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Integrating Periodontal Care Into Diabetes Management: A Narrative Perspective for Bangladesh With Global Relevance

Abdullaha Al Mamun  | Md Rabiul Awual

Chittagong Medical College, Chattogram, Bangladesh

Correspondence: Abdullaha Al Mamun (abdullahibnosman@outlook.com)

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ABSTRACT

Background: Type 2 Diabetes Mellitus (T2DM) and periodontal disease are highly prevalent chronic conditions that share a complex, bidirectional relationship. While extensive research confirms their mutual influence—where poor glycemic control exacerbates periodontal destruction and chronic periodontal inflammation impairs insulin sensitivity—this critical connection remains largely unaddressed in both clinical guidelines and public health policy, particularly in low- and middle-income countries (LMICs) like Bangladesh.

Objective: This narrative, evidence-informed perspective article aims to explore the epidemiological, clinical, and systemic interconnections between periodontal disease and T2DM, with a specific focus on Bangladesh. It underscores the urgent importance of integrating oral health into diabetes care frameworks and advocates for strategic health policy reforms grounded in recent research and global best practices.

Findings: Globally, over 500 million people live with diabetes, and nearly half of the adult population suffers from some form of periodontal disease. In Bangladesh, a recent epidemiological study indicated that T2DM prevalence exceeds 10%, with hospital-based studies indicating that over 80% of diabetic patients also have periodontal disease. The bidirectional link is well-established: periodontitis exacerbates insulin resistance and increases HbA1c levels, while poorly controlled diabetes accelerates periodontal tissue destruction. This article identifies systemic barriers, policy gaps, and a lack of public awareness as key impediments to integrated care. It proposes evidence-based strategies, including enhanced interprofessional collaboration, public health campaigns, leveraging digital health, and developing culturally sensitive policies.

Conclusion: Integrating periodontal care into comprehensive diabetes management is not merely a clinical recommendation but a public health imperative for Bangladesh, with significant global relevance. Addressing this bidirectional relationship through collaborative healthcare models and targeted policy reforms can improve glycemic control, reduce diabetes complications, and enhance the overall quality of life for millions, contributing to more sustainable and holistic healthcare systems.

1 | Introduction

The burden of noncommunicable diseases (NCDs) is increasing rapidly, especially in low- and middle-income

countries. Among these, Type 2 Diabetes Mellitus (T2DM) stands out as a major long-term health challenge. The International Diabetes Federation projects that the number of people living with diabetes will reach over 643 million

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globally by 2030 [1]. In Bangladesh, approximately 10.8% of the adult population suffers from diabetes, with limited access to structured diabetic and oral care [2]. Periodontal disease, a chronic inflammatory condition affecting the tooth-supporting apparatus, is also widespread, affecting nearly 50% of adults globally and contributing significantly to tooth loss, systemic inflammation, and poor quality of life [3, 4].

In recent years, researchers have increasingly understood the two-way relationship between diabetes and periodontal disease; each condition makes the other worse. Hyperglycemia fosters periodontal tissue destruction, whereas periodontal inflammation aggravates glycemic instability through proinflammatory mediators [5, 6]. In a context such as Bangladesh, this relationship is further amplified by low oral health literacy, tobacco and betel nut use, and underresourced dental care systems. This perspective article synthesizes existing evidence to highlight the critical need for integrating periodontal care into diabetes management in Bangladesh, acknowledging its global relevance. It is important to note that this is a narrative, evidence-informed perspective piece, not a systematic review or empirical study, aiming to synthesize current understanding and propose actionable public health strategies.

2 | Methods

This article is a narrative perspective informed by peer-reviewed literature from PubMed, Scopus, and institutional reports. We prioritized meta-analyses, clinical trials, and LMIC-specific data. No statistical software was used. This approach allows for policy-relevant synthesis, rather than hypothesis testing.

2.1 | Pathophysiological Mechanisms Linking Periodontal Disease and T2DM

The chronic hyperglycemic state of T2DM leads to immunological dysfunction, impaired neutrophil activity, and increased production of advanced glycation end-products (AGEs) that accumulate in periodontal tissues and increase the inflammatory response (see Figure 1) [7–9]. These AGEs bind to RAGE receptors on monocytes and endothelial cells, enhancing the production of cytokines (e.g., TNF- α , and IL-6), matrix metalloproteinases, and oxidative stress, which promote alveolar bone destruction [10, 11]. Additionally, T2DM compromises neutrophil function, impairs wound healing, and disrupts the oral microbiome, increasing susceptibility to periodontal pathogens.

On the other hand, periodontal pathogens such as *Porphyromonas gingivalis* and *Tannerella forsythia* trigger systemic inflammation through the release of lipopolysaccharides (LPS), which can induce insulin resistance [12, 13]. Periodontitis has been associated with elevated HbA1c levels (see Figure 2), poor metabolic control, and a greater risk of diabetic complications [14–16].

These complications may include nephropathy, retinopathy, and cardiovascular diseases, which are more prevalent and progress more rapidly in individuals with concurrent periodontitis. These comorbidities further burden the healthcare system and compromise overall quality of life.

Chronic periodontal inflammation, triggered by dysbiotic oral microbial communities (periodontal pathogens), leads to a persistent systemic inflammatory state. This involves the release of proinflammatory cytokines such as Tumor Necrosis Factor- α (TNF- α), Interleukin-1 beta (IL-1 β), Interleukin-6 (IL-6), and C-Reactive Protein (CRP) into the bloodstream. These systemic inflammatory mediators directly contribute to insulin resistance by interfering with insulin signaling pathways in target cells, particularly in muscle, fat, and liver tissues. This impaired insulin sensitivity subsequently leads to elevated blood glucose levels and poorer glycemic control, as indicated by higher HbA1c values. Conversely, hyperglycemia in individuals with T2DM creates an environment conducive to bacterial overgrowth and impaired immune responses, exacerbating periodontal tissue destruction and completing the vicious cycle.

2.2 | Epidemiological Evidence From Bangladesh and the Region

Multiple studies across South Asia reinforce the high coprevalence of these conditions. In a Bangladeshi hospital-based study ($n = 379$), more than 75.7% of T2DM patients presented with some form of periodontal disease [17], with a strong association between periodontitis and gum swelling, betel nut chewing, and a lack of secondary oral hygiene practices [18]. Similar results were reported in Bangalore, India, where more than 89% of diabetic patients who brushed once daily had periodontal pathology [19].

A meta-analysis also confirmed increased tooth loss and deep periodontal pockets in T2DM patients [20], while Pima Indians in Arizona reported a threefold greater periodontitis incidence in diabetic patients than in nondiabetic patients [21], which was previously sixfold greater [22]. Moreover, HbA1c levels $\geq 8\%$ are significantly associated with moderate-to-severe periodontitis [23]. Although modest, these improvements are comparable to those achieved with pharmacological interventions and warrant the inclusion of periodontal treatment in diabetes management protocols.

National data suggest a T2DM prevalence of 10.8%, with urban areas experiencing even higher rates due to sedentary lifestyles and dietary changes [2]. However, oral health remains severely neglected in health policy and practice. Dental services are limited, especially in rural areas, and few clinics incorporate periodontal evaluations into diabetes care routines.

An additional concern is the lack of awareness among diabetic patients about the importance of oral health. In a country where healthcare literacy is already low, oral-systemic connections are poorly understood, and dental visits are often limited to emergency care.

2.3 | Therapeutic Implications and Bidirectional Management

Meta-analyses suggest that nonsurgical periodontal therapy (NSPT) significantly reduces systemic markers of inflammation

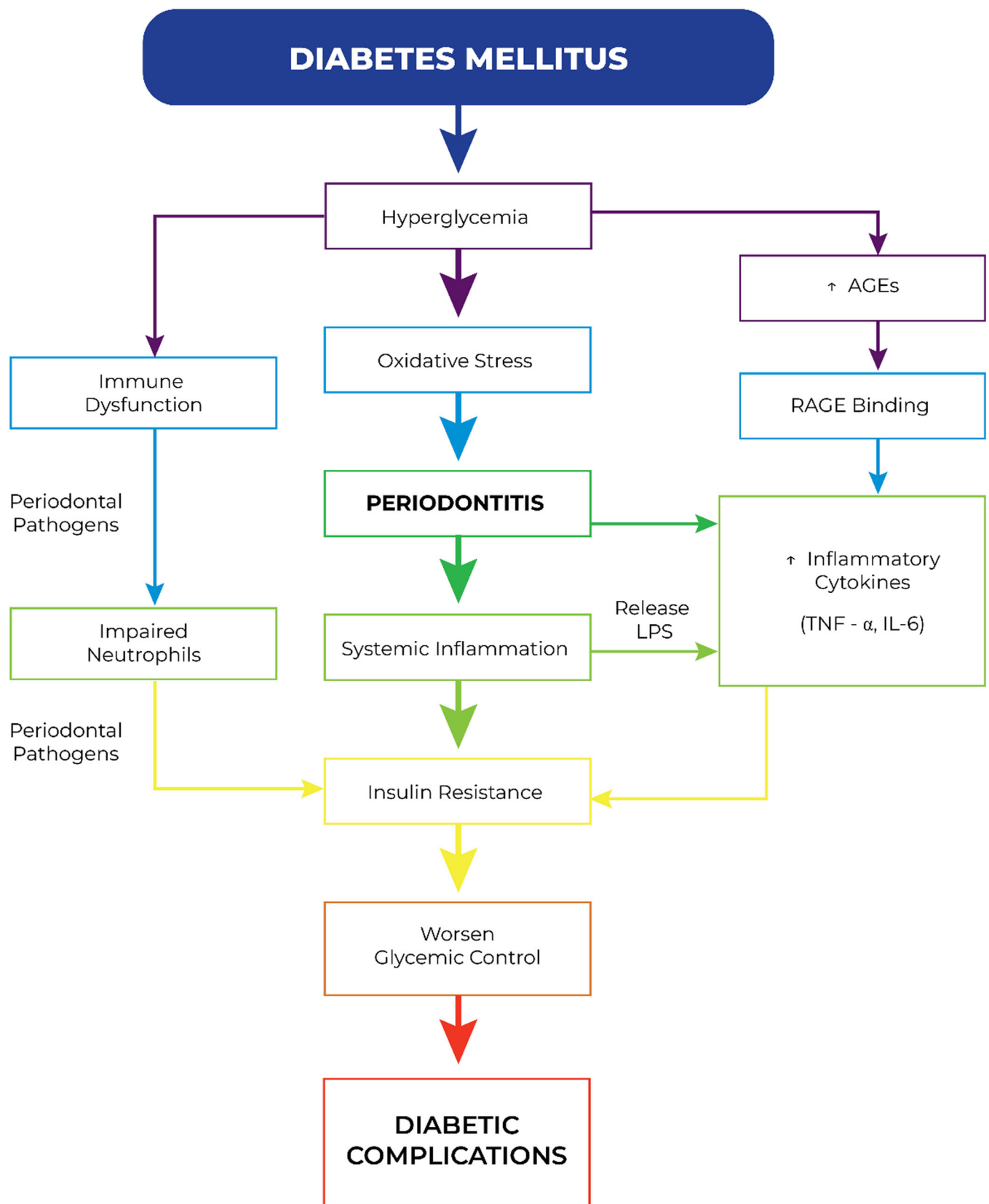


FIGURE 1 | Bidirectional pathophysiological interplay between diabetes mellitus and periodontitis.

and lowers HbA1c (see Figure 3) by 0.27%–0.48% over 3–6 months [24, 25]. These improvements are comparable to what can be achieved by adding a second oral diabetes medication, especially for patients whose blood sugar is poorly controlled at the start [26].

Given this strong evidence, integrating periodontal evaluation into diabetes clinics could serve as a low-cost, very effective strategy for improving both oral and metabolic outcomes. Tools such as the Periodontal Screening and

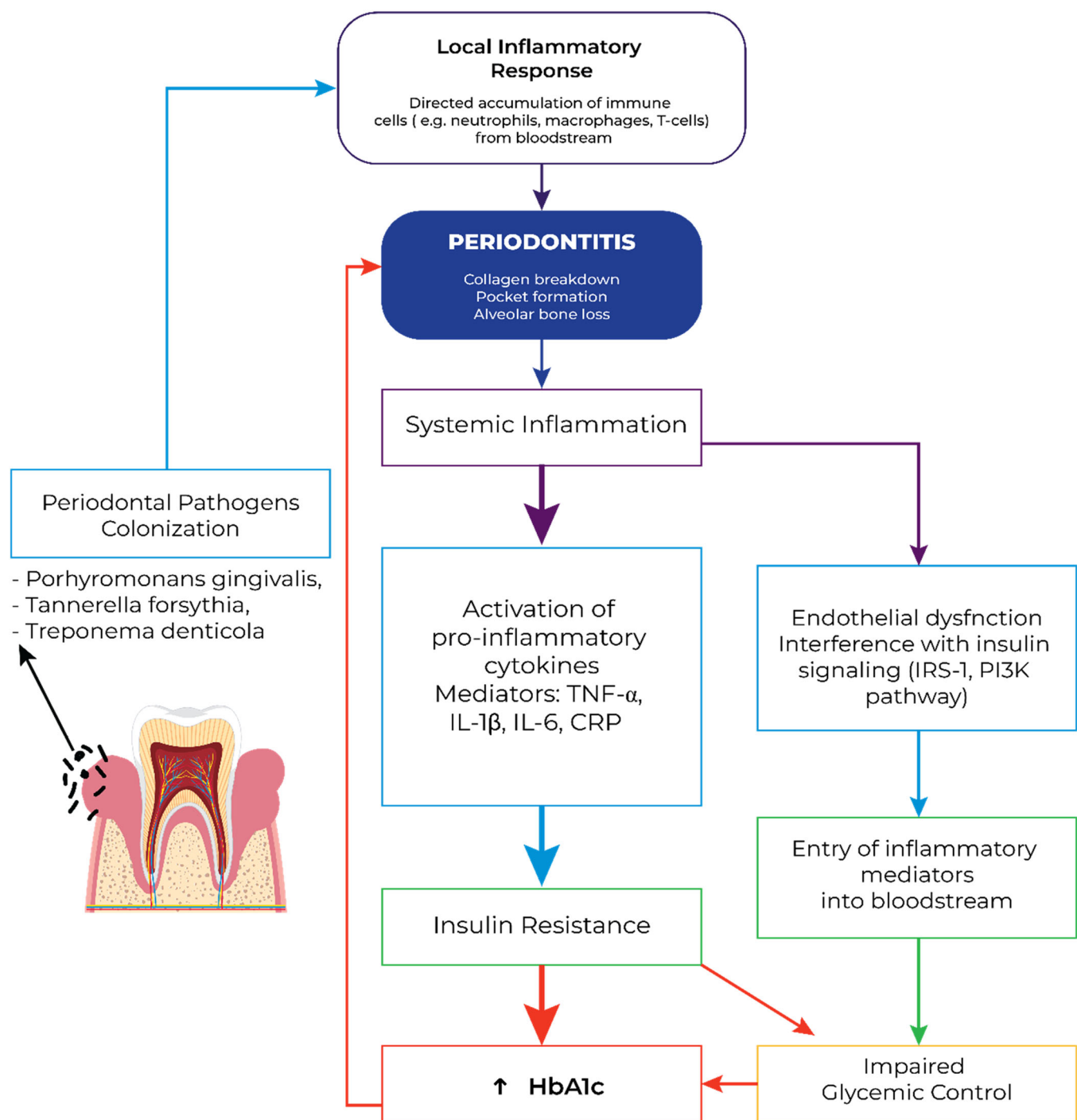


FIGURE 2 | Flow chart illustrating the impact of periodontitis on glycemic control in T2DM.

Recording (PSR) and Community Periodontal Index (CPI) are suitable for use even in primary care settings [27].

Routine gum assessments can also encourage patients to better manage their diabetes. This is because it helps them see a clear connection between their oral hygiene and their overall body health. Furthermore, incorporating NSPT into diabetic care protocols may reduce the overall medication burden and mitigate the progression of comorbid conditions. Moreover, NSPT is comparatively inexpensive, making it a

feasible and scalable intervention within resource-constrained health systems.

2.4 | Systemic Health Consequences and Policy Blind Spots

Untreated periodontitis in diabetic patients contributes not only to tooth loss but also to macrovascular and microvascular complications such as nephropathy, retinopathy, and

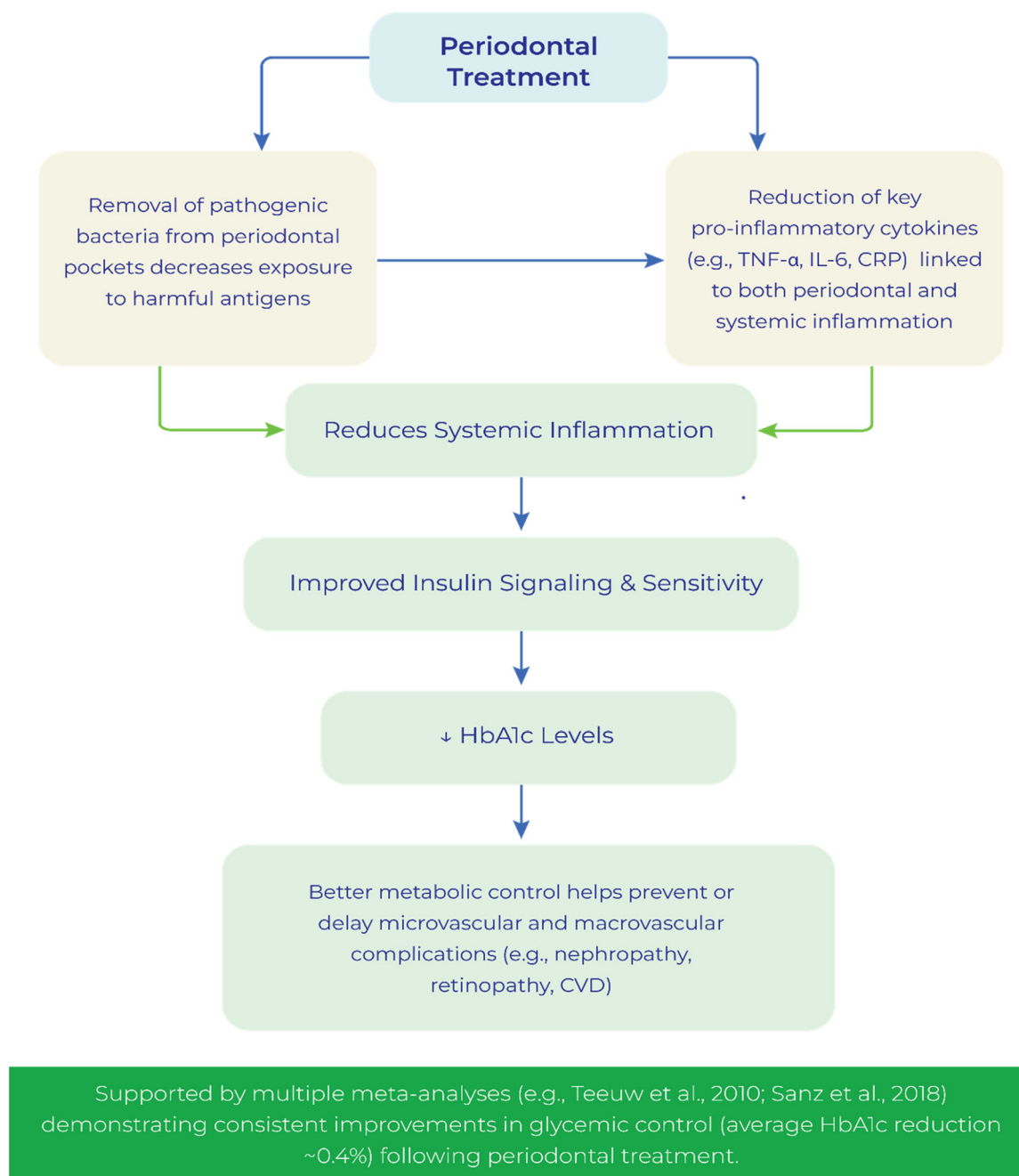


FIGURE 3 | Impact of periodontal treatment on glycemic control and diabetes outcomes.

cardiovascular disease [28, 29]. However, few LMICs have national guidelines incorporating oral health into NCD care models. Dental services remain siloed and are often excluded from universal health coverage (UHC) schemes, especially in rural South Asia [30].

Despite mounting evidence, oral health continues to be perceived as secondary in public health agendas, largely owing to the historical separation between medical and dental education systems. This disconnect undermines early detection of oral complications in diabetic patients and delays appropriate intervention.

Broader health system reform is warranted. Training healthcare workers in oral-systemic links, allocating

resources for dental education in diabetes camps, and subsidizing preventive dental services could yield long-term cost savings [31, 32].

2.5 | Public Health Implications and Systemic Barriers

Despite robust evidence, the integration of periodontal care into diabetes management is not a national policy priority in Bangladesh. Most NCD programs focus on heart disease, hypertension, and nephropathy, whereas oral health receives limited institutional attention. Structural fragmentation, a lack of interprofessional training, and insufficient resource allocation all contribute to this policy gap.

Furthermore, health information systems rarely collect data on oral health, making it difficult to quantify the burden or demonstrate the cost-effectiveness of integration. Public insurance or subsidized care schemes do not cover dental services, leaving patients to pay out of pocket, creating an access barrier for low-income populations.

Pilot initiatives are essential to demonstrate feasibility. Small-scale programs integrating periodontal screening into diabetes clinics at government hospitals could be used to evaluate outcomes such as changes in HbA1c, periodontal health status, and patient satisfaction. To address patient reluctance, integrating oral health education into existing diabetes support groups, where peers share personal experiences linking gum health to blood sugar control, has proven effective in improving attendance and adherence.

2.6 | Opportunities for Integration and Innovation

Several pragmatic steps can be taken to improve the integration of oral health into diabetes care (see Figure 4). First, primary healthcare providers should be trained to conduct basic oral health screenings via standardized tools such as the Periodontal Screening and Recording (PSR) index or the Community Periodontal Index (CPI) [27]. Pilot initiatives are essential to

demonstrate feasibility and cost-effectiveness within the Bangladeshi context. For instance, small-scale programs integrating basic periodontal screening and referral into diabetes clinics at primary healthcare centers or government hospitals could be implemented to evaluate outcomes such as changes in HbA1c, periodontal health status, and patient satisfaction over a 6–12 month period (see Table 1).

Second, diabetes counseling sessions at both public and private health facilities can include oral health education. Posters, brochures, and video content in Bengali could be developed in collaboration with the Bangladesh Dental Society and public health NGOs. For example, the NGO BRAC has piloted oral health awareness in diabetes camps in Dhaka slums.

Third, Bangladesh can explore digital health interventions, such as mobile health (mHealth) platforms, to educate patients on oral hygiene practices and provide reminders for dental check-ups. Further, to mobile app reminders, a national telehealth platform could offer basic oral health consultations and triage services, particularly for individuals in remote areas with limited access to dental professionals. This could involve trained tele-operators guiding patients through oral self-examinations and facilitating virtual referrals.

Fourth, in communities where betel nut use exacerbates gum disease, partnering with local leaders, such as imams, priests, or

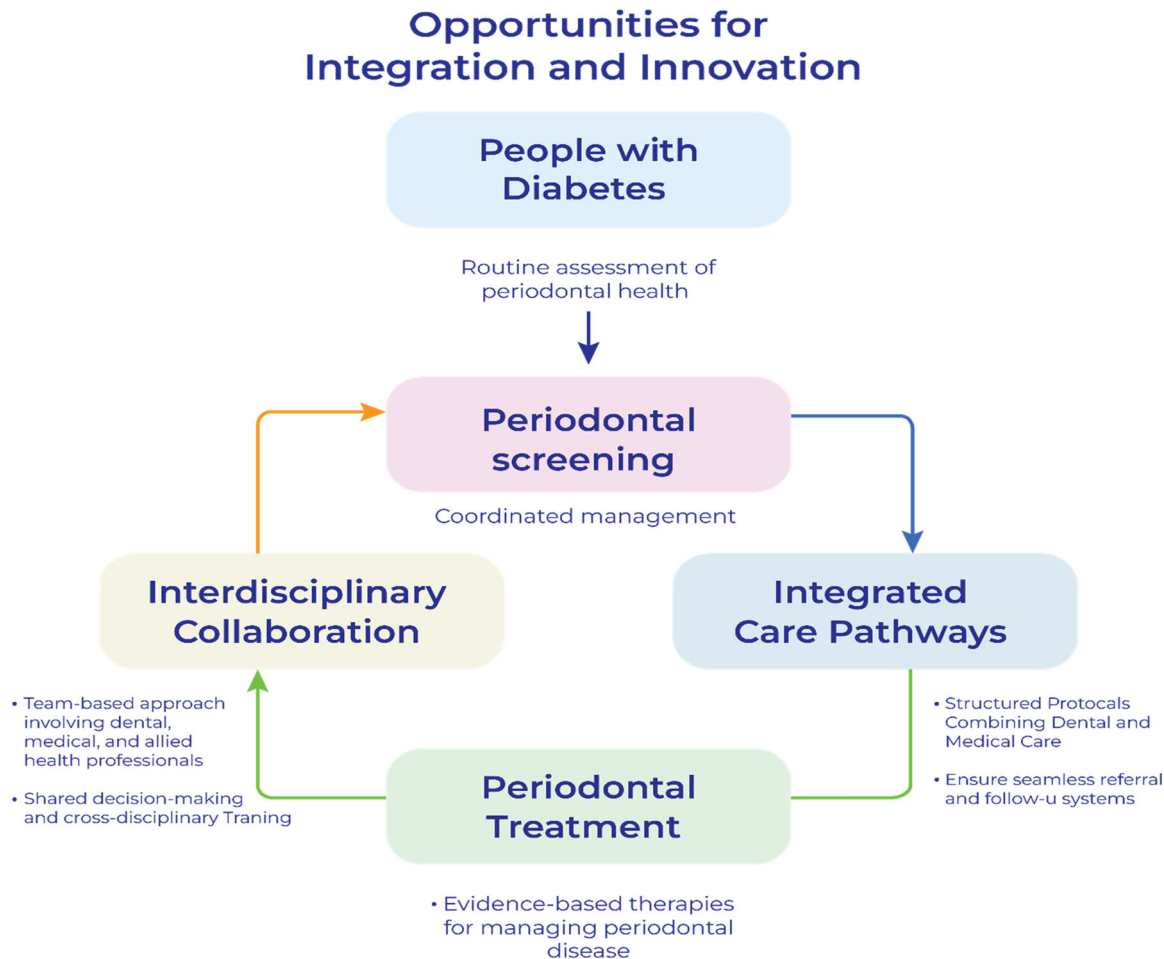


FIGURE 4 | Conceptual framework for integrating periodontal screening into diabetes management in Bangladesh.

TABLE 1 | Summary of key policy recommendations for incorporating periodontal care into diabetes services in Bangladesh.

Intervention	Outcome	Feasibility
Periodontal screening in diabetes clinics (PSR/CPI)	Early detection and timely care	High
NSPT inclusion in NCD care guidelines	Improved glycaemic control	Moderate
Oral health education in diabetes camps	Enhanced patient awareness	High
mHealth tools for oral hygiene and dental reminders	Better follow-up and adherence	High
Dentist–endocrinologist referral linkages	Integrated chronic disease care	Moderate
Community awareness via schools/religious leaders	Behavioral change, tobacco cessation	High

schoolteachers, to deliver culturally tailored messages has successfully reduced harmful practices. Similarly, linking oral hygiene to religious practices (e.g., cleansing rituals before prayers) can improve adherence. Workshops and continuing medical education (CME) programs for physicians, nurses, and community health workers could focus on recognizing oral health signs, understanding the diabetes-periodontal link, and providing initial patient education. These training modules could be co-developed by dental and medical associations in Bangladesh.

Table 1 provides a concise summary of feasible, evidence-informed policy interventions to integrate periodontal care within diabetes management in Bangladesh.

2.7 | Economic and Equity Implications of Integration

Integrating periodontal care into diabetes management is not only a clinical priority but also an economic imperative. Diabetes is a major driver of healthcare costs globally, particularly through its complications, such as cardiovascular disease, renal failure, and limb amputation. Periodontal disease, if left untreated, contributes to poor glycemic control, which in turn increases the risk and cost of these complications.

Studies suggest that periodontal therapy, especially nonsurgical interventions such as scaling and root planing, can reduce HbA1c levels by up to 0.48%, a reduction comparable to that associated with the addition of a second-line antidiabetic drug [24]. This glycemic improvement can translate into a significant reduction in diabetes-related hospitalizations and long-term treatment costs. For example, in settings where insulin resistance is intensified by systemic inflammation, reducing oral inflammation can delay or reduce the need for more expensive insulin therapies and dialysis for nephropathy.

Moreover, the cost of basic periodontal care is modest compared with that of managing diabetic complications. A single course of periodontal therapy costs a fraction of what is spent annually on managing diabetic foot infections or cardiovascular incidents. A modeling study by Jeffcoat et al. (2014) in the United States revealed that patients receiving periodontal treatment had significantly lower medical costs and fewer hospital admissions than those who did not [33]. While the economic context of Bangladesh differs, the principle of preventive investment leading to long-term savings holds strong applicability.

Additionally, this approach enhances health equity. Rural and low-income populations suffer disproportionately from both diabetes and periodontal disease, but are the least likely to access dental care. By embedding oral health in existing diabetes services, Bangladesh can offer preventive care to vulnerable groups, thus lowering out-of-pocket expenses and improving financial protection. Integrating periodontal services into national NCD packages aligns with Universal Health Coverage (UHC) goals and supports long-term sustainability by optimizing cost-effective, high-impact care. Micro insurance schemes or public–private partnerships could further subsidize care for low-income populations, as seen in other countries where such models cover essential dental services.

2.8 | Global Context and Lessons for Policy Transfer

The challenge of integrating oral and general health systems is not unique to Bangladesh. Even in high-income countries, dental care often remains isolated. However, successful models provide transferable insights. Several high-income countries have successfully integrated dental and diabetes care by making gum checks routine in medical settings. In the UK, the co-management of diabetic patients by dentists and GPs has led to better glycemic outcomes [34]. In Sweden, national guidelines mandate oral assessments as part of diabetes care [35].

Moreover, key international bodies have underscored the need for integrated care pathways. The EFP/IDF (2018) recommends that medical professionals actively screen for periodontal symptoms, educate patients on the oral-systemic link, and refer them for dental assessments [36]. BSP (2017) similarly advised diabetic patients about periodontal risks and promoted regular dental check-ups [37]. The EFP (2012) emphasizes ongoing periodontal monitoring and strengthened dental–medical collaboration [38], whereas the EFP/AAP (2013) advocates for routine periodontal evaluation of newly diagnosed diabetic patients to optimize outcomes [39]. Notably, the AAP (American Academy of Periodontology), BSP (British Society of Periodontology), EFP (European Federation of Periodontology), and IDF (International Diabetes Federation) have consistently highlighted the need for interdisciplinary approaches to improve patient care.

Both the WHO and the International Diabetes Federation have emphasized the need for oral health to be part of NCD control strategies. The Global Oral Health Status Report (2022) calls for

the integration of essential oral health services into Universal Health Coverage (UHC) packages [40].

Bangladesh can adapt these global principles to its local context by leveraging existing NCD infrastructures. The Health Ministry can incorporate oral health into existing surveillance tools, and professional councils can mandate interdisciplinary education at the undergraduate level.

2.9 | Limitations

This perspective article provides a narrative synthesis of existing evidence, distinguishing it from systematic reviews or empirical studies, and therefore does not include primary data analysis or rigorous statistical procedures. Consequently, it lacks country-specific epidemiological data or detailed cost-effectiveness modeling for Bangladesh, which prevents precise quantification of local disease burden or the exact feasibility of proposed interventions.

Moreover, the generalizability of global insights and policy recommendations is inherently limited due to significant variations in healthcare infrastructure, socioeconomic contexts, and cultural practices. While relying on robust published literature, this article acknowledges the inherent biases and limitations of its sources. Therefore, future research is crucial; it should focus on large-scale, country-specific pilot studies and comprehensive economic evaluations to validate integrated care models and inform sustainable policy within Bangladesh's unique healthcare system.

3 | Conclusion

The evidence is unequivocal: periodontal disease and T2DM are interconnected through shared pathophysiological pathways, and managing one can positively affect the other. For Bangladesh, where both conditions are prevalent and healthcare resources are limited, integrated care models are not just ideal—they are essential.

This article has outlined the biological, epidemiological, and policy dimensions of this interrelationship and proposed scalable solutions rooted in current evidence. Prioritizing periodontal health within diabetes care can improve patient outcomes, reduce long-term complications, and contribute to broader public health goals.

To achieve this goal, a concerted effort from policymakers, medical and dental educators, public health professionals, and international partners is needed. By taking decisive action, Bangladesh has the opportunity to lead, for example, and contribute to the global dialog on equitable, integrated health systems.

Author Contributions

Abdullaha Al Mamun: conceptualization, supervision, visualization, project administration, validation, writing – original draft, writing – review and editing. **Md Rabiul Awwal:** validation, writing – original draft, data curation.

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Ethics Statement

The authors have nothing to report.

Consent

The authors have nothing to report.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The authors confirm that data supporting the findings of the study are available within the article and its references. Thus, no additional data sources are needed.

Transparency Statement

The lead author, Abdullaha Al Mamun, affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

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