

Effectiveness of adjunctive use of probiotic blend in non-surgical periodontal therapy Background

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Authorship and Contribution:

We certify that the article has not received prior publication and is not under consideration for publication elsewhere. On behalf of all Co-Authors, I the corresponding Author shall bear full responsibility for the submission. This research has not been submitted for publication nor has it been published in whole or in part elsewhere. We attest to the fact that all Authors listed on the title page have contributed significantly to the work in conception or designing the work; acquisition, analysis, and interpretation of data for the work.

This was the research done during the RESEARCH SUMMIT on 2018 organized by Asan Memorial Dental College, Chengalpet.

Periodontitis is a chronic host immune-mediated inflammatory response involving the supporting periodontal tissues resulting in tissue breakdown and bone loss that eventually results in tooth loss. Probiotics are live microorganisms that attenuate normal health when consumed in adequate amounts. Its usage has been found beneficial in improving oral health as it stimulates the immune response and interferes with the growth and adhesion of microorganisms. Research has shown that Probiotics can be used as an adjunct in the treatment of periodontitis. In this study, we evaluate the effectiveness of oral supplement of probiotics as an adjunct to nonsurgical treatment.

Materials and Methods

A total of 10 generalized chronic periodontitis patients were included in the study. They were divided into two groups randomly. One group was given a probiotic blend along with SRP and the other group was given a placebo along with SRP. Both the groups were reevaluated for periodontal parameters after the period of 4 weeks.

Results

The results obtained were statistically analyzed for mean values using SPSS software. The treatment group where probiotic supplements were taken showed an effective reduction in gingival index, plaque index, probing pocket depth, and gain in clinical attachment level than the placebo group. It was found to be statistically significant, $p < 0.5$.

Conclusion

Probiotics can be used as an effective adjunct to SRP in treating periodontitis patients.

Keywords: Periodontitis, scaling and root planning, probiotic, placebo.

INTRODUCTION

Periodontitis is a chronic immune-inflammatory disease affecting the supporting structures of the teeth resulting in progressive attachment and bone loss. Probiotics are live microorganisms when administered in adequate amount; provide beneficial health effects to the host and has been available for decades in fermented food products. In recent years the use of probiotics has become a keen interest in the field of dentistry, particularly periodontics. Probiotics have a positive effect on the development and stability of microbiota thereby stimulating the innate and adaptive immune responses Banthia Rucci et al 2013. Probiotics as an adjunct to mechanical therapy in chronic periodontitis proved to be efficient in controlling the disease A Vivies-Soler 2020.

It is an established fact that the primary factors in the development of periodontal disease are the host and bacterial challenges. Periodontal disease affects bone and supporting tissues of the periodontium eventually resulting in tooth loss. The development of periodontal disease depends on the presence of pathogenic bacteria, the absence of so-called beneficial bacteria, and the susceptibility of the host Slots J_{et al} 1991; Sockransky et al 1991. The overall balance between bacterial challenge and the body's immunoinflammatory responses is critical to the development of periodontal disease making the absence of so-called beneficial bacteria a key factor to focus on. Despite this knowledge, Initial therapy only targets the reduction of periodontopathogens by nonsurgical periodontal treatment Salvi GE et al 2005. It primarily encompasses scaling and root planning and oral hygiene instructions Haffajee et al 2000. Although the pathogens can be greatly reduced by scaling and root planning, periodontopathogens quickly recolonize the treated site Teughels et al 2007. The administration of beneficial bacteria is a developing concept in the prevention and treatment of periodontal diseases. This novel probiotic treatment has both antimicrobial as well as inflammatory properties. Probiotics have been used for a number of years in the field of general medicine for the treatment of inflammatory bowel disease, prevention of allergies, management of vaginal infections, and the prevention of respiratory infections. In the field of periodontics, probiotics have come up as an attractive alternative to antibiotics. They target particular periodontal pathogens inhibiting the initial plaque adhesion, thereby increasing the long-term success of periodontal therapy. Studies have reported a reduction of bleeding on probing, plaque index, and gingival index after the use of probiotics Krasse P et al 2005;

Kang MS et al 2005; Riccia DN et al 2007, Twetman S et al 2009. Hence this study was conducted to assess the benefits of adjunctive use of the probiotic blend with SRP in the treatment of chronic periodontitis patients for a period of 4 weeks in comparison with a placebo.

MATERIALS AND METHODS

Patients visiting the department of Periodontology and Implantology, Asan Memorial Dental College and Hospital, Chengalpet, were included in the study. Ethical clearance was obtained from the institutional scientific review committee, prior to conducting the research. A total of 10 patients with generalized chronic periodontitis who satisfied the inclusion criteria were selected and informed consent was obtained from all participants.

The inclusion criteria are as follows:

1. Patients with generalized chronic periodontitis with no relevant medical history.
2. Patients aged 35 years and above.
3. Minimum of 3 teeth in each quadrant excluding third molars.
4. Presence of at least 5 teeth with PPD \geq 5mm, CAL \geq 2mm, and bleeding on probing >20%.

The exclusion criteria are as follows:

1. Pregnant and lactating individuals.
2. Patients who had undergone any periodontal treatment/anti-inflammatory or antibiotic therapy in the last 6 months.

Following baseline examination, all patients received full mouth nonsurgical periodontal therapy (Scaling and Root planing). Gingival index (Loe and Silness), Plaque index (Loe and Silness), Bleeding on Probing (BOP), Periodontal pocket depth (PPD) and Clinical attachment level (CAL) were recorded at baseline and after 4 weeks of treatment.

The patients were randomly divided into two groups: Group A- SRP + Probiotics and Group B – SRP + Placebo. A commercially available probiotic blend from Wow life science was used for the purpose of this study. Each capsule delivers 20 billion CFUs of good bacteria and contains a premium blend of 14 gut-friendly good probiotic bacterial strains:

L.plantarum, L.casieri, L.rhamnosus, L.acidophilus, B.Lactis, L.reuteri, L.salivarius, L.paracasei, L.gasseri, S.thermophilus, B.fifidium and B.Breve. Group A patients were asked to take one capsule/day 30 minutes before the meal for 30 days. All patients were asked to report after a period of 1 month according to NICE guidance for reassessment and evaluation of periodontal status.

RESULTS:

On clinical examination, there was a decrease in signs of inflammation as shown in Figure 1 and 2 pre-treatment and post-treatment photographs. The probiotic blend was found to be biocompatible with no adverse effects.

Fig 1: Pre-treatment Clinical Photograph



Fig 2: Post-treatment Clinical Photograph



The mean values were calculated for both the groups by comparing baseline and post-treatment periodontal parameters such as gingival index, plaque index, periodontal pocket depth, and clinical attachment level.

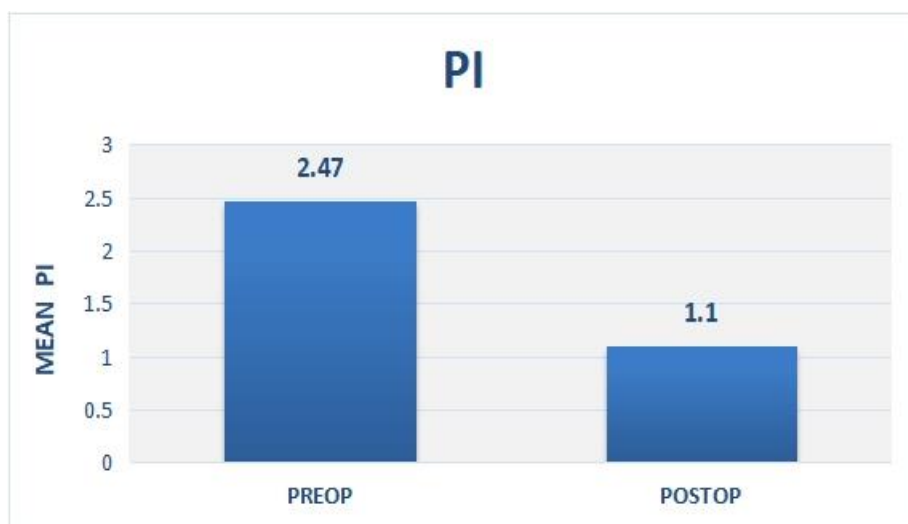
Statistical analysis, using SPSS 20 software was done and the results were obtained. The Gingival index was significantly reduced when compared to the baseline of 2.46 ± 0.52 mm, with a statistically significant decrease of 1.01mm (95% CI, 0.5373 to 1.4826mm, $t(9) = 4.8339$, $p = 0.0009$, as shown in graph 1.

GRAPH 1: Comparison of a gingival index between pre-treatment and post-treatment group



The reduction in plaque index was also found to be statistically significant. The plaque index was reduced post-treatment by 1.1 ± 0.88 mm as opposed to baseline values of 2.47 ± 0.52 mm, a statistically significant decrease of 1.37 mm (95% CI, 0.8978 to 1.8422 mm, $t(9) = 6.5636$, $p = 0.0001$ as shown in graph 2.

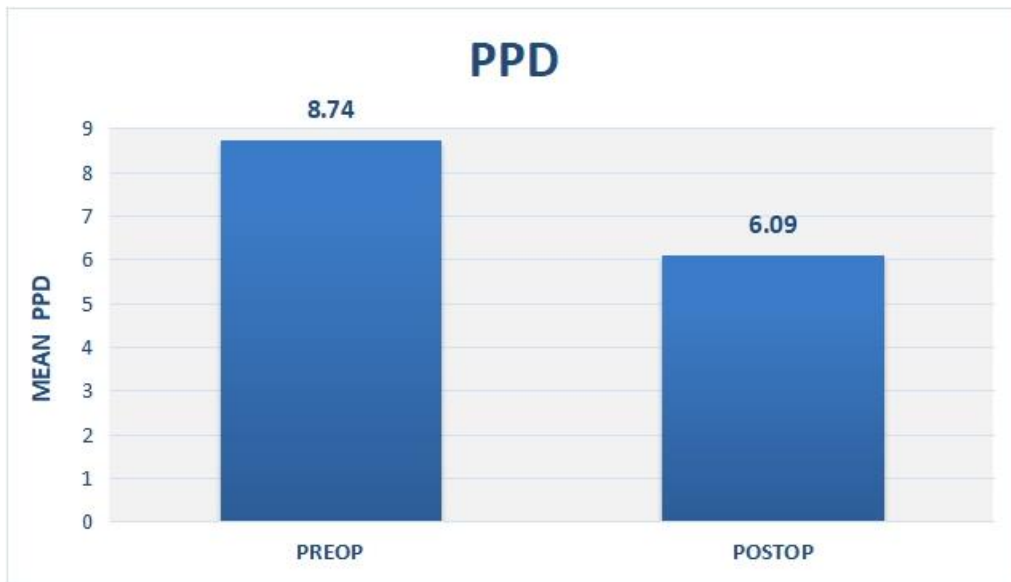
GRAPH 2: Comparison of plaque index between pre-treatment and post-treatment group



Periodontal pocket depth reduction was found in all patients post-treatment. The mean value at baseline was 8.74 ± 3.06 mm compared to 6.09 ± 1.92 mm post-treatment, showing a

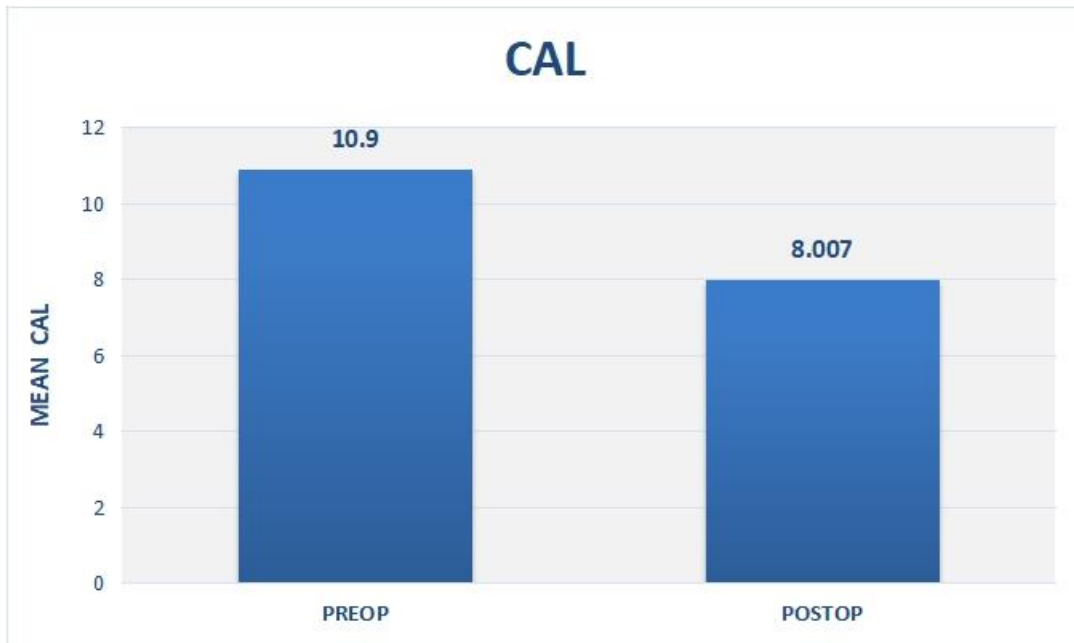
significant decrease of 2.65 mm (95% CI, 0.3615 to 4.9385 mm), $t(9) = 2.6195$, $p = 0.0278$ as shown in graph 3.

GRAPH 3: Comparison of periodontal pocket depth in pre-treatment and post-treatment group



Clinical attachment loss in posttreatment is 8.01 ± 1.9 mm as opposed to a higher CAL, clinical attachment loss in pretreatment is more by 10.9 ± 2.77 mm when compared to clinical attachment loss in the posttreatment group by 8.01 ± 1.9 mm. This showed a statistically significant reduction by 2.893mm (95% CI, 1.1463 to 4.6396 mm, $t(9) = 3.7469$, $p = 0.0046$ as shown in the graph in 4.

GRAPH 4: Comparison of clinical attachment loss in pre-treatment and post-treatment group



DISCUSSION:

Conventional treatment modalities for periodontal disease include nonsurgical and surgical management, which emphasizes mechanical debridement, often accompanied by antibiotics. The ideal treatment of chronic periodontitis results in a reduction in periodontal pocket depth, with gains in clinical attachment levels (Goodson et al 2012) Despite the widely discussed clinical benefits of nonsurgical periodontal therapies, including antibiotic therapy, and scaling and root planing therapy, they do not always result in improvements, especially for sites with deep probing depths, or when patients suffer from comorbidities (diabetes mellitus, obesity, and cardiovascular disease; D’Aiuto et al., 2018; Teeuw et al., 2014; Tomasi et al., 2007)

Therefore presently there has been a paradigm shift where treatment options propose altering ecology of niches, in order to modify pathological plaque to a biofilm of commensalisms. Probiotics are defined as live microorganisms that confer health benefits to the host when administered in adequate amounts, Hill et al., 2014. by helping growth of beneficial bacteria and thus can be beneficial in treating periodontitis patients.

Various mechanisms have been proposed to establish the beneficial effects of probiotics on the periodontium. Probiotics enhance innate immunity and also stimulate dendritic cells (antigen presenting cells) resulting in the expression of Th1 (T-helper cell 1) or Th2 (T-helper cell 2) response by mimicking periodontal pathogens without periodontal destruction. Chatterjee A et al 2011.

They can prevent bacterial adherence to salivary pellicles by competitive binding and altering the cell surface composition. Grimaudo NJ et al 1997. They also alter the bacterial coaggregation in the biofilm by competitively competing with certain periodontal pathogens. They secrete bacteriocins that have a high affinity to host cells and inhibit pathogenic growth as well as decrease secretion of pro-inflammatory cytokines.

The probiotic strains are isolated from numerous sources such as humans, animals, plants, the environment, and foods Speranza et al 2018; Becirovi et al 2018. They are identified and characterized by microbiological, biochemical, and molecular-based techniques. *Streptococcus salivarius*, *S. oralis*, *L. rhamnosus*, *L. fermentum*, *L. plantarum* *L. casei*, *L. acidophilus*, *L. brevis*, *L. sporogenes*, *L. salivarius*, *L. delbrueckii*, *L. pentosus*, *Bifidobacterium lactis* and *B. longum* are the most reported probiotic strains that exert anti-biofilm activity. The probiotic blend used in this study contains *L. plantarum*, *L. casei*, *L. rhamnosus*, *L. acidophilus*, *B. Lactis*, *L. reuteri*, *L. salivarius*, *L. paracasei*, *L. gasseri*, *S. thermophilus*, *B. bifidum* and *B. Breve*. Probiotics prevent the adhesion and formation of pathogenic micro-organisms Barzegari et al 2020.

The probiotic supplement was well tolerated among all, except one patient who reported bloating of the stomach at the end of the treatment period. No other side effects were reported. At the end of the study, Group A patients showed significant reduction in pocket depths and increased clinical attachment levels and the intergroup analysis proved to be statistically significant. This was in correlation with a study done by Lang and Tonetti in 2003 that showed a similar decrease in disease risk progression.

A randomized controlled trial done by Vivekananda et al 2010 confirmed the plaque inhibition and anti-inflammatory and antimicrobial effects of *L. reuteri* Prodentis. An RCT study done by Teughels et al in 2013, showed significantly larger PPD reductions, especially in deep pockets and lower percentages of sites with residual pocket depths of ≥ 5 mm concluding that oral administration of *L. reuteri* lozenges could be a useful adjunct to SRP in chronic periodontitis.

The Study done by Ghadeer Khalil Mohammad El-bagoory et al 2021 involves the local application of probiotic *L. reuteri* in combination with SRP gives more favorable results than SRP alone in cases with chronic periodontitis. This pilot study assessed the benefit of probiotic blend as an adjunct to SRP over the clinical parameters in chronic periodontitis patients with promising results.

CONCLUSION:

Most studies show a limited and temporary improvement in periodontal parameters when probiotics are given. Well-designed clinical studies with larger sample sizes and long-term follow-ups are required. In our study, there was a significant reduction in plaque accumulation in patients who had probiotics along with SRP than in the patients with placebo along with SRP. The main limitation of our study is relatively the small number of participants. But it could serve as the basis for further studies. Our study proved that a probiotic blend can be used as an adjunct to non-surgical periodontal therapy in treating periodontitis.

FINANCIAL SUPPORT AND SPONSORSHIP:

The study received no funding from any agencies or external sources.

CONFLICTS OF INTEREST:

The authors declare that there was no conflict of interest.

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