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EFFECT OF PROBIOTIC *Lactobacillus reuteri* ON PERIODONTAL INDEX IN PATIENTS WITH CHRONIC PERIODONTITIS (SYSTEMATIC REVIEW)

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Abstract : Periodontal disease is one of Indonesia's most common dental and oral health problems. The initial periodontal therapy carried out is scaling and root planing. Several factors can cause scaling and root planing therapy to be less effective, such as deep pockets and patients with systemic disease, so adjunctive therapy needs to be given. The adjunctive therapy that can be given is probiotics. Several studies on the probiotic Lactobacillus reuteri have shown a reduction in periodontal pathogenic bacteria. This paper will determine the effect of additional probiotic Lactobacillus reuteri after scaling and root planing therapy in chronic periodontitis patients, as well as to determine changes in periodontal index values. Systematic literature review with quantitative analysis will used as a method. Journals were selected according to inclusion and exclusion criteria, in English with a publication period of the last 10 years, and collected from 3 journal databases, namely PubMed, DOAJ, and Google Scholar. Then bias analysis, data extraction, and meta-analysis were carried out. The result from the quantitative analysis of five journals showed that on the periodontal bleeding on probing index, the probiotic Lactobacillus reuteri as an additional scaling and root planing therapy had a moderate effect on healing chronic periodontitis. It can be concluded that the probiotic Lactobacillus reuteri as an additional scaling and root planing therapy has an effect in healing chronic periodontitis.

Keywords : *Adjunctive therapy, Chronic periodontitis, Lactobacillus reuteri, Probiotics*

INTRODUCTION

Periodontal disease is a dental and oral health problem that occurs second most frequently after caries. Based on data from Riset Kesehatan Dasar (RISKESDAS) in 2018, the prevalence of periodontitis is 74.1%.[1] Periodontitis is

a multifactorial periodontal disease in the form of inflammation of the tissues supporting the teeth.[2]

The clinical picture of periodontitis is loss of attachment accompanied by the formation of periodontal pockets.[2] Plaque-causing bacteria such as *Porphyromonas gingivalis, Aggregatibacter actinomycetemcomitans, Tannerella forsythia, Fusobacterium nucleatum,* and *Prevotella intermedia* will produce plaque and calculus so they become the main etiology of periodontitis.[2] The initial therapy to eliminate the causative bacteria of plaque is scaling and root planing.[2,3]

Scaling and root planing are carried out to restore gingival health by removing all elements that cause inflammation in the gingiva.[2] However, this therapy is less effective because it does not always show good results, therefore adjunctive therapy is needed by taking medication.[4] Antibiotics are usually used as an adjunctive therapy for periodontitis patients.[4]

Antibiotics are expected to reduce or eliminate residual bacteria after scaling and root planing.[5] Scaling and root planing with the addition of antibiotics show positive results but have side effects on patients, such as digestive disorders, nausea, ulcers, diarrhea, and burning sensations.[5] Long-term side effects of the use of antibiotics are also considered because they can damage the normal flora and have the potential for antibiotic-resistant bacteria.[3,5]

Antibiotics as an addition after therapy are not recommended, so probiotics are used as an alternative.[5] Probiotics can reduce inflammation and bacterial recolonization and are safer to use over a long period.[5] Probiotics are said to be ideal if they can provide maximum benefits and are not toxic.[6]

In dentistry, probiotics have been proven to be effective in treating various dental and oral health problems.[6] Probiotics are live microorganisms that are safe to consume and when given in adequate amounts can be beneficial for health.[6] Commonly used microorganisms are *Lactobacillus spp., Streptococcus spp., Bifidobacterium spp., Bacillus spp.,* and *Escherichia coli*.[7] Probiotics are available in various forms.[8]

The research conducted by Vivekananda showed that *Lactobacillus reuteri* succeeded in significantly reducing the number of plaque-causing bacteria in periodontitis patients.[9] Another study conducted by Teughels also reported a reduction in the number of plaque-causing bacteria after consuming probiotic lozenges.[10]

Based on the description above, researchers are interested in conducting systematic research regarding the effect of using the probiotic *Lactobacillus reuteri* on chronic periodontitis patients as seen from the periodontal bleeding on probing and probing pocket depth index.

METHODOLOGY

This research is a systematic literature review with quantitative analysis in the form of meta-analysis. This study used method research questions (Population:

chronic periodontitis patients, Intervention: scaling and root planing therapy with the lozenge of *Lactobacillus reuteri* probiotic, Comparison: scaling and root planing therapy, Outcome: periodontal bleeding index on probing and probing pocket depth). The selected journals used a randomized controlled trial with the following criteria:

Inclusion criteria:

1. Chronic periodontitis patients over 18 years old
2. Good systemic conditions
3. Never had periodontal therapy

Exclusion criteria:

1. Pregnant and breastfeeding mothers
2. Patients who consumed antibiotics, calcium channel blockers, anticonvulsants and immunosuppressants
3. Patients with systemic diseases that should take medication for a long period

The literature will be used in English with a publication period of the last 10 years and uses 3 journal databases, namely PubMed, DOAJ, and Google Scholar. Bias analysis will use the Cochrane Collaboration Tool and the research with a high risk of bias will be excluded. The data obtained will be synthesized quantitatively using the meta-analysis method. To determine the effect of probiotic *Lactobacillus reuteri* as an addition after scaling and root planing, the effect size results using Cohen's d formula are used as follows:

$$\mathrm{ES} = \mathrm{d} = \frac{\overline{\mathrm{x}_1} - \overline{\mathrm{x}_2}}{\mathrm{s}_{\mathrm{within}}}$$

with

$$S_{within} = \sqrt{\frac{(n_1 - 1){S_1}^2 + (n_2 - 1){S_2}^2}{n_1 + n_2 - 2}}$$

To interpret the effect size results from this formula, the reference from Cohen's d is used, namely:

Small effect: $0.2 \leq \mathrm{d} < 0.4$

Medium effect: $0.4 \leq \mathrm{d} < 0.8$

Large effect: $\mathrm{d} \geq 0.8$

RESULTS

This research was conducted according to PRISMA (Preferred Reporting Items for Systematic Reviews and Meta Analyses) guidelines.

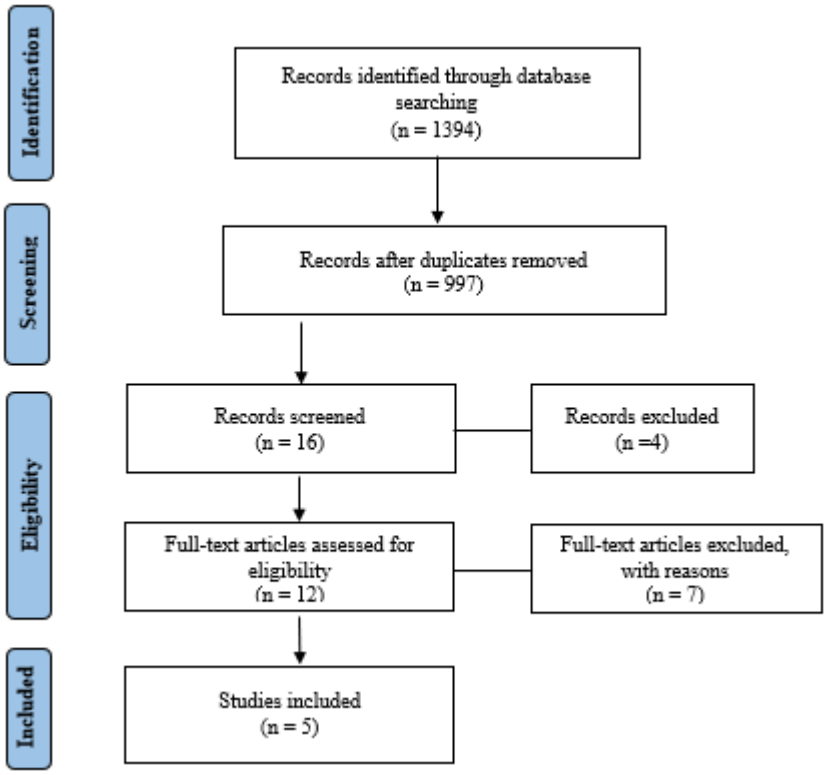

Figure 1. PRISMA Flowchart

There are 1394 journals obtained from three journal databases (PubMed, DOAJ, and Google Scholar). After checking for duplication and selecting according to the inclusion and exclusion criteria, 16 journals were obtained. Four journals cannot be accessed in full text, four journals use additional *Lactobacillus* as an intervention, and the other journals add other forms of *Lactobacillus reuteri* so that the remaining five journals will be synthesized quantitatively.

General characteristics of research journals

Table 1. General Characteristics of Research Journals

Author	Sample size	Age	Place
Teughels 2013[10]	30	≥ 35 Years Old	Department of Periodontology, Faculty of Dentistry, Cukurova University, Adana, Turkey
Tekce 2015[11]	40	35 – 50 Years Old	Faculty of Dentistry, Department of Periodontology, Yeditepe University, Goztepe, Istanbul, Turkey
Costactura 2018[12]	40	18 – 70 Years Old	Dental hygienist, Department Diagnosis, Hygiene and Oral Prevention, Policlinico "Tor Vergata", Rome, Italy
Laleman 2019[13]	39	34 – 83 Years Old	Department of Periodontology, Catholic University Leuven, Belgium

Pelekos 2019[14]	41	≥ 18 Years Old	Faculty of Dentistry, The University of Hong Kong, Hong Kong SAR, China

The type of research in all selected journals is randomized controlled trial. There are two journals published in the same year, namely 2019, then three other journals, respectively published in 2013, 2015, and 2018.[10–14] Results of bias analysis in the five journals at low risk of bias.[10–14]

Meta-analysis Research on probiotics **has** been proven to have an effect on treating dental and oral diseases. Probiotics are used as an alternative to antibiotics because they do not cause dangerous side effects and safe for use over a long period.

Meta-analysis was used to determine the use of *Lactobacillus reuteri* probiotics as adjunctive therapy, to prove the effectiveness in treating patients with chronic periodontitis as seen from the periodontal bleeding on probing index and periodontal pocket depth.

Table 2. Effect Size Bleeding On Probing

Author	Effect Size	Mean Effect Size
Teughels 2013	0,3768	0,5848
Tekce 2015	0,8232	
Costacurta 2018	1,9119	
Laleman 2019	0,0657	
Pelekos 2019	-0,2536	

Table 2 shows the results of the meta-analysis on the periodontal bleeding on probing index. Costacurta's research showed the largest effect size value, 1.9119, and Pelekos's research had the lowest, -0.2536. The mean effect size result for the periodontal bleeding on probing index is 0.5848, according to Cohen's d interpretation, this value provides a moderate effect in curing chronic periodontitis.

Table 3. Effect Size Probing Pocket Depth

Author	Effect Size	Mean Effect Size
Teughels 2013	0,0609	0,0676
Tekce 2015	0,3585	
Costacurta 2018	0,0691	
Laleman 2019	0,0311	
Pelekos 2019	-0,1814	

Table 3 shows the results of the meta-analysis on the periodontal probing pocket depth index with the highest result in Tekce's study at 0.3585 and the lowest in Pelekos's study at 0.1814. The mean effect size results for the periodontal probing pocket depth index is 0.0676, according to Cohen's d interpretation, this value has a small effect in treating chronic periodontitis.

DISCUSSION

This study aimed to determine if there was an effect of the addition of the probiotic *Lactobacillus reuteri* after scaling and root planing therapy in chronic periodontitis patients with quantitative analysis. The results of the study showed

that patients who consumed the lozenges of probiotic *Lactobacillus reuteri* had an effect on reducing the periodontal bleeding on probing and probing pocket depth index results.

The probiotic *Lactobacillus reuteri* will damage the biofilm formation of competing microorganisms with a quorum quenching mechanism by inhibiting communication between bacteria by producing bacteriocins, reuterin.[15,16] Reuterin will inhibit the growth and metabolism of pathogenic bacteria.[7,16] Probiotics will also compete directly with pathogenic bacteria as Gausse's Law, probiotics will dominate so that pathogenic bacteria will disappear.[16] Therefore, probiotics are considered natural antibiotics because they can inhibit and eliminate pathogenic bacteria.[7]

Based on periodontal index analysis using quantitative meta-analysis methods in this study, the bleeding on probing value with the mean effect size obtained was 0.5848, which had a moderate effect. Bleeding on probing occurs due to inflammation which is characterized by vascular changes including capillary blood vessels and dilatation.[2] Bleeding on probing is an indicator in measuring inflammation in periodontal tissue so that the probiotic *Lactobacillus reuteri* can control the inflammation in the periodontal tissue of chronic periodontitis patients.[2]

The probing pocket depth value was declared to have no effect because the mean effect size value obtained was 0.0676. Periodontal pocket depth is the distance from the gingival margin to the bottom of the pocket as measured using a periodontal probe.[17] A periodontal pocket is a pathological increase in the depth of the gingival sulcus due to migration of the periodontal epithelium towards the apical direction due to subgingival plaque and bacterial invasion.[17]

Analysis from periodontal index values was also carried out in the journals that had been obtained. Research according to Tekce's study the risk of disease development after patients consumed the lozenges of *Lactobacillus reuteri* probiotic and it was proven that fewer patients had a risk of disease development.[11] This study reported that 17 subjects from the total 20 subjects had a high risk of developing the disease, while only 12 of the 20 subjects were in the treatment group.[11]

Laleman's study discussed the side effects of additional use of the probiotic *Lactobacillus reuteri*, there were 4 patients from the study who reported side effects.[13] The treatment group reported that one person complained of dry mouth and another person felt there was something different in the oral cavity after using lozenges while for the control group, one person complained of dry mouth and feeling thirstier than usual and another person complained of discomfort in the oral cavity after waking up.[13] Laleman also discussed the risk of disease development.[13] Laleman reported that 14 subjects from the control group had a high risk of disease development high level while for the treatment group, there were only 8 people.[13]

CONCLUSIONS

The probiotic *Lactobacillus reuteri* affects the healing of chronic periodontitis on the periodontal bleeding on probing index value. There are suggestions for other research to develop this research by using other types of probiotics.

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REFERENCES

1. Kementrian Kesehatan Republik Indonesia. Laporan Nasional RISKESDAS 2018. Badan Penelitian dan Pengembangan Kesehatan. Jakarta: *Lembaga Penerbit Badan Penelitian dan Pengembangan Kesehatan; 2019.*
2. Newman MG, Takei HH, Klokkevold PR, Carranza FA. *newman and carranza's clinical periodontology.* 13th ed. Elsevier. 2019.
3. GK E bagoory, HM E gindy, MY S, Ea E zamarany. The adjunctive effect of probiotics to nonsurgical treatment of chronic periodontitis: A randomized controlled clinical trial. *Indian Soc Periodontol. 2021;25*:525–31.
4. Nguyen T, Brody H, Radaic A, Kapila Y. Probiotics for periodontal health—Current molecular findings. *Periodontol 2000. 2021;87(1)*:254–67.
5. Ramos TC de S, Vilas Boas ML, Nunes CMM, Ferreira CL, Pannuti CM, Santamaria MP, et al. Effect of systemic antibiotic and probiotic therapies as adjuvant treatments of subgingival instrumentation for periodontitis: a randomized controlled clinical study. *J Appl Oral Sci. 2022;30*:1–11.
6. Allaker RP, Stephen AS. Use of Probiotics and Oral Health. *Curr Oral Heal Reports. 2017;4(4):*309–18.
7. Schlagenhauf U, Jockel-Schneider Y. Probiotics in the Management of Gingivitis and Periodontitis. *A Review. Front Dent Med. 2021;2.*
8. Elavarasu S, Jayapalan P, Murugan T. Bugs that debugs: Probiotics. *J Pharm Bioallied Sci. 2012;4(August)*:S319–22.
9. Vivekananda MR, Vandana KL, Bhat KG. Effect of the probiotic Lactobacilli reuteri (prodentis) in the management of periodontal disease: A preliminary randomized clinical trial. *J Oral Microbiol. 2010;2(2010)*:1–9.
10. Teughels W, Durukan A, Ozcelik O, Pauwels M, Quirynen M, Haytac MC. Clinical and microbiological effects of Lactobacillus reuteri probiotics in the treatment of chronic periodontitis: A randomized placebo-controlled study. *J Clin Periodontol. 2013;40(11)*:1025–35.
11. Tekce M, Ince G, Gursoy H, Dirikan Ipci S, Cakar G, Kadir T, et al. Clinical and microbiological effects of probiotic lozenges in the treatment of chronic periodontitis: A 1-year follow-up study. *J Clin Periodontol. 2015;42(4)*:363–72.
12. Costacurta M, Sicuro L, Margiotta S, Ingrasciotta I, Docimo R. Clinical effects of lactobacillus reuteri probiotic in treatment of chronic periodontitis. A randomized, controlled trial. *ORAL Implantol.*

2018;11(4):191–8.
13. Laleman I, Pauwels M, Quirynen M, Teughels W. A dual-strain Lactobacilli reuteri probiotic improves the treatment of residual pockets: A randomized controlled clinical trial. *J Clin Periodontol. 2020;47(1)*:43–53.
14. Pelekos G, Ho SN, Acharya A, Leung WK, McGrath C. A double-blind, paralleled-arm, placebo-controlled and randomized clinical trial of the effectiveness of probiotics as an adjunct in periodontal care. *J Clin Periodontol. 2019;46(12)*:1217–27.
15. Rehman ZU, Leiknes TO. Quorum-quenching bacteria isolated from red sea sediments reduce biofilm formation by Pseudomonas aeruginosa. *Front Microbiol. 2018;9(JUL)*:1–13.
16. Dobson A, Cotter PD, Paul Ross R, Hill C. Bacteriocin production: A probiotic trait? *Appl Environ Microbiol. 2012;78(1)*:1–6.
17. Berglundh T, Giannobile W V, Lang NP, Sanz M. *lindhe's clinical periodontology and implant dentistry*. 7th ed. Vol. 1. Oxford, United Kingdom: John Wiley & Sons Ltd; 2022.