Patient-Reported Probiotic Use During Non-Surgical Periodontal Therapy in Stage III Grade B Periodontitis: Clinical Findings, Oral Health Impact and Behavioral Correlates

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Ethics Approval Statement

The study was approved by the ethics committee of Istanbul Medipol University in accordance with the Declaration of Helsinki (Decision No: 1553; Date: 11 December 2025).

Conflict of Interest Statement

The authors confirm that there are no conflicts of interest associated with this study.

Patient Consent Statement

Written informed consent was obtained from all participants before enrollment, and participation was voluntary without any effect on periodontal treatment.

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This study was not funded.

2. Material and Methods

2.1. Study design and participants

This prospective observational study was conducted at the Department of Periodontology, Faculty of Dentistry, Istanbul Medipol University. The study was approved by the ethics committee of Istanbul Medipol University in accordance with the Declaration of Helsinki (World Medical Association, 2013) (Decision No: 1553; Date: 11 December 2025). The study was reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement (von Elm et al., 2007). Written informed consent was obtained from all participants before enrollment, and participation was voluntary without any effect on periodontal treatment.

Sample size estimation was based on the 3-month deep-pocket PPD difference reported by Teughels et al. (2013) (SRP + probiotic: 2.88 ± 0.35 mm; SRP + placebo: 2.25 ± 0.27 mm). Using a conservative standardized effect size of 0.50, a two-sided α of 0.05 and 80% power, at least 63 patients per group were required; therefore, 65 patients were included in each group. Because the present study was observational and exposure was not investigator-assigned, this calculation was used to estimate an adequate minimum group size for detecting clinically relevant between-group differences rather than to support causal inference.

Patients scheduled to undergo NSPT were consecutively screened for eligibility at the periodontal clinic. Of 184 patients screened, 140 eligible patients were enrolled after pre-enrollment exclusions, and 130 patients who completed the required follow-up assessments were included in the final analysis. Eligible participants were 18–70 years of age, had at least 20 natural teeth, were diagnosed with Stage III Grade B periodontitis and were available for baseline, 1-month and 3-month evaluations. Patients were excluded if they had used systemic antibiotics within the previous 3 months, had received periodontal treatment within the previous 6 months, had systemic disease, were pregnant or lactating, or had severe cognitive or psychiatric conditions that could interfere with questionnaire completion or follow-up. Current smoking status was recorded at baseline and was not used as an exclusion criterion.

The final analytic sample comprised 65 patients in the probiotic product-use group and 65 patients in the non-user group.

2.2. Periodontal diagnosis, treatment and probiotic exposure definition

Periodontal diagnosis and stage/grade assignment were established according to the 2017 World Workshop classification of periodontal diseases and conditions (Papapanou et al., 2018; Tonetti et al., 2018). Only patients with Stage III Grade B periodontitis were included. Periodontitis was defined by detectable interdental CAL at two or more non-adjacent teeth. Stage III Grade B periodontitis was defined by interdental CAL ≥5 mm at the site of greatest loss, with grading based on a bone loss/age ratio of 0.25-1.00.

All patients received routine NSPT, including individualized oral hygiene instruction and supra- and subgingival mechanical debridement/root surface instrumentation where indicated (Herrera et al., 2020; Suvan et al., 2020). All NSPT procedures were performed by the same periodontist (M.C.).

The study did not include an investigator-assigned probiotic intervention. No probiotic strain, dose, formulation, frequency, duration or adherence protocol was prescribed as part of the study. Group classification was based on self-reported use of probiotic supplements or commercially labelled probiotic products during active periodontal treatment and post-treatment follow-up. Patients who reported such use were classified as probiotic product users, whereas those reporting no probiotic supplement or commercially labelled probiotic product use during the same interval were classified as non-users. Traditional homemade fermented foods, including homemade yogurt, kefir, pickles, vinegar, sourdough products and boza, were recorded as dietary fermented-food habits when reported but were not used to define probiotic exposure because strain composition, colony-forming unit content, microbial viability, dose and consistency of intake could not be verified (FAO/WHO, 2002; Hill et al., 2014; Sahin, 2026). Therefore, the exposure represented self-reported real-world probiotic-labelled product use rather than standardized probiotic intake.

2.3. Clinical assessment

Clinical periodontal measurements including PI, BOP, PPD, CAL were performed at baseline, 1 month, and 3 months after NSPT by a calibrated examiner (B.T.) who was not involved in treatment delivery and was blinded to participants' probiotic product-use status and questionnaire responses. Participants were instructed not to disclose their probiotic product use during clinical examinations. Probiotic product-use data and questionnaire responses were recorded separately from the clinical examination forms and were linked to the clinical dataset only after completion of all follow-up measurements.

Before study initiation, examiner calibration was performed in 10 volunteers who were not included in the study. Probing pocket depth and clinical attachment level measurements were repeated at six sites per tooth, and intra-examiner reproducibility was assessed. The calibrated examiner demonstrated high reproducibility, with a κ value of 0.896, and repeated measurements differed by no more than 1 mm at 90% of sites.

2.4. Questionnaire and patient-reported assessment

At baseline, participants completed a structured questionnaire including demographic and health-related information, previous periodontal treatment history, probiotic knowledge/familiarity, attitudes toward probiotic use in periodontal therapy, previous probiotic exposure and probiotic form/source preferences. The questionnaire framework was adapted from previously used probiotic knowledge and consumption surveys and from the approved study protocol (Patait et al., 2022; Sahin, 2026; Wang et al., 2025).

Baseline probiotic knowledge/familiarity was assessed using items related to prior awareness of the term "probiotic", self-rated knowledge level, correct identification of the probiotic definition and perceived general probiotic benefit. These variables were additionally combined into an exploratory baseline knowledge/familiarity index.

Attitudes toward probiotic use in periodontal therapy were assessed using Likert-type items addressing perceived periodontal benefit, willingness to use probiotics as part of periodontal treatment, confidence in probiotic use if recommended by a dentist and ease of acceptance when adequate explanation was provided. A high acceptance profile was defined a priori as agreement or strong agreement with at least three of four predefined attitude items.

The questionnaire also included items on product and formulation preferences, including preferred supplement formulation, commercially labelled probiotic product type and preferred route/form of use. Traditional homemade fermented foods were recorded only as dietary fermented-food habits and were not used to define exposure. These items were used descriptively to characterize patient preferences and were not used to define a standardized probiotic exposure.

OHRQoL was assessed using the Turkish version of the Oral Health Impact Profile-14 (OHIP-14-TR) at baseline, 1 month and 3 months (Mumcu et al., 2006; Slade, 1997). Each item was scored on a 5-point Likert scale, and total scores ranged from 0 to 56, with higher scores indicating poorer OHRQoL. At follow-up, additional patient-reported measures included self-rated current oral health, perceived change in oral problems since treatment, overall treatment satisfaction and future willingness to use probiotics if recommended. Among probiotic product users, probiotic-related experience was also recorded, including satisfaction with probiotic use and self-reported adherence.

2.5. Statistical analysis

All statistical analyses were performed using IBM SPSS Statistics version 30.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation or median [interquartile range], as appropriate, and categorical variables as number and percentage. Baseline comparisons between probiotic product users and non-users were performed using the independent-samples t test or Mann–Whitney U test for continuous variables and the chi-square test or Fisher's exact test for categorical variables.

Clinical outcomes and OHIP-14 total scores at 1 and 3 months were analyzed using regression models adjusted for age, sex, current smoking status, education level, previous periodontal treatment and the baseline value of the corresponding outcome. Current smoking was coded as current smoking versus non-current smoking. Continuous outcomes, including PI, mean PPD, CAL, BOP and OHIP-14 total score, were analyzed using linear regression

models. Count outcomes, including the number of sites with PPD ≥5 mm, were analyzed using generalized linear models with a log link and expressed as rate ratios with 95% confidence intervals. Additional sensitivity models included previous probiotic recommendation and prior familiarity with the term “probiotic”.

Within-group changes in clinical and OHRQoL outcomes across baseline, 1 month and 3 months were analyzed using the Friedman test. Questionnaire-based probiotic knowledge/familiarity, attitude, acceptance, preference, satisfaction and adherence-related variables were analyzed according to item type using the chi-square test, Fisher’s exact test, Mann–Whitney U test or Wilcoxon signed-rank test, as appropriate. Factors associated with reported probiotic product use were evaluated using multivariable logistic regression. A two-sided p value <0.05 was considered statistically significant.