



The Most Effective Concentration of Chlorhexidine as a Mouthwash- Systematic Review.

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Abstract:

Chlorhexidine is been used for the past 50 years as a mouthwash and is considered as the gold standard both in terms of patient acceptance and substantivity. Over the year's two concentrations namely 0.12% and 0.2% have been used extensively with 0.2% being the concentration of choice in Europe and 0.12% elsewhere including India.

The efficacy of Chlorhexidine at both 0.2 % and 0.12 % was similar therefore using a lower concentration would reduce Chlorhexidine's side effects on taste alteration, localized irritation and stains teeth.

Aim: The aim of our systematic review was to assess the efficacy of different concentration of Chlorhexidine mouthwash by evaluating the effect on plaque and gingival inflammation and on microbial load.

Materials And Methods: A PUBMED search was done using the following keywords "Chlorhexidine Mouthwash", "different concentrations", bleeding, clinical attachment loss, stain, discoloration which yielded 271 articles. On applying the inclusion and exclusion criteria it revealed 4 articles that were suitable for our Systematic review.

Results: Chlorhexidine 0.3% was more efficacious compared to CHX 0.2% for these three parameters - plaque index, taste perception and microbiological analysis. On the other hand no statistically significant difference was found between 0.12% and 0.2% Chlorhexidine.

Conclusion: No statistically significant difference was seen in the efficacy of 0.12% and 0.2% Chlorhexidine mouthwash. But 0.3% Chlorhexidine mouthwash was decidedly better when compared to 0.2%. Therefore more studies should be done to establish this observation on a larger population.

Keywords: Chlorhexidine mouthwash, different concentration, microbial load, gingival inflammation, plaque.

INTRODUCTION:

Chlorhexidine Gluconate is a bis-biguanide which has been in used as an antibacterial agent for the past 60 years since it was introduced by the Imperial Chemical Industries Limited in the early 1960's as a surface and topical disinfectant and anti microbial agent since then and has found its way into medical catheters, as self releasing gels in various devices used in medicine [1].

It is only in the late 1970's (1976) when it was launched as an oral mouthwash after its anti-plaque activity was realized. The antiseptic is the most effective and safest anti-plaque agent to date, and is indicated for use in the general population and in high risk groups of patients[2]. Its efficacy in reducing bacterial load and its negligible or low chances of developing tolerance has made it a truly remarkable agent.

It is active against both Gram-positive and Gram-negative strains as well as fungi. It has both bacteriostatic and bactericidal actions [3], [4]. Chlorhexidine has excellent anti-plaque activity and unique property of Substantivity[5]. So it has wide applications starting from maintaining oral hygiene, pre surgically to post operative and also in physically and mentally handicapped patients. Chlorhexidine is now routinely used by clinicians when they treat patients with fixed appliances in orthodontia and maxillofacial surgeries.

Chlorhexidine is available in the following forms as mouth rinses, soaps, gels, sprays, toothpastes and varnishes of varying strength 0.2%, 0.12%, 0.1% up to 5%. The lower strength has been used as mouth rinses (0.12%, 0.2%, 0.1%) while (2%, 5%) has been used as an endodontic irrigant and surface disinfection.

Periodontal disease is cause of concern because of its potential to cause destruction of the dentition and its over-

all cost to patient. The association of systemic conditions with periodontal disease and their ability to modify and potentiate their effect has received tremendous interest. Even when the disease is diagnosed and treated factors like patient compliance and home care are a matter of concern. The level and type of bacteria in the oral cavity predispose to the recurrence of infection. Long term antibiotic use has been considered but has resulted in resistance and other undesirable side effects.

Since many studies have pointed towards the correlation of efficacy to strength of the Chlorhexidine used, unfortunately higher concentrations have shown correspondingly increase in the side effects namely - staining of teeth and tooth coloured restorations and impairment of taste[6]. Therefore it was decided to find the most efficacious strength of Chlorhexidine used as a mouthwash while minimising the side effects.

AIM:

The aim of our systematic review was to assess the efficacy of different concentration of Chlorhexidine mouthwash by evaluating the effect on plaque and gingival inflammation and on microbial load.

Materials and Methods:

Structured Question:

Is there any difference amongst various concentration of Chlorhexidine mouthwash in terms of decreasing plaque, gingival inflammation, microbial load and causing side effects?

PICO

P: Patient using Chlorhexidine mouthwash.

I: Intervention and C: Comparison: Different concentrations of Chlorhexidine

O: Primary Outcome: decrease in microbial load.

History		Download history Clear history	
Search	Add to builder	Query	Items found Time
#2	Add	Search (((((((((((chlorhexidine) OR CHX) OR chlorhexidine gluconate) OR chlorhexidine di-gluconate) OR periogard) OR peridex) OR rexidine) OR hexidine) AND Randomized Controlled Trial[ptyp] AND Humans[Mesh])) AND (((mouthwash) OR mouthrinse) AND Randomized Controlled Trial[ptyp] AND Humans[Mesh])) AND (((0.12%) OR 0.2%) OR concentration) OR percentage) AND Randomized Controlled Trial[ptyp] AND Humans[Mesh])) AND (((((((((((gingivitis) OR gingival haemorrhage) OR periodontal diseases) OR gingival pocket) OR periodontal pocket) OR gingival bleeding) OR gingival diseases) OR periodontitis) OR gingival bleeding) OR probing depth) OR gingival inflammation) OR bleeding on probing) OR papillary bleeding) OR sulcus bleeding index) OR pocket depth) OR periodontal attachment loss) OR plaque index) OR dental plaque) OR plaque) OR discoloration) OR stain) OR tartar) OR calculus))) AND Randomized Controlled Trial[ptyp] AND Humans[Mesh]))	271 10:33:40

Fig 1: Pubmed search Strategy

Secondary Outcome: Improvement in Periodontal Healing in terms of reduction in Probing Pocket Depth, Gain in Clinical Attachment Level and decrease in plaque and gingival inflammation, stains and Taste alteration.

Inclusion Criteria:

1. Randomized Controlled Trials.
2. Human Clinical Trials where effectiveness of 2 or more concentrations of Chlorhexidine mouthwash were compared in terms of Clinical and Microbiological parameters.

Exclusion Criteria:

1. Sample Size less than 10.
2. Studies without Statistical Analysis.
3. Studies where Chlorhexidine has been combined with any other agent except alcohol.

Search Methodology:

Electronic search was done using PUBMED in the English language [Fig 1] applying the inclusion and exclusion criteria [Fig 2].

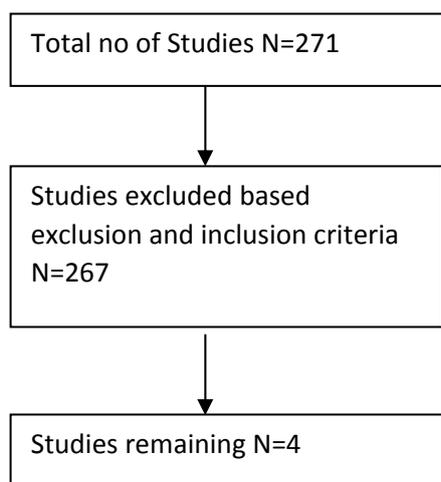


Fig2: Flowchart for selecting studies for this systematic review.

RESULTS:

A total of 4 studies were included in our systematic review subject to our inclusion and exclusion criteria. In three studies 0.12% was compared with 0.2% Chlorhexidine Mouthwash and in the fourth 0.2% was compared with 0.3% [5], [7]–[9].

These revealed no difference in the 2 parameters - Taste Perception and Plaque in three studies where 0.12% was compared with 0.2% Chlorhexidine Mouthwash.

In terms of Microbial Load there was a small difference between the 2 concentrations only in the last study i.e., The Effect of some Chlorhexidine containing mouthwash on salivary bacterial count while the other 2 studies showed no significant difference for this parameter as well.

The prevalent belief is that if there is no difference in the efficiency and efficacy of a medicament then the lower dosage should be considered.

On the other hand in the solitary study done comparing 0.3% with 0.2% Chlorhexidine Mouthwash revealed that in terms of Plaque, Taste Perception and Microbial Load both Total as well as Specific (A actinomycetemcomitans – both strains 652 and JP₂, P gingivalis, P intermedia, T forsythia) 0.3% was significantly better than 0.2%.

DISCUSSION:

Chlorhexidine is a bis-biguanide antiseptic. It is active against both Gram-positive and Gram-negative strains as well as fungi. It has both bacteriostatic and bactericidal actions. Chlorhexidine has excellent anti-plaque activity and unique property of Substantivity[6].

Periodontal disease is cause of concern because of its potential to cause destruction of the dentition and its overall cost to patient. The association of systemic conditions with periodontal disease and their ability to modify and potentiate their effect has received tremendous interest.

Long term antibiotic use has been considered but has resulted in resistance and other undesirable side effects. The advent of antibacterial like bis-biguanide-have therefore been considered a boon in maintaining optimum levels of oral hygiene.

S.no	Title	Design	Subject, Gender, Age	Intervention	Control	Outcome of the study
1	A preliminary comparison of the effect of 0.3% versus 0.2% chlorhexidine mouth rinse on de novo plaque formation-A Pilloni	RCT	20 subjects, 19-25years	0.3% CHX	0.2% CHX	0.3% better than 0.2% Plaque Index 0.3% better than 0.2% Total bacterial count 0.3% better than 0.2% specific bacterial count Pg, Pi, Aa ₆₅₂ , Aa ₁₁₂ , Tf 0.3% better than 0.2% Taste Perception
2	Comparison of two commercially available Chlorhexidine Mouthwashes	RCT	80 subjects 40 males -40 females	0.12%	0.2%	0.12% and 0.2%- no difference-Plaque Index 0.12% and 0.2%- no difference-Taste Perception 0.12% and 0.2%- no difference-Total bacterial count
3	Effect of different chlorhexidine formulations in mouthrinses on de novo plaque formation	RCT	10 subjects 5 males -5 females	0.12%	0.2%	0.12% and 0.2%- no difference-Plaque Index 0.12% and 0.2%- no difference-Taste Perception 0.12% and 0.2%- no difference-Total bacterial count
4	The effect of some Chlorhexidine-containing Mouthwash on salivary Bacterial count	RCT	16 subjects 7 males -9 females	0.12%	0.2%	0.12% and 0.2%- no difference-Plaque Index 0.12% and 0.2%- no difference-Taste Perception 0.12% and 0.2%- small difference-Total bacterial count

Fig 3: Results

Chlorhexidine has been used as a mouthwash for over 40 years now and has been an antibacterial agent of choice in control of both the quantity of bacterial colonies and formation of plaque. It has been an agent of choice for its effectiveness as well as low scope of resistance.

Chlorhexidine has been regarded as a “gold” standard in chemical plaque control for over 45 years in dentistry for the prevention of plaque and gingivitis. Large reductions were found in plaque formation using Chlorhexidine Gluconate, applied topically or as a mouth rinse[1].

It has been observed that while efficacy is directly proportional to the concentration it increases side effect. These include staining of tooth as well as restorations and alteration in taste sensation. Considering this, if the difference in efficacy is small vis-à-vis its side effects it would be prudent to use a lower concentration[5].

Therefore we have undertaken this study to find the most efficacious strength of Chlorhexidine Mouthwash.

The search was limited to an online only strategy on PubMed. The following queries were entered: Chlorhexidine Gluconate, Chlorhexidine digluconate, chlorhexidine,

CHX, periogard, Peridex, hexidine, rexidine, mouthwash mouthrinse, 0.12%, 0.2%, concentration, percentage, gingivitis, periodontitis, gingival bleeding, gingival disease, periodontal disease, gingival pocket, periodontal pocket, bleeding on probing, papillary bleeding, sulcular bleeding, probing depth, attachment loss, plaque index, dental plaque, gingival inflammation, discoloration, tartar, calculus, stains, plaque, randomized controlled trial and human trial.

These yielded 271 articles out of 4 were considered for the purpose of our study on applying the inclusion and exclusion criteria[5], [7]–[9].

The results of this review show that a CHX mouth rinse is effective in controlling plaque, as established by the Plaque Index according to Silness & Loe (1964) and Quigley & Hein(1962). CHX is also effective in controlling gingivitis, as established by the Gingival Index (Loe & Silness 1963). A number of commercially prepared CHX mouthrinses are now available at concentrations of 0.12%,

0.1%, 0.05% and 0.06%, being lower than the more commonly used 0.2% in Europe and India.

Systematic review yielded no significant difference between 0.2% and 0.12% in terms of Plaque Index, Taste or Periodontal pathogens.

It was suggested that 0.3% Chlorhexidine used twice daily for 15 seconds was effective in reducing gingivitis, improve Plaque Index, decrease load of periodontal pathogen and affected taste less.

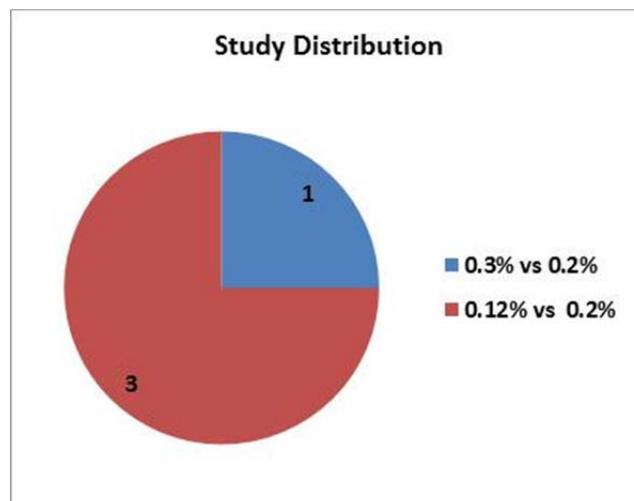


Fig 4: Graph with Study Distribution

CONCLUSION:

We conclude that the effectiveness of this agent is dose dependent. In a review on CHX effectiveness[5], it is reported a small but significant difference in favour of plaque inhibition from CHX 0.2% comparing to CHX 0.12% though this did not get reflected in our review.

One study reported statistically better results of CHX 0.3% compared to CHX 0.2% regarding plaque index, taste perception and microbiological analysis as well, although being preliminary results only, further studies and a cost/benefit evaluation are suggested to finally include the use of CHX 0.3% mouth rinse in the everyday treatment protocol.

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