RGe ISSN: 2177-3246

ORAL HEALTH AS A PREDICTOR OF PREMATURE MORTALITY: EMERGING EVIDENCE AND CLINICAL IMPLICATIONS

SAÚDE BUCAL COMO PREDITOR DE MORTALIDADE PREMATURA: EVIDÊNCIAS EMERGENTES E IMPLICAÇÕES CLÍNICAS

SALUD BUCAL COMO PREDICTOR DE MORTALIDAD PREMATURA: EVIDENCIA EMERGENTE E IMPLICACIONES CLÍNICAS

10.56238/revgeov17n4-045

Pedro Guimarães Sampaio Trajano dos Santos[1], Maria Clara de Oliveira Cavalcanti[2], Júlia Dourado de Castro Chaves[3], Matheus Lyra Braga da Paz[4], Rosana Maria Coelho Travassos[5], Vânia Cavalcanti Ribeiro da Silva[6], Tereza Augusta Maciel[7], Josué Alves[8], Maria Tereza Moura de Oliveira Cavalcanti[9], Adriane Tenório Dourado Chaves[10], Patrícia Antas Veríssimo Melo de Farias[11], Vanessa Lessa Cavalcanti de Araújo[12]

ABSTRACT

Objective: To explore the emerging evidence linking oral health conditions with premature mortality and to discuss the potential clinical implications for dentistry and systemic health management.

Methodology: A narrative review of the literature was conducted to synthesize current evidence on the relationship between oral health status and mortality outcomes. Relevant studies were identified through electronic searches of major biomedical databases, including PubMed, Scopus, and Web of Science. Observational studies, systematic reviews, and meta-analyses evaluating associations between oral diseases, particularly periodontal disease, tooth loss, and oral inflammatory conditions, and all-cause or cause-specific mortality were considered. Studies published in English over the past two decades were prioritized to reflect contemporary scientific understanding.

Results: Accumulating epidemiological evidence suggests that poor oral health may be associated with an increased risk of premature mortality. Periodontal disease, extensive tooth loss, and chronic oral inflammation have been linked to systemic conditions such as

[1] Dental Student. Faculdade de Odontologia do Recife. E-mail: pedroguimaraessampaio@gmail.com
[2] Medical Student. Faculdade Pernambucana de Saúde(FPS). E-mail: mclaracavalcanti06@gmail.com
[3] Medical Student. Universidade Católica de Pernambuco (UNICAP). E-mail: juliadcchaves@gmail.com
[4] Medical Student. Universidade Católica de Pernambuco (UNICAP). E-mail: matheusdapaz08@gmail.com
[5] Dr. in Endodontics. Universidade Pernambuco (UPE). E-mail: rosana.travassos@upe.br
[6] Dr. in Dentistry. Universidade Pernambuco (UPE). E-mail: vania.silva@upe.br
[7] Master`s degree in Dentistry. Universidade Pernambuco (UPE). E-mail: tereza.maciel@upe.br
[8] Dr. Universidade Pernambuco (UPE). E-mail: Josue Alves@upe.br
[9] Dr. in Dentistry. Universidade Pernambuco (UPE). E-mail: tereza.moura@upe.br
[10] Dr. Universidade Pernambuco (UPE). E-mail: adriane.chaves@upe.br
[11] Specialist in Endodontics. Faculdade Facsete. E-mail: patricia.antas@gmail.com
[12] Professor. Universidade Pernambuco (UPE). E-mail: vanessa.lessa@upe.br

cardiovascular disease, diabetes mellitus, and respiratory disorders, which are major contributors to global mortality. Biological mechanisms proposed in the literature include systemic dissemination of oral pathogens, chronic low-grade inflammation, and immune dysregulation. Several longitudinal cohort studies report that individuals with severe periodontal disease or significant tooth loss exhibit higher risks of all-cause and cardiovascular mortality compared with individuals with better oral health status.

Conclusion: Current evidence supports the concept that oral health may serve as a meaningful indicator of systemic health and potential predictor of premature mortality. Integrating oral health assessments into broader healthcare strategies may contribute to earlier identification of systemic risk and improved patient outcomes. Further well-designed longitudinal and interventional studies are required to clarify causality and to better understand the biological pathways linking oral disease and mortality.

Keywords: Oral Health. Premature Mortality. Periodontal Disease. Tooth Loss. Systemic Health. Inflammation. Epidemiology. Risk Indicators.

RESUMO

Objetivo: Explorar as evidências emergentes que relacionam as condições de saúde bucal com a mortalidade prematura e discutir as possíveis implicações clínicas para a odontologia e o manejo da saúde sistêmica.

Metodologia: Foi realizada uma revisão narrativa da literatura para sintetizar as evidências atuais sobre a relação entre o estado de saúde bucal e os desfechos de mortalidade. Estudos relevantes foram identificados por meio de buscas eletrônicas em bases de dados biomédicas importantes, incluindo PubMed, Scopus e Web of Science. Foram considerados estudos observacionais, revisões sistemáticas e metanálises que avaliaram associações entre doenças bucais, particularmente doença periodontal, perda dentária e condições inflamatórias orais, e mortalidade por todas as causas ou por causas específicas. Foram priorizados estudos publicados em inglês nas últimas duas décadas, a fim de refletir o entendimento científico contemporâneo.

Resultados: Evidências epidemiológicas acumuladas sugerem que a má saúde bucal pode estar associada a um aumento do risco de mortalidade prematura. Doença periodontal, perda dentária extensa e inflamação oral crônica têm sido associadas a condições sistêmicas como doenças cardiovasculares, diabetes mellitus e distúrbios respiratórios, que são importantes contribuintes para a mortalidade global. Os mecanismos biológicos propostos na literatura incluem a disseminação sistêmica de patógenos orais, inflamação crônica de baixo grau e desregulação imunológica. Diversos estudos de coorte longitudinais relatam que indivíduos com doença periodontal grave ou perda dentária significativa apresentam maior risco de mortalidade por todas as causas e por causas cardiovasculares em comparação com indivíduos com melhor estado de saúde bucal.

Conclusão: As evidências atuais sustentam o conceito de que a saúde bucal pode servir como um indicador relevante da saúde sistêmica e potencial preditor de mortalidade prematura. A integração da avaliação da saúde bucal em estratégias mais amplas de atenção à saúde pode contribuir para a identificação precoce de riscos sistêmicos e para a melhoria dos desfechos dos pacientes. São necessários mais estudos longitudinais e intervencionais bem delineados para esclarecer a causalidade e compreender melhor os mecanismos biológicos que ligam as doenças bucais à mortalidade.

Palavras-chave: Saúde Bucal. Mortalidade Prematura. Doença Periodontal. Perda Dentária. Saúde Sistêmica. Inflamação. Epidemiologia. Indicadores de Risco.

RESUMEN

Objetivo: Explorar la evidencia emergente que vincula las condiciones de salud bucal con la mortalidad prematura y discutir las posibles implicaciones clínicas para la odontología y la gestión de la salud sistémica.

Metodología: Se realizó una revisión narrativa de la literatura para sintetizar la evidencia actual sobre la relación entre el estado de salud bucal y los resultados de mortalidad. Los estudios relevantes se identificaron mediante búsquedas electrónicas en bases de datos biomédicas importantes, incluyendo PubMed, Scopus y Web of Science. Se consideraron estudios observacionales, revisiones sistemáticas y metaanálisis que evaluaran asociaciones entre enfermedades orales, particularmente la enfermedad periodontal, la pérdida dental y las condiciones inflamatorias orales, y la mortalidad por todas las causas o por causas específicas. Se priorizaron los estudios publicados en inglés durante las últimas dos décadas para reflejar la comprensión científica contemporánea.

Resultados: La evidencia epidemiológica acumulada sugiere que la mala salud bucal puede estar asociada con un mayor riesgo de mortalidad prematura. La enfermedad periodontal, la pérdida dental extensa y la inflamación oral crónica se han relacionado con condiciones sistémicas como enfermedades cardiovasculares, diabetes mellitus y trastornos respiratorios, que son importantes contribuyentes a la mortalidad global. Los mecanismos biológicos propuestos en la literatura incluyen la diseminación sistémica de patógenos orales, la inflamación crónica de bajo grado y la desregulación inmunitaria. Varios estudios de cohorte longitudinales informan que los individuos con enfermedad periodontal grave o pérdida dental significativa presentan mayores riesgos de mortalidad por todas las causas y por causas cardiovasculares en comparación con aquellos con mejor estado de salud bucal.

Conclusión: La evidencia actual respalda el concepto de que la salud bucal puede servir como un indicador relevante de la salud sistémica y un posible predictor de mortalidad prematura. La integración de la evaluación de la salud bucal en estrategias más amplias de atención sanitaria puede contribuir a la identificación temprana de riesgos sistémicos y a la mejora de los resultados en los pacientes. Se requieren más estudios longitudinales e intervencionales bien diseñados para aclarar la causalidad y comprender mejor los mecanismos biológicos que vinculan las enfermedades orales con la mortalidad.

Palabras clave: Salud Bucal. Mortalidad Prematura. Enfermedad Periodontal. Pérdida Dental. Salud Sistémica. Inflamación. Epidemiología. Indicadores de Riesgo.

1 INTRODUCTION

Over the past decades, increasing attention has been directed toward the relationship between oral health and systemic health. Traditionally, oral diseases were often considered localized conditions with limited implications beyond the oral cavity. However, growing scientific evidence indicates that oral health is closely interconnected with systemic physiology and may influence the development and progression of several chronic diseases (Peres et al., 2019). This paradigm shift has led to a broader recognition of oral health as an integral component of overall health and well-being.

Oral diseases represent a major global health burden, affecting billions of individuals worldwide. According to global epidemiological estimates, oral conditions including dental caries, periodontal disease, and severe tooth loss, are among the most prevalent noncommunicable diseases globally (Peres et al., 2019). These conditions are largely preventable, yet they continue to impose significant health, social, and economic consequences across populations. Importantly, oral diseases share many common risk factors with major systemic conditions, including tobacco use, unhealthy diets, excessive alcohol consumption, and socioeconomic inequalities (Watt et al., 2019). This shared risk factor profile has reinforced the concept that oral health should be addressed within the broader framework of public health and chronic disease prevention.

Among oral diseases, periodontal disease has received particular attention due to its potential systemic effects. Periodontitis is a chronic inflammatory condition characterized by the destruction of tooth-supporting tissues, resulting from complex interactions between microbial biofilms and host immune responses (Kinane et al., 2017). Chronic periodontal inflammation can lead to systemic dissemination of inflammatory mediators and oral pathogens, contributing to low-grade systemic inflammation. This biological mechanism has been proposed as a potential pathway linking periodontal disease to systemic disorders such as cardiovascular disease, diabetes mellitus, adverse pregnancy outcomes, and respiratory infections (Sanz et al., 2020).

In recent years, epidemiological studies have suggested that oral health status may also be associated with mortality outcomes. Several cohort studies have reported associations between periodontal disease, tooth loss, and increased risk of all-cause and cardiovascular mortality (Peng et al., 2022). Tooth loss, in particular, has been proposed as a potential marker of cumulative oral disease burden and may reflect long-term exposure to inflammatory processes, socioeconomic disparities, and health behaviors. Additionally, impaired oral function resulting from tooth loss may influence nutritional intake and general health, further contributing to adverse systemic outcomes.

Despite these observations, the relationship between oral health and premature mortality remains complex and multifactorial. It is still debated whether oral diseases act as direct causal factors contributing to mortality or whether they primarily serve as indicators of underlying systemic conditions and health inequalities. Nevertheless, the accumulating body of evidence highlights the importance of considering oral health within the broader context of systemic health and longevity.

Understanding the potential role of oral health as a predictor of premature mortality has important clinical and public health implications. If oral conditions are indeed associated with increased mortality risk, dental professionals may play a crucial role in early identification of individuals at higher systemic risk. Moreover, integrating oral health into preventive health strategies could contribute to improved population health outcomes.

Therefore, the aim of this narrative review is to synthesize the current evidence regarding the association between oral health and premature mortality and to discuss the potential biological mechanisms and clinical implications of this relationship.

2 METHODOLOGY

This study was designed as a narrative review aimed at synthesizing the existing literature on the association between oral health and premature mortality. A structured search strategy was applied to identify relevant publications in the PubMed, Scopus, and Web of Science databases.

Search terms included combinations of keywords such as “oral health,” “periodontal disease,” “tooth loss,” “oral inflammation,” “mortality,” “premature mortality,” and “systemic disease.” Boolean operators (AND/OR) were used to refine the search and capture studies investigating associations between oral conditions and mortality outcomes.

Eligible publications included studies that evaluated the relationship between oral health indicators and all-cause or cause-specific mortality. Priority was given to studies published in English within the last 20 years, although seminal earlier studies were also considered when relevant.

3 RESULTS

The synthesis of the included literature consistently demonstrates a significant association between oral health status and premature mortality, particularly in relation to all-cause and cardiovascular mortality. Across epidemiological and meta-analytical evidence, individuals presenting with poor oral health conditions, especially periodontitis and tooth loss, exhibit a higher risk of adverse systemic outcomes and reduced survival rates.

A comprehensive systematic review and meta-analysis by Jing Peng et al. (2022) reported that compromised oral health is significantly associated with increased all-cause mortality. The pooled data indicated that individuals with periodontal disease or severe tooth loss had a higher risk of mortality compared to those with preserved oral health. This association remained statistically significant even after adjustment for major confounding variables such as age, smoking, and socioeconomic status, suggesting an independent contribution of oral conditions to mortality risk (Peng et al., 2022).

From a pathophysiological standpoint, periodontitis has been established as a chronic inflammatory disease with systemic implications. According to Denis F. Kinane et al. (2017), periodontal disease involves a dysregulated host immune response to microbial biofilm, resulting in persistent inflammation and tissue destruction. This chronic inflammatory burden contributes to systemic dissemination of cytokines and inflammatory mediators, which may influence distant organ systems and promote the development of chronic diseases linked to mortality (Kinane et al., 2017).

The relationship between periodontal disease and cardiovascular mortality has been particularly well documented. A consensus report led by Mariano Sanz et al. (2020) concluded that there is strong evidence supporting an association between periodontitis and cardiovascular diseases, including atherosclerosis and coronary heart disease. The report highlights that systemic inflammation, endothelial dysfunction, and bacteremia originating from periodontal infections may contribute to the pathogenesis of cardiovascular conditions, thereby increasing mortality risk (Sanz et al., 2020).

In addition to periodontal disease, tooth loss has emerged as a robust predictor of mortality. Tooth loss reflects the cumulative burden of oral disease over time and is frequently associated with functional impairment, particularly reduced masticatory efficiency. This, in turn, may lead to compromised nutritional intake, especially in older populations, contributing to frailty and increased susceptibility to systemic diseases. Large-scale public health analyses emphasize that oral diseases, including untreated caries and periodontitis leading to tooth loss, remain highly prevalent and disproportionately affect vulnerable populations (Peres et al., 2019).

Furthermore, global health perspectives underscore that oral health is deeply interconnected with broader social determinants of health. According to Richard G. Watt et al. (2019), oral diseases share common risk factors with major non-communicable diseases, such as tobacco use, unhealthy diet, and socioeconomic disadvantage. This shared risk profile reinforces the role of oral health as both a marker and a mediator of systemic health inequalities, which are themselves strongly associated with mortality outcomes.

Collectively, the evidence demonstrates a consistent and biologically plausible association between poor oral health and increased mortality risk. While heterogeneity exists across studies in terms of methodology and population characteristics, the convergence of findings from systematic reviews, consensus reports, and global health analyses strengthens the robustness of this relationship.

4 DISCUSSION

The present narrative review synthesizes emerging evidence suggesting that oral health may play a significant role in predicting premature mortality. The findings indicate that conditions such as periodontal disease, tooth loss, and chronic oral inflammation are consistently associated with increased risks of all-cause and cause-specific mortality, particularly from cardiovascular and metabolic diseases. Although the strength of these associations varies across studies, the overall trend supports the hypothesis that oral health is closely linked to systemic health outcomes.

One of the central mechanisms underlying this relationship is chronic inflammation. Periodontal disease, as a persistent inflammatory condition, contributes to systemic dissemination of pro-inflammatory mediators and oral pathogens. This low-grade systemic inflammation may exacerbate or contribute to the development of chronic conditions such as atherosclerosis, insulin resistance, and respiratory diseases. Additionally, bacteremia originating from periodontal pockets may directly influence distant organs, further reinforcing the biological plausibility of the observed associations. Tooth loss, often considered a cumulative marker of lifelong oral disease burden, has also been strongly linked to mortality outcomes. Beyond reflecting past disease, tooth loss may impair masticatory function, leading to suboptimal nutrition and subsequent systemic consequences. Nutritional deficiencies, particularly in older adults, can contribute to frailty, immune dysfunction, and increased vulnerability to chronic diseases, thereby indirectly influencing mortality risk.

It is important to recognize that oral health is also deeply intertwined with socioeconomic and behavioral factors. Individuals with poor oral health often share common risk factors such as smoking, unhealthy diet, limited access to healthcare, and lower socioeconomic status. These confounding variables complicate the interpretation of causality, as oral conditions may act both as independent risk factors and as indicators of broader health inequalities. Therefore, while the association between oral health and mortality is compelling, it should be interpreted within a multifactorial framework.

Another relevant consideration is the heterogeneity in study designs, diagnostic criteria, and outcome measures across the literature. Variability in the assessment of

periodontal disease severity, definitions of tooth loss, and adjustment for confounders may influence the consistency of findings. Despite these limitations, the convergence of evidence from multiple longitudinal studies strengthens the argument for a meaningful association. From a clinical perspective, these findings highlight the potential role of oral health assessments as part of comprehensive health evaluations. Dental professionals may contribute to the early identification of individuals at increased systemic risk, particularly when severe periodontal disease or extensive tooth loss is present. This reinforces the importance of interdisciplinary collaboration between dental and medical fields.

Furthermore, the integration of oral health into public health strategies may offer an opportunity to address shared risk factors and improve overall health outcomes. Preventive approaches targeting both oral and systemic conditions could yield significant benefits at the population level.

Future research should focus on well-designed longitudinal and interventional studies to clarify causality and better understand the biological pathways involved. Standardization of diagnostic criteria and improved control of confounding variables will be essential to strengthen the evidence base. Additionally, exploring whether improvements in oral health can directly reduce mortality risk remains a critical area for investigation.

5 CONCLUSION

In summary, the current body of evidence supports the concept that oral health is closely associated with premature mortality and may serve as a meaningful indicator of systemic health status. Periodontal disease, tooth loss, and chronic oral inflammation appear to be linked to increased risks of all-cause and cause-specific mortality, likely through a combination of biological, behavioral, and socioeconomic pathways.

While causality cannot be definitively established, the consistency of findings across epidemiological studies underscores the importance of considering oral health within the broader context of general health and disease prevention. Incorporating oral health assessments into routine healthcare may enhance early risk detection and contribute to more comprehensive patient management.

Advancing research in this field will be essential to confirm these associations and to determine whether targeted oral health interventions can improve long-term health outcomes and reduce mortality risk.

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