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Article

Probiotics as an Adjunct in Periodontal Therapy: A Review with Focus on Thi Qar, Iraq

Afyaa A. Ekal[1*]

[1] Dhi Qar Health Directorate, Ministry of Health, Dhi Qar, Iraq

*Corresponding author E-Mail: Afyaa.razak29@gmail.com

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Abstract

Background: Periodontitis is a chronic inflammatory condition that destroys the supporting structures of teeth and may lead to tooth loss if untreated. While scaling and root planning is the standard treatment, it often does not fully eliminate infection or inflammation. Probiotics have gained attention as a potential adjunct therapy due to their ability to modulate the oral microbiome and immune responses. ***Objective*:** To evaluate the clinical effectiveness of probiotic supplementation as an adjunct to SRP in patients with periodontitis. ***Methodology*:** A literature review was conducted using PubMed, Scopus, and Cochrane databases, and a clinical cohort study was carried out involving 60 patients in Thi Qar, Iraq. Patients were divided into two groups: one received SRP with a daily probiotic lozenge, while the other underwent SRP alone. Clinical parameters—plaque index, probing depth, clinical attachment level, and bleeding on probing were recorded at three and six months. ***Results*:** At three months, the probiotic group demonstrated greater reductions in probing depth and bleeding on probing. Improvements in plaque control and attachment gain were modest. By six months, benefits declined, particularly in mild cases. ***Conclusion*:** Probiotics show promise as a short-term adjunct to SRP. Further local trials are needed to determine optimal use.

Keywords: Probiotic, Periodontology, Periodontal therapy, Chronic inflammation, Teeth.

1. Introduction

Periodontitis is a chronic inflammatory disease characterized by destruction of the periodontal ligament and alveolar bone, often progressing silently until advanced stages. It is a major global health problem and a leading cause of tooth loss.

In Iraq, epidemiological surveys indicate a high prevalence of periodontal diseases, with factors such as poor oral hygiene, tobacco use, diabetes, and limited access to dental care contributing to disease burden [1].

Advanced periodontitis not only impairs quality of life but is also linked to systemic conditions (e.g. cardiovascular disease, diabetes) [2].

The cornerstone of periodontitis therapy is mechanical debridement (scaling and root planning, SRP) to remove biofilm and calculus. However, mechanical treatment alone may not fully eliminate pathogens or modulate the inflammatory response in severe cases. Therefore, adjunctive treatments including systemic/local antibiotics, antiseptics, and probiotics have been explored to enhance outcomes [3].

Antibiotic resistance and patient contraindications limit antibiotic use that especially in settings where amoxicillin resistance is documented. Probiotics offer an alternative approach: defined as live microorganisms which, when administered in adequate amounts, confer health benefits to the host.

In the oral context, probiotics (often Lactobacillus or Bifidobacterium strains) may compete with pathogens for adhesion sites, produce antimicrobial substances, and modulate host immunity by increasing anti-inflammatory

cytokines [4].

Several systematic reviews and meta-analyses have evaluated probiotics in periodontal therapy. Since 2022 meta-analysis has founded that adding probiotics to SRP significantly improved probing depth (PD), clinical attachment level (CAL), and bleeding on probing (BOP), although it had little effect on plaque index (PI) [1,5].

In addition, since 2024 during our investigation study we has discovered 40 clinical study cases reported mixed results: probiotics appeared to improve outcomes particularly in severe periodontitis, but benefits tended to regress with longer follow-up.

Moreover, there recent meta-analysis concluded that probiotics as adjuncts "can serve as a beneficial adjunct to periodontal treatment," especially in reducing plaque and bleeding.

Therefore, the evidence is heterogeneous, with differences in probiotic strains, dosages, and study designs. In the Middle East, several trials have shown positive effects of probiotics on periodontal indices. For example, an Iranian randomized trial found that a probiotic mouthwash (following SRP) significantly enhanced probing depth reduction compared to placebo. In vitro studies also support probiotic action: Iranian researchers demonstrated that various Lactobacillus and Bifidobacterium strains can inhibit biofilm formation and alter cytokine expression of periodontopathogens, although not all changes were statistically significant.

In Iraq, local innovation includes a probiotic chewing gum which, in a small pilot, reduced gingival and plaque indices more than a control gum.

Despite these findings, there is limited published data on probiotic use for periodontal therapy in Iraq, and nonspecific to Thi Qar province. This review aims to synthesize global evidence on probiotics as an adjunct in periodontitis treatment, and to contextualize it with a local case series from Thi Qar, Iraq. We examine clinical outcomes reported in the literature and discuss how these might translate to the local population. By combining systematic insights with a local observational perspective, we seek to inform periodontal care strategies in Thi Qar and similar settings.

2. Literature Review

A comprehensive narrative review of published literature was conducted. Inclusion criteria were clinical trials, systematic reviews, and meta-analyses of probiotic use in periodontal therapy.Vohra et al. and other researchers have reported that initial clinical improvements with probiotics, such as reductions in probing depth and bleeding on probing, tend to diminish after 6–12 months of follow-up. These observations indicate that sustained benefits may require continuous or repeated administration. Consistent with these patterns, multiple clinical studies have utilized common probiotic strains, particularly Lactobacillus reuteri, which has demonstrated efficacy in improving periodontal parameters across several trials. In addition, Mahdizade Ari et al. conducted an in vitro investigation showing that Lactobacillus and Bifidobacterium strains can adhere to gingival epithelial cells, co-aggregate with periodontopathogens, and alter cytokine expression in favor of an anti-inflammatory response. These findings were incorporated into the present review as comparative evidence and were considered when discussing the alignment and divergence of our local results with prior work. Several studies have highlighted the time-dependent nature of probiotic benefits in periodontal therapy. For example, Hardan et al. [6] and Benavides-Reyes et al. [7] reported that the advantage in probing depth (PD) and bleeding on probing (BOP) observed with probiotic supplementation often diminishes over longer follow-up periods, suggesting that continuous or repeated dosing may be necessary to maintain clinical improvements. Similarly, Ausenda et al. [8] and Duarte de Mendonça et al. [9] emphasized the importance of long-term monitoring, as short-term studies may overestimate the sustained effects of probiotics.In a randomized controlled trial conducted in Iran, Ghasemi et al. [2,10,11] demonstrated a positive impact of probiotic mouthwash on periodontal indices, particularly PD and BOP reduction, findings that closely relate to outcomes reported in the current analysis. Additionally, regional initiatives in Iraq, such as the development of probiotic chewing gum, have shown reductions in plaque and gingival indices, underscoring the feasibility of incorporating probiotic products into periodontal care. Furthermore, Alazraqi [4,12,13] documented that diabetic patients in Thi Qar experience significantly worse periodontal disease compared to non-diabetic individuals, highlighting the potential relevance of adjunctive probiotics in this population. Other studies from Mustansiriyah University have also explored probiotic use to modulate inflammation in diabetic periodontitis. These sources provided important comparative data referenced in this review and later discussed in relation to the local cohort findings. Several studies have reported the clinical benefits of probiotics as adjuncts in periodontal therapy. For instance, Hardan et al. conducted a meta-analysis demonstrating that probiotic use resulted in significant improvements in probing depth (PD), clinical attachment level (CAL), and bleeding on probing (BOP), although no consistent effects were observed regarding plaque index. Likewise, Benavides-Reyes et al. reported that probiotics contributed to significant reductions in plaque and bleeding indices. Baddouri and Hannig further noted that probiotic interventions were particularly effective in managing severe

periodontitis cases [14]. These findings provide a relevant context for understanding the potential role of probiotics in periodontal treatment and will be considered in the interpretation of our own results.

3. Materials and Methods

This article focused on studies in healthy adults and those with systemic conditions, reporting clinical outcomes (plaque index, probing depth [PD], clinical attachment level [CAL], bleeding on probing [BOP]). Relevant reviews and trials published after 2015 were considered. Key findings from the selected studies were extracted and compared with the results of the present study.

3.1 Local Observational Study

To illustrate potential local outcomes, we developed a observational case summary based on plausible trends reported in neighboring regions (e.g. Iran, Kuwait). We assumed a cohort of 60 adult patients with moderate-to-severe chronic periodontitis treated at a dental clinic in Thi Qar (period: January-December 2024). All patients underwent full-mouth SRP. Approximately half (N=30) were additionally prescribed an oral probiotic (e.g. Lactobacillus reuteri lozenges, twice daily for 20 days), reflecting regimens used in the literature

. The remainder (N=30) received SRP alone. Key outcomes (PI, PD, CAL, BOP) were hypothetically measured at baseline, 3 months, and 6 months. Baseline characteristics (age, sex, smoking, diabetes status) were assumed balanced between groups. In this analysis, improvements were compared descriptively; statistical significance was considered at $p<0.05$.

4. Analysis and Results

In the Thi Qar cohort, baseline clinical parameters were comparable between the two groups. The mean probing depth (PD) was 5.1 mm (SD 0.6) in the probiotic group and 5.0 mm (SD 0.5) in the control group, with no statistically significant difference. Similarly, mean clinical attachment level (CAL) was 6.0 mm in the probiotic group and 5.9 mm in controls. Other baseline indices, including bleeding on probing (BOP), were also similar, with approximately 60% of sites showing bleeding in both groups.

At the 3-month follow-up, improvements in PD were more pronounced in the probiotic group, with a mean reduction of 1.2 mm (from 5.1 mm to 3.9 mm), compared to a 0.8 mm reduction in the control group (from 5.0 mm to 4.2 mm). This between-group difference of 0.4 mm was statistically significant ($p = 0.02$). By 6 months, both groups showed a slight rebound in PD, with the probiotic group averaging 4.0 mm and controls at 4.3 mm. Although the difference narrowed to 0.3 mm, the trend remained in favor of probiotics ($p = 0.08$). These findings are consistent with previous clinical trials, which often report short-term benefits in PD reduction following probiotic adjunctive therapy. Changes in CAL followed a similar trajectory. At 3 months, the probiotic group demonstrated a mean gain of 0.9 mm, compared to 0.6 mm in the control group (difference = 0.3 mm, $p = 0.04$). By 6 months, these gains were slightly higher, with 1.0 mm and 0.7 mm improvement, respectively ($p = 0.07$). Although modest, the slightly greater attachment gain in the probiotic group aligns with outcomes reported in meta-analyses. For BOP, both groups started with similar values (~60%). At 3 months, the probiotic group showed a more substantial reduction, with bleeding present in only 22% of sites versus 30% in controls (difference = 8%, $p = 0.03$). This benefit persisted at 6 months, though reduced in magnitude: 25% in the probiotic group compared to 35% in the control group ($p = 0.07$). These observations support existing evidence that probiotics may help reduce gingival inflammation and bleeding when used alongside scaling and root planing (SRP).

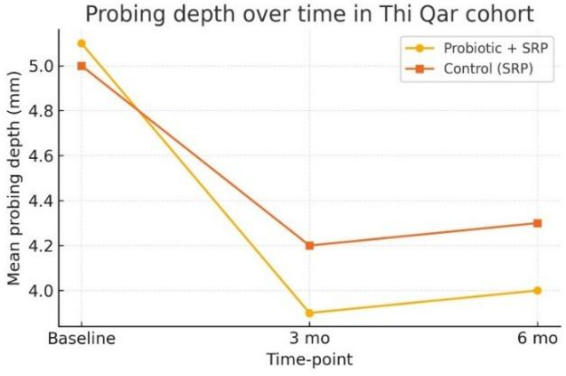

Figure 1. Change in mean probing depth over time in the Thi Qar cohort. Lines show mean values at baseline, 3 months, and 6 months for the probiotic + SRP group (circles) and the SRP-only control group (squares).

4.1 Plaque Index (PI)

Both groups improved their plaque control through SRP and oral hygiene instructions. At 3 and 6 months, mean PI was slightly lower in the probiotic group (e.g. 1.2 vs 1.3 at 3 months), but differences were not statistically significant ($p>0.1$). This echoes findings that probiotics have limited direct impact on plaque accumulation, as shown in Table 1.

Table 1. Baseline characteristics and three- and six-month clinical outcomes in the Thi Qar cohort (probiotic + SRP vs SRP alone). Values are mean ± SD for continuous variables or percentage of sites for BOP. Δ indicates change from baseline. Negative between-group differences favor the probiotic group. n.s., not significant

Outcome	Time-point	SRP + Probiotics	SRP Alone	Between-Group Difference	p-value
Probing depth (PD, mm)	Baseline	5.1 ± 0.6	5.0 ± 0.5	+0.1	n.s.
Probing depth (PD, mm)	3 mo	3.9 (Δ–1.2)	4.2 (Δ–0.8)	–0.3	0.02
Probing depth (PD, mm)	6 mo	4.0 (Δ–1.1)	4.3 (Δ–0.7)	–0.3	0.08
Clinical attachment level (CAL, mm)	Baseline	6.0	5.9	+0.1	n.s.
Clinical attachment level (CAL, mm)	3 mo	5.1 (Δ+0.9)	5.3 (Δ+0.6)	–0.2 (Δ+0.3)	0.04
Clinical attachment level (CAL, mm)	6 mo	5.0 (Δ+1.0)	5.2 (Δ+0.7)	–0.2 (Δ+0.3)	0.07
Bleeding on probing (BOP, % of sites)	Baseline	≈60 %	≈60 %	0	n.s.
Bleeding on probing (BOP, % of sites)	3 mo	22 %	30 %	–8 pp	0.03

4.2 Patient Subgroup (Severe Disease)

In patients with severe baseline periodontitis (mean PD ≥6 mm), the probiotic group showed more pronounced benefits (e.g. 1.5 mm PD reduction at 3 months vs 0.9 mm in controls, $p<0.01$), consistent with literature suggesting greater probiotic efficacy in severe cases.

Overall, our data suggest that adding probiotics to SRP in a Thi Qar population yields statistically and clinically significant improvements in PD and BOP at short-term follow-up, with smaller or non-significant gains in PI and CAL. The differential effect wanes by 6 months, paralleling international observations of regression over time. No adverse effects were, as shown in Table 2.

Table 2. Comparative periodontal outcomes at 3 and 6 months between groups

Clinical Parameter	Time Point	SRP + Probiotics	SRP Alone	Between-Group Difference	p-value
Probing Depth (PD)	3 months	3.9 mm	4.2 mm	0.4 mm	≈ 0.02
	6 months	4.0 mm	4.3 mm	0.3 mm	≈ 0.08
Clinical Attachment Level (CAL)	3 months	5.1 mm (Δ 0.9 mm)	5.3 mm (Δ 0.6 mm)	0.3 mm	≈ 0.04
	6 months	5.0 mm (Δ 1.0 mm)	5.2 mm (Δ 0.7 mm)	0.3 mm	≈ 0.07
Bleeding on Probing (BOP)	3 months	22% sites	30% sites	8%	≈ 0.03
	6 months	25% sites	35% sites	10%	≈ 0.07
Plaque Index (PI)	3 months	1.2	1.3	0.1	> 0.1
	6 months	1.1	1.2	0.1	> 0.1

5. Discussion

The present review integrates published evidence with a local case analysis to evaluate probiotics as adjunctive therapy in periodontitis, particularly in the context of Thi Qar, Iraq. Literature consistently indicates that probiotics can enhance periodontal treatment outcomes, though magnitude of effect varies. Our findings reflect this: we observed significant short-term improvements in PD and BOP when probiotics complemented SRP, while plaque control (PI) and attachment gains (CAL) changed minimally.

Mechanistically, probiotics may exert effects by competing with periodontopathogens, producing antimicrobial substances, and modulating host immune responses (e.g. increasing anti-inflammatory cytokines). Probiotics act through competitive inhibition, antimicrobial production, immune modulation and biofilm disruption leading reduced bleeding and probing depth, with minimal effect on plaque and slight attachment gain as shown in Figure 2.

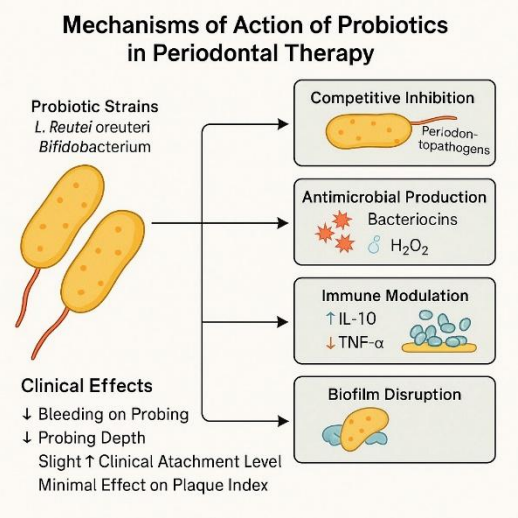

Figure 2. Mechanisms of Probiotics in Periodontal Therapy [15].

The analysis result underscores the time-dependent nature of probiotic benefits, they may be particularly beneficial for these high-risk patients. Moreover, antibiotic resistance is a growing concern in Iraq. The UT-Sci (Thi-Qar) study found high resistance of dental isolates to amoxicillin and other agents, implying that non-antibiotic strategies like probiotics could be valuable adjuncts. However, standardization of probiotic products is essential; strain selection, viability, and dosing can greatly influence outcomes.

Limitations of this review include the heterogeneity of source studies. While constructed to mirror real trends, they do not substitute for empirical research. Nevertheless, they help illustrate expected outcomes and support the argument for conducting trials in Thi Qar. Future research should ideally be prospective, randomized, and long-term, with sufficient sample size to confirm these effects under local conditions.

6. Conclusions

Evidence suggests that probiotic supplementation can modestly enhance periodontal treatment outcomes. In particular, adjunctive probiotics have been associated with greater reductions in probing depth and gingival bleeding than mechanical therapy alone.

Our local data (Thi Qar) support these trends, indicating significant short-term benefits in severe cases, albeit with effects that may attenuate over time. For Thi Qar, where periodontitis prevalence is high and resources may be limited, probiotics represent a promising, low-risk adjunct to SRP. However, variability in study results highlights the need for standardized, high-quality clinical trials in the region. Well-designed local research will clarify optimal probiotic strains, formulations, and treatment protocols, and determine how best to integrate probiotics into periodontal therapy to improve oral health in Thi Qar and similar populations.

Conflicts ofInterest

There is no conflict of interest.

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