

# Awareness of the Interrelationship of Periodontal Disease & Systemic Health: A Questionnaire-Based Survey

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## Abstract:

**Introduction:** Periodontal disease, a prevalent oral health condition, is characterized by chronic inflammation of the supporting structures of the teeth, including the gums, periodontal ligament, and alveolar bone. Research has revealed a complex interrelationship between periodontal disease and systemic health, suggesting that oral health can significantly impact overall well-being. Understanding the awareness levels of this interrelationship among the general population is crucial for promoting comprehensive healthcare approaches.

**Aim:** The aim of this survey is to assess the awareness and knowledge levels of individuals regarding the interplay between periodontal disease and systemic health.

**Material and methods:** This study employed a cross-sectional design to gather data. In December 2022, an offline form & online survey Google Form was created and distributed randomly among adults aged 20 years and above. The questionnaire consisted of 10 questions, and participants were instructed to select the choices that best aligned with their preferences or experiences.

**Results:** The general public possessed a considerable level of awareness regarding the association between periodontal disease and overall systemic health.

**Conclusion:** By effectively motivating patients, it is possible to attain periodontal maintenance and encourage the achievement of optimal oral hygiene.

**Keywords:** Diabetes, Hypertension, Periodontitis, Preterm low birth weight, Rheumatoid arthritis, Systemic Disease.

### Introduction

Periodontitis is a chronic multifactorial inflammatory disease associated with a dysbiotic biofilm and characterized by progressive destruction of the tooth-supporting apparatus, which can lead to tooth loss<sup>1</sup>. Periodontal disease is the leading cause of tooth loss and ranks among the top two threats to oral health. Periodontal disease is the leading cause of tooth loss and ranks among the top two threats to oral health<sup>2</sup>. The oral cavity is home to approximately 800 species of bacteria<sup>3,4</sup> and it is believed that the development of periodontal disease is a result of the intricate interplay between bacterial infection and the host response, influenced by behavioral factors like smoking<sup>5</sup>.

Bacteria and their products within dental plaque can have direct and indirect effects on the periodontium. Directly, these bacteria and their products can induce an inflammatory response, leading to edema and increased gingival bleeding. Indirectly, bacteria predominantly trigger destructive processes mediated by the host. The primary cause of tissue destruction in periodontitis is the mobilization of host tissues through the activation of monocytes, lymphocytes, fibroblasts, and other host cells. Additionally, bacterial lipopolysaccharides (LPS) are believed to stimulate the production of catabolic cytokines and inflammatory mediators, including prostaglandin E2 (PGE2), an arachidonic acid metabolite. These cytokines and inflammatory mediators then prompt the release of tissue-derived enzymes, specifically matrix metalloproteinases, which contribute to the degradation of the extracellular matrix and bone<sup>6</sup>.

Periodontal disease, a prevalent chronic inflammatory condition affecting the structures supporting the teeth<sup>7</sup>, has been extensively associated with various common medical conditions<sup>8,9</sup>. Scientific evidence has linked periodontal disease to conditions such as type 2 diabetes mellitus (T2DM)<sup>10</sup>, cardiovascular disease<sup>11</sup>, and adverse pregnancy outcomes<sup>12</sup>, among others.

With a substantial volume of research on the oral-systemic links gathered in recent decades, there arises a necessity to closely evaluate the evidence and interpret the findings within a clinical context and aware the general population about the oral-systemic health relationship. This questionnaire based survey is aimed to assess the awareness and knowledge levels of individuals regarding the interplay between periodontal disease and systemic health.

### Material and methods:

This is a cross-sectional in which the offline form and online survey google form was circulated among random adult individuals above the age of 20 years in december, 2022. There was a total of 10 questions in the questionnaire, and the respondents were asked to mark their appropriate choices. The questions were asked in both english and native marathi languages for better understanding of the patients. (Figure 1)

**Inclusion criteria:** The study included a sample of 360 random adult individuals who had a minimal education qualification of high school and were above the age of 20 years. For participants with postgraduate education, only those with postgraduation in subjects other than dental courses were included in the study.

**Exclusion criteria:** The study excluded patients without any formal schooling and individuals with dental backgrounds.

**Results:**

The study involved a total of 360 individuals from the general population. Among these participants, there were 192 individuals below 35 years of age, 126 individuals aged between 35 and 50 years, and 42 individuals who were over 50 years old. In terms of gender specification, there were 126 females and 234 males. (Figure 2A, 2B)

Among the participants, a significant proportion expressed a high level of importance in maintaining proper gum and teeth care, demonstrating their awareness of gum diseases such as periodontitis (Figure 3A, 3B).

Although many individuals were knowledgeable about the symptoms of periodontitis, it was noteworthy that a considerable number of respondents did not have any systemic diseases. (Figure 4A, 4B).

Interestingly, the study revealed that nearly one-third of the individuals lacked awareness regarding the relationship between periodontitis and systemic diseases, including the effects of diabetes on oral health (Figure 5A, 5B).

Additionally, a significant portion of respondents exhibited limited understanding regarding the impact of antihypertensive drugs on the progression of periodontitis, as well as the association between periodontitis and cardiovascular diseases (Figure 6A, 6B).

Furthermore, only approximately one-fourth of the participants were aware of the concept that rheumatoid arthritis could lead to tooth loss, and that periodontitis could contribute to premature deliveries and low birth weight babies among pregnant women. This highlights a potential gap in knowledge and awareness among the surveyed individuals regarding these specific interrelationships. (Figure 7A, 7B).

**Discussion:**

In recent literature, evidence has emerged suggesting a potential connection between chronic inflammatory periodontitis and various systemic diseases.<sup>13,14</sup>

Periodontitis, a persistent oral infection, is recognized as an independent risk factor for conditions such as cardiovascular diseases, cerebrovascular diseases, peripheral arterial disease, respiratory diseases, and low birth weight<sup>15</sup>. Furthermore, periodontitis has been associated with increased morbidity and mortality in individuals with diabetes, insulin resistance, rheumatoid arthritis, obesity, osteoporosis, and pregnancy complications<sup>16,17</sup>. Interestingly, some of these conditions may contribute to the incidence and severity of periodontal disease by modifying the body's immune response to oral bacteria and their by-products<sup>18</sup>.

Evidence suggests a bidirectional relationship between periodontitis and systemic diseases<sup>19</sup>. Several potential mechanisms or pathways have been proposed to explain how oral infections can lead to secondary systemic effects, including the metastatic spread of infection from the oral cavity due to transient bacteremia, the dissemination of oral microbial toxins through the bloodstream causing metastatic injury, and the induction of metastatic inflammation through immunological damage caused by oral microorganisms<sup>20</sup>.

The results from this study shows that 97.5% of the population enrolled in our study is aware about the importance of oral health. But only 43.9% individuals are aware of relation between oral and systemic health. These results were in accordance with the study done by Gupta et al<sup>21</sup>. In our study, we observed

a favorable general awareness level among patients regarding periodontitis, with 76.4% demonstrating good awareness. This finding aligns with the study conducted by Hemalatha DM et al<sup>22</sup>. However, it contrasts with the results of a study conducted by Bhatia et al<sup>23</sup>, which indicated poor awareness among the North Indian population. The higher level of awareness observed in our study could potentially be attributed to the higher literacy rate among the surveyed population.

Both periodontitis and diabetes are frequent chronic diseases and generate enormous costs for the public health-care system. Numerous studies, review articles,<sup>24,25</sup> and meta-analyses<sup>26</sup> indicated a mutual influence between periodontitis and diabetes. This study showed less awareness of the population i.e. 37.8% regarding the relationship between diabetes and periodontitis. This result was in accordance with the study done by Ummadisetti et al. where only 49.8% of the sample population knew about the mutual relationship between diabetes and periodontitis<sup>27</sup>.

It is now clear from the epidemiologic studies that a potential link does exist between periodontal disease and cardiovascular disease. Oral healthcare professionals can identify patients who are unaware of their risk of developing serious complications as a result of cardiovascular disease and who are in need of medical intervention<sup>28</sup>. A significant number of the study population had no knowledge regarding the bilateral association of periodontal disease and cardiovascular disease. These results were similar to that of a study done by Bawankaret al<sup>29</sup>.

A two-way interrelationship between periodontitis and rheumatoid arthritis may exist in which periodontitis affects the pathogenesis of rheumatoid arthritis<sup>30</sup> and vice-versa<sup>31</sup>. Very less number of individuals were aware of the relation between rheumatoid arthritis and periodontitis. In a study by AlJohaniK et al. very few medical and dental students were aware about the associations between periodontal disease and rheumatoid arthritis (44.9%)<sup>32</sup>. So, only 25.8% nonmedical individuals in our study were aware about the associations between periodontal disease and rheumatoid arthritis.

In a study done by Nutalapatiet. only 38.3% of gynecologists were aware that periodontal diseases can affect the outcome of delivery<sup>33</sup>. In our study, only 23.6% of individuals were aware about the relationship between periodontitis and preterm low birth weight deliveries.

By utilizing a questionnaire-based approach, this study aims to gather valuable insights into the current understanding, attitudes, and beliefs surrounding this topic, shedding light on potential areas for education and intervention. This study explores various dimensions related to periodontal disease and systemic health interconnections, including the impact of periodontal disease on the development and progression of systemic conditions such as cardiovascular disease, diabetes, adverse pregnancy outcomes, and others.

Furthermore, the survey delves into the awareness of the signs and symptoms of periodontal disease, the importance of regular dental check-ups, and the role of oral hygiene practices in preventing both oral and systemic health issues. It seeks to identify gaps in knowledge and perceptions that may hinder effective oral health promotion and disease prevention strategies.

### **Clinical relevance of the study:**

The findings of this questionnaire-based survey will provide valuable insights for policymakers, healthcare providers, and oral health professionals to develop targeted educational programs, raise awareness, and integrate oral health into comprehensive healthcare frameworks. By understanding the existing knowledge gaps and misconceptions, appropriate interventions can be designed to improve oral health outcomes and reduce the burden of associated systemic diseases.

## Conclusion

This survey study explores the awareness levels of the interrelationship between periodontal disease and systemic health. It aims to contribute to the growing body of evidence emphasizing the need for a multidisciplinary approach to healthcare, where oral health is recognized as an integral component of overall well-being. By addressing knowledge gaps, promoting early intervention, and fostering collaboration between oral health and general healthcare professionals, we can strive towards better health outcomes and improved quality of life.

## Acknowledgments:

The authors express their thanks to the research team from the Department of Periodontics for their support during data collection and analysis.

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**Figures:**

**The list of the questions:**

Figure 1: Survey form

**Awareness of the interrelationship of periodontal disease & systematic health: A questionnaire-based survey**

Name/नाव: Age/ वय: Sex/ लिंग:

Education/ शिक्षण:

Occupation/ व्यवसाय:

Sr. No.	Questions	Yes/ हो	No/ नाही	Other/ इतर
1. १.	Do you think care of teeth and gum are important as other organs of body? दातांची व हिरड्यांची काळजी घेणे हे शरीरातील इतर अवयवांप्रमाणेच महत्त्वाचे आहे असे तुम्हाला वाटते का?			
2. २.	Are you aware of gum disease or periodontitis? हिरड्यांचा आजार किंवा पायरी या बद्दल तुम्ही जागृत आहात का?			
3. ३.	Do you know the symptoms of gum disease like swollen and bleeding gums, mobility of the teeth and bad breath? हिरड्या सुजणे हिरड्यातून रक्त येणे दातांचे हलणे व तोंडाचा वास येणे अशी सगळी लक्षणे हिरड्यांच्या आजारांची आहे हे तुम्हाला माहित आहे का?			
4. ४.	Did you have any systematic disease? तुम्हाला शरीराचे इतर कोणते आजार (प्रणालीगत रोग) आहेत का?			
5. ५.	Are you aware of relationship between gum disease and general body health? हिरड्यांचे आजार व संपूर्ण शरीराचे आरोग्य यांमध्ये असलेल्या संबंधाबद्दल तुम्ही जागृत आहात का?			
6. ६.	Do you know that high sugar level in diabetic patients can increase risk of oral infection and loosing of teeth? तुम्हाला माहित आहे का मधुमेह असलेल्या रुग्णांच्या रक्तात वाढलेल्या साखरेच्या प्रमाणामुळे मौखिक संसर्ग व दातांचे हलणे वाढण्याची शक्यता जास्त असते?			
7. ७.	Do you aware that some medicines given for blood pressure can cause enlargement of gum size? रक्तदाबाच्या बीपी रुग्णांना देण्यात येणाऱ्या काही औषधींमुळे हिरड्यांच्या आकारात वाढ होते याबद्दल तुम्ही जागृत आहात का?			
8. ८.	Are you aware of gum disease can increase the risk of heart disease? हिरड्यांच्या आजारांमुळे हृदयाचे विकार होण्याची शक्यता वाढते याबद्दल तुम्हाला माहिती आहे का?			
9. ९.	Do you know rheumatoid arthritis patient have high prevalence of tooth loss? संधिवात असलेल्या रुग्णांमध्ये दात हलण्याचे प्रमाण जास्त असते हे तुम्हाला माहित आहे का?			
10. १०.	Are you aware that gum disease can cause swollen & bleeding gums during pregnancy and risk of causing premature deliveries and low birth weight babies? गरोदरपणात हिरड्यांच्या आजारांमुळे हिरड्या सुजून त्यातून रक्त येणे तसेच अकाली प्रसूती व जन्माच्या वेळी बाळाचे वजन कमी असणे याची शक्यता वाढते याबद्दल तुम्ही जागृत आहात का?			

Figure 2A: Age of the population enrolled in the study

Figure 2B: Gender specifications of the population enrolled for the study

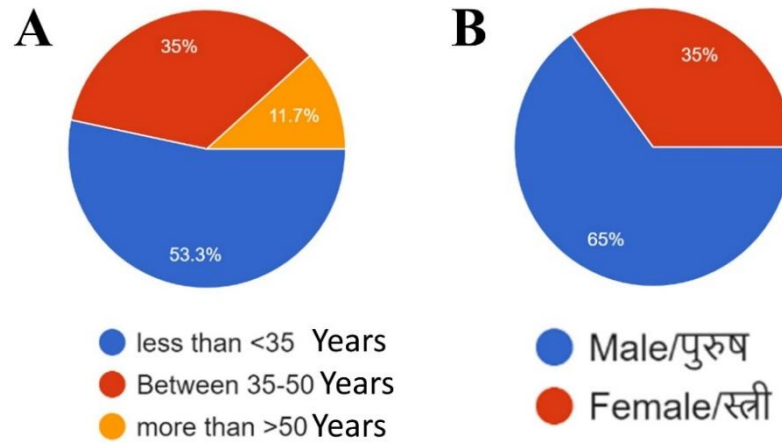


Figure 3A: Awareness about maintaining oral hygiene among population.

Figure 3B: Awareness of gum diseases or periodontitis among population

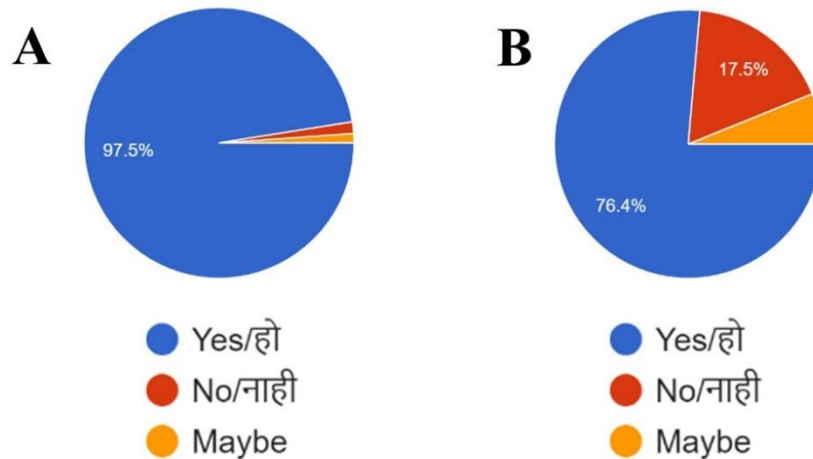


Figure 4A: Awareness of symptoms of periodontal diseases among the population

Figure 4B: Prevalence of systemic diseases among the population

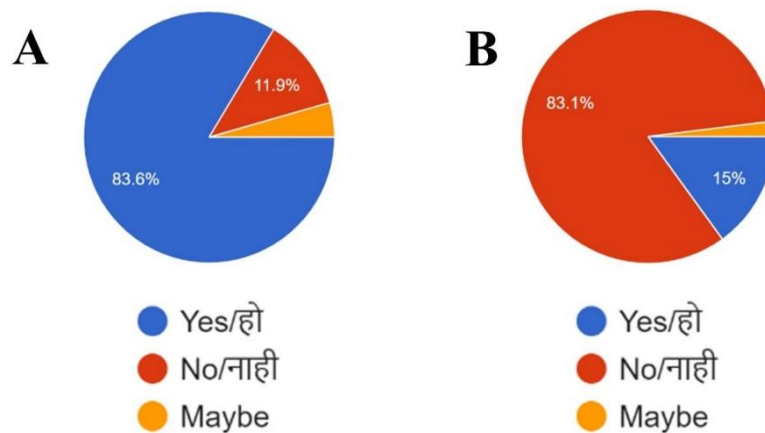


Figure 5A: Awareness of the relationship between periodontal and systemic health

Figure 5B: Awareness of the co-relationship between diabetes and periodontal diseases



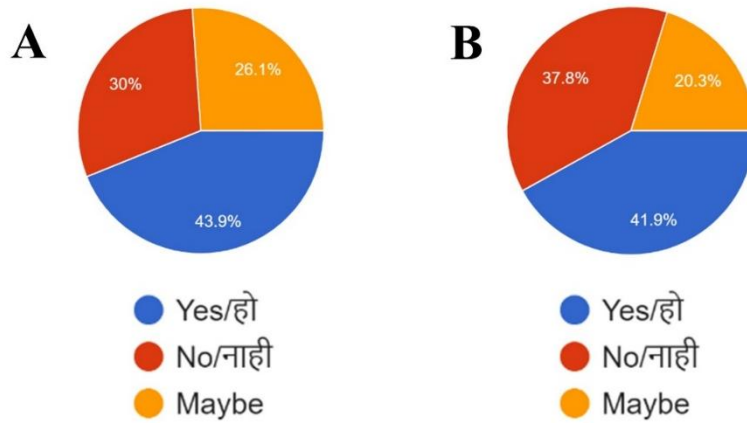


Figure 6A: Awareness of the effect of antihypertensive medication on periodontal health

Figure 6B: Awareness of periodontal diseases as a risk factor for cardiovascular diseases

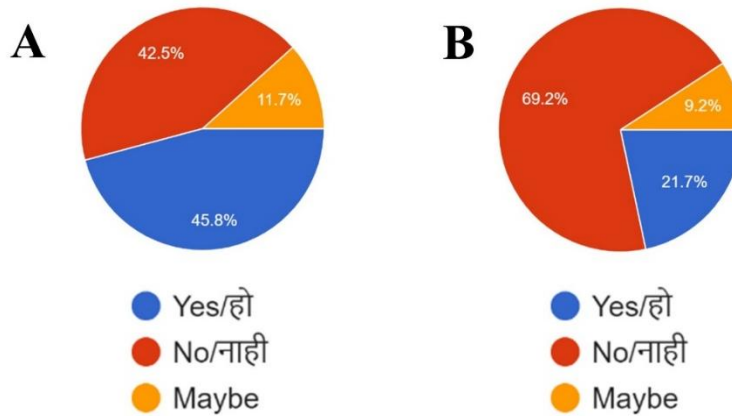


Figure 7A: Awareness of the interrelationship between rheumatoid arthritis and periodontal diseases.

Figure 7B: Awareness of effect of periodontal disease on pregnancy outcome.

