Research Article

COMPARATIVE ANTI - PLAQUE EFFECT OF HERBAL DENTAL FORMULA

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A R T I C L E   I N F O

A B S T R A C T

Ayurveda and Sri Lankan traditional medical system devotes a significant importance to oral health problems on its preventive aspect rather than curative. This herbal formulation is specified as a dentifrice in *Thalpathe Piliyam*. But it was not scientifically evaluated. Therefore, this study was carried out to evaluate the effectiveness of reducing plaque accumulation on teeth, maintenance of oral hygiene and compare the efficacy of powder with the novel toothpaste. Forty patients were selected with written consent from Dental OPD. They were randomly divided in to two groups; group A and B (20 patients in each) irrespective of their sex, religion, habitat etc. Group A was advised to brush twice a day for 01 month by using the toothpaste and Group B from same formula as in powder form. Oral Hygiene Index (OHI -S), Calculus Index (CI - S), Debris Index (DI –S) and Plaque Index (PII) were used as objective criteria. According to the statistical analysis, it can be concluded that clinical effectiveness of toothpaste is more significant than tooth powder. Therefore, long term studies should be carried out to confirm the result.

INTRODUCTION

Oral hygiene is an integral part of general health and quality of life. Since early 20th century varying degrees of attention have been given to the significance of dental infections for the wellbeing of the body. However, at present dental infections are considerable as a source of the spread of microorganisms to other critical sites in the body which causes a serious threat to the health of certain high risk patients.

The WHO defines as oral health as a state of being free from mouth and facial pain, oral and throat cancer, oral infection and periodontal (gum) diseases, tooth decay, tooth loss and other diseases and disorders that limit an individual's capacity in biting, chewing, smiling, speaking and psychosocial wellbeing.

Oral health problem arises mainly as a result of two oral diseases such as dental caries and periodontal diseases. Although, the prevalence of these two diseases are changing still it remains true that virtually every adult in the world has experience of either dental caries or periodontal disease or both.

According to WHO report in April 2012, globally 60-90% of children have dental cavities and about 100% of adults have dental cavities, often leading to pain and discomfort in periodontal diseases. Severe periodontal disease which may result in tooth loss is found in 15-20% of middle aged (35-45y)

adults. The natural history of periodontal diseases is not yet being clearly understood as that of dental caries, although both are plaque induced diseases. The main prevention strategy for periodontal disease is therefore, been related with the regular and continuous removal of plaque.

Over the past several decades there has been a gradual shift in the focus from treatment of oral diseases to prevention procedure. However, the ancient system of Indian medicine (Ayurveda) devotes a significant importance to oral health problems especially on its preventive aspect than curative. In Susruta Samhita, there are numerous descriptions of severe periodontal diseases with loose teeth and purulent discharge from the gingiva. The Charaka Samhita has emphasized on modalities of tooth brushing and maintenance of oral hygiene in *Dinacharya.*

The importance of tooth brushing and maintain of oral hygiene have been clearly mentioned in Ayurveda. It has been emphasized that the herbal stick *(Dantakashtaka)* for brushing the teeth should be either astringent, pungent or bitter. The chewing herbal stick is very similar to the tooth brush. In that, both have bristles and are used to remove plaque from the tooth surfaces mechanically. Therefore, in this study herbal tooth formulation was introduced to the study population as a tooth brushing remedy in two different forms as tooth powder and tooth paste. This herbal formulation is specified as dentifrice in authentic text. But it was not scientifically evaluated.

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METHODOLOGY

The study was designed to determine the efficacy of Herbal formula in the management of plaque formation.

Preparation of Drug: Detailed description of the ingredients of the herbal tooth paste formulation was studied. All the raw materials were identified and authenticated by the Dept. of Dravyaguna Vignana, GWAI, University of Kelaniya, Sri Lanka.

Haritaki (*Terminalia chebula*) – fruit Kushta (*Saussurea lappa)*- root

Sahachara (*Barleria prionitis*)– root Vacha *(Acorus calamus)* - kanda

Chavya *(Piper chaba)* – root Punarnava *(Boehavia diffussa)*– root

Shunti *(Zingiber officinalis)* –kanda Pippali *(Piper longum)* – fruit

Desaman *(Jasminum grandiflorum)* – flower*,*

Base of the tooth paste ($CaCo_3$, $CaPO_4$, Glycerin, Acacia etc.)

Process of Tooth paste preparation

- ✓ Calcium carbonate used as an abrasive compound & %of glycerin as humectant.
- ✓ Calcium carbonate and 30% sieved powder of raw materials mixed together using mixture.
- ✓ Added the glycerin and mixed within 680 rpm.
- ✓ Then added powder & mixed well.
- ✓ Finally added 1 drop of clove oil and preservatives and mixed 2 minutes with 680 rpm.
- ✓ The pH value of final product was 7.6. (International pH value range of the tooth paste is 7 – 10)
- ✓ Finally, product was packed in tubes and labeled it.

Clinical Study

Study Population

The present study was a comparative randomized clinical trial. Participants were informed the purpose and study design and individual written informed consent was obtained. The patients for this study were selected from Out Patient Department of Gampaha Wickramarachchi Ayurveda Hospital and National Ayurveda Hospital, Colombo, Sri Lanka

Selection criteria

The subjects in the age group of 16-60 years diagnosed with plaque depositions (identified by disclosing agent) were selected for the study.

Exclusion Criteria

- ✓ Oral diseases due to any other systemic diseases.
- ✓ Chronic debilitating patients.
- ✓ Age < 16yrs and >60years.
- ✓ Pregnant women and lactating mothers.
- ✓ Medically compromised patients.
- ✓ Subjects with adverse habits like tobacco users in smoke or smokeless form.
- ✓ History of alcohol consumption.
- ✓ Those with clinically unacceptable restorations or bridges, orthodontic appliances were excluded.
- ✓ Those with a known history of allergy to chemical or any herbal products were also excluded.

Grouping and Posology

The study comprised of 40 patients who were randomly divided into two groups by using lottery method as follows:

- ✓ Group – A (n – 20) Patients treated with tooth paste (quantity of gram seed at a time) twice a day (after breakfast & after dinner) for one month
- ✓ Group - B (n – 20) Patients treated with tooth powder (quantity of gram seed at a time) twice a day (after breakfast & after dinner) for one month

Follow up: Two months

Instructions to the patients

- ✓ Advised the patient to brush the teeth twice a day using tooth brush, with the paste or powder.
- ✓ Asked the patient to use medium bristles brush.
- ✓ Asked the patient to dip the brush in warm water before getting the dentifrice.
- ✓ Method of brushing demonstrated with the model and instructed as circular, vertical and horizontal movements.
- ✓ Asked the patient to report immediately if he/she felt any discomfort in using the dentifrice during the course of the study.

Assessment criteria

The effect of therapy was assessed on the basis of improvement of objective parameters such as Simplified Oral Hygiene Index (OHI -S), Plaque Index (PII), Debris Index – Simplified (DI -S) and Calculus Index Simplified (CI -S), in Pre and Post treatment as well as in follow up period.

DI-S and **CI-S** values range from 0-3, which can be interpret as:
Good - 0.0-0.6
Fair -0.7-1.8, Poor - 1.9-3.0

OHI –S value ranges from 0-6, which can be interpreted as:
Good – 0.0-1.2, Fair - 1.3-3.0, Poor - 3.1-6.0
PII, values range from 0-3, which can be interpreted as:
Excellent– 0, Good - 0.1 – 0.9,

Fair - 1.0 - 1.9, Poor - 2.0 - 3.0

Statistical Analysis

Data was collected during pre and post treatments and end of follow up period of study. Data analyzes were carried out using SPSS statistical package - 16. Data distribution were generated and data were tabulated frequencies. Wilcoxon Rank test of Non parametric test used to compare the values.

Assessment of Therapy

- ✓ Complete Remission: 100% relief of signs and no recurrences in follow up study.
- ✓ Marked Improvement:>75% of relief in signs is considered as Marked Improvement.
- ✓ Moderate Improvement: 50% - 75% of relief in signs is considered as Moderate Improvement.
- ✓ Mild Improvement: 25% - 49% of relief in signs is considered as Mild Improvement.
- ✓ Unchanged: <25% relief in signs is considered as unchanged.

RESULTS AND DISCUSSION

Total forty patients were participated in clinical trial and completed successfully. None of the patient has complained any experience of allergy or any discomfort during the treatment or follow up study.

Effect on Therapy on Objective Parameters

Debris Index (DI – S)

The debris index of group A; was varied as Poor 53% and Fair 47% prior to the clinical trial and showed the improvement as 80% Fair and 20% Good category after the trail period. Thereafter, it was evident as 20% as good, 60% as Fair and 20% as poor category during follow up period.

In group B; Poor 33% and Fair 67% prior to the trial and showed as Poor 13%, Fair 60%, Good 27% after the trial. During follow up period it was observed 28% as Good, 52% Fair and 20% under Poor category.

Debris Index - B

Debris Index - A
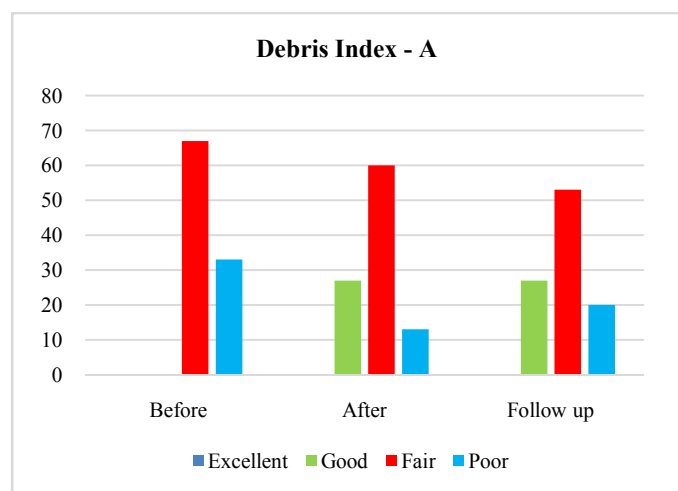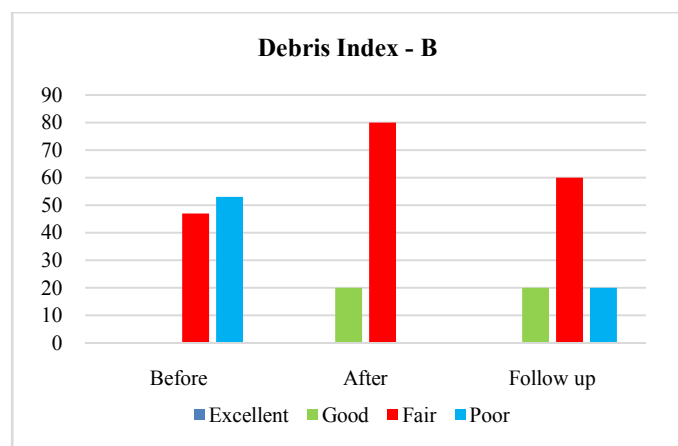
Calculus Index

The Calculus Index of group A; was varied as Poor 52% and Fair 48% prior to the trial and it was improved as Fair 80% and Good 20% patients after the trial period. During follow up study it was observed 20% as Good, 60% Fair and 20% Poor.
In group B; before the this as it was recorded as Poor 33% and Fair 67%. But after this as it was observed as Poor 13%, Fair 60% and Good 27% patients. But in follow up study it was evident 27% as Good, 53% Fair and 20% under Poor category.

Calculus Index -A

Calculus Index -B
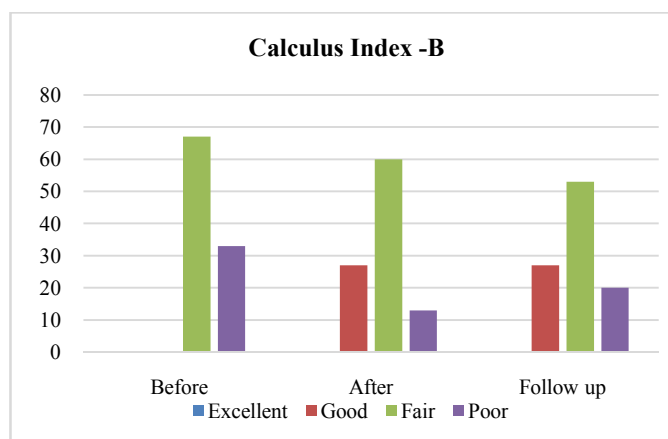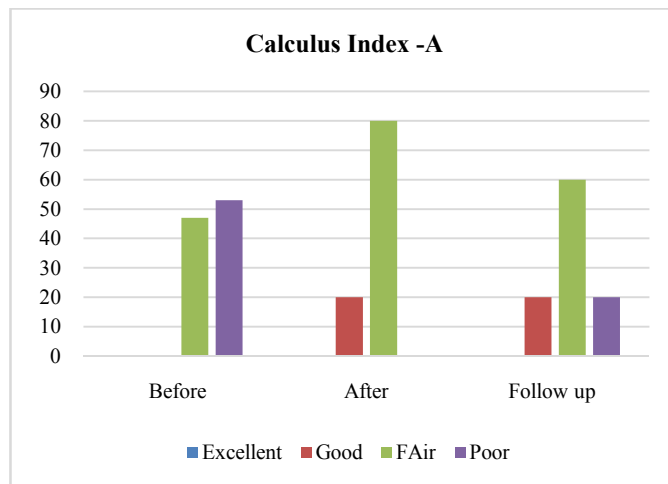
Oral Hygiene Index

The Oral Hygiene Index of group A; was varied as Poor 67% and Fair 33% prior to the trial and its' improvement has been evident as Fair 87% and Good 13% after the trial period. During follow up study it was observed as 13% Good, 74% Fair and 13% patients as Poor category.

In group B; prior to the trial it was recorded as Poor 27% and Fair 73%. But after treatment it was recordedas Poor 7%, Fair 73% Good 20% patients. In follow up study it was identified as 27% as Good, 53% as Fair and 20% patients as Poor category.
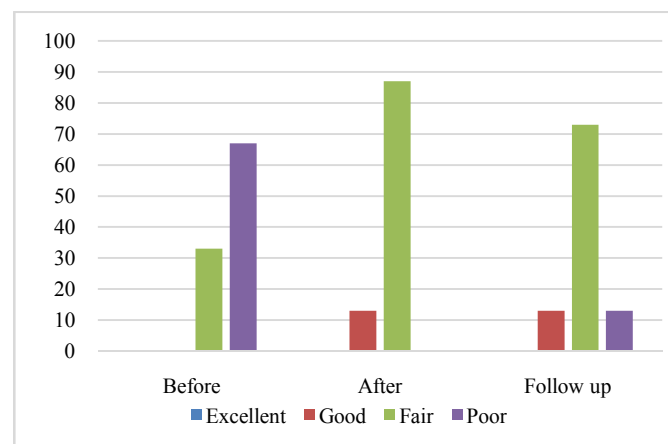

Oral Hygiene Index -A

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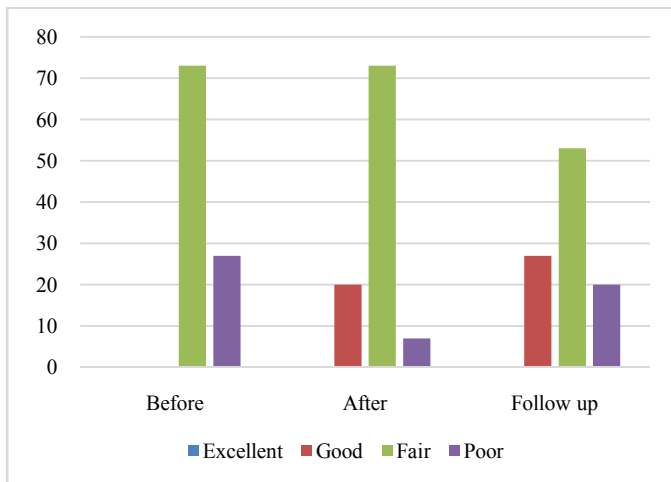
Oral Hygiene Index – B

Plaque Index

The Plaque Index of group A; was varied as Poor 67% and Fair 33% patients and it was improved as Fair 73% and Good 27% patients. During follow up study it was reported Good as 27%, Fair 53% and Poor 20% of patients.

In group B; Poor 47% and Fair 53% patients were reported prior to the trial and it was improved as Poor 20%, Fair 53% and Good 27%of patients after the trial period. Further it was reported during follow up period 20% as Good, 53% Fair and 27% patients as Poor category.
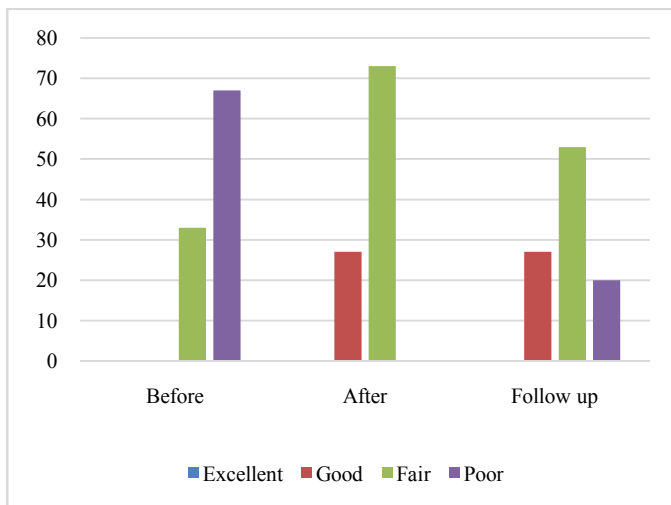
Plaque Index -A
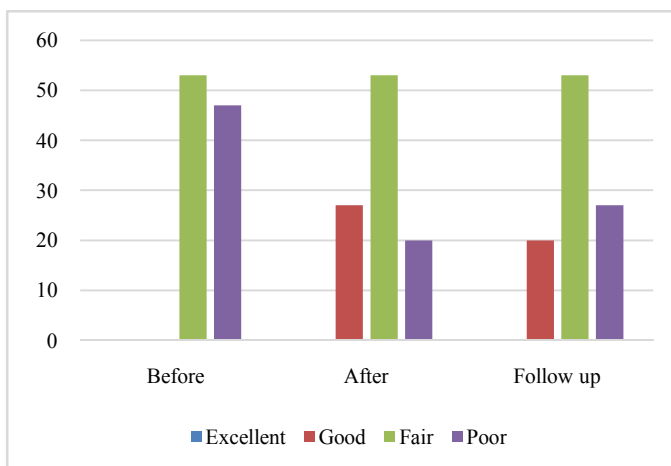
Plaque Index - B

Comparative Effect of Tooth Paste and Tooth Powder

Wilcoxon rank was used to test the comparative effect of both treatments.

Table 1 Comparative Effect of Tooth paste and Tooth powder

Index	Stage	Mean rank		Asymp.sig.	
		Tooth paste	Tooth powder	Tooth paste	Tooth powder
Debris	Before	2.53	2.83		
	After	1.80	1.87	0.000	0.008
	Follow up	2.00	1.93		
Calculus	Before	2.67	2.20		
	After	1.80	1.80	0.000	0.014
	Follow up	1.80	1.80		
Oral Hygiene	Before	2.67	2.27		
	After	1.87	1.87	0.000	0.009
	Follow up	2.00	1.93		
Plaque	Before	2.67	2.47		
	After	1.73	1.93	0.000	0.005
	Follow up	1.93	2.07		

While considering the comparative effect, regarding both preparations data reveals that in all four indices their difference in mean rank values from above 3 stages which was significant at 95% confidence interval($p < 0.05$). That further emphasized both preparations are effective on reducing the plaque formation on teeth. But tooth paste has been reported highly significant effect on reducing the plaque formation on teeth than tooth powder.

Total effect of Therapy
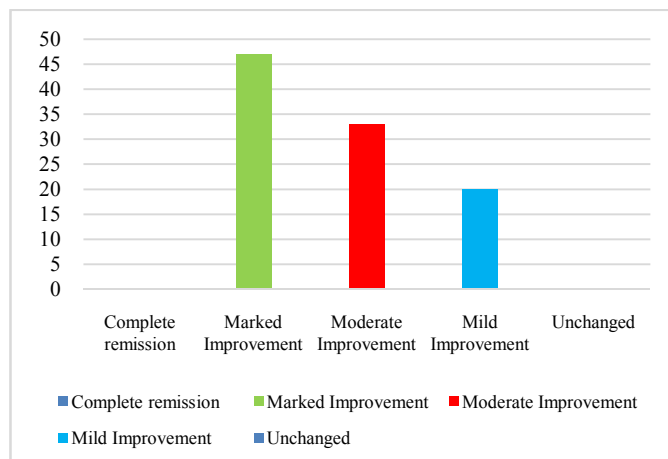
After 01month treatment period 20% of patients have reached to mild improvement in plaque formation. 33% of patients have moderate improvement and 47% of patients have marked improvement. None of the patients were observed under complete remission or unchanged categories.

DISCUSSION

Nearly 50% of patients were identified with poor oral hygiene before the clinical trial. Although considering comparative effect on plaque formation Group A – herbal tooth paste has been shown better results in reducing the plaque formation than tooth powder. Though maximum ingredients of both forms of dentifrice have same pharmacodynamic properties such as *Katu* (pungent), *Tikta* (bitter), *Rasa* (taste), *Laghu* (light), *Ruksha* (rough), *Tikshna* (sharp), *Guna* (properties), *Ushna veerya, Katu vipaka* and *tridosha* shamaka in nature predominant with *Srotoshodhana, Lekhana* and *Krimighna* actions and also with proven pharmacological actions such as abrasive, anti-microbial activities. However, paste has been shown more effective, which may be due to its quick

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absorption power enhanced by hydro-alcoholic nature with fineness, more penetrating capacity and equally dispersing ability on tooth surface.

CONCLUSION

Herbal tooth formulation in powder and paste form found to be effective in reducing the plaque accumulation. But in paste form showed comparatively better results in reducing plaque formation.

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