"Effectiveness of Alum and Chlorhexidine Mouth rinses on Oral hygiene of School Children aged 13-15 yrs: A Comparative In Vivo study"

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Abstract

Objectives: The study aimed to determine the efficacy of 0.02 Molar solution of Alum and positive control Chlorhexidine mouth rinse of 0.2% in reducing debris and calculus.

Materials and Methods: A Double blind Randomized clinical trial was conducted among school children of two Govt. school; 0.02 Molar solution of Alum was given to one govt. school children and 0.2% of Chlorhexidine mouth rinse children was given to another govt. school. Oral hygiene status was assessed at baseline, 1 month and 2 month using Simplified Oral hygiene Index (OHI-S).

Results: 70 school children in each group completed the study with mean baseline oral hygiene score for Alum group and chlorhexidine group was 4.4093 and 4.4631. After 1 months the oral hygiene score for both the group was 3.137 and 3.0779. Similarly After 2 months the oral hygiene score for both the group was 2.6786 and 2.6312 respectively, representing an improvement in the oral hygiene of school children (P< 0.05).

Conclusion: The Present study showed equal reduction in debris score and calculus score in both Alum group as well as Chlorhexidine group.

Keywords: Alum, Chlorhexidine, Plaque Index, Gingival index,(OHI-S).

Introduction

In South East Asian countries a significant percentage of adolescents are having poor oral hygiene and betel nut chewing habit. Both of which have serious public health consequences.[1]

Oral disease still remains one of the most commonly occurring oral health problems in the children, all over the globe. Dental caries has significant impact on general health of children and on social and economic well-being of the community (Sheiham 2008).[2]

Various mechanical and chemical plaque control measures like tooth brush, dentifrices, mouth rinse and dental floss are being used in our day today life for plaque control measures, but this has proven inadequate, thereby research efforts have focused on chemotherapeutic agents.[3]

The first reference credited for mouth rinse as a formal practice to Chinese medicine about 2700 BC for the treatment of gum disease. Mouth rinse as an adjunct to mechanical cleaning became popular with the upper class in Roman period, Pliny recommending salty water as the mouth rinse, Hippocrates advocated mouth rinse with a mixture of Alum, salt and vinegar.[4]

The micro-organism on tooth surface is an important etiological factor in most common oral disease like dental caries, gingivitis and destructive periodontal disease.[4]

Many mouth rinses are used as an adjunct to regular oral hygiene practices such as chlorhexidine gluconate, Listerine, Cetyl pyridium chloride, hydrogen peroxide, benzoic acid, methyl parabene etc.

Chlorhexidine mouth rinse is considered to be the gold standard in prevention of plaque formation and development of gingivitis.[5] But in the long term usage product it has some side effects such as extrinsic tooth staining, poor taste, tooth discoloration, sensitivity, change in taste, pain and Irritation because of alcohol content. These side effects led to the search of new alternative.

Alum has been used since Roman times for the purification of water. Alum has been used as adjuvant to vaccine to enhance immune response. They are used as astringent to prevent bleeding from small cut.

Alum is a specific compound containing hydrated potassium aluminum sulfate. They are soluble in water and have sweetish taste. It fuses at 92^0 C (198^0 F) in its own water of crystallization.

Alum has been widely used for its astringent properties and has been recommended by the FDA over counter advisory panel category – I. Active ingredient in mouth rinse.[6]

A recent study also reported on efficacy of daily Alum rinse (0.02M) in reducing salivary streptococcus mutans. Alum concentration of 0.08 M inhibited phosphorylytic activity of several enzymes present in human plaque.[7]

Thus, keeping in mind the potential antimicrobial effect of Alum solution, this study was aimed to assess the effect of 0.02 Molar solution of Alum and 0.2% of Chlorhexidine as a supplement to regular oral hygiene

measures on the debris and calculus among school children.

Material and Methods

Study design: A Randomized controlled double blind clinical trial was done among 2 government school children to compare 0.02 Molar solution of Alum mouth rinse to positive control 0.2% of chlorhexidine for two months duration.

The study received Ethical approval from the institutional ethical board committee. The school children reported to the clinical study were screened by the dental examiner based on Inclusion and Exclusion criteria.

Inclusion criteria

- They should have a minimum of 20 sound teeth
- Good general health / good periodontal health
- School children with age group between 13-15 years
- Debris and calculus score of > 2.0 using Simplified oral hygiene index(OHI-S)

Exclusion criteria

- Orthodontic appliance or one or more incisor with prosthetic crown.
- Required immediate health care/ destructive periodontal disease
- Undergone antibiotic, steroid therapy or any anti-inflammatory drugs in the preceding month.
- History of allergies to dental products or their ingredients.
- Oral prophylaxis in the preceding month or periodontal therapy in the preceding 3 months.

To prevent ''Hawthorne effect'' two government school were selected which is far away from each other, so that school children will not exchange their mouth rinses.

The first 120 school children of 13-15 years were selected for the study based on inclusion and exclusion criteria and inform consent was taken from the subjects, and the school children were selected based on randomization and were divided into 2 groups with 60 school children in each group. To reduce the attrition problem an addition of 10 subjects will be enrolled in each group so the total sample size was 140.

Baseline examination of all the study subjects was done by a single investigator under natural light.

The Index used to measure debris and calculus status of the subject was done using Simplified Oral hygiene Index (OHI-S).

After obtaining base line data, mouth rinse containing 0.02 M Alum was distributed to one government school children and 0.2% of Chlorhexidine was distributed to another government school children. The instruction was given to the study subjects to use the mouth rinse i.e. 5 ml of mouth rinse, twice daily for 60 days. During the study the participants were informed not to use any other mouth rinses and not to visit any other dentist for treatment which interferes the study results.

The subjects were re-assessed after 1 month and 2 months interval, to check any adverse effect present after the use of mouth rinse were excluded from the study, followed by assessment of debris and calculus status using Simplified Oral hygiene Index (OHI-S).

Statistical analysis

The data was entered into the computer (MS – Office 2007) Excel sheet, the data was subjected to statistical analysis using statistical package (SPSS version 20.0), and the statistical test used was Chi square test and Independent Sample t- test.

Results

A total of 140 school children were included in the study and were randomly allocated into 2 groups with 70 in each group. The study subjects were followed for a period of 2 months.

A total of 130 study subjects were available for the follow up. The number of drop outs in the Alum group was four (5.71%), and in chlorhexidine group was two (2.85%). Two drop out in Alum group was due to transfer of work into other areas and 2 subjects were excluded in the chlorhexidine group as they had side effect of metallic taste after the use (Table 1). The subjects who completed the follow up were included in the study for final analysis.

Table 1: Drop outs from baseline to 2 months duration

Study group	Oral health regime	Subjects at the start of the study	Time of the study in month	Subjects at end of the study	Drop outs
Group 1	Alum	70	2	66	4
Group 2	CHX	70	2	68	2
Total		140	2	134	6

Table 2: (OHI-S) Score of Alum and Chlorhexidine from baseline to 1 month and 2 month

Mouth rinse	Mean	Standard deviation	P value
Alum			
Baseline to 1 month (OHI-S) Scores	4.4093 3.137	0.56128 0.45307	0.000*
Baseline to 2 month (OHI-S) Scores	4.4093 2.6786	0.56128 0.4183	0.000*
1month to 2 month (OHI-S) Scores	3.137 2.6786	0.4530 0.4183	0.510
Chlorhexidine			
Baseline to 1 month (OHI-S) Scores	4.4631 3.0779	0.4364 0.4334	0.000*
Baseline to 2 month (OHI-S) Scores	4.4631 2.6312	0.4364 0.5022	0.000*
1month to 2 month	3.0779 0.4334		0.084

(OHI-S) Scores	2.6312	0.5022	

(P< 0.05)

Table 2: Shows reduction in the mean (OHI-S) scores which was statistically significant (P< 0.05) from baseline to 1 month and from baseline to 2 month. Similarly, for chlorhexidine group also there was the reduction in the mean (OHI-S) scores from baseline to 1 month and from baseline to 2 month interval which was statistically significant (P< 0.05).

Graph 1: (OHI-S) Scores of Alum and Chlorhexidine from baseline to 1 month and 2 month
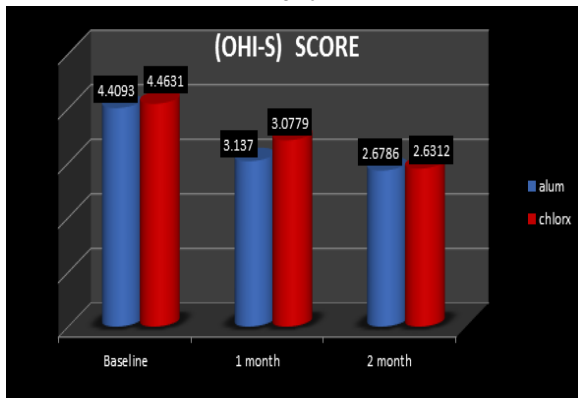
Table 3: Shows Inter group comparison between Alum and Chlorhexidine mouth rinse shows reduction in the mean (OHI-S) score which was statistically significant (P< 0.05) from baseline to 1 month and from baseline to 2 months

Duration	Mean (OHI-S) score of Alum	Mean (OHI-S) score of Chlorhexidine	P value
Baseline	4.4093	4.4631	0.764
1 Month	3.1370	3.0779	0.0000*
2 Month	2.6786	2.6312	0.0000*

(P< 0.05).

Discussion

Periodontal disease has been incorporated with a complex micro biota and its development seems to be an outcome of specific infection. G +VE bacteria are associated with periodontal health, whereas G –VE rods are associated with periodontal disease.[8]

The WHO has recently published oral disease such as Dental caries, periodontal disease, tooth loss, Oral mucosal lesion; Oro pharyngeal cancer, HIV/AIDS related oral disease and Oro dental trauma are the major public health problem worldwide. Furthermore oral disease restricts activities at schools, at work and at home causing million of working hours to be lost each year throughout the world. Gingival bleeding is highly prevalent among adult population in all regions of the world, with deep pockets (> 6mm) affects 10% of the adult population.[8]

Traditionally mechanical method of tooth brushing proves to be inadequate. So the research has focused on chemotherapeutic agents for reducing or preventing plaque induced dental disease and periodontal disease. Recently special attention has been on natural medication including Propolis, Alum and various plant extracts.[9]

Putt MS et. al, compared the effect of aqueous solution of 0.02 M Alum with 15% sucrose solution on plaque and gingivitis. The result showed greater inhibition in the plaque score in Alum mouth rinse group from baseline to 1 week and 2 week.[4] This was similar to the present study which was done to determine the effectiveness of 0.02 M Alum mouth rinse and the positive control 0.2% of chlorhexidine mouth rinse on oral hygiene status of school children.

The result of the present study among 2 groups showed statistically significant reduction (P< 0.05) in the mean debris and calculus scores using (OHI-S) index from baseline to one month and from baseline to 2 month in Alum mouth rinse group and even in Chlorhexidine mouth rinse. Although, there was a slight reduction in the mean debris and calculu score in both the group from 1 month to 2 month respectively.

Similar Study was conducted on clinical trial on Alum mouth rinse and saturated saline where the subjects mean age was 11 years as they were entering a period of high caries activity with permanent teeth erupting. Results showed that there was an absolute reduction in the streptococcus mutans count when compared to control group, which was similar to the present study where some study subjects selected were having periodontal disease. by Rupesh S et.al.[3]

White GE et. al, compared the efficiency of scrapping the tongue, saturated saline and Listerine in reducing streptococcus mutans level, and they found that Alum group had significant reduction in streptococcus mutans level.[10]

Studies conducted by Jawad K et. al, by employing mechanical and chemical anti plaque approach, showed that increase in the concentration of Alum solution increases the salt solution concentration thereby there strong antibacterial effect as compared to the low concentration of alum.[11] The results of the studies discussed came in harmony with the fact that employs both mechanical and chemical anti plaque approach, with increase in the concentration of Alum have strong anti-bacterial effect than low concentration.[11]

Studies carried out by Hussain et.al, found an improvement in the plaque index, gingival index and on periodontal health in patient treated with the conventional root planning with alum irrigation intra pocket irrigation, in comparison with the conventional root planning alone was found to be statistically significant.[12]

A direct comparison of equimolar solutions of $AlCl_2$, $SnCl_2$ and $ZnCl_2$ resulted in similar plaque reductions for all three salts. Skorland et. al.[13]

The result of the present study showed a clinically significant effect that enhanced the benefit of daily tooth brush. But there was a side effect in Chlorhexidine group i.e. 2.85% of subjects had side effect of metallic taste after the use of Chlorhexidine mouth rinse. The mechanism of action of Alum mouth rinse in reducing the plaque and the gingival score was attributed due to increase in the activity in inhibiting phosphorylytic reaction in the human plaque during glycolysis process. Thereby there was reduction in the microbial count in the plaque.

The main intention of the study was addition of 0.02 molar solution of alum mouth rinse topically reduces the plaque and gingivitis as compared to chlorhexidine mouth rinse.

From the results there was a significant reduction in the debris and calculus scores in simplified oral hygiene index in both Alum mouth rinse group as well as chlorhexidine group. The data of the present study clearly showed that the addition to tooth brushing, mouth rinsing with 0.02 M solution of Alum mouth rinse was effective in improvement in oral hygiene of children.

Conclusion

Alum mouth rinse can be used as an adjunct to chlorhexidine mouth rinse for regular oral hygiene practices as it showed equal reduction in plaque and gingival inflammation with no adverse effects.

Further studies have to be done to check the substantiality of long term effect with the larger sample size.

Conflict of interest: There is no conflict to declare

Funding: None to declare

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