</sup> Chronic inflammation, which disrupts the equilibrium of numerous systems, including the nervous, immunological, and endocrine systems, is involved in the immunomicrobial pathogenesis of periodontitis.<sup>3,4</sup> Because of the non-oral risk factors that strongly link with the development of periodontitis, the development and progression of the disease vary from person to person. Multiple systemic disorders, including diabetes, cardiovascular disease, and respiratory disease, have been linked to periodontitis,<sup>5</sup> with proinflammatory cytokines such as tumour necrosis factor (TNF)- $\alpha$ , interleukin (IL)-1, and

IL-6 playing a role.<sup>6</sup> Furthermore, the level of anguish experienced by periodontitis patients was linked to the disease's progression.<sup>7,8</sup> In addition, as periodontitis progressed, sadness became more common.<sup>9</sup> Furthermore, studies have shown that chronic stress and depression are on a spectrum and might cause immune system dysregulation, hindering periodontitis progression.<sup>10</sup>

Depression is one of the most common psychiatric illnesses, and both major depression and sub threshold depressive symptoms can cause serious health consequences.<sup>11</sup> Various studies have indicated the scientific plausibility of a link between depression and periodontitis. These studies have shown that depression and stress can alter an individual's immune response, making him or her more susceptible to developing an infectious disease and perhaps affecting periodontal health.<sup>12</sup> There are few biological psychosocial explanations that explain the link between depression and periodontal health. The neglect of oral health care behaviour is the most important of the suggested mechanisms that attempt to link psychosocial factors to periodontitis.<sup>13</sup> This hypothesis is based on the idea that depressed patients' oral hygiene and professional regular dental care are neglected due to a lack of desire and interest. Depression is also linked to bad habits like smoking and alcoholism, two factors that have been linked to an increased risk of chronic periodontitis.<sup>14,15</sup> Another way through which depression may be a risk factor for the development and progression of illness is through changes in the host immune response, which makes the individual more likely to develop an overall unhealthy condition, which may have an impact on periodontal health.<sup>16</sup>

Because several research has demonstrated that psychological states might play a role in the progression of chronic diseases, the association between psychological elements and periodontitis requires meticulously controlled studies. Understanding this link is necessary for future periodontal disease prevention and treatment planning. The goal of this study was to see if there was a link between periodontal clinical parameters and depression.

## **MATERIALS AND METHODS**

The study is a case-control study in which 40 patients of both sexes (28 men and 12 women) diagnosed with periodontitis and aged 20 to 60 years were enrolled using convenience sampling. The American Academy of Periodontology standards were used to determine eligibility. The outcomes of periodontal and depression studies were compared in a control group of 40 patients (26 men and 24 women) aged 20 to 60 years who did not have periodontitis.

The study protocol was approved by the Institutional Ethical Committee, and the subjects gave their informed consent. Both cases and controls had their medical and dental histories taken. To exclude the effect of demographic and socioeconomic variables, as well as gender and age, smokers (current and former) were omitted from the study. All cases and controls had their oral hygiene index simplified (OHIS) measured. The debris and calculus index components of the OHIS were measured for six representative teeth (16, 11, 26, 36, 31, and 46) and the mean value was interpreted. A single trained examiner used a William's periodontal probe to quantify probing depth (PD) and clinical attachment loss (CAL) at 6 sites per tooth. Periodontitis was diagnosed based on clinical evidence of attachment loss. The patients in the control group had to meet the following criteria: no periodontal disease-related clinical loss of attachment and a maximum PD of 4 mm in the dentition.

Beck's depression inventory was used to determine depression levels. It is a 21-statement self-report questionnaire that includes symptoms and attitude. Each of the 21 statements is given a score between 0 and 3. Sadness, pessimism, feelings of failure, lack of satisfaction, suicidal ideation, impatience, and social withdrawal are among the statements.<sup>17</sup> The largest value of each sentence was added to score Beck's depression inventory. A cut-off score of 17

or higher identified patients with depression symptoms in this investigation. In Brazil, the scale was also approved.<sup>18</sup>

SPSS software was used to conduct the statistical analysis (SPSS Inc., Chicago, IL, USA; version 17.0 under windows 2000). The link between clinical periodontal markers and depression was determined using the Student's t-test.

## RESULT

Based on Beck's depression questionnaire, periodontal factors were associated with depression levels, yielding the following results:

Mean CAL was  $0.67 \pm 0.23$  for case group but in control group it was  $0.13 \pm 0.21$ , which was statistically significant at  $P < 0.001$ . The mean PD was  $4.97 \pm 0.68$  for case group compared to  $1.96 \pm 0.13$  for control group, which were statistically significant at  $P < 0.001$ . The mean depression value was  $24.01 \pm 2.65$  for cases but in controls value was  $12.08 \pm 5.99$ , which was statistically significant at  $P < 0.001$  (Table 1). This shows that, the higher the self-rated Beck's depression scores more pronounced periodontal disease severity as assessed by PD, CAL.

**Table 1: Relationship between periodontal clinical parameters and depression**

Variables	Cases		Control		P
	Mean	SD	Mean	SD	
OHI(S)	3.98	1.01	3.58	1.21	0.07
PD	4.97	0.68	1.96	0.13	<0.01**
CAL	0.67	0.23	0.13	0.21	<0.01**
Depression scale	24.01	2.65	12.08	5.99	<0.01**

\*\* Significant at 1% level (highly significant).

## DISCUSSION

Stress is a psychophysical response to a variety of emotional, cognitive, or social demands that is seen as excessive by the person and includes a variety of emotional and physiological responses.<sup>19</sup> Hans Selye coined the term "stress," which he defined as "a non-specific response of the organism to every request made on it," recognised three phases (alarm, resistance, and fatigue), and classed it as acute or chronic based on the duration of the stressful event.<sup>20</sup>

Chronic stress has been linked to the start and progression of depression, a mood illness characterised by persistent sorrow and loss of interest.<sup>21</sup> The most frequent psychiatric ailments are mood disorders, particularly Major Depressive Disorder.<sup>22</sup> Unipolar disorder, in which mood alternates between euthymia and depression, and bipolar disorder, in which mood alternates between hypomania and mania, as well as euthymia and depression, both have major depressive episodes.<sup>22</sup> Affected sleep, appetite, and cognition<sup>22,23</sup>; chronic pain; trouble carrying out routine daily activities; an increased risk of isolation; and, in the most severe cases, suicidal ideation are all symptoms of mood disorders.<sup>24,25</sup> Depression is one of the most common reasons of suicide in the United States, accounting for about 50,000 suicides each year.<sup>26</sup>

Periodontitis has been linked to both chronic stress and depression.<sup>27,28</sup> Periodontitis is a bacterial-caused inflammatory condition that leads to the breakdown of the anatomical components that support the teeth, bone loss,<sup>30,31</sup> and tooth loss. It is one of the most common causes of tooth loss in developed countries, and its frequency rises with age,<sup>32</sup> reaching up to 40% in patients aged 65–74 years old.<sup>33</sup> As a result, we chose to focus on the impact of depression in periodontitis progression in this investigation. Patients with periodontitis had considerably higher self-rated depression scale scores than controls, according to clinical examinations.

Many screening methods have been developed to identify depressive symptoms or the existence of depression, and self-reporting measures have been promoted as a simple, quick, and low-cost way to improve diagnosis. The Beck's depression inventory, which is one of the most often used depression/depressive symptoms screening measures, was employed in the current investigation since studies have established the reliability of using self-reporting depression/depressive symptoms for research purposes.<sup>34</sup> After controlling for age, smoking, and gender, partial correlation analysis reveals a significant positive link between the severity of periodontal disease (PD, CAL) and depression as measured by Beck's depression inventory.

Our findings are consistent with the majority of previous research. Moss et al., 1996, discovered that depression was linked to a more severe course of periodontitis.<sup>35</sup> Baker et al. discovered a significant link between periodontal health and psychopathology in psychiatric patients. Belting and Gupta (1961) found that when psychotic patients were compared to controls, their periodontal health decreased, with similar outcomes to the aforementioned study.<sup>36</sup>

Davis and Jenkins' study from 1961 found a link between periodontal disease severity and greater anxiety, which is consistent with our findings. Anxiety, according to this study, raises blood levels of adrenocorticotrophic hormones (ACTHs) such cortisol, which has a deleterious impact on the periodontal immune system. According to neuroendocrine research, depression is caused by a disruption in the hypothalamic-pituitary axis system and the hypothalamic-pituitary-thyroid system.<sup>37</sup> An change in the limbic system causes increased release of corticotropin releasing hormone, which leads to hypersecretion of adrenocorticotrophic hormone and cortisol. Cortisol's detrimental effects on the immune system have a negative impact on the onset and progression of periodontitis.<sup>38</sup>

The current study's findings clearly indicate the link between sadness and periodontitis. Other demographic and socioeconomic parameters, such as education, lifestyle, and nutritional status, were not examined apart from age, gender, and smoking, which is one of our study's weaknesses. Longitudinal research with a larger sample size that focus on clinical, neurophysiological, neuroendocrinological, and psychopharmacological investigations would provide definitive proof of depression's role in periodontitis progression.

## CONCLUSION

As we can say that there is a possibility that dysregulated neurobiological and neurobehavioral factors, as well as periodontal immune–microbiome imbalances, all linked to chronic stress and depression, may play a critical role in the genesis and progression of necrotizing periodontal lesions, as well as chronic periodontitis. In a modern periodontal practise that stresses individual diagnosis, treatment planning, and maintenance, the depression scale could be a useful tool. In this study, the severity of periodontal disease and the severity of depression in patients were found to be substantially associated.

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