

The Effect of New Formula (Nut Meg Extract) As A Mouth Wash Compared With Chlorhexidine Mouth Wash

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ABSTRACT

Aims: To compare the anti-plaque and anti-inflammatory effects of new mouth rinse (nut meg) to the conventional chlorhexidine anti-inflammatory and anti-plaque effects (*in vivo* study). **Materials and Methods:** Sixteen dental students in the final year participated in this study (2 females and 14 males) aged 22–23 years (mean 22.5 years). A double blind study was carried out by measuring plaque index, modified gingival index and bleeding index pre-treatment and post-treatment with the two mouth rinses (nut meg and chlorhexidine). The same volunteers were participated in the two test periods and each period lasted 5 days with a wash out twice daily. Deterioration rate for each parameter was derived and used as a unit of analysis. **Results:** The new mouth rinse (nut meg extract) had a significant anti-plaque and anti-inflammatory effects (measured by reduction in bleeding index), which was nearly equivalent to the anti-plaque and anti-inflammatory effects of chlorhexidine. No significant difference was noticed between post-treatment group ($p > 0.05$) of the two mouth rinses regarding plaque and bleeding indices. **Conclusion:** The nut meg extract mouth rinse had anti-inflammatory effect which encourage its use in dentistry as a new mouth rinse for the treatment of gingivitis.

Key Words: Nut meg, herbal extract, anti-inflammatory effect.

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INTRODUCTION

Dental plaque, which is the soft deposits that forms as a biofilm adhering to the tooth surface or other hard surfaces,⁽¹⁾ induces an inflammatory response in associated gingival tissues.⁽²⁾ Therefore, if dental plaque formation can be minimized, gingivitis could be controlled and possibly eliminated.⁽³⁾

The maintenance of proper standards of plaque control over time by mechanical means (tooth brushing and flossing) is extremely difficult and time-consuming.⁽⁴⁾ Therefore, anti-microbial agents have been incorporated into mouth rinses for use as adjunct to traditional cleaning procedure.⁽⁵⁾

The plaque inhibiting effect of chlor-

hexidine is well documented since its introduction as a chemical anti-plaque agent in 1970. When used twice daily as a mouth rinse, it almost inhibits plaque growth.⁽⁶⁾ But chlorhexidine has some unpleasant side effects restricting its general use such as its bitter taste, staining of teeth and sometimes sloughing of the oral mucosa.⁽⁷⁾

In order to overcome such side effects, the World Health Organization (WHO) started to advise researchers to investigate the possible use of natural sources such as herbal extract.⁽³⁾

Nut meg (*Myristica fragrans*), whose seed is widely used as a spice to flavour many kinds of food,⁽⁸⁾ in alternative medicine has reported to have anti-fungal and anti-inflammatory properties mainly due

to inhibition of prostaglandin synthesis.⁽⁹⁾ It has also been reported to have anti-oxidant activities due to the presence of flavonoid which is a potent anti-oxidant against superoxide radicals.^(10, 11)

Nut meg yields 5–15% of volatile oils which contain among their constituent eugenol that inhibits lipid peroxidation and maintains activities of enzymes like superoxide dismutase.⁽¹²⁾

Myristica fragrans has anti-microbial activity by inhibiting the thromboxane synthesis.⁽¹³⁾ The analgesic property of nut meg has also been reported mainly due to the active components, eugenol and isoeugenol.⁽¹⁴⁾

The present study aimed to compare the anti-plaque and anti-inflammatory effects of nut meg mouth rinse to a conventional chlorhexidine mouth rinse (*in vivo* study).

MATERIALS AND METHODS

1) Volunteer Selection

A total of 16 dental students (in the final year) were from College of Dentistry, University of Mosul volunteered to participate in this study (2 females and 14 males) with age ranged between 22–23 years.

The selected volunteers have at least 20 scorable teeth with good alignment and good gingival condition (no gingival enlargement or probing depths > 4 mm affecting more than two teeth or overt caries). No volunteer wore orthodontic appliances or removable dentures.

Volunteers with long term medication, recent intake of systemic antibiotics and systemic diseases were excluded from this study. Non of the volunteers showed pathological changes of the oral mucosa.⁽¹⁵⁾

The nature of the trial was explained to each volunteer verbally by the examining clinician during a preparation period of 2 weeks (the pre-experimental hygiene phase of the study). The volunteers were received repeated detailed instructions in self performed plaque control to ensure optimal plaque control during this period. They were also given dental floss and instructions on proper use of it. Oral prophylaxis to remove all plaque, calculus and extrinsic tooth stain were done for indi-

cated volunteers.

At the beginning of the experimental period, the individuals had to attain a baseline gingivitis of $\leq 25\%$ sites bleeding on probing. The same volunteers participated in the two test periods and each period lasted 5 days from Sunday to Thursday. Wash out period of two days was allowed between the two different experimental mouth wash periods; during it, the volunteers were instructed to resume the previous mechanical plaque control.

The volunteers were suspended all oral hygiene practices during the test periods. Instead, they were asked to rinse in a randomly crossed over double blind sequence with the following mouth washes:

The chlorhexidine digluconate 0.12% aqueous solution (positive control) with the instruction of rinsing twice daily with 10 ml volume used for one minute.

2) Preparation of Nut Meg Extract

The test solution of nut meg was prepared by mixing 20 gm of nut meg oil with one liter of 70% ethyl alcohol. The solution was mixed until completely became soluble. The oil of nut meg material prepared in this study by pressing 5 KN of 100 gm of dry nut meg plant to obtain 6.2 gm of oil plant.⁽¹⁶⁾

3) Procedure

The duration of each rinse being one minute. At the beginning and at the end of each test period the volunteers were exposed to a new clinical examination in which the presence and amount of plaque was examined and scored by the use of plaque index system.⁽¹⁷⁾

The inclusion criteria also involved gingival condition that assessed visually using modified gingival index,⁽¹⁸⁾ record from gingiva of each tooth except the wisdom teeth. In addition to that, gingival bleeding was assessed using National Institute of Dental and Craniofacial Research (NIDCR) protocol for the assessment of gingival bleeding as the facial and mesofacial sites of teeth in two randomly selected quadrants: One maxillary and one mandibular were evaluated for bleeding by using periodontal probe after drying the quadrant of teeth with air. Then, started with the most posterior teeth in the quad-

rant (excluding the third molar), the probe placed into the sulcus at the facial site and carefully sweeps the probe into the mesial interproximal area.⁽¹⁹⁾

The same dentist performed all of the examination. The chlorhexidine mouth rinses were supplied from Maleh Chemical Product (MKP) and both rinses were supplied in the manufacturer's bottles but the product labeling was masked with study labels.

After the test period, the volunteers were asked about their feeling of taste and other side effects of rinsing solution.

The data obtained from this study were subjected to statistical analysis including descriptive and analytical methods.

For descriptive way, percentage and frequency were used, while Student's t-test was used for paired samples (intra-

group comparison) and for (inter-group) matching of the group with a 5% level of significance.

RESULTS

A total of 16 dental students, 2 females and 14 males, aged between 22–23 years (mean 22.5 years) satisfactorily completed the study. There were no missing data points (the number of teeth surfaces included were 112 surfaces).

The average total mouth, upper and lower arches and buccal and lingual plaque indices had been recorded for both mouth rinses with average mean from 0.806–1.132 for chlorhexidine mouth rinse group, and from 0.751–1.161 for nut meg mouth rinse group. There was no significant difference between pre-treatment groups of two mouth rinses ($p > 0.05$) (Table 1 and Figure 1).

Table (1): Mean and standard deviation of plaque index for the whole mouth for the two mouth rinse treatment groups

Mouth Rinse	Mean Plaque Index \pm SD		t-test	p-value
	Total Pre-treatment	Total Post-treatment		
Chlorhexidine	0.806 \pm 0.314	1.132 \pm 0.343	-2.80	0.009, S
Nut Meg	0.751 \pm 0.411	1.161 \pm 0.246	-3.37	0.002, S
t-test	-0.43	-0.27	S: Significant difference	
p-value	0.670, NS	0.788, NS	NS: No significant difference	

SD: Standard deviation.

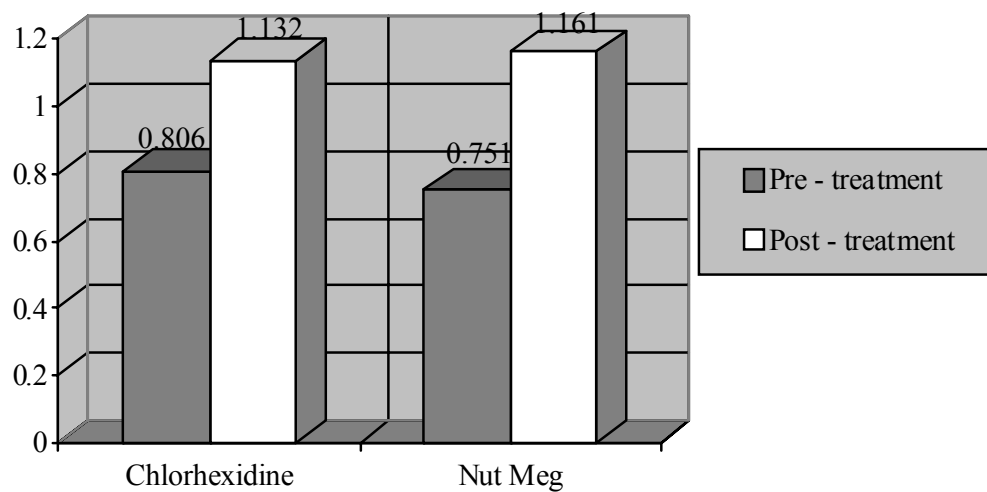


Figure (1): Mean plaque index for the two mouth rinses

The two mouth rinses showed highly significant difference ($p \leq 0.05$) (for chlorhexidine, $p= 0.009$; for nut meg, $p= 0.002$) in reducing plaque indices for the treatment groups, but there was no significant difference ($p= 0.788$) between the two mouth rinses on post-treatment groups.

Also, the average modified gingival

index for each treatment group was recorded, with an average mean ranged from 0.843–0.826 for nut meg mouth rinse group and from 1.113–1.441 for chlorhexidine mouth rinse group. Also, there was no significant difference between the pre-treatment groups of both mouth rinses ($p > 0.05$) (Table 2 and Figure 2).

Table (2): Mean and standard deviation of modified gingival index for the whole mouth for the two mouth rinse treatment groups

Mouth Rinse	Mean Modified Gingival Index \pm SD		t-test	p-value
	Total Pre-treatment	Total Post-treatment		
Chlorhexidine	1.113 \pm 0.382	1.441 \pm 0.169	-3.13	0.004, S
Nut Meg	0.843 \pm 0.465	0.826 \pm 0.448	0.10	0.917, NS
t-test	-1.798	5.14	S: Significant difference	
p-value	0.082, NS	0.000, S	NS: No significant difference	

SD: Standard deviation.

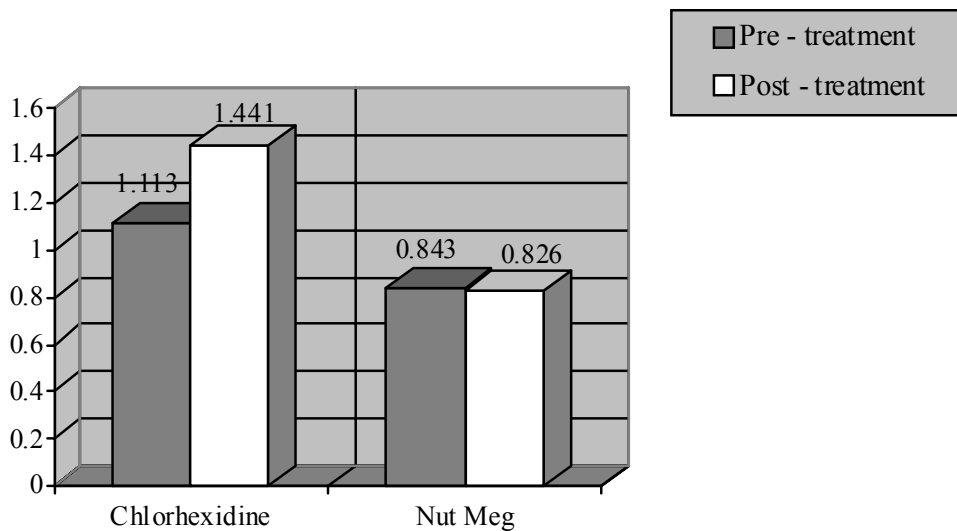


Figure (2): Mean modified gingival index for the two mouth rinses

The chlorhexidine mouth rinse showed significant difference ($p= 0.004$) in reducing modified gingival index in the treatment group comparing with nut meg mouth rinse, which had no significant difference ($p= 0.917$) on modified gingival index in the treatment groups. So, there was a highly significant difference ($p= 0.000$) in post-treatment effect on modified gingival index between the two mouth

rinses.

The improvement in bleeding index for the treatment group between the two mouth rinses had been shown with average bleeding index range from 0–10 for nut meg group and from 1–13 for chlorhexidine group. There was no significant difference between the pre-treatment groups ($p > 0.05$) (Table 3 and Figure 3).

Table (3): Average and standard deviation of bleeding index for the whole mouth for the two mouth rinse treatment groups

Mouth Rinse	Average Bleeding Index \pm SD		t-test	p-value
	Total Pre-treatment	Total Post-treatment		
Chlorhexidine	6.47 \pm 3.80	5.53 \pm 4.39	0.62	0.538, NS
Nut Meg	6.19 \pm 4.20	3.38 \pm 2.73	2.25	0.032, S
t-test	0.086	-1.574	S: Significant difference	
p-value	0.932, NS	0.126, NS	NS: No significant difference	

SD: Standard deviation.

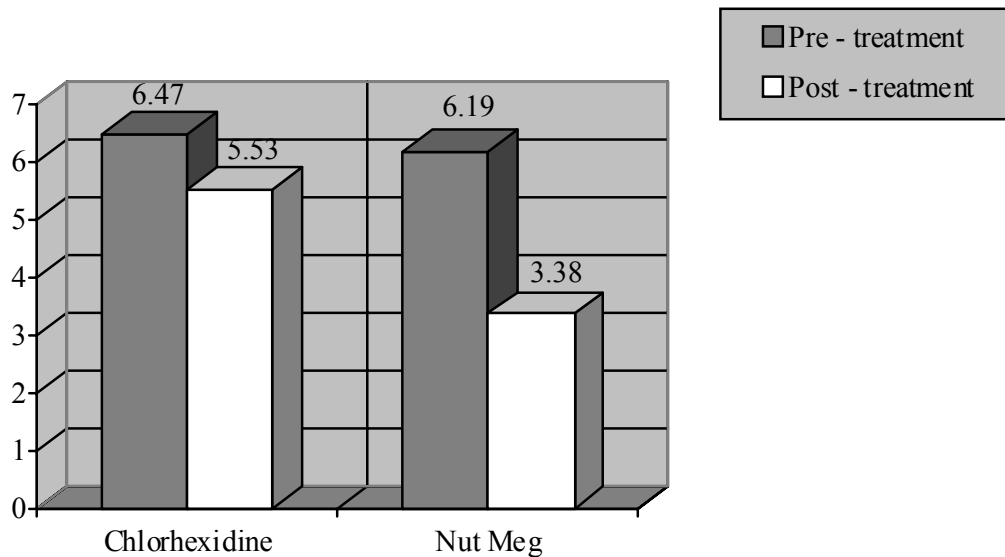


Figure (3): Mean bleeding index for the two mouth rinses

The results revealed that chlorhexidine mouth rinse showed no significant difference between pre- and post- treatment groups ($p= 0.538$) compared with nut meg which showed significant differences between pre- and post- treatment groups ($p= 0.032$). However, there was no signifi-

cant difference ($p= 0.126$) between post-treatment groups of the two mouth rinses.

The percentage of reduction in total increase in plaque index, modified gingival index and bleeding index for both mouth rinses with their mean of reduction were shown in Table (4).

Table (4): The percentage of reduction in plaque index, modified gingival index and bleeding index (with mean) for both mouth rinses

Mouth Rinse	Percentage of Reduction (Mean)		
	Plaque Index	Modified Gingival Index	Bleeding Index
Chlorhexidine	93 (0.34)	81 (0.41)	31.2 (5.4)
Nut Meg	88 (0.49)	43 (0.41)	6 (1)

The adverse effects associated with the use of new mouth rinse (nut meg) were shown in Table (5). About 10 patients ac-

commodated burning sensation which lasted approximately 30 seconds after 2-3 days.

Table (5): The adverse effect of nut meg mouth rinse with number of patients affected

Side Effects	Total Number of Patients N= 16*
Burning Sensation	15
Bad Taste	8
Desquamation	1

*N: Total number of patients in this group.

DISCUSSION

The clinical trial as designed to test the anti-plaque and anti-inflammatory effects of newly formulated mouth rinse based on 3 different parameters: Plaque scores and gingival bleeding level as the primary outcome and with modified gingival index as secondary outcome variables. The analyses were based on deterioration rate for each parameter calculated using the baseline and exist scores for each parameter.

The regular home care by the patient in addition to professional removal of plaque generally ensures adequate plaque and gingivitis control in healthy adults. It has been estimated, however, that even in the developing countries, only minor part of population can be expected to practice adequate mechanical plaque removal.^(20, 21) Therefore, the application of anti-microbial mouth rinse is useful adjunct to mechanical oral hygiene procedure.

The present study revealed the expected result that chlorhexidine had a considerable efficacy against the accumulation of plaque on clean tooth surface, appear to be derived from the persistence action of this dicationic antiseptic often termed substantivity.⁽²²⁾

In turn, plaque inhibitory action is dependent on several factors, including dose and duration of rinsing which has already been proved by Claydon *et al.*⁽²³⁾

According to this study, the new mouth rinse (nut meg) have been proved to have anti-plaque effect which is detected by reduction in the percentage of plaque accumulation (88%). This is probably due to the fact that *Myristica aetheroleum* has anti-microbial activity.⁽¹³⁾

This study also showed that there is no significant difference ($p= 0.788$) between anti-plaque effect of the two mouth rinses so this proves that nut meg rinse is

effective as chlorhexidine as mouth rinse in reducing plaque accumulation, taking in consideration that there was no significant difference between the pre-treatment plaque score.

According to this study, chlorhexidine mouth rinse had a significant effect in reducing modified gingival index, which was in agreement with the study of Yates *et al.*⁽²⁴⁾ compared with the new rinse (nut meg) which have no significant effect on modified gingival index, in consideration that there was no significant difference between pre-treatment modified gingival index score between the two groups. This is probably due to the fact that modified gingival index is a subjective index based on tissue colour or estimated degree of swelling which could be largely variable according to examining subject and objective measures such as extent of gingival bleeding on probing or the amount of cervical fluid flow should be made.⁽²⁵⁾

The result also demonstrated that chlorhexidine mouth rinse have no significant effect ($p > 0.05$) in reducing bleeding index which was agreed with the study of Al-Ani,⁽²⁶⁾ but disagreed with the study of Yates *et al.*⁽²⁴⁾ Also, the new mouth rinse reduce bleeding index in a significant level ($p \leq 0.05$). There was no significant difference between pre-treatment bleeding index of the two mouth rinses. This reduction in bleeding index was nearly equivalent with the reduction in plaque index of the two mouth rinses, suggesting a correlation between these reductions.

Fine *et al.*⁽²⁷⁾ observed both a significant reduction in plaque accumulation and gingival inflammation following irrigation with anti-microbial mouth rinse. This was in agreement with the present study.

A particular component of the tested nut meg mouth rinse is *Myristica fragrans*, which inhibit prostaglandin and arachi-

donic acid synthesis.^(8,9) So, it has a potent anti-inflammatory effect. This effect is demonstrated in this study by the reduction in bleeding index, an improvement parameter of gingival inflammation.

Although the volunteers received thorough instruction for correct method and time for proper rinsing, rinsing problem arose (particularly in posterior teeth) because these teeth are less readily to reach by mouth rinse due to severe burning sensation, which is due to the presence of characteristic pleasant fragrance which gives the slight warm taste.⁽⁸⁾ So, it might explain the reduction of percentage of effectiveness compared with chlorhexidine.

CONCLUSION

The tested new mouth rinse (nut meg) have been shown to have significant anti-plaque and anti-inflammatory effects (tested by reduction in bleeding index) in comparison with the conventional chlorhexidine mouth rinse which encourage its use in the treatment of gingival inflammation because it is a natural plant devoid from any chemical agent. It may meet patient approval for long term usage. It has little side effects compared with synthetic one. Also, it is available in the market and least cost than other synthetic compounds.

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