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Evaluation of short term side effects of administration of 0.2% and 0.12% Chlorhexidine Mouthwash

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Abstract
Mouthwashes are an antiseptic solution which is used to reduce the microbial load in the oral cavity. Mouth rinses have the ability to deliver the therapeutic effect all over the tooth surface including interproximal areas in which even toothpastes are not much effective. Even though, chlorhexidine mouthwash is more effective in plaque control, it cannot be used for long duration because some of its unpleasant side-effects after long duration usage. Evaluation of Short Term Side Effects of Administration of 0.2% and 0.12% Chlorhexidine Mouthwash.

The present study was planned in Department of Paediatric & Preventive Dentistry, Buddha Institute of Dental Science and Hospital, Patna, Bihar, India. Total 20 cases of the patients were enrolled in the present study. The 10 cases in Group A patients were administered with the 0.2% chlorhexidine mouthwash. The remaining 10 cases in Group B patients were administered with the receiving 0.12% chlorhexidine mouthwash thorough oral prophylaxis. All the patients were instructed to brush at least 30 minutes before using mouthwash and not to use any other chemical dental hygiene products during the evaluation period. Rinsing with water after the procedure was not allowed.

Chlorhexidine is a germicidal mouthwash that reduces bacteria in the mouth. Chlorhexidine oral rinse is used to treat gingivitis (swelling, redness, bleeding gums). Chlorhexidine is usually prescribed by a dentist. Chlorhexidine oral rinse is not for treating all types of gingivitis. The data generated from the present study concludes that 0.12% Chlorhexidine mouthwash as compared to 0.2% Chlorhexidine mouthwash as an adjunct to non-surgical periodontal therapy. Although Chlorhexidine mouthwash has been proven to be effective in reducing plaque, its use in daily practice is still limited due to its several side effects. The present study evaluated the subject's attitude towards the side effects of chlorhexidine.

Keywords: Antiplaque, Chlorhexidine, Gingivitis, etc

Introduction

Dental plaque is the main etiologic agent in the development and progression of gingival and periodontal diseases [1]. Principal means of preventing the development and progression of various periodontal diseases is mainly through mechanical removal of plaque through regular tooth brushing [2]. But for mentally or physically-handicapped patients who are unable to brush their teeth themselves or other individuals who lack the dexterity, skill or motivation for mechanical plaque removal, mouthwashes may aid in controlling dental plaque and periodontal disease [3]. Mouthwashes should never be used as sole means of oral hygiene but it should always be used in conjunction with mechanical plaque control measures. The use of mouthwash to control plaque bacteria date back around 5000 years when the Chinese recommended the use of child's urine for the control of gingivitis [4]. Mouthwashes can be used for various preventative and therapeutic purposes viz. to treat oral infections, reduce inflammation, decrease halitosis and to deliver fluoride locally for preventing caries. The use of mouthwash is usually based on anecdotal evidence rather than scientific evidence especially for over-thecounter (OTC) products. This may often leads to the use of an inappropriate product and incorrect mode of application, leading to a failed treatment outcome [5]. The patient's ability to perform good mechanical oral hygiene practices, dental status, gingiva and oral mucosa, other oral diseases (xerostomia), and the efficacy of a mouthwash and its potential adverse effects should be taken into consideration before recommending a particular mouthwash.

Mouthwash, mouth rinse, oral rinse, or mouth bath is a liquid which is held in the mouth passively or swilled around the mouth by contraction of the perioral muscles and/or movement of the head, and may be gargled, where the head is tilted back and the liquid bubbled at the back of the mouth.

Usually mouthwashes are antiseptic solutions intended to reduce the microbial load in the oral cavity, although other mouthwashes might be given for other reasons such as for their analgesic, anti-inflammatory or anti-fungal action. Additionally, some rinses act as saliva substitutes to neutralize acid and keep the mouth moist in xerostomia (dry mouth). Cosmetic mouthrinses temporarily control or reduce bad breath and leave the mouth with a pleasant taste [6].

Rinsing with water or mouthwash after brushing with a fluoride toothpaste can reduce the availability of salivary fluoride. This can lower the anti-cavity re-mineralization and antibacterial effects of fluoride. Fluoridated mouthwash may mitigate this effect or in high concentrations increase available fluoride. A group of experts discussing post brushing rinsing in 2012 found that although there was clear guidance given in many public health advice publications to "spit, avoid rinsing with water/excessive rinsing with water" [8] they believed there was a limited evidence base for best practice [7].

Common use involves rinsing the mouth with about 20-50

ml (2/3 fl oz) of mouthwash. The wash is typically swished or gargled for about half a minute and then spat out. Most companies suggest not drinking water immediately after using mouthwash. In some brands, the expectorate is stained, so that one can see the bacteria and debris. Mouthwash should not be used immediately after brushing the teeth so as not to wash away the beneficial fluoride residue left from the toothpaste. Similarly, the mouth should not be rinsed out with water after brushing. Patients were told to "spit don't rinse" after toothbrushing as part of a National Health Service campaign in the UK [8].

Gargling is where the head is tilted back, allowing the mouthwash to sit in the back of the mouth while exhaling, causing the liquid to bubble. Gargling is practiced in Japan for perceived prevention of viral infection. One commonly used way is with infusions or tea. In some cultures, gargling is usually done in private, typically in a bathroom at a sink so the liquid can be rinsed away.

The most common use of mouthwash is commercial antiseptics, which are used at home as part of an oral hygiene routine. Examples of commercial mouthwashes companies include Cēpacol, Colgate, Corsodyl, Dentyl pH, Listerine, Odol, Oral-B, Sarakan, Scope, Tantum verde, and Biotene. Mouthwashes combine ingredients to treat a variety of oral conditions. Variations are common, and mouthwash has no standard formulation so its use and recommendation involves concerns about patient safety. Some manufacturers of mouthwash state that antiseptic and anti-plaque mouth rinse kill the bacterial plaque that causes cavities, gingivitis, and bad breath. It is, however, generally agreed that the use of mouthwash does not eliminate the need for both brushing and flossing. The American Dental Association asserts that regular brushing and proper flossing are enough in most cases, in addition to regular dental check-ups, although they approve many mouthwashes. For many patients, however, the mechanical methods could be tedious and time-consuming and additionally some local conditions may render them especially difficult. Chemotherapeutic agents, including mouthrinses, could have a key role as adjuncts to daily home care, preventing and controlling supragingival plaque, gingivitis and oral malodor [9].

Minor and transient side effects of mouthwashes are very common, such as taste disturbance, tooth staining, sensation of a dry mouth, etc. Alcohol-containing mouthwashes may make dry mouth and halitosis worse since it dries out the mouth. Soreness, ulceration and redness may sometimes occur (e.g. aphthous stomatitis, allergic contact stomatitis) if the person is allergic or sensitive to mouthwash ingredients such as preservatives, coloring, flavors and fragrances. Such effects might be reduced or eliminated by diluting the mouthwash with water, using a different mouthwash (e.g. salt water), or foregoing mouthwash entirely.

Prescription mouthwashes are used prior to and after oral surgery procedures such as tooth extraction or to treat the pain associated with mucositis caused by radiation therapy or chemotherapy. They are also prescribed for aphthous ulcers, other oral ulcers, and other mouth pain. Magic mouthwashes are prescription mouthwashes compounded in a pharmacy from a list of ingredients specified by a doctor. Despite a lack of evidence that prescription mouthwashes are more effective in decreasing the pain of oral lesions, many patients and prescribers continue to use them. There has been only one controlled study to evaluate the efficacy of magic mouthwash; it shows no difference in efficacy among the most common formulation and commercial mouthwashes such as chlorhexidine or a saline/baking soda solution. Current guidelines suggest that saline solution is just as effective as magic mouthwash in pain relief or shortening of healing time of oral mucositis from cancer therapies [10].

Chlorhexidine digluconate is a chemical antiseptic and is used in a 0.12–0.2% solution as a mouthwash. However, there is no evidence to support that higher concentrations are more effective in controlling dental plaque and gingivitis. It has anti-plaque action, but also some anti-fungal action. It is especially effective against Gram-negative rods. The proportion of Gram-negative rods increase as gingivitis develops so it is also used to reduce gingivitis. It is sometimes used as an adjunct to prevent dental caries and to treat gingivitis periodontal disease, although it does not penetrate into periodontal pockets well. Chlorhexidine mouthwash alone is unable to prevent plaque, so it is not a substitute for regular toothbrushing and flossing. Instead, chlorhexidine is more effective used as an adjunctive treatment with tooth brushing and flossing. In the short term, if toothbrushing is impossible due to pain, as may occur in primary herpetic gingivostomatitis, chlorhexidine is used as temporary substitute for other oral hygiene measures. It is not suited for use in acute necrotizing ulcerative gingivitis, however. Rinsing with chlorhexidine mouthwash before a tooth extraction reduces the risk of dry socket, a painful condition where the blood clot is lost from an extraction socket and bone is exposed to the oral cavity. Other uses of chlorhexidine mouthwash include prevention of oral candidiasis in immunocompromised persons, treatment of denture-related stomatitis, mucosal ulceration/erosions and oral mucosal lesions, general burning sensation and many other uses [11].

Chlorhexidine has good substantivity (the ability of a mouthwash to bind to hard and soft tissues in the mouth). However, chlorhexidine binds to tannins, meaning that prolonged use in persons who consume coffee, tea or red wine is associated with extrinsic staining (i.e. removable staining) of teeth. Chlorhexidine mouthwash can also cause taste disturbance or alteration. Chlorhexidine is rarely associated with other issues like overgrowth of enterobacteria in persons with leukemia, desquamation and irritation of oral mucosa, salivary gland pain and swelling, and hypersensitivity reactions including anaphylaxis [58]. A randomized clinical trial conducted in Rabat university in Morocco found better results in plaque inhibition when chlorohexidine with alcohol base 0.12% was used, when compared to an alcohol free 0.1% chlorhexidine mouthrinse. Chlorhexidine mouthrinses increase staining score of teeth over a period of time. Hexetidine also has anti-plaque, analgesic, astringent and anti-malodor properties but is considered as an inferior alternative to Chlorhexidine [12].

Mouthwashes are an antiseptic solution which is used to reduce the microbial load in the oral cavity. Mouth rinses have the ability to deliver the therapeutic effect all over the tooth surface including interproximal areas in which even toothpastes are not much effective. Even though, chlorhexidine mouthwash is more effective in plaque control, it cannot be used for long duration because some of its unpleasant side-effects after long duration usage. Evaluation of Short Term Side Effects of Administration of 0.2% and 0.12% Chlorhexidine Mouthwash.

Methodology

The present study was planned in Department of Paediatric & Preventive Dentistry, Buddha Institute of Dental Science and Hospital, Patna, Bihar, India. Total 20 cases of the patients were enrolled in the present study. The 10 cases in Group A patients were administered with the 0.2% chlorhexidine mouthwash. The remaining 10 cases in Group B patients were administered with the receiving 0.12% chlorhexidine mouthwash thorough oral prophylaxis. All the patients were instructed to brush at least 30 minutes before using mouthwash and not to use any other chemical dental hygiene products during the evaluation period. Rinsing with water after the procedure was not allowed.

All the patients were informed consents. The aim and the objective of the present study were conveyed to them. Approval of the institutional ethical committee was taken prior to conduct of this study.

Following was the inclusion and exclusion criteria for the present study.

Inclusion criteria: Patients with age range: 17-29 years, No history of periodontal disease, Presence of at least 20 teeth with no caries or complex restorations, No history of smoking, No history of alcohol consumption.

Exclusion criteria: Patients with the periodontal disease, Patients with history of recurrent aphthous ulcer, History of any systemic disease, Patients with altered taste sensation, Patients on medication affecting the oral microflora, etc.

Results & Discussion

Chlorhexidine mouthwash is the gold standard mouthwash which is good example for chemical mouthwash. It is a cationic polybiguanide. It is basically antibacterial used as an antiseptic and for other applications. A variety of products are available chemical plaque control, which is divided into the first generation (e.g., phenols, quaternary ammonium compounds), second generation (e.g., bisbiguanides-chlorhexidine gluconate [CHXG]), and third generation (e.g., delmopinol) [13]. Chlorhexidine is an important ingredient in mouthwashes to reduce plaques accumulation and bacterial growth. Hence, it is used during the treatments such as gingivitis, periodontitis, trauma, and after wisdom tooth extraction. Mode of action Chlorhexidine is a broad-spectrum biocide effective against Grampositive bacteria, Gram-negative bacteria, and fungi. Depending on its concentration, it has both bacteriostatic (inhibits bacterial growth) and bactericidal (kills bacteria) mechanisms of action. Chlorhexidine kills the microorganism by disrupting the cell membrane [14]. Positively charged chlorhexidine attracted toward negatively charged phospholipids in the cell wall and causes rupture which leads to lysis of cytoplasm and end up in cell death. On application in vitro, chlorhexidine can kill nearly 100% of Gram-positive and Gram-negative bacteria within 30 seconds [15]. It provides immediate bactericidal and prolonged bacteriostatic action due to adsorption onto the pellicle-coated enamel surface [16]. Chlorhexidine is active against Gram-positive, Gram-negative, facultative anaerobes, aerobes, and yeasts [17].

Chlorhexidine is ineffective against poliovirus and adenovirus. Since chlorhexidine formulations can destroy the majority of categories of microbes, there is limited risk for the development of opportunistic infections. In topical applications, chlorhexidine is shown to have the unique ability to bind with the proteins present in human tissues such as skin and mucous membranes with limited systemic or bodily absorption [18]. Protein-bound chlorhexidine releases slowly leading to prolonged activity. This phenomenon is known as substantivity [19] and allows for a longer duration of antimicrobial action against a broad spectrum of bacteria and fungi. In fact, chlorhexidine antimicrobial activity has been documented to last at least 48 hours on the skin [20]. In oral applications, chlorhexidine binds to the mouth tissue, oral mucosa, and teeth. This helps to reduce the bacterial count and prevents dental plaque. It has become the gold standard in dentistry due to its ability to adhere to soft and hard tissue and maintain a potent sustained release [21].

Chlorhexidine has also been applied to medical devices such as dental implants, vascular catheters, needleless connectors and anti-microbial dressings. Chlorhexidine, when applied to or impregnated in medical devices protects against microbial colonization and subsequently biofilm development. The overdose of chlorhexidine may cause nausea, vomiting, feel like drunken, etc. It may also leads to some side effects such as white patches in mouth or lips, ulcers, swelling of salivary glands, irritation, dry mouth, unpleasant taste, decreased sensation due to an allergic reaction to some individuals.

Although chlorhexidine mouthwash has some side effects being a gold standard mouthwash it is effective in maintaining good oral hygiene during gingivitis, periodontitis, traumas [22], oral cyst [23] and after wisdom tooth extraction. It lasts longer in the mouth than other mouthwashes. It is required for healing and regeneration of oral tissues. However, continuous use of products containing chlorhexidine for long periods can cause stains on teeth, tongue and gingiva also on silicate and resin restorations, alter taste sensation, sweeping, xerostomia, ulcers, etc. Hence, it cannot be used for daily prophylactic measures.

Table 1: Demographic Details

Parameters	Group A	Group B
No. of Cases	10	10
Administration of	0.2% chlorhexidine mouthwash	0.12% chlorhexidine mouthwash
Sex: Males Females	 4 6	 5 5
Age	8 – 15 years	10– 16 years

Table 2: Short Term Side Effects

Parameters	Group A	Group B
No. of Cases	10	10
Administration of	0.2% chlorhexidine mouthwash	0.12% chlorhexidine mouthwash
Pain	No pain	No Pain
Burning Sensation: 1st Day 3rd Day 7th Day	 No No 5	 No No 3
Taste disturbance: Mild Severe	 3 2	 2 1
Tooth discoloration:	2	1

Goon *et a*l. [24] reported five cases of allergic contact dermatitis from chlorhexidine, out of which three had positive patch test reactions to chlorhexidine.

A literature review of 66 case reports was done by Heinemann *et al*. [25] Twenty reactions occurred when chlorhexidine was applied to damaged skin surfaces and 27 patients showed an immediate type reaction when chlorhexidine was applied to mucous membranes. Similarly, two cases of mucosal sensitivity to contact with chlorhexidine were reported by Yusof and Khoo [26].

Kenrad [27] also reported major changes in the oral mucosa after an overdose of mouth rinsing with chlorhexidine gluconate, which included a thickening of the mucosa resembling leukoplakia but disappeared when the dose was reduced.

In a case report similar to the present one, anaphylaxis due to topical skin application of chlorhexidine was reported. This was confirmed by skin testing and CAST. Thus, the application of chlorhexidine especially to mucous membranes was discouraged as it could cause anaphylaxis [28].

The most common side effects associated with Chlorhexidine gluconate oral rinses are: 1) an increase in staining of teeth and other oral surfaces; 2) an increase in calculus formation; and 3) an alteration in taste perception. Oral irritation and local allergy-type symptoms have been spontaneously reported as side effects associated with use of Chlorhexidine gluconate rinse. The following oral mucosal side effects were reported during placebo - controlled adult clinical trials: aphthous ulcer, grossly obvious gingivitis, trauma, ulceration, erythema, desquamation, coated tongue, keratinization, geographic tongue, and short frenum. Each occurred at a frequency of less than 1.0%. Among post marketing reports, the most frequently reported oral mucosal symptoms associated with Chlorhexidine gluconate oral rinse are stomatitis, gingivitis, glossitis, ulcer, dry mouth, hypesthesia, glossal edema, and paresthesia. Minor irritation and superficial desquamation of the oral mucosa have been noted in patients using Chlorhexidine gluconate oral rinse. There have been cases of parotid gland swelling and inflammation of the salivary glands (sialadenitis) reported in patients using Chlorhexidine gluconate oral rinse [29].

Conclusion

Chlorhexidine is a germicidal mouthwash that reduces bacteria in the mouth. Chlorhexidine oral rinse is used to treat gingivitis (swelling, redness, bleeding gums). Chlorhexidine is usually prescribed by a dentist. Chlorhexidine oral rinse is not for treating all types of gingivitis. The data generated from the present study concludes that 0.12% Chlorhexidine mouthwash as compared to 0.2% Chlorhexidine mouthwash as an adjunct to non-surgical periodontal therapy. Although Chlorhexidine mouthwash has been proven to be effective in reducing plaque, its use in daily practice is still limited due to its several side effects. The present study evaluated the subject's attitude towards the side effects of chlorhexidine.

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