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The role of probiotics in preventing dental caries

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Abstract

Tooth decay has occurred due to the numerous microorganisms in the mouth such as Streptococcus and Lactobacilli bacteria that can produce acid. Commercial antiplatelet agents are predominantly antibacterial compounds, but these compounds can disrupt oral bacterial flora and induce and enhance the growth of opportunistic pathogens, including Candida albicans. Nowadays, bacterial therapy is a replacement therapy for microorganisms. One of the methods of bacterial therapy is the use of probiotic bacteria. So far, many studies have been done on the effect of probiotic-containing food products on the microbial factors of tooth decay. Therefore, this study aimed to investigate the effect of probiotics on dental caries. The search queries were from ISI, PubMed, Scopus, Science Direct, magiran, SID databases. Key words were probiotic, dental caries, bacterial caries, tooth decay, laboratory and clinical studies. Finally, the selected articles were used for the review table. The results of the review of studies showed that probiotic strains are able to control bacterial agents that cause dental caries.

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Introduction

Caries is the most common chronic disease of childhood and adolescence with nutritional program, salivary microflora and host response contributing to it [1]. Tooth decay has occurred due to the numerous microorganisms in the mouth such as Streptococcus and Lactobacilli bacteria that can produce acid. Commercial antiplatelet agents are predominantly antibacterial compounds, but these compounds can disrupt oral bacterial flora and lead to the induction and growth of opportunistic pathogens including Candida albicans [2,3]. Important strategies for preventing caries are focused on carbohydrates and microorganisms, and the removal of caries-related microorganisms from the oral environment seems not only harsh but also unreasonable, hence alternative ways to effect environmental ecology have been studied [4-6]. Dental caries are a major part of clinical problems. Bacterial therapy is a replacement therapy for microorganisms. One of the methods of bacterial therapy is the use of probiotic bacteria. The World Health Organization (WHO) describes probiotics as living microorganisms that "provide the host with health benefits if consumed to the extent necessary. This definition emphasizes the importance of probiotics as living cells. Probiotic organisms alter conditions in favor of beneficial bacteria in the gut. These microorganisms are essential for the digestion of nutrients and the balance of the intestinal microflora. So far, many researches have been done on the effect of probiotic-containing food products on the microbial agents of tooth decay. In this study, we tried to investigate the clinical and in vitro effects of probiotics on tooth decay.

Methodology

The search queries were from ISI, PubMed, Scopus, Science Direct, Magiaran, SID databases. Key words were probiotic, dental caries, bacterial caries, laboratory and clinical studies. Finally, the selected articles were used for the review table.

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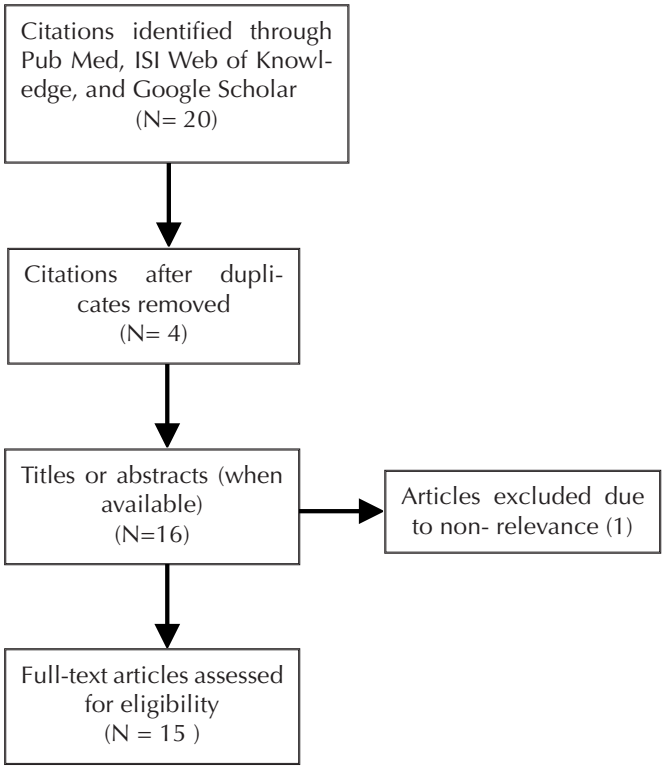

Figure1. Flow diagram for study selection

Results

The results of the study by Busscher et al. (1999) showed that probiotics of L. Acidophilus and L. rhamnosus GG, L. casei have a positive relationship with Streptococcus mutans inhibition [7]. The results of the study by Haukioja et al (2009) showed that probiotics L. paracasei, L. rhamnosus L. johnsonii by binding and survival in saliva bind to lactobacillus better than bifidobacterium[8]. The results of the study by Lima et al. (2005) showed that probiotics of L. casei Shirota and L. acidophilus have different pattern of binding to the tested species [9]. The results of the study by Hasslof et al. (2010) showed that probiotic Lactobacilli species (L. plantarum, L. paracases, L. rhamnosus GG and L. acidophilus La5, L. reuteri) by inhibiting Streptococcus mutans inhibition Different capacities in Streptococcus mutans inhibition are examined depending on the species studied [10]. The results of the study by Haukioja et al. (2008) showed that probiotics of L. casei Shirota, L. rhamnosus GG, Bifidobacterium lactis, L. reuteri Bb12 by inhibiting the protein composition of saliva polyclonal and binding of other oral bacteria inhibited the binding of other bacteria and Improvement of the protein composition of the saliva polycrystalline [11]. The results of Pham et al.'s (2009) study showed that probiotic L. salivarius W24 has a stabilizing effect on the salivary microflora, affecting the composition stability and decay of salivary bacteria, stabilizing the salivary microflora, altering the composition and decay of salivary bacteria [12]. The results of the study by Comelli et al. (2002) showed that probiotic Lactococcus lactis and S. thermophilus are inhibited by different inhibitory effects on the growth inhibition of Streptococcus mutans [13]. The results of Nase et al.'s (2001) study showed that probiotic L. rhamnosus GG reduces salivary Streptococcus mutans [14]. The results of Nikawa et al.'s (2004) study showed that probiotic L. reuteri causes salivary Streptococcus mutans [15]. The results of Caglar et al.'s (2005) study showed that Bifidobacterium probiotic reduces salivary Streptococcus mutans [16]. The results of Caglar et al.'s (2006) study showed that probiotic ihd and L.reuteri L.reuteri decrease Streptococcus mutans salivation [17]. The results of Montalto et al.'s (2004) study showed that Lactobacillus spp probiotic increases lactobacillus and does not alter salivary Streptococcus mutans [18]. The results of the study by Cildir et al (2009) showed that the probiotic Bifidobacterium animalis subsp. Lactis DN-173010 reduces Streptococcus mutans and does not alter lactobacilli in saliva [19]. The results of the study by Steeksen et al. (2009) showed that probiotic L. rhamnosus LB21 reduces Streptococcus mutans [20]. The results of the study by Chuang et al. (2010) showed that probiotic L. paracasei GMNL-33 did not change Streptococcus mutans in saliva immediately after the intervention and decreased 2 weeks after the end of the intervention [21]. The results of Caglar et al.'s (2008) study showed that the probiotic Bifidobacterium lactis Bb-12 reduced Streptococcus mutans and did not alter lactobacilli in saliva [22]. The results of Caglar et al.'s (2006) study showed that probiotics L.reuteri and L.reuteri reduce Streptococcus mutans in saliva [17].

Table1. Summary of studies involved in the meta-analysis.

Reference	probiotics in preventing dental caries	Publication year	First author
[7]	L . acidophilus و L. rhamnosus GG , L. casei	1999	Busscher et al.
[8]	L. paracasei و L. rhamnosus L. johnsonii	2009	Haukioja et al.,
[9]	casei Shirota , L. acidophilus	2005	Lima et al.,
[10]	Lactobacilli L. paracases وL. rhamnosus GG	2010	Hasslof et al.
[11]	L. casei Shirota , L. rhamnosus GGو Bifidobacterium lactis , L. reuteri Bb12	2008	Haukioja et al
[12]	L. salivarius W24	2009	Pham et al
[13]	Lactococcus lactis , S. thermophilus	2002	Comelli et al
[14]	L. rhamnosus GG	2001	Nase et al
[15]	L. reuteri	2004	Nikawa et al
[16]	Bifidobacillus	2005	Caglar et al
[17]	L.reuteri L.reuteri	2006	Caglar et al
[18]	Lactobacillus spp	2004	Montalto et al
[19]	Bifidobacterium animalis subsp. Lactis DN-173010	2009	Cildir et al
[20]	L. rhamnosus LB21	2009	Steeksen et al

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Reference	probiotics in preventing dental caries	Publication year	First author
[21]	L. paracasei GMNL-33	2010	Chuang et al
[22]	Bifidobacterium lactis Bb-12	2008	Caglar et al

Discussion

Probiotics work by various mechanisms in the oral cavity, including the production of antibacterial agents against oral pathogens such as hydrogen peroxide organic acids and bacteriocins [23-27]. In another mechanism, probiotics compete with pathogenic agents for adhesion to the mucosa and teeth and prevent the attachment and invasion of pathogenic bacteria [28, 29]. The next mechanism of probiotics is that they can alter the environment of the oral environment, such as a severe decrease in pH so that caries are not able to survive in the highly acidic environment, or a change in the protein structure of the salivary polyacrylate and a decrease in agglutinin GP340 and Saliva peroxidase [30]. Finally, probiotics can have beneficial effects by stimulating nonspecific immunity and regulating cellular and humoral immune responses [31, 32], but further studies on the sites of induction and immunity in the mouth after the administration of probiotics are needed. Often a combination of probiotic strains is used to enhance these beneficial effects [33]. Harmless bacteria in fermented food products compete with the pathogenic bacteria after consumption and impede their viability. Probiotic bacteria work in several ways: prevent cell adhesion and invasion of pathogenic bacteria, compete with pathogenic bacteria to provide the required materials and adhere to the environment, may kill toxins or produce antimicrobial substances. They are also effective in regulating local and systemic immune systems [34, 35]. Evidence from studies has shown that different probiotic strains can prevent dental caries by controlling bacterial caries.

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Authors' contributions

PSH and SR searched and reviewed the literature and PSH and MRZ prepared the first draft of manuscript; SR and PSH helped in preparing final draft of manuscript, checked and corrected the grammar. All authors read and approved the final report.

Conflict of interests

All authors declare that no conflict of interest exist.

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