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Anticariogenic Efficacy Of Herbal And Conventional Toothpaste

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ABSTRACT:**INTRODUCTION:**

Dental caries is one of the commonest infectious microbial diseases of the world since ages and has an increased incidence in recent past due to drastic changes in lifestyle habits. Considering the overflowing number of the brands of numerous herbal toothpastes in the market, the efficacy of these toothpastes in controlling the bacterial count has to be scientifically analyzed. Thus the aim of the study is to evaluate the anticariogenic efficacy of herbal and conventional toothpaste.

MATERIALS AND METHODS:

Mueller Hinton Agar was utilized for this activity to determine the zone of inhibition. Mueller Hinton agar was prepared and sterilized for 15 minutes at 121°C. The toothpaste with different concentrations (25µL, 50 µL, 100 µL) were loaded and in the fourth well standard antibiotic amoxyrite was loaded. The plates were incubated for 24 hours at 37°C. After the incubation time the zones of inhibition were measured.

RESULTS:

The results observed were that the zone of inhibition was more with the sample containing miswak and soundarya prasadak (herbal composition - 20mm) than the sample containing fluoride (18mm) and black pepper (19mm).

CONCLUSION:

The results of the study conclude that the herbal toothpastes have a slightly better antibacterial activity compared to the conventional tooth pastes. These traditional methods have numerous other claims also which are of great benefit for health.

KEYWORDS: Antibacterial, Caries, disease, herbal toothpaste, Conventional

INTRODUCTION:

Dental hard tissues undergo phasic demineralization and remineralization as a result of dental caries, a biofilm-mediated, sugar-driven, multifactorial, dynamic illness [1]. Caries can harm the tooth crown and, in later life, the exposed root surfaces throughout one's life, in both the primary and permanent dentitions. Caries development is influenced by the interaction of protective and pathogenic factors. This interaction of variables underlies the categorization of people and groups into caries risk categories, enabling a more customized approach to care [2].

The pathogenicity of complex oral micro-communities is the main cause of dental disorders as dental plaques, dental caries, and periodontal diseases. Through the generation of caries, dental plaque has been shown to be a key element in the beginning and development of gingival and periodontal illnesses [3]. One of the causes of microorganism buildup and their hazardous behaviors is poor oral hygiene. As a supplement to the mechanical plaque control approach, the conventional oral hygiene method of chemical plaque control can be used [4,5]. It has been suggested that adding chemicals with antiplaque or antimicrobial activity to dental products could be used as a preventative measure to lower the risk of plaque-mediated disease by decreasing the cariogenic bacteria in the oral cavity [6]. Though caries are effectively avoidable by simple

inexpensive and easy to practice personal hygiene habits. Most effective among them is the tooth brushing habit. Of various factors of this practice, antibacterial efficacy of the tooth paste has a major role to play in the outcome [4].

Toothpastes labeled as "natural" typically do not contain synthetic sweeteners, artificial colors, preservatives, additives, or ingredients such as synthetic flavors or flavors [7]. Manufacturers of the herbal toothpastes use a wide variety of botanicals that they claim mimic the benefits of traditional toothpastes [8]. The trend towards 'plant-based' has led to a surge in buyer demand for products that are free of side effects, free of animal products, vegan-friendly, etc. In some parts of the world, herbal products are predominant. It outsells fluoride-based toothpastes. While research on traditional oral care products is abundant, clinical research on herbal mouthwashes and toothpastes is very limited [9]. The antibacterial, antiviral, and anti-inflammatory activity of herbal products has found its way into dentistry. Some studies have examined the effects of plant extracts and plant products on specific oral pathogens and other researchers focused on the inhibition of biofilm formation, reducing the microbial adhesion that is primarily responsible for dental plaque formation [10-12].

MATERIALS AND METHODS

This study was conducted in Orange Lab at Saveetha Dental College with different toothpastes containing fluoride, herbal combination, and probiotics. The samples in the tubes were vortex mixed for a minute to allow the dispersion of bacteria into the medium. Then, 0.1 ml of undiluted inoculum was spread on mitis salivarius bacitracin agar medium. The plates were kept in anaerobic conditions at 37°C for 24-48 h. The colonies on MSB plates were subcultured on a medium containing 5% sheep blood. The colonies having alpha hemolysis were chosen for further identification after a 24-hour incubation period at 37°C.

Antibacterial Activity:

Antibacterial activity of respective nanoparticles against the strain *Staphylococcus aureus*, *Bacillus*, and *E.coli*. Mueller Hinton Agar was utilized for this activity to determine the zone of inhibition. Mueller hinton agar was prepared and sterilized for 15 minutes at 121°C. Media poured into the sterilized plates and let it stable for solidification. The wells were cut using a 9mm sterile polystyrene tip and the test organisms were swabbed. The nanoparticles with different concentrations (25µL, 50 µL ,100 µL) were loaded and in the fourth well standard antibiotic

amoxyrite was loaded. The plates were incubated for 24 hours at 37°C. After the incubation time the zones of inhibition were measured.

RESULTS:



The above picture shows 4 different dentifrices, demonstrating various levels of antimicrobial activity against tested isolate *Streptococcus mutans*. The results observed were that the zone of inhibition were more with the sample containing miswak and saundarya prasadak (herbal composition - 20mm) than the sample containing fluoride (18mm) and black pepper (19mm).

| Sample | Zone of inhibition |
|---|--------------------|
| Sample containing fluoride | 18mm |
| Sample containing miswak | 20mm |
| Sample containing saundarya prasadak | 20mm |
| Sample containing ginger and black pepper | 19mm |

DISCUSSION:

Plaque plays an important role in the development of dental caries. Once established, the pioneer bacteria attach and create an acidic environment that leads to cavitation over time with a series of microenvironmental changes [13]. Therefore, the antibacterial effect of dentifrices is one of the key factors in toothpaste selection. Toothpaste ingredients with antibacterial properties kill microbes, reducing microbial growth and colonization on tooth surfaces. This study aimed to evaluate the anti-caries effects of different herbal toothpastes and compare them with conventional toothpastes with known antibacterial effects. Among various microorganisms, *Streptococcus mutans* was selected as test microorganism due to its involvement in caries formation and progression, respectively [14]. Results indicate that both herbal dentifrices and conventional dentifrices were effective against both the cariogenic bacteria. The zone of inhibition when compared, the herbal dentifrices were comparatively better than or equal to the conventional tooth pastes [15].

The antibacterial efficacy against *S. mutans* was variable between different herbal and conventional toothpastes, and this was due to the actions of different ingredients in dentifrices and their efficacy in inhibiting different microorganisms [16]. Other in vivo studies have shown no significant difference in the effectiveness of herbal toothpaste in reducing caries compared to conventional toothpaste. (4)The study also stated that there were no adverse effects from the use of these herbal dentifrices.

Antibacterial agents widely used presently for prevention of dental caries include xylitol, tea extracts, essential oils, antibiotics, etc. Xylitol, a natural sweetener derived from xylose, is presently being applied broadly to chewing gums, toothpastes and mouthwashes [17-26].

Our study is primarily focused on comparing the efficacy of herbal and conventional dentifrices in controlling caries bacteria. This supports the claim that herbal dentifrices are anti-cariogenic. Using natural medicines to cure various diseases has become an increasing trend [27]. Herbal medicine has made significant contributions to modern medical practice [10,11]. The antimicrobial activity of the herbs is due to the presence of secondary metabolites such as alkaloids, flavonoids, polyphenols, and lectins. Synergistic interactions between the principal components of these herbs are considered to be a vital part of their efficacy [28]. A similar hypothesis suggested that antibacterial activity is similar with slightly better results in herbal toothpastes when compared

against conventional toothpastes [29]. This activity may be attributed to the efficacy of various components of the toothpaste in inhibiting growth of various organisms [10]. The present study agrees with the above result. Since concentrations of herbs in toothpaste are not specified, varying concentrations to calculate minimum inhibitory concentrations for these ingredients may improve toothpaste results.

CONCLUSIONS:

The results of the study conclude that the herbal toothpastes have a slightly better antibacterial activity compared to the conventional tooth pastes. These traditional methods have numerous other claims also which are of great benefit for health. However, further studies are required to evaluate their clinical advantages in the treatment or prevention of biofilm-mediated diseases. The addition of natural plant extracts to toothpastes can increase the antimicrobial spectrum, thus reducing, controlling or preventing oral diseases.

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CONFLICTS OF INTEREST:

The authors declare that there are no conflicts of interest in the present study

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