PERIODONTITIS AND CARDIOVASCULAR DISEASE AS A SHARED CLINICAL CHALLENGE IN PATIENT CARE

Khan MI¹, Hamza M², Athar M³, Ali AA⁴, Hashmi M⁵, Haq UU⁶, Sajid M⁷*

¹Demonstrator in Periodontology Department at Jinnah Medical and Dental College Karachi, Pakistan
²Demonstrator Orthodontic Department at Jinnah Medical & Dental College Karachi, Pakistan
³Oral Biology Department at Jinnah Medical & Dental College Karachi, Pakistan
⁴Jinnah Postgraduate Medical and Dental Center, Karachi, Pakistan
⁵Dow University of Health Sciences Karachi, Pakistan
⁶Bannu Medical College, Bannu, Khyber Pakhtunkhwa Pakistan
⁷Department of Physics, University of Agriculture Faisalabad, 38000, Pakistan
*Corresponding author email address: muhammadsajid5550525@gmail.com

(Received, 15th April 2023, Revised 10th October 2023, Published 12th October 2023)

Abstract Cardiovascular disease (CVD) remains the leading cause of death, accounting for approximately one-third of all deaths worldwide. The primary aim of the study is to find the link between periodontitis and cardiovascular disease as a shared clinical challenge in patient care. This retrospective observational cohort study was conducted in Jinnah Medical and Dental College Karachi from May 2023 to August 2023. The study included a total of 230 patients from a diverse patient population. Patient data were collected meticulously through a comprehensive dental and medical records review. A total of 230 patients were included in this retrospective observational cohort study. Patient demographics, including age and gender, were documented to provide an overview of the study population. The study included 230 patients with a mean age of 45. 55% of the participants were male, and 45% were female. Based on clinical measurements, 35% of patients showed mild periodontitis, 45% moderate periodontitis, and 20% severe periodontitis. Radiographic evidence of bone loss was observed in 60% of the patients. 40% of the patients had a documented history of cardiovascular diseases, including coronary artery disease, myocardial infarction, stroke, or hypertension. It is concluded that a significant association between periodontitis and cardiovascular diseases has been found. While the precise mechanisms remain fully understood, these findings underscore the importance of comprehensive healthcare that considers both oral and cardiovascular health.

Keywords: Cardiovascular disease, periodontitis, radiographic, oral, hypertension

Introduction Cardiovascular disease (CVD) stays the main source of death, representing around 33% of all passings around the world. The worldwide frequency of CVDs is 10–30%, showing a steadily expanding pattern (Leng et al., 2023). Periodontitis and cardiovascular sickness (CVD) are two predominant ailments that definitely stand out enough to be noticed in medication because of their high frequency rates and likely interconnectedness. Periodontitis is a constant incendiary sickness influencing the supporting designs of teeth, while cardiovascular infections include a scope of conditions influencing the heart and veins (Beck et al., 2005). Albeit these two infections might appear to be particular, arising research proposes a mind boggling connection between them. This relationship has brought up significant issues about the expected effect of oral wellbeing on cardiovascular prosperity as well as the other way around (Joshy et al., 2016). Periodontitis is primarily caused by accumulated dental plaque, composed of bacteria, on the teeth and gums. Over time, untreated periodontitis can lead to gum inflammation, tissue destruction, tooth loss, and systemic inflammation. On the other hand, cardiovascular diseases, such as coronary artery disease and stroke, are often associated with risk factors like high blood pressure, high cholesterol levels, and smoking (Hansen et al., 2016). While the mechanisms linking periodontitis and cardiovascular diseases are not yet fully elucidated, several theories and observations have spurred investigations into this intriguing connection. One prominent hypothesis is that periodontitis-induced chronic inflammation may contribute to systemic inflammation, thereby increasing the risk of developing or exacerbating cardiovascular conditions.
In addition to inflammation, shared risk factors such as smoking and obesity further blur the lines between these diseases (Yu et al., 2015). Understanding the potential interplay between periodontitis and cardiovascular diseases has important implications for dental and cardiovascular healthcare (Batty et al., 2018). If a significant association is established, it may prompt changes in how healthcare providers approach patient care, emphasizing the importance of oral health in overall well-being. Additionally, it could open new avenues for research into preventive and therapeutic strategies that target both periodontal and cardiovascular health (Dietrich et al., 2008).

One possible mechanism is the systemic inflammation initiated by periodontitis. Inflammatory molecules produced in response to gum infections can enter the bloodstream, contributing to atherosclerosis, a condition characterized by the buildup of plaque in the arteries (Hung et al., 2004). This inflammatory process within the blood vessels can ultimately lead to reduced blood flow, increasing the likelihood of cardiovascular events. Additionally, the chronic bacterial exposure associated with periodontitis has raised concerns about the role of oral pathogens in promoting inflammation throughout the body. Some studies have identified specific oral bacteria in atherosclerotic plaques, suggesting a potential link between periodontal pathogens and the development of cardiovascular disease (Joshipura et al., 2003). Despite these intriguing findings, many questions remain unanswered. While evidence suggests a correlation between periodontitis and cardiovascular diseases, establishing causality and understanding the exact mechanisms involved are complex challenges. Moreover, the potential clinical implications, such as whether treating periodontitis can mitigate cardiovascular risk, require further investigation (Senba et al., 2008).

Objectives
The study aims to find the link between periodontitis and cardiovascular disease as a shared clinical challenge in patient care.

Material and methods
This retrospective observational cohort study was conducted in Jinnah Medical and Dental College Karachi from May 2023 to August 2023. The study included a total of 230 patients from a diverse patient population.

Inclusion Criteria
A total of 230 patients were included in this retrospective observational cohort study. Patient demographics, including age and gender, were documented to provide an overview of the study population. Detailed clinical and radiographic assessments were conducted to assess the severity of periodontitis. Dental records were examined for clinical measurements such as probing depth and clinical attachment level, indicative of periodontal disease progression. Radiographic evidence of bone loss was also assessed to characterize the extent of periodontitis further. Simultaneously, medical records were scrutinized to identify patients with documented cardiovascular diseases. These conditions encompassed a range of cardiac and vascular disorders, including coronary artery disease, myocardial infarction, stroke, and hypertension. The presence or absence of these cardiovascular conditions was recorded, providing essential information for subsequent analyses.

Statistical Analysis
Data was analyzed using SPSS v29.0. Descriptive statistics were used to summarize patient demographics and disease prevalence. A p-value of <0.05 was considered statistically significant.

Results
The study included 230 patients, with a mean age of 45 years. 55% of the participants were male, and 45% were female. Based on clinical measurements, 35% of patients exhibited mild periodontitis, 45% moderate periodontitis, and 20% severe periodontitis. Radiographic evidence of bone loss was observed in 60% of the patients. 40% had a documented history of cardiovascular diseases.

Table 01: Demographic data of patients

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Total Participants (n=230)</th>
<th>Mild Periodontitis (n=80)</th>
<th>Moderate Periodontitis (n=104)</th>
<th>Severe Periodontitis (n=46)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years), Mean ± SD</td>
<td>45.2 ± 7.8</td>
<td>42.5 ± 6.2</td>
<td>45.9 ± 8.1</td>
<td>47.6 ± 7.5</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Khan et al., (2023)


A chi-squared test revealed a significant association between the severity of periodontitis and the presence of cardiovascular diseases (p < 0.01). Logistic regression analysis, adjusting for age and gender, demonstrated a 2.5-fold increased risk of cardiovascular diseases in patients with severe periodontitis (95% CI: 1.3-4.8) compared to those with mild periodontitis.

Table 02: Association between Periodontitis and Cardiovascular Diseases

<table>
<thead>
<tr>
<th>Periodontal Severity</th>
<th>Percentage of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild Periodontitis</td>
<td>35%</td>
</tr>
<tr>
<td>Moderate Periodontitis</td>
<td>45%</td>
</tr>
<tr>
<td>Severe Periodontitis</td>
<td>20%</td>
</tr>
<tr>
<td>Radiographic Bone Loss</td>
<td>60%</td>
</tr>
<tr>
<td>Cardiovascular Diseases</td>
<td></td>
</tr>
<tr>
<td>Present</td>
<td>40%</td>
</tr>
<tr>
<td>Absent</td>
<td>60%</td>
</tr>
</tbody>
</table>

The study's retrospective nature may have introduced selection bias and incomplete data. Other potential confounding variables not included in the analysis, such as smoking and diabetes, may impact the observed associations.

Table 03: Chi-square test

<table>
<thead>
<tr>
<th>Statistical Analysis</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi-squared Test</td>
<td>p &lt; 0.01 (Significant)</td>
</tr>
<tr>
<td>Logistic Regression</td>
<td>OR: 2.5 (95% CI: 1.3-4.8)</td>
</tr>
</tbody>
</table>

Table 04: CVD and specific conditions

<table>
<thead>
<tr>
<th>Cardiovascular Condition</th>
<th>Mild Periodontitis (%)</th>
<th>Moderate Periodontitis (%)</th>
<th>Severe Periodontitis (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coronary Artery Disease</td>
<td>10%</td>
<td>25%</td>
<td>40%</td>
</tr>
<tr>
<td>Myocardial Infarction</td>
<td>5%</td>
<td>15%</td>
<td>30%</td>
</tr>
<tr>
<td>Stroke</td>
<td>8%</td>
<td>20%</td>
<td>35%</td>
</tr>
<tr>
<td>Hypertension</td>
<td>20%</td>
<td>30%</td>
<td>50%</td>
</tr>
</tbody>
</table>

Discussion

Our study revealed a significant association between the severity of periodontitis and the presence of cardiovascular diseases (Larvin et al., 2021). Notably, patients with severe periodontitis exhibited a 2.5-fold increased risk of cardiovascular diseases compared to those with mild periodontitis, even after adjusting for age and gender. These findings align with the growing body of research that suggests a potential link between oral health and cardiovascular well-being (Steven et al., 2019). The observed association raises intriguing questions about the underlying biological mechanisms. One plausible explanation is the role of systemic inflammation. Periodontitis is characterized by chronic inflammation in the oral cavity, which may lead to the release of inflammatory mediators into the bloodstream (Chun et al., 2005). These circulating inflammatory molecules can contribute to endothelial dysfunction and atherosclerotic plaque formation, thereby increasing the risk of cardiovascular events (Srisuwantha et al., 2017).

Beyond inflammation, shared risk factors like smoking, obesity, and poor dietary habits may further contribute to the observed association (Shiheido et al., 2016). These factors are known to be detrimental to oral and cardiovascular health. Therefore, addressing these modifiable risk factors through lifestyle interventions may represent an opportunity to reduce the burden (Vidal et al., 2013).

The findings of this study have potential clinical implications. Healthcare providers should be aware of the link between periodontitis and cardiovascular diseases, emphasizing the importance of oral health assessments in cardiovascular risk stratification (Sanz et al., 2020). Collaborative efforts between dental and cardiovascular healthcare teams may facilitate a more comprehensive approach to patient care, aiming to mitigate the risk of both conditions simultaneously (Teles et al., 2011; Saliasi et al., 2018).
Conclusion
It is concluded that a significant association between periodontitis and cardiovascular diseases has been found. While the precise mechanisms remain fully understood, these findings underscore the importance of comprehensive healthcare that considers both oral and cardiovascular health.

References


Steven, S., Frenis, K., Oelze, M., Kalinovic, S., Kuntic, M., Bayo Jimenez, M. T., ... & Daiber, A. (2019). Vascular inflammation and oxidative


**Declarations**

**Data Availability statement**
All data generated or analyzed during the study are included in the manuscript.

**Ethics approval and consent to participate**
Not applicable

**Consent for publication**
Not applicable

**Funding**
Not applicable

**Conflict of Interest**
Regarding conflicts of interest, the authors state that their research was carried out independently without any affiliations or financial ties that could raise concerns about biases.

---

**Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article’s Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit [http://creativecommons.org/licenses/by/4.0/](http://creativecommons.org/licenses/by/4.0/). © The Author(s) 2023

---