ISSN: 2581-5989
PubMed - National Library of Medicine - ID: 101738774

International Journal of Dental Science and Innovative Research (IJDSIR)

IJDSIR : Dental Publication Service

Available Online at: www.ijdsir.com

Volume – 4, Issue – 1, February - 2021, Page No. : 681 - 687

Treatment of chronic periodontitis by scaling and root planning with and without adjunctive synbiotics–a clinical and microbiological study

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Citation of this Article: Bharti P, Gupta RK, Singh P, Dev Y, Chouhan H, "Treatment of chronic periodontitis by scaling and root planing with and without adjunctive synbiotics–a clinical and microbiological study", IJDSIR- February - 2021, Vol. – 4, Issue - 1, P. No. 681 – 687.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Aim: To evaluate and compare the improvement in clinical parameters (Plaque Index, Gingival Index, Probing Depth and RAL) and asses the count of *P. gingivalis, T. forsythia, T. denticola* in plaque sample obtained subgingivally before and after SRP with and without adjunctive synbiotics.

Materials and Methodology: 40 subjects of Chronic Periodontitis were selected and were divided into two groups (Group A and Group B). In group A, patients were subjected to SRP while in group B patients were subjected to SRP along with synbiotics.

Observations and results

Statistically significant reduction was observed in the Plaque Index, Probing depth and Relative attachment level between Group A and Group B. Significant reduction in number of colonies of *P. gingivalis* and *T. forsythia* in Group A as compared to Group B at 12 week was noted.

Keywords: Synbiotics, Chronic Periodontitis, Periodontopathogens.

Introduction

Chronic periodontitis is an inflammatory disease of tooth-supporting tissues caused by specific microorganisms residing in the subgingival biofilm which leads to progressive destruction of the periodontal ligament, alveolar bone and causes pocket formation, gingival recession or both.[1] In etiopathogenesis of periodontitis, principal role is played by pathogenic anaerobic bacteria defined as periodontopathogens.When the balance between the periodontal microbiota and the host immune system is disrupted, periodontitis is likely to ensue.

Basic treatment approach for periodontitis is scaling and root planing (SRP), which alters and suppress the microflora responsible for the disease. But it is not always effective to improve clinical parameters. The adjunctive use of antibiotics has been shown to provide a better clinical and microbiological result but the use of antibiotics is associated with development of bacterial resistance, allergic reactions in some patients and gastrointestinal disturbances. Therefore, there is need for new treatment paradigms in periodontal disease management.

Probiotics are live micro-organisms which when administered in adequate amounts grant a health benefit to the host. Studies have shown that probiotics can decrease serum levels of IL-1β, TNF-α, CRP and decrease expression of IL-6, which result in decreasing inflammation.[2] To enhance the survival of probiotic bacteria, Synbiotics were developed which are a mixture of probiotics and prebiotics that beneficially affects the host by improving the survival and implantation of live microbial dietary supplements in the gastrointestinal tract.[3]

The present investigation evaluated and compared the clinical and microbiological parameters after SRP with and without adjunctive synbiotics in the treatment of chronic periodontitis.

Materials And Methods

Participants of age group 18–60 years were selected from the Out Patient Department of Periodontics and Oral Implantology. An ethical approval for the study was obtained from the ethical committee of the institution. Each subject was given a detailed verbal and written description of the study and all the selected subjects were required to sign an informed consent form prior to commencement of the study. 40 subjects were selected and randomly divided into two groups on the basis of inclusion and exclusion criteria: **Group A (Control) -** In this group patients were subjected to SRP alone and **Group B (Test) -** In this group patients were subjected to SRP along with Synbiotics. Selected subjects had undergone radiographical (OPG) examination prior to SRP.

At baseline the following clinical parameters were recorded for all the subjects:

1. Plaque index (PI) (Silness & Loe, 1964)[4]
2. Gingival Index (Loe & Silness, 1963)[5]
3. Probing Depth (PD)
4. Relative attachment level (RAL)

The clinical parameters were recorded at Baseline (7 days), 4 week, 8 week and 12 week after SRP.

For the detection of red complex microbes, subgingival plaque sample was collected around the teeth from both the groups at Baseline and 12 week interval. Isolation of tooth was done with cotton rolls, and supragingival plaque was removed with cotton pellets. A sterile curette was inserted into the base of pocket and plaque was removed. The sample was placed immediately in a plastic vial and sealed properly.The transport of samples to the laboratory was done via the use of Tris-EDTA transport media, and the samples were sent within the same day.

Microbial testing was done with PCR thermal cycler with the use of DNA extraction technique. *(Figure 1, 2)*

For each subject, changes from Baseline were summarized for 4week, 8 week and 12 week by taking mean over those in group A (control group) and in group B (test group).Subjects in the test group consumed two capsules/day synbiotic supplements containing 2.75 10× 10^9 CFU of 4 strains of Probiotics, including *Lactobacillus Acidophilus, Lactobacillus Rhamnosus, Bifidobacterium Longum* & *Saccharomyces Boulardii* and 100 mg fructooligosaccharide for 8 weeks.

Results And Discussion

1.Plaque Index (PI) (Silness & Loe, 1964)[4] *(Table 1)*

The mean plaque index in group A and group B at baseline, 4 week, 8 week and 12 week was 1.64±0.24, 1.41±0.22, 1.20±0.20, 1±0.18 and 1.54±0.25, 1.30±0.21, 1.04±0.21, 0.81±0.17 respectively. A significant difference was observed in plaque index from baseline at each interval ($p<0.05$) in both the groups. The difference between the groups was observed at 8 week ($p=0.02$) and 12 week ($p=0.003$), which was statistically significant.

2.Gingival Index (Loe and Silness, 1963)[5] *(Table 2)*

Group A and Group B had mean gingival index of 1.54±0.33, 1.38±0.32, 1.12±0.30, 0.86±0.29 and 1.45±0.50, 1.27±0.45, 1.03±0.45, 0.75±0.41 at baseline, 4 week, 8 week and 12 week. A significant difference was observed in gingival index from baseline at each interval ($p<0.05$) in both the groups. When the inter group comparison was made, there was statistically non-significant difference in the mean gingival index among group A and B at different time interval ($p>0.05$).

3.Probing Depth *(Figure 3, Table 3)*

Group A had mean probing depth of 5.44±0.38 mm, 5.33±0.38 mm, 5.11±0.36 mm and 4.74±0.35 mm at baseline, 4 week, 8 week and 12 week respectively. A significant difference was observed in probing depth in group A at 4 week, 8 week and 12 week from baseline ($p<0.05$). Group B had mean probing depth of 5.38±0.49 mm, 5.27±0.49 mm, 4.98±0.47 mm and 4.42±0.56 mm at baseline, 4 week, 8 week and 12 week respectively. A significant difference was observed in probing depth in group B at 4 week, 8 week and 12 week from baseline ($p<0.05$). When the inter group comparison was made, there was statistically significant difference in the probing depth between the Group A and Group B at 12 week ($p<0.05$).

4.Relative Attachment Level *(Figure 4,Table 4*)

The mean RAL in group A at baseline, 4 week, 8 week and 12 week was 8.48±0.39 mm, 8.32±0.39 mm, 8.10±0.39 mm and 7.73±0.35 mm respectively. A significant difference was observed in RAL at 4 week, 8 week and 12 week from baseline.($p <0.05$) The mean RAL in group B at baseline, 4 week, 8 week and 12 week was 8.38±0.48 mm, 8.27±0.48 mm, 7.93±0.47 mm and 7.34±0.51 mm respectively. A significant difference was observed in RAL at 4 week, 8 week and 12 week from baseline ($p<0.05$). When the inter group comparison was made, there was statistically significant difference in the RAL between the Group A and Group B at 12 week ($p<0.05$).

Microbiological Parameters *(Figure 5-6, Table 5, 6, 7)*

T.forsythia colonies decreased from 16 at baseline to 10 at 12 week interval in group A ($p=0.010$) showing significant reduction. The number of colonies for group B were reduced from 15 at baseline to 4 at 12 week interval ($p<0.001$) showing significant reduction in the number of colonies. Intergroup comparison at 12 week was significant ($p<0.05$), indicating significantly more reduction in the test group.

T.denticola colonies decreased from 14 at baseline to 8 at 12 week interval in group A ($p=0.050$) showing significant reduction. The number of colonies for group B

were reduced from 16 at baseline to 4 at 12 week interval (P<0.001) showing significant reduction. Intergroup comparison at 12 week was non-significant (p=0.168), revealing no statistically significant difference.

For *P.gingivalis* the colonies decreased from 16 at baseline to 10 at 12 week interval in the group A (p=0.010) showing significant reduction. The number of colonies for test group were reduced from 15 at baseline to 4 at 12 week interval (p<0.001) showing significant reduction in the number of colonies. Intergroup comparison at 12 week was significant (p<0.05), indicating significantly more reduction in the test group.

Initial approach for management of periodontal disease is the reduction and elimination of specific periodontal pathogens by scaling and root planing. It is in these situations where adjunctive therapies, such as antibiotics or synbiotics, may prove useful. However, the frequent recolonization of treated sites by periodontal pathogens and recurrence of disease, and the emergence of antibiotic resistance have led to emergence of new approaches for the management of periodontitis.

Efforts have been made to explore the use of Probiotics as another method to modulate the composition of pathogenic biofilms in conjunction with scaling and root planing.[6] Sometimes, prebiotics and probiotics are combined in the same product and characterized as synbiotics. Several studies have showed the useful effects of prebiotics, probiotics, and synbiotics on oxidative stress.[7-8] Recently, using probiotics in order to improve metabolic profile,[9] periodontal status,[10] inflammatory factors,[11] and biomarkers of oxidative stress[12-13] has received great attention.

Teughels et al (2013)[14] conducted a study and found significantly (p < 0.05) greater reductions in *P. gingivalis* in the subgingival, supragingival and saliva samples in the SRP + Probiotic group over the 12 week period, when compared to the SRP group. In addition, *P. intermedia* tended to show a larger reduction in the supragingival plaque samples at week 12 of the SRP + Probiotic group (p = 0.085).In another study conducted by **Vivekananda et al (2010)**[15] mean CFU reduction of the three pathogens *(Aggregatibacter actinomycetemcomitans (Aa), Porphyromonas gingivalis (Pg), and Prevotella intermedia (Pi)* was highest where adjunctive Prodentis was used with standard SRP.

The main emphasis of using synbiotics in oral health applications is to control diseases such as periodontitis, dental caries, halitosis, and candidiasis. The immune modulation induced by probiotic Lactobacillus strain might help reduce immune over-reaction observed in periodontitis.

The results showed that consumption of synbiotic for 8 weeks along with SRP significantly decreased the mean of PD, and CAL after the intervention. There was a significant reduction in number of colonies of *P. gingivalis* and *T. forsythia* in test group as compared to control at the end of the study i.e. at 12 week.

Table 1: Intergroup Comparison Of Plaque Index Between The Group A And Group B

	Group A	Group B	Significance of Difference Using Mann Whitney Test		
	Mean ±S.D.	Mean ± S.D.	Z	P value	Significance
Baseline	1.64± 0.24	1.54±0.25	-1.379	0.168	Non-Significance
4week	1.41± 0.22	1.30± 0.21	-1.832	0.067	Non-Significance

8week	1.20± 0.20	1.04± 0.21	-2.315	0.021	Significance
12week	1.00± 0.18	0.81± 0.17	-2.973	0.003	Significance

Table 2: Intergroup Comparison Of Gingival Index Between The Group A And Group B

	Group A	Group B	Significance of Difference Using Mann Whitney Test		
	Mean±S.D	Mean±SD	Z	P value	Significance
Baseline	1.54± 0.33	1.45±0.50	-0.872	0.383	Non-Significance
4week	1.38± 0.32	1.27±0.45	-1.144	0.253	Non-Significance
8week	1.12± 0.30	1.03±0.45	-1.063	0.288	Non-Significance
12week	0.86± 0.29	0.75±0.41	-1.257	0.209	Non-Significance

Table 3: Intergroup Comparison of Probing Depth Between The Group A And Group B

	Group A	Group B	Significance of Difference Using Mann Whitney Test		
	Mean±SD	Mean±S.D.	Z	P value	Significance
Baseline	5.44± 0.38	5.38± 0.49	-0.014	0.989	Non-Significance
4week	5.33± 0.38	5.27± 0.49	-0.054	0.957	Non-Significance
8week	5.11± 0.36	4.98± 0.47	-0.586	0.558	Non-Significance
12week	4.74± 0.35	4.42± 0.56	-1.975	0.048	Significance

Table 4: Intergroup Comparison Of Relative Attachment Level Between The Group A And Group B

	Group A	Group B	Significance of Difference Using Mann Whitney Test		
	Mean± S.D.	Mean± SD.	Z	P value	Significance
Baseline	8.48± 0.39	8.38± 0.48	-0.259	0.796	Non-Significance
4week	8.32± 0.39	8.27± 0.48	-0.014	0.989	Non-Significance
8week	8.10± 0.39	7.93± 0.47	-1.013	0.311	Non-Significance
12week	7.73± 0.35	7.34 ±0.51	-2.764	0.006	Significance

Table 5: Intergroup Comparison Of Presence Of *P.Gingivalis* Between The Group A And Group B

	Group A		Group B		Significance of Difference Using CHI- SQ Test		
	N	%	N	%	Chi-sq	P value	Significance
Baseline	16/20	80	15/20	75	0.143	0.705	Non-Significance
12week	10/20	50	4/20	20	3.956	0.047	Significance

Table 6: Intergroup Comparison Of Presence Of *T.Denticola* Between The Group A And Group B

	Group A		Group B		Significance of Difference Using CHI-SQ Test		
	N	%	N	%	Chi-sq	P-value	Significance
Baseline	14/20	70	8/20	40	0.533	0.465	Non-Significance
12week	16/20	80	4/20	20	1.905	0.168	Non-Significance

Table 7: Intergroup Comparison Of Presence Of *T.Forsythia* Between The Group A And Group B

	Group A		Group B		Significance of Difference Using CHI-SQ Test		
	N	%	N	%	Chi-sq	P value	Significance
Baseline	16/20	80	15/20	75	0.143	0.705	Non-Significance
12week	10/20	50	4/20	20	3.956	0.047	Significance

Conclusion

It can be concluded that the supplementation of synbiotic with SRP in chronic periodontitis may have beneficial effects on periodontal and microbiological parameters. Within the limits of present of study, further longitudinal studies are recommended to evaluate the clinical and microbiological parameters, a study design of larger sample size with proper selection of the patient.

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Legend Figures

Fig. 1: DNA Extraction Reagents

Fig. 2: PCR thermal Cycler

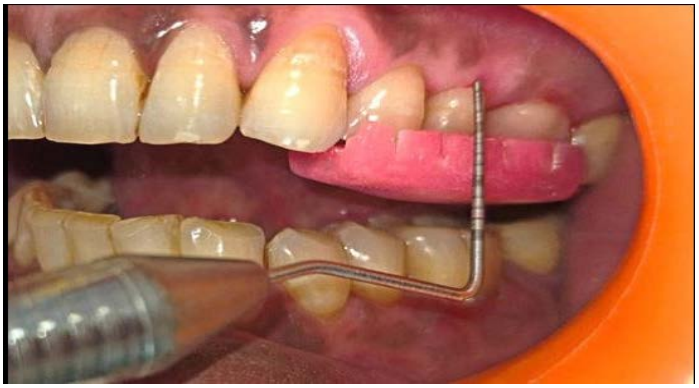

Fig. 3: Probing depth

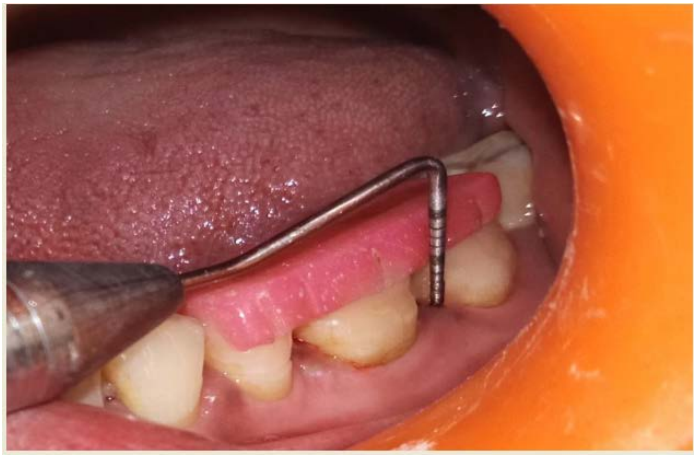

Fig.4: Relative attachment level

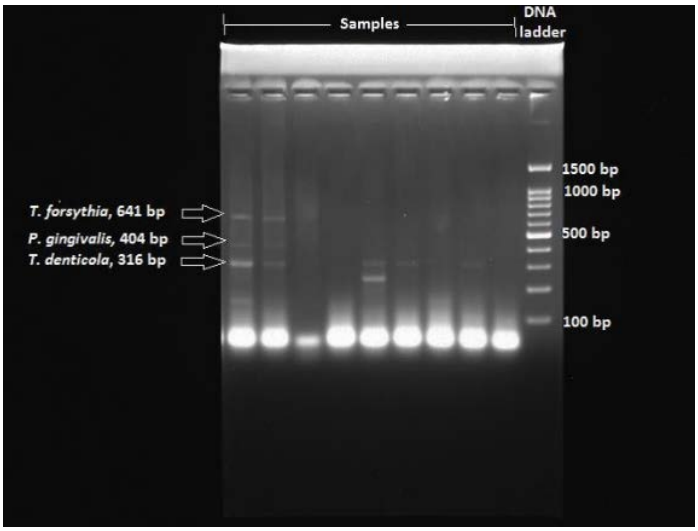

Fig. 5: Agarose Gel image showing detection of red complex bacteria

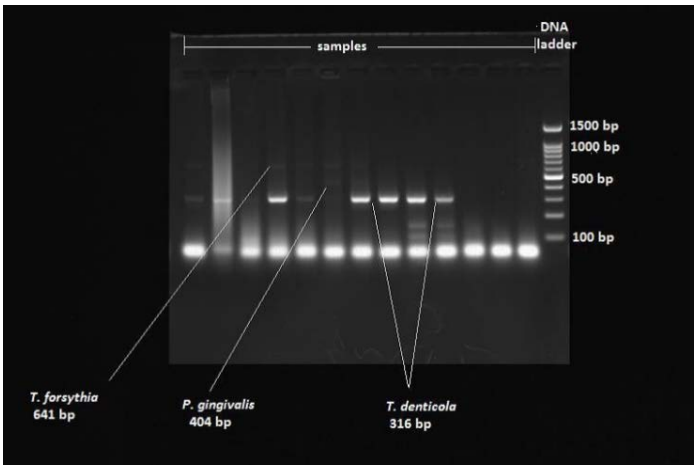

Fig. 6: Detection of Red Complex bacteria