Analysis of the Gradient Differences in Oral Health-Related Quality of Life (OHRQoL) among Patients with Gingivitis and Periodontitis after Undergoing Phase I Treatment

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Abstract: Gingivitis and periodontitis affect oral health-related quality of life (OHRQoL) differently, but post-treatment gradient differences are unclear. This analysis proposes disease severity, treatment response, and psychosocial adaptation as key mechanisms. Gingivitis, causing reversible inflammation, disrupts short-term comfort, while periodontitis, with structural damage, leads to prolonged functional and psychosocial burdens. After Phase I therapy, gingivitis patients improve rapidly, whereas periodontitis patients face slower recovery due to residual deficits and psychological adaptation. Biological thresholds (e.g., tissue repair) and subjective symptom valuation (e.g., pain tolerance) drive these gradients. Tailoring interventions to biological and perceptual factors may optimize outcomes. Further research should validate this framework for personalized care.

***Keywords*:** Gingivitis; Periodontitis; Oral health-related quality of life; Gradient differences

1. Introduction

Gingivitis and periodontitis, prevalent inflammatory conditions, impair oral health-related quality of life (OHRQoL) through distinct pathological pathways. Phase I therapy alleviates symptoms, yet disparities in OHRQoL recovery between these groups remain underexplored. Existing research prioritizes clinical metrics over mechanisms driving post-treatment gradient differences in subjective well-being. This theoretical analysis examines how disease severity (reversible inflammation vs. irreversible tissue damage), treatment responsiveness, and psychosocial adaptation interact to shape OHRQoL trajectories[1].

2. Theoretical Analysis Foundation

2.1 Theories of Factors Affecting OHRQoL

OHRQoL is shaped by biological, psychological, and social dimensions. The biomedical model emphasizes clinical parameters (e.g., inflammation, tooth mobility), while psychosocial theories highlight subjective experiences (pain, aesthetics) and social interactions. For gingivitis, transient discomfort dominates OHRQoL impairment, aligning with acute symptom-driven models. In periodontitis, chronic functional deficits (chewing difficulty) and stigma from visible tissue damage align with biopsychosocial frameworks[2].

2.2 Differences in the biological effects of Phase I therapy

Phase I therapy reduces inflammation but exerts distinct biological impacts on gingivitis versus periodontitis. Studies show gingivitis patients achieve near-complete resolution of bleeding (90-95% reduction) within 4 weeks post-scaling, driven by reversible epithelial repair. In periodontitis, scaling reduces probing depth by 1.2-1.5 mm on average, yet residual pockets >4mm persist in 30-40% of sites due to irreversible connective tissue loss. Biomarker analyses reveal gingivitis exhibits faster normalization of IL-6 levels (70% decline vs. 50% in periodontitis), reflecting limited tissue invasion. These differential responses underscore gingivitis's confined inflammation versus periodontitis's structural compromise, shaping divergent OHRQoL recovery trajectories[3].

3. Analysis of the mechanism of gradient differences

3.1 The direct effect of disease severity

Disease severity directly shapes OHRQoL through biological and functional pathways. Gingivitis, marked by localized and reversible inflammation, primarily disrupts transient comfort (e.g., bleeding, tenderness). In contrast, periodontitis induces irreversible tissue destruction (attachment loss, bone resorption), leading to persistent functional impairments such as chewing difficulty, tooth mobility, and aesthetic damage. Structural degradation amplifies physical limitations, directly

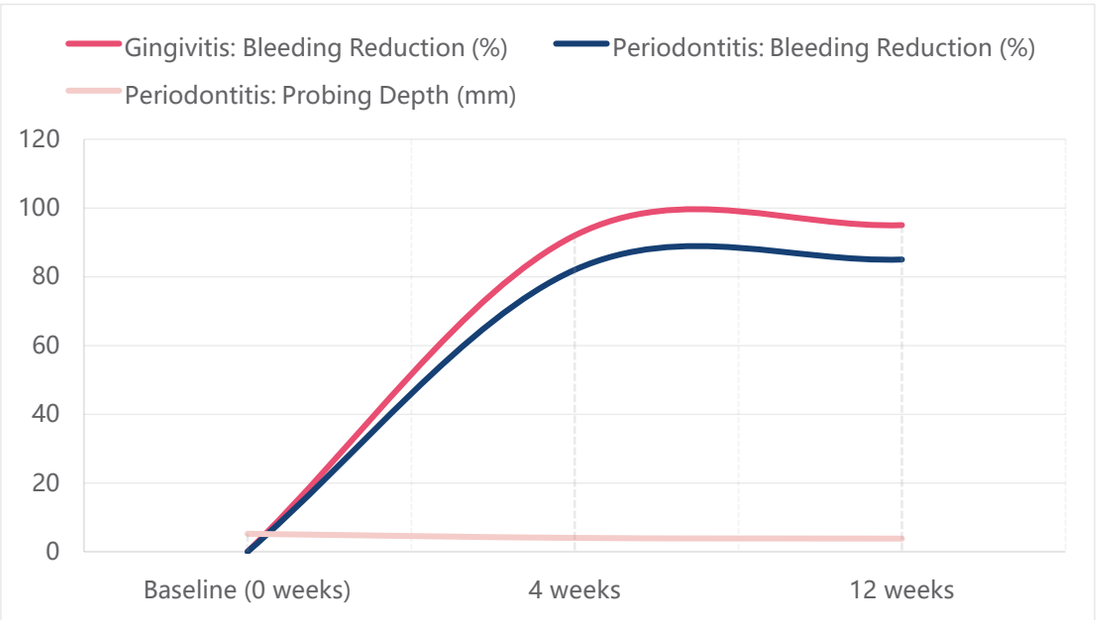

Figure 1. Comparative Visualization of Brain MRI Scans and Tissue Signal Intensity Profiles: Isointense vs. Adult-like Phases in Dual Cases (Case 1 and Case 2)

lowering functional capacity in daily activities like eating and speaking[4].

3.2 Nonlinear effects of therapeutic responsiveness

Therapeutic outcomes on OHRQoL follow nonlinear trajectories shaped by disease chronicity and tissue repair thresholds. Gingivitis, with reversible inflammation, achieves rapid symptom relief, saturating OHRQoL gains early. Periodontitis, requiring structural regeneration, exhibits delayed improvements due to biological thresholds (e.g., critical attachment levels for functional recovery) and adaptive feedback loops (psychological adaptation to chronic symptoms). Marginal gains diminish post-initial therapy, necessitating adjunct interventions to overcome plateaus.

3.3 The regulatory role of social psychology

Social psychology critically regulates OHRQoL by mediating patients' perception of treatment outcomes and disease-related stigma. Gingivitis, often perceived as a transient and minor condition, minimally disrupts self-esteem or social interactions, allowing swift normalization of daily activities post-therapy. In contrast, periodontitis, linked to chronic progression and visible tissue damage such as gingival recession or tooth displacement, amplifies psychosocial burdens. Stigma arising from halitosis, aesthetic impairment, or perceived neglect may persist despite clinical improvement, decoupling biological recovery from subjective well-being. Social support networks and patient self-efficacy in hygiene practices additionally determine long-term OHRQoL stability. These psychosocial dynamics act as amplifiers or dampeners, reshaping the translation of clinical success into holistic quality of life[5].

4. Clinical significance and theoretical expansion

4.1 The theoretical basis of personalised treatment strategies

Personalized strategies to optimize oral health-related quality of life (OHRQoL) must address the interplay of biological severity, psychosocial vulnerability, and nonlinear therapeutic responses. Patients with severe periodontitis and low self-efficacy may require phased therapies to align clinical targets with psychosocial adaptation rates. Conversely, gingivitis patients benefit from rapid symptom resolution, leveraging minimal psychosocial disruption.

4.2 Practical application of theoretical models

Translating theoretical insights into clinical practice requires multidimensional frameworks tailored to OHRQoL gradients. First, pre-treatment assessments should stratify patients by biological severity and psychosocial profiles. For gingivitis, standardized protocols emphasizing rapid symptom resolution suffice. For periodontitis, phased interventions

align clinical targets with psychosocial adaptation timelines — initial therapy focuses on functional stabilization, followed by aesthetic rehabilitation to address lingering stigma. Real-time OHRQoL monitoring via validated questionnaires enables dynamic adjustments, such as integrating mental health support for patients reporting persistent social anxiety.

5. Conclusion

Gradient OHRQoL disparities post-therapy reflect biological severity, nonlinear treatment responses, and psychosocial adaptation. Personalized strategies integrating these dimensions are critical. Future research must validate theoretical models and refine interventions to align clinical outcomes with patient-centered well-being.

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