Clinical Efficacy of Probiotics as An Adjunct to Scaling and Root Planning in The Treatment Of Chronic Periodontitis

Sana Ikram¹, Muhammad Arsalan Raffat², Saeeda Baig³, Shazia Akbar Ansari⁴, Kevin Joseph Jerome Borges², Nuzhat Hassan⁵

Abstract

Objective: The objective of this study was to assess the clinical efficacy of scaling and root planing (SRP) alone and SRP along with adjunctive probiotic containing Lactobacillus reuteri (L.reuteri) in the management of chronic periodontitis (CP) and comparing the efficacy of two treatment modalities.

Methods: Twenty-eight systemically healthy participants, clinically diagnosed with CP on the bases of pocket depth were enrolled from the outpatient department of Periodontology, Ziauddin College of Dentistry, Ziauddin University, Clifton, Karachi, Pakistan. After complete periodontal examination all clinical periodontal parameter i.e., Probing Pocket depth (PPD), Clinical attachment level (CAL), percentage sites for plaque accumulation (PI) and bleeding on probing (BOP) were measured and recorded at baseline, 6 weeks and 12 weeks after therapy. Patients meeting the inclusion criteria underwent non-surgical periodontal therapy i.e. SRP both with hand instruments and with ultrasonic scalers. After SRP oral hygiene measures were reassured and then participants were randomly allocated to one of two groups i.e., Probiotics (N=14) or Placebo (N=14). Both L. reuteri and placebo were given twice daily for 12 weeks and patients were recalled for assessment.

Results: At baseline both groups were similar clinically. Intra-group comparison of clinical periodontal parameters showed improvement in the participants of both groups. Inter-group comparison showed greater reduction in PPD and BOP and more gain in CAL in probiotic group on each follow up visits and statistically significant difference was observed in two groups. Whereas for PI the difference between two groups at follow-up visit was insignificant i.e. both treatment strategies were equal in reducing percentage sites of plaque accumulation.

Conclusion: The results of our study concludes L.reuteri containing probiotic along with SRP is superior when compared to SRP alone in terms of resolving inflammation and improving periodontal health. Probiotics can be used as a promising alternative adjunctive therapy with minimal or no side effects in the treatment of chronic periodontitis.

Keywords: Chronic Periodontitis, probiotics, lactobacillus reuteri, root planing.

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Introduction

Inside the oral cavity a balance exists between the resident commensals and pathogenic microbes

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regardless of their pathogenicity i.e., whether those bacteria are commensal or pathogenic in nature. Considering the physical limitations encountered by SRP in complete removal of microbial deposits i.e. inaccessibility to pocket depth, furcation and interproximal areas, adjunctive therapies have effectively improved clinical periodontal outcomes. After removal of calculus through SRP, harbouring oral mucosal surface with commensals, good or beneficial bacteria i.e., probiotics can be of greater interest as they not only resolve inflammation but also help in the shift of microbial environment from pathological to commensal. According to the World Health Organization (WHO) probiotics are the live microorganisms which when administered in adequate amount they confer health benefits to the host.

During the last decade use of beneficial bacteria "probiotics" have proven to be effective in management and prevention of various systemic conditions/pathologies. These include respiratory infections, rheumatoid arthritis, cardiovascular disease, renal disease, obesity, diabetes and gastric disturbance including diarrhoea and inflammatory bowel disease. In the field of dentistry probiotics are found to be effective in the prevention of tooth decay (dental caries), halitosis and oral infections. Currently the conventional non-surgical periodontal treatment in Pakistan comprises of SRP with systemic antibiotics as an adjunctive. Systemic antibiotics have various adverse effects such as antimicrobial resistance, destruction of the normal flora, gastro-intestinal problems and disturbances, and in few cases occurrence of superinfection. Considering the above-mentioned detrimental effects of systemic antibiotics an alternative treatment approach with less or no side effects could be of great interest. Probiotics can be that alternative but its role in the field of periodontology is still debatable.

Combining the antibacterial properties of these beneficial probiotics with SRP could be efficacious in overcoming the limitations offered by SRP with minimal or less side effects. Therefore, the research question of this study was whether the combination of probiotic and SRP will resolve periodontal inflammation and improve clinical periodontal outcome more efficiently than SRP alone.

**Subjects and Methods**

This double-blind placebo controlled clinical trial (RCT) was performed in the setting of Ziauddin College of Dentistry, Ziauddin University, Clifton, Karachi, Pakistan. This RCT was designed to evaluate the clinical impact of SRP alone and SRP combined with Probiotic containing Lactobacillus reuteri (L.reuteri), and to compare these two treatment modalities in the patients with chronic periodontitis.

A total of 67 patient were screened in the department of periodontology for the diagnosis of CP. Subjects from both genders, age ≥30 years, who were systemically healthy with clinically diagnosed CP, having pocket depth of ≥4mm were included in the study. Subjects with systemic or local illness or having the history of antibiotic use 2 months prior to the commencement of study, smoking or alcohol were excluded. Pregnant and lactating women and subjects with history of any periodontal treatment during past 6 months were excluded. Subjects who were unable to maintain their oral hygiene and failed to give written consent were also excluded from the study. After explaining the study procedure and pros and cons of the therapy, verbal and written informed consent was taken from the patients and total 28 participants were enrolled in the study (Fig 1).

All study participants meeting the inclusion criteria of the study were allocated to one of two groups (Group 1 = SRP + placebo and Group 2 = SRP + probiotics) through randomization. For the purpose of randomization sealed opaque envelopes were used. Participants were asked by the appointed research assistant to pick one envelope containing the name of the therapy which was provided to them after the baseline periodontal examination and recording the clinical periodontal parameters. Throughout the study period full blinding was maintained with the help of research assistant who held all the details related to the study groups and treatment strategy till the completion of the trial and complete analysis of the research data.

Sample size was calculated to be 14 in each group through the formula of clinical superiority trials from the website www.sealedenvelope.com, setting...
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The study was conducted after approval of Ethics Review Committee (ERC) of Ziauddin University, Karachi, Pakistan (Reference code: 0220817SIOB). Study protocols were followed as per guideline of Consolidated Standards of Reporting Trials (CONSORT). Clinical trial was registered in the website www.Clinicaltrial.gov prior to initiating of the study (Reference code: NCT03499184).

Plaque index (PI), bleeding on probing (BoP), probing pocket depth (PPD) and clinical attachment loss (CAL) were the clinical periodontal parameters which were taken into account as a measure of periodontal health. These clinical periodontal parameters were recorded with the help of community periodontal index probe at the baseline (day 0), 6 weeks and 12 weeks intervals from all the teeth excluding 3rd molars. All participants were taught brushing technique (modified bass technique) and were instructed to use similar tooth paste (Colgate Total) during study period, twice daily. After complete periodontal examination baseline recordings of all periodontal parameters were taken and then all participants underwent SRP through both hand and ultrasonic scaler (Woodpacker). After SRP participant according to their allocated groups were given adjunctive therapy for 12 weeks i.e. Group 1 was given placebo powder containing sachets and Group 2 was given probiotics containing sachets. Both probiotic and placebo powder were similar in colour and texture.

All participants were advised to apply the powder of sachets over the tooth surface around the gingival margin after mixing it with small quantity of normal tap water for 2 minutes, with the help of toothbrush after regular brushing. Participants were recalled for follow-up visits at 6 and 12 weeks intervals.

All collected data were analysed using Statistical Package for the Social Sciences (SPSS) (version 23 for Windows, IBM, Chicago, IL). Results were expressed in mean ± SD and proportion as percentages. Intra-group comparison was performed.

Fig 1. Patient selection criteria.
using repeated measured ANOVA and inter-group comparison at each interval was performed using independent sample t-test. P-value of ≥ 0.05 was considered to be statistically significant.

Results

Out of 28 participants 17 (60.7%) were males, whereas, 11 (39.28%) were females. Mean age of the participants in Group 1 was 40.14 ± 2.64 years and mean age in Group 2 was 41.78 ± 3.58 years (Table 1). Intra-group difference in the clinical parameters for Group 1 and Group 2 were analysed at baseline-6 week, 6 week-12 week, baseline-12 week intervals. Intra-group difference in both study groups at each interval found to be statistically significant (Table 2). Inter-group comparison was made at baseline-6 week, 6 week-12 week, baseline-12 week intervals and it revealed a statistically significant difference between Group 1 and Group 2 in PPD, CAL and BOP at three study intervals. Whereas, for PI inter-group comparison was found to be insignificant at 6-12 week and overall 0-12 weeks intervals (Table 3).

There was no dropout during the study period and no side effects were reported by participants with the use of probiotics and placebo.

Discussion

To the best of our knowledge, this was the first study conducted in Pakistan, to evaluate the clinical impact of L.reuteri containing probiotics as an adjunctive therapy along with SRP in improving the clinical periodontal parameters in comparison to SRP alone.

This was double-blind randomized control clinical trial of 12 week. CAL, PPD, BOP and PI were taken as measures of periodontal health and were recorded at baseline and each follow-up visit. The results of this trial suggested that although intra-group improvement in periodontal health was observed in both groups but additional use of probiotics with SRP yielded greater improvement in the clinical periodontal outcomes. At baseline, all clinical periodontal parameters in both groups were similar. Significantly, larger reduction in PPD and BOP was observed in probiotic group at follow-up visits (Table 3). Patients using local probiotics containing L.reuteri gained significantly more attachment than the patients taking placebo (Table 3). Inter-group comparison of PI was statistically insignificant that indicated the two groups 1 and 2 were similar in reducing percentage sites of plaque accumulation.

In intra-group analysis of our study, Group 1 showed significant reduction in pocket depth, bleeding sites and percentage sites of plaque accumulation and gain in attachment level at baseline-6 week, 6 week-12 week, baseline-12 week intervals (Table 2). Previous literature suggests similar results showing SRP as an effective non-surgical therapeutic mean in improving periodontal health15,16. A possible reason could be as SRP removes soft and hard microbial deposits it reduces bacterial load as well as the secretion of inflammatory cytokines17. These two etiological factors elicit inflammatory response leads to periodontal destruction. Reducing bacterial count and cytokine secretion could provide support to the surrounding tooth structures to overcome inflammation.

Throughout the study period, intra group comparison of group 2 showed significantly improved periodontal outcomes (Table 2). PPD reduced and CAL gained significantly. Significantly, less sites with bleeding and plaque accumulation were also observed in the group. This result is in accordance with previous study18. The possible reason could be that introduction of L. reuteri into oral microbiome will shift the microbiota from pathological to commensal14 making the oral environment favourable for periodontal healing. Another possible reason could be the effect of L. reuteri on bone growth as this bacteria is able to induce bone growth19. Gain in clinical attachment level could be due to the bone growth promoting properties of L. reuteri.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Treatment groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of patients (n)</td>
<td>14</td>
</tr>
<tr>
<td>Gender (M/F)</td>
<td>8/6</td>
</tr>
<tr>
<td>Age (mean in years ± SD)</td>
<td>40.14 ± 2.64</td>
</tr>
</tbody>
</table>

n; sample size, SD; Standard deviation, SRP; Scaling and root planing.
During inter-group comparison, Group 2 was found to be significantly more effective than placebo group as an adjunct to SRP. The possible reason could be that although SRP effectively eliminates calculus but in certain situations such as in cases of increased pocket depth and crowding of teeth and malocclusion, access to the pocket depth becomes difficult. These circumstances makes calculus and plaque removal difficult, the chances of bacterial recolonization becomes higher. Studies show that these limitations of SRP alone could be overcome by addition of adjunctive therapies. One of the possible reason for the significant improvement in test group might be due to antibacterial effects of L. reuteri. L. reuteri causes increased mucin secretion from epithelium surface which further enhances the epithelial barrier creating difficulties in bacterial adhesion to the epithelium. In addition, this probiotic and pathogenic microbe share the same binding sites over mucosal surface. Competition for these binding sites by L. reuteri over mucosal surface results in competitive exclusion of pathogenic microbes. L. reuteri also produces reuterin which is a bacteriocin that is bactericidal in nature. All of these properties of L. reuteri make it a favourable natural antibacterial agent. Apart from overcoming deficiencies of SRP, this treatment strategy prevents recolonization of pathogens, which is one of the foremost reason of relapse of non-surgical periodontal treatment. The results of inter-group comparison of our study for PPD, CAL and BOP is similar to previously published data. However, our data for percentage sites of plaque accumulation differs from previous studies.

Although probiotics complement the clinical impact of SRP further studies are warranted to

Table 2. Intra-group difference

<table>
<thead>
<tr>
<th>Variable</th>
<th>Treatment Group 1</th>
<th>Treatment Group 2</th>
<th>p-value</th>
<th>Treatment Group 1</th>
<th>Treatment Group 2</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline</td>
<td>Day 42</td>
<td>Day 84</td>
<td></td>
<td>Baseline</td>
<td>Day 42</td>
</tr>
<tr>
<td>Overall percentage of the site with plaque (PI)</td>
<td>84.58 ± 8.06</td>
<td>54.38 ± 8.13</td>
<td>33.67 ± 9.47</td>
<td>.00</td>
<td>85.23 ± 8.23</td>
<td>43.46 ± 9.17</td>
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<tr>
<td>Overall % of site with BOP</td>
<td>71.94 ± 23.13</td>
<td>58.23 ± 12.77</td>
<td>46.24 ± 11.40</td>
<td>.00</td>
<td>70.47 ± 11.8</td>
<td>34.25 ± 6.32</td>
</tr>
<tr>
<td>PPD</td>
<td>4.25 ± 1.12</td>
<td>4.08 ± 0.76</td>
<td>3.95 ± 0.78</td>
<td>.00</td>
<td>4.32 ± 0.91</td>
<td>3.44 ± 0.64</td>
</tr>
<tr>
<td>CAL</td>
<td>4.12 ± 0.74</td>
<td>3.99 ± 0.89</td>
<td>3.86 ± 0.59</td>
<td>.00</td>
<td>4.08 ± 0.66</td>
<td>3.69 ± 0.67</td>
</tr>
</tbody>
</table>

PI; plaque index, BOP; bleeding on probing, PPD; probing pocket depth, CAL; clinical attachment loss.

Table 3. Inter-group comparison

<table>
<thead>
<tr>
<th>Variables</th>
<th>Treatment</th>
<th>Intervals</th>
<th>Baseline to 6 weeks</th>
<th>6week to12 weeks</th>
<th>Baseline to 12 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPD</td>
<td>Group 1</td>
<td>Group 2</td>
<td>.01</td>
<td>.00</td>
<td>.00</td>
</tr>
<tr>
<td>CAL</td>
<td>Group 1</td>
<td>Group 2</td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
</tr>
<tr>
<td>Overall percentage of the site with plaque (PI)</td>
<td>Group 1</td>
<td>Group 2</td>
<td>.00</td>
<td>.13</td>
<td>.18</td>
</tr>
<tr>
<td>Overall percentage of the site with BOP</td>
<td>Group 1</td>
<td>Group 2</td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
</tr>
</tbody>
</table>

PPD: probing pocket depth, CAL: clinical attachment loss, PI: plaque index, BOP: bleeding on probing.
evaluate the effect of SRP and probiotics at radiological and microbiological level.

**Conclusion**

The results of our study concludes L. reuteri containing probiotic along with SRP is superior when compared to SRP alone in terms of resolving inflammation and improving periodontal health. Probiotics can be used as a promising alternative adjunctive therapy with minimal or no side effects in the treatment of chronic periodontitis.

**Acknowledgement**

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**Conflict of interest**

The authors declare no conflict of interest, and all authors have studied and approved the final manuscript.

**References**


6. Hill C, Guamer F, Reid G, Gibson GR, Merenstein DJ, Pot B, et al. The International Scientific Asso-
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