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Research Article

Assessing The Impact of Oral Hygiene Interventions on Reducing Cardiovascular Events: A Descriptive Study

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Abstract:
Background: Cardiovascular disease (CVD) was a leading cause of global mortality, with growing evidence suggesting a link between periodontal disease (PD) and cardiovascular health. Periodontal disease was thought to contribute to systemic inflammation, a key factor in the development of CVD. This study aimed to assess whether oral hygiene interventions, including regular brushing, flossing, and professional dental cleanings, could reduce the incidence of cardiovascular events by decreasing systemic inflammation.
Methods: 200 participants diagnosed with periodontal disease were divided into two groups: **Group 1:** Participants who adhered to regular oral hygiene interventions. **Group 2:** Participants with poor oral hygiene and inconsistent dental care. Data on cardiovascular events (heart attacks, strokes) were collected over five years, and systemic inflammation markers (CRP, IL-6) were measured at baseline and quarterly intervals. The incidence of cardiovascular events and changes in inflammatory markers were compared between the two groups.
Results: Group 1 demonstrated a 35% reduction in systemic inflammation markers (CRP, IL-6) after three months of consistent oral hygiene interventions and experienced a 10% incidence of cardiovascular events over the study period. Group 2 showed no significant change in systemic inflammation markers and experienced a 25% incidence of cardiovascular events. There was a positive relationship between improved oral hygiene and a reduction in cardiovascular events and inflammation.
Conclusions: Oral hygiene interventions significantly reduced systemic inflammation and cardiovascular events among individuals with periodontal disease. Improved oral hygiene, including regular dental care, was shown to be important in reducing cardiovascular risk, potentially complementing traditional cardiovascular disease prevention strategies.

Keywords: Oral hygiene, cardiovascular disease, periodontal disease, systemic inflammation, preventive care, CRP, IL-6.

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Introduction

Periodontal disease (PD), characterized by chronic inflammation of the tissues supporting the teeth, has long been associated with systemic health conditions, particularly cardiovascular diseases (CVD). Numerous studies suggest that the bacteria and inflammatory mediators present in periodontal tissues contribute to systemic inflammation, which in turn plays a significant role in the progression of cardiovascular diseases by promoting the formation of atherosclerotic plaques and increasing the risk of thrombotic events. [1,2]

Systemic inflammation is a common underlying factor in both periodontal disease and cardiovascular diseases. Periodontal pathogens, such as *Porphyromonas gingivalis* and *Fusobacterium nucleatum*, and inflammatory mediators, such as interleukins and C-reactive protein (CRP), can enter the bloodstream via the inflamed gingival tissues, thereby increasing the systemic inflammatory load. [3,4] Studies have suggested that addressing the local infection in the oral cavity may modulate the systemic inflammatory response, potentially reducing the risk of cardiovascular events. [5,6]

Oral hygiene interventions, including regular brushing, flossing, and professional dental care, aim to reduce the bacterial load and inflammation in the oral cavity. These measures are designed to prevent the progression of periodontal disease and promote better systemic health. However, the evidence regarding the direct impact of oral hygiene on cardiovascular health, particularly in individuals with periodontal disease, remains limited. [7,8]

This study aimed to assess the impact of oral hygiene interventions on reducing cardiovascular events in individuals with periodontal disease. We hypothesized that regular oral hygiene practices would reduce systemic inflammation, as measured by CRP and interleukin-6 (IL-6) levels, and subsequently lower the incidence of cardiovascular events in the long term.

Materials and Methods

Study Design

This was a prospective, longitudinal study conducted over a 5-year period. The study aimed to assess the impact of oral hygiene interventions on the reduction of cardiovascular events in individuals diagnosed with periodontal disease. The study population consisted of 200 adults aged 30-70 years, recruited from a dental clinic. Participants were selected based on the presence of moderate to severe periodontal disease, determined by clinical examination and radiographs. A stratified random sampling method was used to assign participants into two groups: an intervention group and a control group.

Inclusion Criteria

- Adults aged between 30 and 70 years
- Diagnosed with moderate to severe periodontal disease (Clinical Attachment Loss > 3mm)
- No history of significant cardiovascular events (e.g., heart attack, stroke) at baseline
- No systemic conditions that significantly affect systemic inflammation (e.g., uncontrolled diabetes, cancer, active infections)

Exclusion Criteria

- Pregnant or lactating women
- Individuals with a history of recent cardiovascular events (within the past 6 months)
- Individuals on medications that affect systemic inflammation (e.g., immunosuppressive drugs, steroids)

Intervention

Participants in the **intervention group** received a comprehensive oral hygiene regimen that included:

- **Brushing** with fluoride toothpaste twice daily, emphasizing proper brushing techniques
- **Flossing** once daily to remove plaque between teeth
- **Professional dental cleanings** every 3 months to remove calculus and plaque buildup
- Educational sessions on maintaining oral hygiene and reducing risk factors for periodontal disease, such as smoking and poor diet

Participants in the **control group** continued with their usual oral hygiene practices and received no additional interventions during the study period. Both groups were monitored for adherence to the oral hygiene protocol through regular follow-up visits.

Data Collection

At baseline and during regular follow-up visits (every 3 months), the following data were collected:

- **Systemic Inflammation Markers**: Serum levels of C-reactive protein (CRP) and interleukin-6 (IL-6) were measured using enzyme-linked immunosorbent assay (ELISA) kits.
- **Cardiovascular Events**: The occurrence of cardiovascular events, including heart attacks, strokes, and other major cardiovascular complications, was recorded annually.
- **Blood Pressure**: Systolic and diastolic blood pressure were measured at each follow-up visit.
- **Lipid Profile**: Total cholesterol, low-density lipoprotein (LDL), high-density lipoprotein (HDL), and triglycerides were measured at baseline and annually.
- **Adherence to Oral Hygiene**: A questionnaire was used to assess the participants' adherence to oral hygiene practices at each visit.

Ethical Considerations

The study was approved by the Institutional Review Board (IRB) of the affiliated institution. Informed consent was obtained from all participants before enrollment, and the study followed ethical guidelines for clinical research.

Statistical Analysis

Data were analyzed using SPSS software (version 23). Descriptive statistics were used to summarize baseline characteristics, and continuous variables were expressed as means ± standard deviations. Differences between groups for continuous variables were assessed using paired t-tests and analysis of covariance (ANCOVA). Categorical variables were analyzed using chi-square tests. A p-value of < 0.05 was considered statistically significant.

Table 1

Parameter	Group 1 (Intervention)	Group 2 (Control)	P-value
CRP (mg/L) - Baseline	4.3 ± 1.2	4.1 ± 1.3	0.35
CRP (mg/L) - 12 months	2.1 ± 0.8	4.3 ± 1.4	**< 0.001**
IL-6 (pg/mL) - Baseline	18.6 ± 6.2	17.9 ± 5.8	0.56
IL-6 (pg/mL) - 12 months	8.7 ± 3.1	17.1 ± 5.3	**< 0.001**
Cardiovascular Events (%)	10%	25%	**0.02**
Blood Pressure (mmHg - Systolic)	120 ± 8.2	122 ± 7.5	0.20
Blood Pressure (mmHg - Diastolic)	78 ± 5.1	80 ± 5.2	0.22
Lipid Profile (Total Cholesterol)	180 ± 12	188 ± 14	0.07

***p-value of < 0.05 was considered statistically significant.**

Results

Systemic Inflammation:

At the 12-month mark, **Group 1 (intervention)** showed a significant reduction in systemic inflammation markers. CRP levels decreased from 4.3 ± 1.2 mg/L at baseline to 2.1 ± 0.8 mg/L ($p < 0.001$), and IL-6 levels decreased from 18.6 ± 6.2 pg/mL to 8.7 ± 3.1 pg/mL ($p < 0.001$). In contrast, **Group 2 (control)** showed no significant changes in these inflammatory markers.

Cardiovascular Events:

The incidence of cardiovascular events was significantly lower in **Group 1** (10%) compared to **Group 2** (25%) ($p = 0.02$). This suggests that oral hygiene interventions may play a role in reducing the risk of cardiovascular events in individuals with periodontal disease.

Blood Pressure and Lipid Profile:

No significant differences were observed between the two groups in terms of blood pressure (systolic and diastolic) or lipid profiles over the 12-month period.

Discussion

The findings of this study suggest that oral hygiene interventions, including regular brushing, flossing, and professional dental cleanings, can significantly reduce systemic inflammation, as evidenced by decreases in C-reactive protein (CRP) and interleukin-6 (IL-6) levels. These reductions in inflammatory markers are associated with a notable decrease in the incidence of cardiovascular events, such as myocardial infarction and ischemic stroke, in individuals with periodontal disease. This reinforces the potential role of oral health management in mitigating systemic inflammation and improving cardiovascular outcomes.

These results align with those of Tonetti et al. (2007) [9], who demonstrated that non-surgical periodontal therapy led to a significant reduction in systemic markers of inflammation and improved endothelial function in individuals with severe periodontitis. Similarly, Beck et al. (2005) [10] reported that periodontal treatment correlated with reduced progression of subclinical atherosclerosis, as measured by carotid intima-media thickness, supporting the idea that addressing periodontal inflammation has systemic vascular benefits. Another study by Offenbacher et al. (2009) [11] also found that periodontal therapy reduced serum levels of CRP and other inflammatory biomarkers, further linking oral health interventions with reduced systemic inflammation.

The reduction in cardiovascular events observed in this study is consistent with findings from a systematic review by Teeuw et al. (2014) [12], which concluded that periodontal treatment is associated with reduced CRP levels and improvements in cardiovascular risk markers. However, as in our study, Teeuw and colleagues also noted limited effects on traditional cardiovascular risk factors, such as blood pressure and lipid profiles. These observations suggest that the cardiovascular benefits of periodontal therapy are mediated primarily through inflammation-related pathways rather than direct modulation of metabolic or hemodynamic parameters.[12]

Interestingly, while this study found no significant impact on blood pressure or lipid profiles, other studies have shown mixed results. For instance, Piconi et al. (2009) [13] reported slight improvements in lipid profiles after periodontal therapy, though these changes were not consistently observed across all participants. Additionally, Li et al. (2014) [14] noted modest reductions in systolic blood pressure following periodontal treatment, suggesting potential variability in outcomes based on study populations and intervention protocols. Despite these discrepancies, the consistent finding across multiple studies is the significant reduction in systemic inflammation, which has downstream effects on vascular health by improving endothelial function, reducing arterial stiffness, and lowering thrombotic risk. This study's findings highlight the importance of addressing systemic inflammation as a distinct mechanism linking periodontal disease to cardiovascular outcomes. Furthermore, they support the integration of

periodontal care into broader cardiovascular risk management strategies. Future studies should explore whether the effects of periodontal treatment on inflammation extend to other inflammatory-mediated conditions, such as diabetes and chronic kidney disease, which share common pathways with cardiovascular disease.

Conclusion

This study highlighted the potential benefits of oral hygiene interventions in reducing systemic inflammation and lowering the risk of cardiovascular events in individuals with periodontal disease. Improving oral health through regular brushing, flossing, and professional cleanings may serve as a valuable strategy for cardiovascular disease prevention.

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