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RESEARCH ARTICLE

CHLORHEXIDINE IN CARIES PREVENTION

***Dr. Anirudha Sharma, Dr. Varsha pandit, Dr. Shivani Bhatia, Dr. Esha Kedia and Dr. Sonali Bansod**

Bharti Vidyapeeth Dental College, India

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ABSTRACT

Dental caries which is a pandemic disease can be prevented even before its occurrence. There are many ways in which it can be prevented either by removing the etiological factors or bringing the etiological factors under control. Recent findings have indicated that antimicrobials are quite useful in reducing the load of microorganisms which are responsible for caries. Chlorhexidine is one of the commonly used antimicrobial available in the market. However, there is a lack of consensus on evidence-based treatment protocols and controversy regarding the role of chlorhexidine in caries prevention among dental educator. So, this article summarizes about role of chlorhexidine in caries prevention.

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INTRODUCTION

Dental caries is a behavioral disease that is characterized by the demineralization of the hard dental tissues through acid that results from fermentation of free sugars by certain microorganisms. Early colonization of the cariogenic microorganisms plays an important role in the development of the disease (Köhler, 2012; Antimicrobials in Future Caries Control, 2004) High-caries-risk patients, such as children with severe early childhood caries, orthodontic patients and the dentate elderly have high cariogenic microorganism load of Streptococcus mutansin an infectious biofilm. Currently, with limited knowledge of individual differences among human micro biota, the aim of using antimicrobials in high-caries-risk patients is to control dental caries by altering the metabolism of the cariogenic biofilm (Antimicrobials in Future Caries Control, 2004). The microbiota present in the bio film of every person is different not only in content but also in thickness. The aim of antimicrobial therapy is to achieve a shift from an ecologically unfavorable to an ecologically stable bio film .By suppressing the proportion of acidogenic and aciduric bacteria that have a growth advantage in low pH conditions, less acid is formed in the aqueous interphase between plaque and enamel, which enables and enhances remineralization by fluoride (Antimicrobials in Future Caries Control, 2004)

Corresponding author:* **Dr. Anirudha Sharma,
Bharti Vidyapeeth Dental College, India.

CHLORHEXIDINE AS AN ANTIMICROBIAL AGENT

Antimicrobial strategy may also be targeted at bacterial adhesion, to prevent formation of complex multispecies biofilms as dental plaque. The bisbiguanide chlorhexidine, which has been studied extensively for over 20 years, is currently the most potent chemotherapeutic agent against mutans streptococci and dental caries. Chlorhexidine is also often used as a positive control for assessment of the anticariogenic potential of other agents (Antimicrobials in Future Caries Control, 2004). Chlorhexidine is an antibacterial agent that shows a preventive effect on exposed roots. Chlorhexidine gluconate 0.12 or 0.2% mouthrinse (1 week each month) can also be used along with high-concentration fluoride toothpaste for caries prevention in high-caries-risk older children and adults. A recent randomized-controlled clinical trial showed a major reduction in caries in high-caries-risk adults using a regimen of 10 ml chlorhexidine gluconate rinse per day for 1 week every month in conjunction with daily fluoride toothpaste use. The effect of chlorhexidine as an antimicrobial agent is closely related to its diffusion capacity within the biofilm and its retention. Its effectiveness is also measured by its ability to reduce bacterial virulence and retard biofilm accumulation (Alaluusua, 1983). Chlorhexidine is delivered as a mouthrinse, gel or varnish in today's dentistry. Prescribed chlorhexidine mouthrinses as a plaque and gingivitis-reducing agent have been proven effective for over 40 years all around the world. The soft oral tissues and tooth surfaces retain the active ingredients in chlorhexidine rinse, providing a long-term antimicrobial effect.

Chlorhexidine as a mouthrinse contains different concentrations in different countries (Table 1). Chlorhexidine mouthrinse cannot be used for patients that are younger than six years old because of the high risk of swallowing the liquid. Chlorhexidine gel and varnish may be applied to people of all ages because of good compliance and minimised side effects such as staining. Chlorhexidine gel may be applied as a paste at home or in trays in the dental clinic. Studies have revealed that intensive application (3–4 daily applications over 2 days or daily application for 10–14 days) may provide reduction in the level of Streptococcus mutans, but large individual variations exist regarding its effect. It is, therefore, advised that the levels of these microorganisms are reassessed over the course of the therapy. The antibacterial effect of available chlorhexidine varnish (1 % Cervitec Plus, IvoclarVivadent; 10 % Prevora, CHX Technologies; or 40 % EC-40, Biodent BV) may last for 3 months. Different treatment regimes are in use. Regimes that consist of 2–3 applications at the start and 1 month or 3 months' follow-up of varnish application have been tested and have yielded conflicting results (Tang et al., 2015; Derks, 2008).

Table 1. Different concentrations in different countries

Antimicrobial	Formulation	Concentration	Product
Chlorhexidine gluconate	Mouthrinse	0.05 % 0.12 % 0.2 %	Concool F[c] Peridex[b] Corsodyl[c]
Chlorhexidine	Gel	0.2 % (+0.2 % NaF) 0.2 % (+0.32 % NaF)	Cervitec Gel[d] TePe Gingival Gel[e]
Chlorhexidine	Varnish	1 % (+1 % thymol) 10 % 10 % 20 % 35 %	Cervitec Plus[d] Chlorzoin[f] Prevora[g] BioC[h] EC 40[h]
Iodine (povidone iodine)	Mouthrinse Solution gargle	7 % 1 %	Popiyodon Gargle[i] Betadine[j]
Essential oils + ethanol	Mouthrinse	0.09 % 1.8-cineol 0.06 % thymol 0.05 % methyl salicylate 0.04 % l-menthol 27 % Ethanol	Listerine[k] (Original)

Applications of Chlohexidine in Caries Prevention

Chlorhexidine and Early Childhood Caries: Prevention of early childhood caries (ECC) continues to be a challenge in many disadvantaged communities. Although early colonisation by mutans streptococci (MS) has been identified as a risk factor for ECC, antimicrobial agents that are suitable for controlling cariogenic bacteria have not been extensively tested for preventing ECC. Fluoride varnish and povidone iodinehave been shown to be effective in reducing ECC; however, as these agents require professional application, they are unsuitable for children who are not likely to visit professional practices. Although a 40% CHX varnish has been reported to reduce ECC, it requires professional application. In contrast, gel preparations containing 0.2% or 1% CHX have shown promise in reducing MS in toddlers and can easily be applied by parents (Derks, 2008).

Chlorhexidine and Orthodontic Treatment: Although the antimicrobial effect of chlorhexidine on Streptococcus mutans has been established in children with fixed appliances, evidence of its carious lesion-inhibiting effect has been shown to be weak. However in the trial it was seen that in the study done by Derks et al ,daily application of chlorhexidine (0.12% gel) did not give additional benefits over twice daily toothbrushing with low-dose fluoride (304%) children's toothpaste in reducing early childhood caries (Tang, 2015; Derks, 2008).

Chlorhexidine and Root Caries: Chlorhexidine varnish controls the development of root carious lesions and reduces their occurrence in the elderly. These results may be explained by the surface characteristics of the root that may retain chlorhexidine better because of the exposure of dentine that provides a reservoir for the surface-bonded antibacterial. Low salivary flow in the elderly patients may also diminish the clearance from the retentive surface on the root, providing a prolonged antibacterial effect (Baca, 2009).

Evidence on the Effectiveness of Chlorhexidine: A recent Cochrane review of the effectiveness of chlorhexidine treatment on children and adolescents and evidence-based clinical recommendations and systematic reviewsfound no advantage in using chlorhexidine over no treatment or a placebo for coronal caries inhibition but showed that chlorhexidine containing products may diminish the bacterial load of the biofilm. Furthermore, the retentive effect of chlorhexidine varnish within the fissures of permanent molars was thought to prevent carious lesion development in fissures after twice or four times yearly application of the varnish over a period of 2 years. However, 1 year after discontinuation of the chlorhexidine varnish, compared to the non- chlorhexidine control group, the carious lesions in a group of children had increased to equal levels (Rethman et al., 2011; Walsh et al., 2015; Slot, 2011)

Conclusion

In conclusion, chlorhexidine is a cariogenic microorganism-suppressing antimicrobial and may, therefore, be useful in reducing the bacterial load in high-caries-risk groups such as children with ECC, those wearing orthodontic fixed appliances and elderly people with reduced saliva flow in adjunction to biofilm removal. Evidence that supports the effectiveness of antimicrobial agent chlorhexidine in preventing dental caries and controlling carious lesion in non-high-caries-risk groups is not shown and hence further studies are required for the same. (Twetman, 2004)

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