International Journal of Psychosocial Rehabilitation, Vol. 24, Issue 01, 2020
ISSN: 1475-7192

STUDY OF THE ANTIMICROBIAL EFFECTS OF COMMERCIALLY AVAILABLE HERBAL TOOTHPASTES AGAINST EARLY CHILDHOOD CARIES

TYPE OF MANUSCRIPT : Research article

RUNNING TITLE : Study of antimicrobial effects of commercially available herbal toothpaste against early Childhood caries

Nadhirah Faiz, RV Geetha, Geo Mani,Dhanraj Ganapathy

ABSTRACT

AIM: *To determine whether herbal toothpastes have more antimicrobial effect than fluoridated toothpaste*

MATERIALS AND METHODS : 4 herbal toothpastes containing Neem, tulsi, ginger and aloe vera respectively were selected and 5 samples of saliva was collected from children between the age groups 4-5 years who had more than 5 teeth with caries present. Antimicrobial effect on these toothpastes were done having the control mediums of 0.2% chlorhexidine and fluoridated toothpaste using that saliva sample as well as isolated streptococcus mutants. The average zone of inhibition was calculated and analyzed.

RESULT: *Clove has been found to have better antimicrobial activity in comparison to the other herbal toothpastes and the controls.*

CONCLUSION : Herbal toothpastes contain good antimicrobial properties.

KEYWORDS: *toothpastes, dental caries, herbal, early childhood caries, streptococcus*

I. INTRODUCTION :

Dental caries in infants and toddlers have a distinctive pattern. Different terminology have been used to refer to dental caries among children.[1] The definitions which were first used to describe this condition were related to etiology, with the focus on inappropriate usage of nursing practices. The following terms are used in a interchangeable manner : Early childhood tooth decay, nursing caries, baby bottle-fed tooth decay, early childhood caries, early childhood dental decay, comforter caries, maxillary anterior caries, rampant caries, and many more.[2,3] Some of these terms indicate the cause of dental caries in pre-school children.[3] Baby bottle-fed tooth decay refers to the decay in an infant's tooth, associated with what the infant drinks.[4] However, some authors use the term “nursing caries” because it indicates the inappropriate bottle use and nursing practices as the causative factors.[2,5] However, the term “early childhood caries” is becoming popular with dentists and dental researchers alike.[3,6]

The term “early childhood caries” was suggested at the 1994 workshop sponsored by the Centers for Disease Control and Prevention in an attempt to focus the attention on multiple factors (i.e. socioeconomic, behavioral, and psycho-social) that contribute to caries at such early ages, rather than ascribing sole cause to inappropriate feeding methods.[7] ECC is defined as “the presence of one or more decayed, missing teeth, or filled tooth surfaces in any primary tooth in a child 72 months of age or younger. In children younger than 3 years of age, any sign of smooth-surface caries is indicative of severe early childhood caries (S-ECC). From ages 3 years through 5 years, one or more cavitated, missing teeth (due to caries), or filled smooth surfaces in primary maxillary anterior teeth, or decayed, missing, or filled score of ≥4 (age 3), ≥5 (age 4), or ≥6 (age 5) surfaces constitutes S-ECC.[8]

Final year BDS Saveetha Dental college and hospital, Saveetha institute of medical and technical sciences, Saveetha University. Associate Professor,Department of Microbiology,Saveetha Dental college and hospital, Saveetha institute of medical and technical sciences , Saveetha University. Senior lecturer,Department of Pedodontics and Preventive Dentistry,Saveetha Dental college and hospital, Saveetha institute of medical and technical sciences, Saveetha University. Professor&Head, Department of Prosthodontics, Saveetha Dental College, Saveetha Institute of Medical and Technical Sciences, Chennai, India

CORRESPONDING AUTHOR *: Dhanraj Ganapathy, Professor&Head, Department of Prosthodontics, Saveetha Dental College, Saveetha Institute of Medical and Technical Sciences, Chennai, India. Email; dhanrajmganapathy@yahoo.co.in*

Received: 10 Nov 2019 | Revised: 20 Dec 2019 | Accepted: 02 Jan 2020

In the initial phase of ECC,it is recognized as a dull, white demineralized enamel that quickly advances to an obvious decay along the gingival margin.[9] Primary maxillary incisors are generally affected earlier than the 4 maxillary anterior teeth which are often involved concurrently.[10] Carious lesions may be found on either the lingual or labial surfaces of the teeth and, in some cases, on both.[11] The decayed hard tissue is evident clinically as a yellow or brown cavitated lesion. In older children whose entire primary dentition is completely erupted, it is usual to see considerable advancement of the dental damage.

Streptococcus sobrinus and S. mutans are the main cariogenic micro-organisms.[11,12] These acid-producing pathogens of the mouth cause damage by dissolving tooth structures in the presence of fermentable carbohydrates such as glucose, sucrose and fructose.[13,14] Most of the investigations[10,15,16] have shown that in children with ECC, S. mutans has regularly exceeded 30% of the cultivable plaque flora. These bacterial masses are often associated with carious lesions, white spot lesions, and sound tooth surfaces near the lesion areas. Conversely, S. mutans typically constitutes less than 0.1% of the plaque flora in infants with negligible to no caries activity.[17] It is well known that initial acquisition of mutans streptococci (MS) by children occurs during a well-delineated age range that is being designated as the window of infectivity.[18] Most of the long-term studies also demonstrated that the individuals with low infection levels in this period are less likely to be infected with MS, and subsequently have the lowest level of risk of developing caries.[19,20] This may be explained by the competition between the oral bacteria, resulting in the invasion of the niches, where MS can easily colonize, by less pathogenic species.[21]

The fluorides usage for dental purposes began in the 19th century. Fluorides are found naturally throughout this world.[22] They are present to some extent in all food and water, so that all humans ingest some fluoride on a regular basis. In addition, fluorides are used by individuals in the form of toothpastes, rinses, lozenges, chewable tablets, drops.

Herbal toothpastes have been standardized and brought into the market as the action of the ingredients in the toothpaste have been found to have certain unique properties which can enhance the oral hygiene of the patient. This study has been conducted to determine whether herbal toothpastes have better antimicrobial effects than the fluoridated toothpaste used which is currently in usage.

II. MATERIALS AND METHODOLOGY :

It is an in vitro study done by disc diffusion technique. For the study, the herbal toothpastes which were utilized are Colgate Swarna Vedhsakti, K.P.Namboodiri's Aloe Vera Toothpaste, Dabur Herbal Toothpaste and K.P Namboodiri's Ginger Herbal Toothpaste. The fluoridated toothpaste utilized as the control is Colgate Kids Toothpaste. The herbaltoothpastes containing neem, tulsi, ginger and aloe vera were diluted in a 1:10 ratio and impregnated in paper disc and placed on Mueller Hinton Agar (MHA). The antibacterial activity of the herbal toothpasteswere tested against Streptococcus mutans as well as 5 salivary samples taken from ages 4-5 where the children have a minimum of 5 decayed teeth , 0.2 % Chlorohexidine and diluted fluoridated toothpaste soaked in the disc is taken as positive control.

Preparation of the disc : Plain paper disc measuring 6 mm diameter was bought from Himedia laboratory. It was sterilized in hot air oven at 160°C for 60 minutes.

Culture suspension : Isolated colony of the organism was inoculated to the nutrient agar and incubated overnight. The colonies were emulsified in sterile normal saline with turbidity matching 0.5 McFalard standard. Using a swab the suspension was spread on the Mueller- Hinton agar like a lawn culture.

The sterile discs were soaked in the test solutions, Chlorohexidine (0.2 % concentration) and diluted fluoridated toothpaste.The discs were then taken and placed on a sterile petridish and dried in hot air oven for 15 minutes. The dried discs were placed in the MHA coated with the test organism and salivary samples respectively. The plates were incubated at 37° C overnight aerobically. After incubation, the plates were checked for the zone of inhibition. The zone was measured in millimeter using a scale.

III. RESULT:

Table 1: Zone of inhibition

TOOTHPASTES	AVERAGE ZONES OF INHIBITION COATED WITH STREPTOCOCCUS ON MHA	AVERAGE ZONES OF INHIBITION COATED WITH SALIVARY SAMPLES ON MHA
NEEM	31.00mm	39.33mm
TULSI	26.50mm	39.00mm
GINGER	23.00mm	37.67mm
ALOE VERA	23.00mm	36.67mm
CHLORHEXIDINE	25.00mm	43.00mm
FLUORIDATED TOOTHPASTES	26.00mm	42.00mm

IV. DISCUSSION :

Streptococcus mutans has been found to be the initiating microorganism in dental caries formation. With this kept in mind, the first stage of the study conducted was estimating the antimicrobial efficacy of the herbal toothpastes against fluoridated toothpaste and the gold standard, chlorhexidine against Streptococcus mutans. Chlorohexidine is known have a quicker kill rate than other antimicrobials and also inactivates microorganisms of a broader spectrum. In this stage of the study conducted, it was found that the antimicrobial activity of herbal toothpastesagainstStreptococcus mutans were extremely good. It was found thatthe antimicrobial activity of clove and meswak against isolated streptococcus mutans exceeded the activity of 0.2 % Chlorohexidine control as well as the fluoridated toothpaste control, which is usually used by all children.

Once the efficacy of the herbal toothpastes had been established as in the same range of antimicrobial activity as the controls, the second stage of the study was conducted. In this stage, the antimicrobial activity of the herbal toothpastes against samples of saliva collected from children of the age group of 4-5 years with a minimum of 5 active carious lesions was tested to compare with the controls' efficacy. It was found that the antimicrobial activity of herbaltoothpastes on the salivarysample coated plates were effective and the zone of inhibition of the clove was found to be slightly more than the controls utilized in the study.

A similar study had been conducted in 2004. The authors used diffusion technique to evaluate the antimicrobial effectiveness of 14 natural herbal dentifrices against four microbes: Streptococcus mutans, Streptococcus sanguis, Actinomyces viscosus and Candida albicans. Colgate Total and sterile pyrogen-free water served as the positive and negative controls, respectively. The authors tested the herbal dentifrices at full strength and at 1:1 dilution. They measured the zones of inhibition at 24 and 48 hours to estimate the antimicrobial potential of the dentifrices and it was found that 6 dentrifices had excellent antimicrobial activity against all 4 test organisms[24].

Such studies are to be conducted for the practitioners to understand the action of herbal products in the effective maintenance of oral hygiene so that the cumulative oral hygiene of a given population can be enhanced with the knowledge spread by the dentists of that locality.

V. CONCLUSION:

Microorganisms have the ability to develop resistance when exposed to a particular agent for a longer time. Recent studies have proved that microorganisms develop resistance to drugs, resistance to chemical agents and also show resistance to the environmental factors. Some strains are referred to as MDR strains. Developing an alternative mode using plant products may help in solving this issue and will also reduce the number of side effects faced with the usual products at use.

REFERENCES:

[1] Tinanoff N. Introduction to the Early Childhood Caries Conference: Initial description and current understanding. Community Dent Oral Epidemiol. 1998;26:5–7. [PubMed]

[2] Dilley GJ, Dilley DH, Machen JB. Prolonged nursing habit: A profile of patients and their families. ASDC J Dent Child. 1980;47:102–8. [PubMed]
[3] Ismail AI, Sohn W. A systematic review of clinical diagnostic criteria of early childhood caries. J Public Health Dent. 1999;59:171–91. [PubMed]
[4] Lacroix I, Buithieu H, Kandelman D. La carie du biberon. J dentaire du Québec. 1997;34:360–74.
[5] Ripa LW. Nursing caries: A comprehensive review. Pediatr Dent. 1988;10:268–82. [PubMed]
[6] Drury TF, Horowitz AM, Ismail AI, Maertens MP, Rozier RG, Selwitz RH. Diagnosing and reporting early childhood caries for research purposes.A report of a workshop sponsored by the National Institute of Dental and Craniofacial Research, the Health Resources and Services Administration, and the Health Care Financing Administration. J Public Health Dent. 1999;59:192–7. [PubMed]
[7] Schroth RJ, Brothwell DJ, Moffatt ME. Caregiver knowledge and attitudes of preschool oral health and early childhood caries (ECC) Int J Circumpolar Health. 2007;66:153–67. [PubMed]
[8] Suzuki N, Yoneda M, Naito T, Iwamoto T, Hirofuji T. Relationship between halitosis and psychologic status. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2008;106:542–7. [PubMed]
[9] Berkowitz RJ. Causes, treatment and prevention of early childhood caries: A microbiologic perspective. J Can Dent Assoc. 2003;69:304–7. [PubMed]
[10] van Houte J, Gibbs G, Butera C. Oral flora of children with “nursing bottle caries” J Dent Res. 1982;61:382–5. [PubMed]
[11] Kelly M, Bruerd B. The prevalence of baby bottle tooth decay among two native American populations. J Public Health Dent. 1987;47:94–7. [PubMed]
[12] Tanzer JM, Livingston J, Thompson AM. The microbiology of primary dental caries in humans. J Dent Educ. 2001;65:1028–37. [PubMed]
[13] Nurelhuda NM, Al-Haroni M, Trovik TA, Bakken V. Caries experience and quantification of Streptococcus mutans and Streptococcus sobrinus in saliva of Sudanese schoolchildren. Caries Res. 2010;44:402–7. [PubMed]
[14] Schafer TE, Adair SM. Prevention of dental disease.The role of the pediatrician. (v-vi).Pediatr Clin North Am. 2000;47:1021–42. [PubMed]
[15] Caufield PW, Griffen AL. Dental caries. An infectious and transmissible disease. Pediatr Clin North Am. 2000;47:1001–19. v. [PubMed]
[16] Berkowitz RJ, Turner J, Hughes C. Microbial characteristics of the human dental caries associated with prolonged bottle-feeding. Arch Oral Biol. 1984;29:949–51. [PubMed]
[17] Milnes AR, Bowden GH. The microflora associated with developing lesions of nursing caries. Caries Res. 1985;19:289–97. [PubMed]
[18] Loesche WJ. Nutrition and dental decay in infants. Am J Clin Nutr. 1985;41:423–35. [PubMed]
[19] Caufield PW, Cutter GR, Dasanayake AP. Initial Acquisition of Mutans Streptococci by Infants: Evidence for a Discrete Window of Infectivity. J Dent Res. 1993;72:37–45. [PubMed]
[20] Ercan E, Dulgergil CT, Yildirim I, Dalli M. Prevention of maternal bacterial transmission on children's dental-caries-development: 4-year results of a pilot study in a rural-child population. Arch Oral Biol. 2007;52:748–52. [PubMed]
[21] Turksel Dulgergil C, Satici O, Yildirim I, Yavuz I. Prevention of caries in children by preventive and operative dental care for mothers in rural Anatolia, Turkey. Acta Odontol Scand. 2004;62:251–7. [PubMed]
[22] Köhler B, Andréen I, Jonsson B. The earlier the colonization by mutans streptococci, the higher the caries prevalence at 4 years of age. Oral Microbiol Immunol. 1988;3:14–7. [PubMed]
[23] Mahesh R, Muthu MS, Rodrigues SJ. Risk factors for early childhood caries: a case–control study. European Archives of Paediatric Dentistry. 2013 Oct 1;14(5):331-7.
[24] Lee SS, Zhang WU, Li Y. The antimicrobial potential of 14 natural herbal dentifrices: results of an in vitro diffusion method study. The Journal of the American Dental Association. 2004 Aug 1;135(8):1133-41.