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Comparative Evaluation of Danta Nirlekhana and Trisugandha Arka Mouth Rinse with Dantanirlekhana Alone in Danta Sharkara-Dental Plaque-An Open Label Double Arm Controlled Clinical Study

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ABSTRACT:

Bacground : Dental plaque is a microbial biofilm and a major etiological factor in dental caries, gingivitis, and periodontitis.(1) In Ayurveda, Danta Sharkara, one of the eight Danta Rogas described by Sushruta, is characterized by hardened deposits around the teeth due to improper oral hygiene and closely resembles dental plaque and calculus.(2) Although scaling (Danta Nirlekhana) effectively removes plaque, recurrence is common without proper maintenance. Trisugandha Arka, prepared from Twak (Cinnamomum zeylanicum), Ela (Elettaria cardamomum), and Patra (Cinnamomum tamala), possesses antimicrobial, anti-inflammatory, antioxidant, and deodorizing properties. This study aimed to evaluate the efficacy of Trisugandha Arka mouth rinse as an adjunct to Danta Nirlekhana in the management of Danta Sharkara.

Methodology:A comparative open-label, double-arm controlled clinical study was conducted on 40 subjects diagnosed with Danta Sharkara. Participants were randomly allocated into two groups of 20 each. Group A underwent Danta Nirlekhana alone, while Group B received Danta Nirlekhana followed by Trisugandha Arka mouth rinse (10 ml for 1 minute, twice daily) for 30 days. Assessment was performed before treatment and on the 31st day using subjective and objective parameters, including Danta Vaivarnya, Poothigandha, Asyasushkata, Dantamoola Shotha, Gingival Index, and Plaque Index.

Results : Both groups showed statistically highly significant improvement ($p<0.01$) in all assessed parameters. Significant reductions were observed in Danta Vaivarnya, Poothigandha, Asyasushkata, Dantamoola Shotha, Gingival Index, and Plaque Index.

Conclusion : Both Danta Nirlekhana alone and Danta Nirlekhana followed by Trisugandha Arka mouth rinse were effective in improving the subjective symptoms and reducing gingival inflammation and dental plaque. However ,Trisugandha Arka mouth rinse showed additional improvement when used as an adjunct to Danta Nirlekhana and therefore considered as a potential adjunctive measure for maintaining oral hygiene and supporting plaque control following Danta Nirlekhana.

Keywords: Danta Sharkara, Trisugandha Arka, Danta Nirlekhana, Plaque Index, Gingival Index, Oral Hygiene, Poothigandha.

INTRODUCTION:

Oral health is an essential component of overall health and plays a vital role in maintaining an individual's quality of life. The oral cavity is continuously exposed to various microorganisms, food particles, and environmental factors, making it susceptible to several diseases. Among these, dental plaque is one of the most common oral health problems and serves as a major etiological factor for dental caries and periodontal diseases.

Dental plaque is a structured microbial biofilm that forms on tooth surfaces and consists of microorganisms embedded in a matrix derived from bacterial and host sources.[3] Inadequate oral hygiene leads to the accumulation of plaque, resulting in tooth discolouration, halitosis, gingival inflammation, and other periodontal complications If not removed effectively, plaque can progress to gingivitis and periodontitis, adversely affecting both oral and systemic health. The prevalence of plaque-related periodontal diseases continues to increase due to changing dietary habits, poor oral hygiene practices, and lifestyle factors.[4]

In Ayurveda, oral health is given significant importance under the concept of Danta Swasthya. Acharya Sushruta has described eight types of Dantarogas, among which Danta Sharkara is characterized by the accumulation of hard, sand-like deposits around the teeth and gingiva. According to Ayurvedic principles, improper cleansing of the teeth leads to the accumulation of food debris (Mala), which, under the influence of Kapha and subsequent drying action of Vata and Pitta, results in the formation of Danta Sharkara.[5]The clinical presentation of Danta Sharkara closely resembles dental plaque as described in modern dentistry. Acharya Sushruta has advocated Dantamala Nirlekhana as the primary line of treatment for Danta Sharkara, followed by procedures such as Kavala, Gandusha, and Pratisarana to maintain oral hygiene and prevent recurrence.[6]In contemporary dentistry, ultrasonic scaling is the standard treatment for the removal of dental plaque and calculus. [7] Although scaling effectively removes deposits from tooth surfaces, plaque formation can reoccur within a short period if proper oral hygiene measures are not followed. Conventional mouth rinses are commonly prescribed as adjunctive therapy, however, prolonged use may be associated with adverse effects such as tooth staining, altered taste sensation, and mucosal irritation. .[8]

Ayurvedic formulations offer a safe and natural alternative for maintaining oral hygiene. Trisugandha Arka, mentioned in Arka Prakasha, is prepared from Twak (Cinnamomum zeylanicum), Ela (Elettaria cardamomum), and Patra (Cinnamomum tamala).[9]These ingredients possess antimicrobial, anti-inflammatory, antioxidant, and deodorizing properties that may help reduce microbial growth, prevent plaque accumulation, improve gingival health, and maintain oral hygiene. The practice of Kavala, comparable to mouth rinsing, is specifically indicated for cleansing the oral cavity and promoting the health of teeth and gums.

Considering the high prevalence of dental plaque, the limitations of existing preventive measures, and the classical indication of Trisugandha Arka in Dantarogas, the present study has been undertaken to evaluate the efficacy of Trisugandha Arka mouth rinse after Danta Nirlekhana in the management of Danta Sharkara (Dental Plaque). The study aims to assess its role in preventing plaque recurrence, improving periodontal parameters, and promoting oral health .

MATERIALS AND METHODS:

Subjects

This comparative clinical study will include 40 subjects diagnosed with Danta Sharkara, who will be randomly assigned into two groups, namely Group A (Control Group) and Group B (Trial Group), with a

minimum of 20 subjects in each group. The inclusion criteria will comprise patients presenting with the lakshanas of Danta Sharkara, having supragingival plaque in all quadrants involving both anterior and posterior tooth surfaces, aged between 20 and 50 years, irrespective of sex, with no active carious lesions, and those willing to provide written informed consent. The exclusion criteria will include patients with a history of systemic diseases such as diabetes mellitus and respiratory diseases including COPD, asthma, pleural effusion, and tuberculosis; patients presenting with any type of oral ulcer associated with dental plaque; patients with Grade II or Grade III tooth mobility; patients wearing partial or complete artificial dentures or orthodontic braces; patients with severe decalcification of teeth or gingival recession; patients who have undergone root canal treatment, crown therapy, or composite restorations; patients with habits of tobacco use, pan chewing, or smoking; pregnant and lactating women; patients with a recent history, within the preceding two weeks, of bronchitis, sinusitis, or tonsillitis; subjects with a known history of allergy to any mouth rinse or medication; subjects presenting with periodontal probing depths of ≥3 mm; and subjects currently using any type of mouth rinse.

INTERVENTION :

Group A (Trial group)

Sample Size: 20	
Danta nirlekhana	Ultrasonic scaling will be done in one sitting followed by routine oral hygiene regimen
Duration of Treatment	30 days
Assessment	Before Treatment (Day 0), After Treatment (Day 31)

Group B (Control group)

Sample Size: 20	
Danta nirlekhana (dental scaling) with Trisugandha Arka Mouth rinse	Ultrasonic scaling will be done in one sitting followed by Trisugandha Arka mouth rinse
Duration of Treatment	30 days
Assessment	Before Treatment (Day 0), After Treatment (Day 31)

Ingredients of Trisugandha Arka:

Sl	**Sanskrit name**	**Botanical name**	**Part used**
1	Twak	Cinnamomum verum	Bark
2	Ela	Elettaria cardamomum Linn.	Fruit,seed
3	Patra	Cinnamomum tamala Nees.	Leaf

Assessment Schedule :

1st Assessment	Before treatment	Day 0	Diagnosis,screening
2nd Assessment	After treatment	Day 31	All the subjective and objective parameters considered

ASSESSMENT CRITERIA:

Sl	Lakshana	Grade 0	Grade 1	Grade 2	Grade 3
1	Danta vaivarnya	Normal Colour	Discolouration Is Less Than 1/3rd Of the Tooth Surface	Discolouration Is More Than 1/3rd And Less Than 2/3rd Of the Tooth Surface	Discolouration is more than 2/3rd of the tooth surface
2	Pooti Gandha	Presence of no odour	Presence of Mild Bad odour	Presence of moderate bad odour	Presence of Severe Bad odour
3	Asya Shushkata	No dryness	Mild dryness	Moderate dryness	Severe dryness
4	Dantamoola shotha	Absence of inflammation	Mild inflammation	Moderate inflammation	Severe inflammation
5	Gingival index	Absence of inflammation	Mild inflammation	Moderate inflammation	Severe inflammation
6	Plaque index	Absence of microbial plaque	Thin microbial plaque	Moderate accumulation of plaque	Large amount of plaque

OBSERVATION:

Sl no	Demographic data	Percentage
1	Age	20–30 years – 87.5% 31–40 years – 10% 41–50 years – 2.5%
2	Gender	Male-37.5% Female – 62.5%
3	Religion	Hindu – 100%
4	Education	Undergraduate – 72.5% Graduate – 15% Postgraduate – 12.5%
5	Marital status	Married – 10% Unmarried – 90%

6	Economic status	Lower class – 0% Middle class – 90% Upper class – 10%
7	Occupation	IT Professional – 5% Doctor – 7.5% Business – 2.5% Student – 80% 87Homemaker – 5% Others – 0%
8	Family history	Negative family history – 100%
9	Diet	Vegetarian – 27.5% Non-vegetarian – 72.5%
10	Vyasana	Tea – 67.5% Coffee – 5% Nil – 27.5%
11	Prakruthi	Pitta–Vata – 5% Pitta–Kapha – 5% Vata–Pitta – 20% Vata–Kapha – 57.5% Kapha–Pitta – 7.5% Kapha–Vata – 7.5%
12	Sara	Pravara – 5% Madhyama – 95%
13	Samhanana	Madhyama – 100%
14	Satva	Pravara – 10% Madhyama – 85% Avara – 5%
15	Pramana	Pravara – 5% Madhyama – 95%
16	Aharashakthi	Madhyama – 100%
17	Jarana shakthi	Pravara – 10% Madhyama – 85% Avara – 5%
18	Vyayama shakthi	Pravara – 10% Madhyama – 85% Avara – 5%
19	Lakshanas	Danta Vaivarnya – 100% Putigandha – 100% Asya Shushkata – 97.5% Danta Mula Shotha – 97.5%

RESULTS:

Sl. No	Lakshanas	Z Values of Intra Group A	Z Values of Intra Group B	Between the group
1	Dantavaivarnya	-4.379	-4.472	Statistically highly significant. Group B showed better results.
2	Poothigandha	-4.359	-4.472	Statistically highly significant. Group B showed better results.
3	Asyasushkatha	-3.742	-4.053	Statistically highly significant. Group B showed better results.
4	Antamoola Shotha	-3.000	-4.472	Statistically highly significant. Group B showed better results.
5	Gingival Index	-4.472	-4.472	Statistically highly significant. Group B showed better results.
6	Plaque Index	-4.472	-4.472	Statistically highly significant. Group B showed better results.

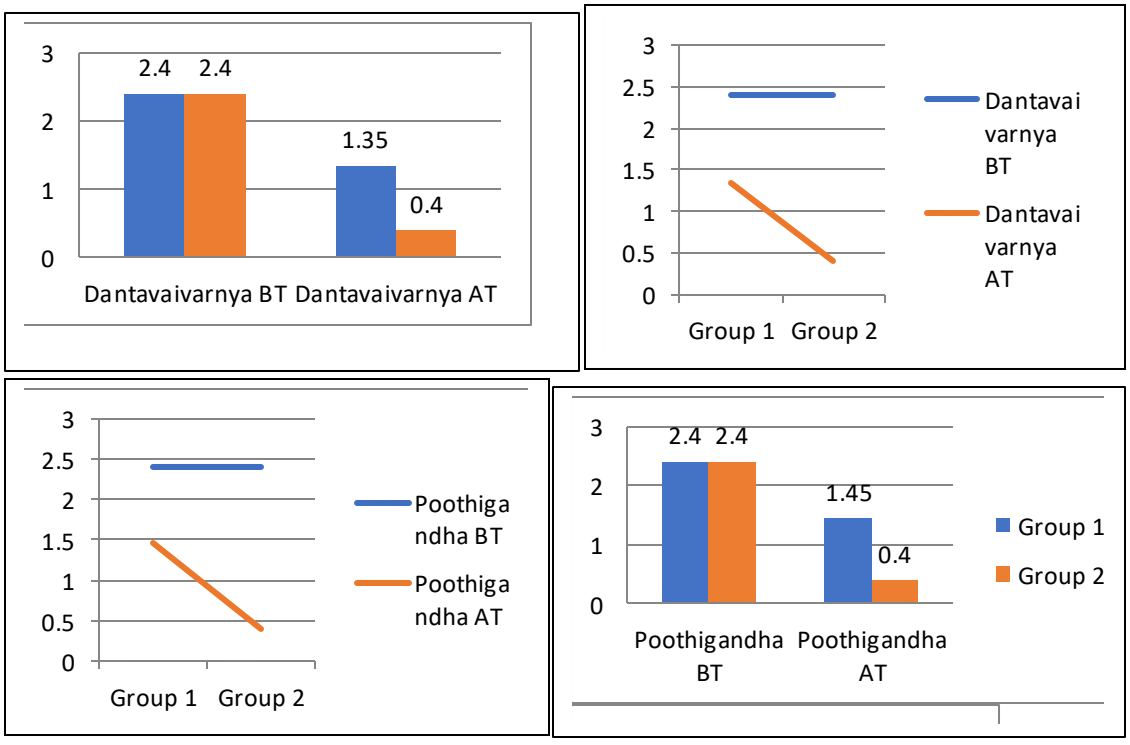
Intra-group comparison was performed using the Wilcoxon Signed Ranks Test. Between-group comparison was based on the Mann–Whitney U Test.

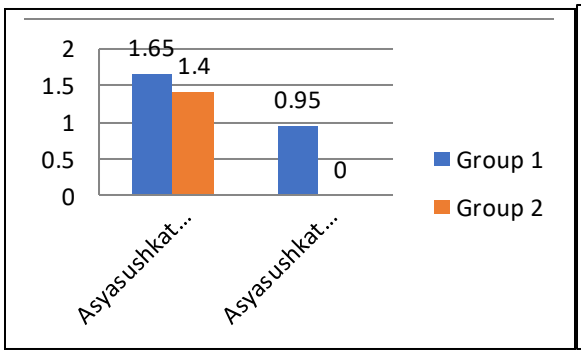
Danta Vaivarnya and Poothigandha were observed in all subjects of both Group A and Group B, accounting for 100% prevalence among the study population.

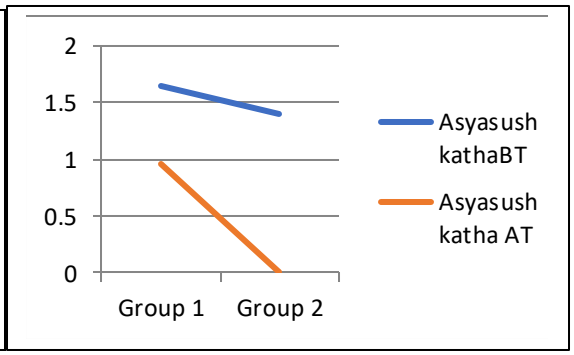
Asyasukhatha was present in 19 (95%) subjects of Group A and all 20 (100%) subjects of Group B, contributing to an overall prevalence of 39 (97.5%) subjects.

Similarly, Dantamoola Shotha was noted in 19 (95%) participants of Group A and all 20 (100%) participants of Group B, with an overall occurrence of 39 (97.5%) subjects.

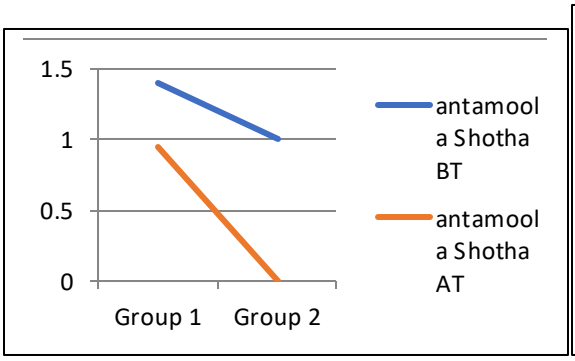
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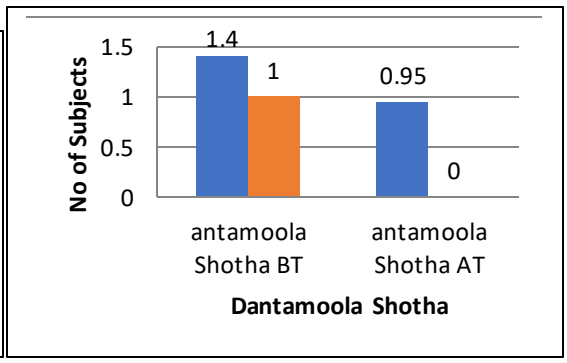




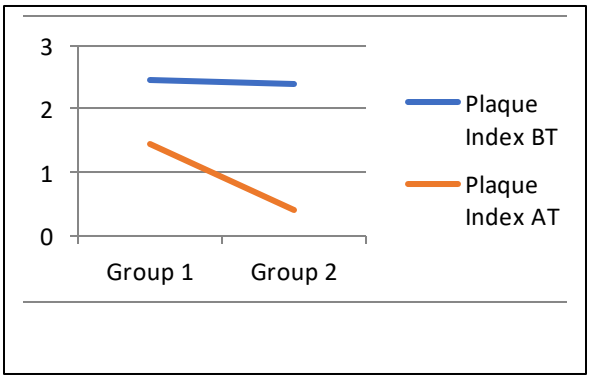


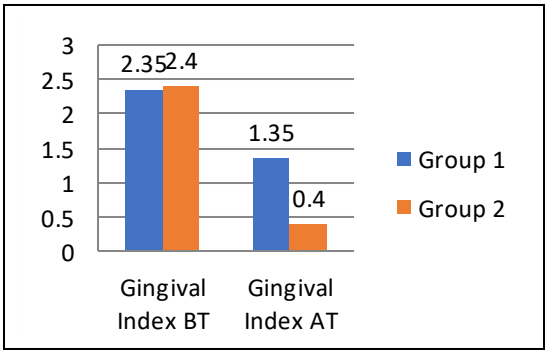
Between group comparison of

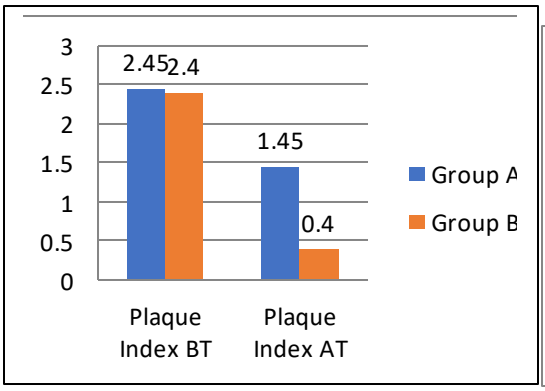


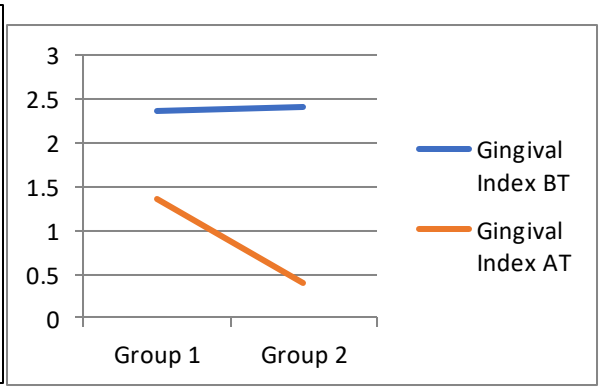


2. POOTHIGANDHA :









DISCUSSION:

DISCUSSION ON SELECTION OF PROBLEM:

Oral health is an essential component of general health and quality of life. Dental plaque, a microbial biofilm accumulating on tooth surfaces, is a major contributor to gingival inflammation and periodontal disorders and may lead to plaque formation, halitosis and dental caries. Danta Nirlekhana (dental scaling) effectively removes existing deposits; however, subsequent microbial recolonization may result in plaque recurrence. Although chemical mouth rinses are commonly used for plaque control, prolonged use may be associated with undesirable effects. Hence, exploring herbal alternatives such as Trisugandha Arka as supportive agents for maintaining oral hygiene and reducing plaque accumulation is clinically relevant.

DISCUSSION ON DISEASE :

Dantasharkara was selected for the present study due to its detailed description in Ayurvedic classics, well-defined etiopathogenesis and established line of management. Acharyas describe it as the accumulation of hard, granular deposits around the teeth and gingiva, resulting in Dantanam Gunahari, or deterioration of the normal qualities of the teeth.

According to Ashtanga Hridaya Uttarasthana, improper dental cleansing (Adhavananam Malo Dantanam) leads to the accumulation of Mala, wherein Kapha undergoes Shoshana under the influence of Vata, resulting in hardened deposits associated with Putigandha. Arunadatta emphasizes the role of prolonged neglect (Upekshana), while Ashtanga Sangraha highlights inadequate oral cleansing as a causative factor. Madhava Nidana further describes the involvement of Pitta and Vata (Pitta-Maruta Shoshitaha) in the hardening of these deposits. (10)

The classical management emphasizes Dantanirlekhana for removing deposits while ensuring Ahimsana Dantamoola, thereby avoiding injury to the gingiva and supporting tissues. Pratisarana, therapies indicated in Dantaharsha and Vatahara measures are also described as supportive treatments.(11)

In contemporary dentistry, Dantasharkara may be correlated broadly with dental plaque and calculus. Plaque is a microbial biofilm that, when inadequately controlled, may undergo mineralization to form calculus and contribute to gingivitis and periodontal disease. Factors such as poor oral hygiene, dietary habits, microbial flora, smoking and systemic conditions influence plaque accumulation and its consequences.

Thus, understanding Dantasharkara through both Ayurvedic and contemporary perspectives provides a rationale for its management through deposit removal and supportive measures aimed at maintaining oral hygiene and minimizing plaque recurrence.

DISCUSSION ON SELECTION OF DRUG:

Selection of an appropriate drug plays an important role in achieving the desired therapeutic outcome in any clinical study. In the present study, Trisugandha Arka was selected as the intervention considering the properties of its ingredients and their possible role in maintaining oral health and preventing recurrence of Danta Sharkara.

Trisugandha Arka is prepared from Twak (Cinnamomum zeylanicum), Ela (Elettaria cardamomum), and Patra (Cinnamomum tamala). These ingredients are described in Ayurvedic literature to possess therapeutic properties that may be beneficial in disorders involving Kapha predominance and local accumulation of impurities. Since Danta Sharkara is associated with accumulation and adherence of

deposits over tooth surfaces, drugs possessing Kapha-hara, Shodhana, and Lekhana properties were considered appropriate.

Twak possesses Katu, Tikta rasa , Laghu and Tikshna Guna, Ushna Veerya, and Katu Vipaka. [12]Ela possesses Laghu and Ruksha Guna with aromatic properties that contributes to maintaining Mukha vaishadya. [13] Patra possesses Katu and Tikta predominant actions with properties that assist in reducing local accumulation and maintaining oral hygiene. [14]

Significance of Arka Formulation

Arka Kalpana holds a distinctive position among the Panchavidha Kashaya Kalpanas, with Arka Prakasha highlighting its traditional advantages, including rapid action, ease of absorption, reduced dose requirement, prolonged shelf life and patient acceptability. [15]Distillation is believed to extract the Sara and Sukshma fractions of drugs, providing a liquid preparation suitable for local administration. Its homogeneous nature facilitates distribution throughout the oral cavity, allowing contact with teeth, gingiva and accessible interdental surfaces.

The volatile aromatic constituents of Twak, Ela and Patra contributed to the formulation's potential antimicrobial activity. However, their concentrations, biofilm penetration and therapeutic effects in the final distillate require further investigation. Distillation also reduces the presence of coarse plant residues, making Arka convenient for use as a mouth rinse. Its storage stability and ease of administration further support its practical application. Considering these traditional and pharmaceutical attributes, Trisugandha Arka was selected as a suitable formulation for investigating its adjunctive role in the management of Dantasharkara.

MODE OF ACTION OF MOUTH RINSE :

Kavala is a therapeutic procedure in which a medicated liquid is retained and actively moved within the Mukha Pradesha, allowing direct contact of the medicine with the oral tissues.[16]It facilitates Kapha Vilayana and Kapha Nirharana, thereby removing accumulated Mala and vitiated Doshas from the oral cavity. The continuous movement of the liquid promotes Srotoshodhana and Mukha Shodhana, while the properties of the medicaments contribute to Dosha Shamana, particularly of Kapha. Depending on the formulation used, it may also produce Lekhana, Shothahara, and Ropana effects. By acting on the Danta, Dantamula, Jihva, and Mukha, Kavala supports the proper nourishment of local Rasa and Rakta Dhatus, enhances Indriya Prasadana, and helps maintain the health and integrity of the oral cavity. Owing to these actions, Kavala can be considered an Ayurvedic equivalent of a mouth rinse for promoting oral hygiene and balancing oral health.

DISCUSSION ON RESULTS :

Comparative Effect of Trisugandha Arka Mouthrinse on Clinical Parameters of Danta Sharkara :

The present study compared the effects of Danta Nirlekhana (scaling) alone with Danta Nirlekhana followed by Trisugandha Arka mouthrinse in patients with Danta Sharkara. The findings demonstrated improvement in both groups across all the assessed subjective and objective parameters. However, the magnitude of improvement was greater in Group B, which received Trisugandha Arka mouthrinse as an adjunct to scaling.

Danta Vaivarnya (tooth discoloration): Both groups showed statistically significant improvement following treatment ($p < 0.001$). The mean score decreased from 2.40 to 1.35 in Group A, whereas it

decreased from 2.40 to 0.40 in Group B. The greater reduction in Group B suggests a comparatively better improvement in tooth discoloration. This finding may be associated with the combined effect of mechanical plaque removal and the adjunctive use of Trisugandha Arka mouthrinse.

Poothigandha (halitosis): A statistically significant reduction in halitosis was observed in both groups ($p < 0.001$). The mean score decreased from 2.40 to 1.45 in Group A and from 2.40 to 0.40 in Group B. The greater reduction observed in Group B indicates a comparatively better improvement in this parameter. The additional benefit may be related to improved oral cleanliness and the possible contribution of the aromatic constituents of Tvak (Cinnamomum), Ela (cardamom), and Patra (bay leaf). However, the specific antimicrobial or deodorizing mechanisms of the prepared formulation require further investigation.

Asyasushkata (oral dryness or discomfort): Group A showed a reduction in the mean score from 1.65 to 0.95, whereas Group B demonstrated a reduction from 1.40 to 0.00. Both groups exhibited statistically significant within-group improvement ($p < 0.001$), with a significantly lower post-treatment score in Group B ($p < 0.001$). These findings suggest a greater improvement in oral dryness or discomfort with the addition of Trisugandha Arka mouthrinse.

Dantamoola Shotha (gingival inflammation): The mean score decreased from 1.40 to 0.95 in Group A and from 1.00 to 0.00 in Group B. The reduction was statistically significant in both groups ($p < 0.01$). At the end of treatment, Group B demonstrated a significantly lower score than Group A ($p < 0.001$). This finding suggests a potentially beneficial adjunctive effect of Trisugandha Arka mouthrinse on gingival inflammation.

Gingival Index: The mean Gingival Index decreased from 2.35 to 1.35 in Group A and from 2.40 to 0.40 in Group B. Although both groups showed statistically significant improvement ($p < 0.001$), the reduction was greater in Group B. The between-group comparison at the end of treatment also demonstrated a statistically significant difference ($p < 0.001$). These findings indicate that scaling combined with Trisugandha Arka mouthrinse was associated with greater improvement in gingival health than scaling and routine oral hygiene alone.

Plaque Index: The mean Plaque Index decreased from 2.45 to 1.45 in Group A, compared with a reduction from 2.40 to 0.40 in Group B. Both groups showed statistically significant improvement ($p < 0.001$), with a greater reduction in Group B. The statistically significant post-treatment difference between the groups ($p < 0.001$) supports the potential additional benefit of Trisugandha Arka mouthrinse in improving plaque control when used following scaling.

Overall, the Wilcoxon Signed-Rank Test demonstrated significant pre-treatment to post-treatment improvement in all six parameters in both groups. The Mann–Whitney U test revealed statistically significant between-group differences at the end of treatment, favouring Group B, across all six parameters. The observed reductions in subjective symptoms, plaque accumulation, and gingival inflammation collectively suggest that Trisugandha Arka mouthrinse provided an additional benefit when used as an adjunct to mechanical plaque removal.

SCOPE OF STUDY :

- The present study can be expanded by conducting multicentric randomized controlled clinical trials with a larger sample size and longer follow-up period to further validate the sustainability of therapeutic benefits and to evaluate the recurrence rate of Danta Sharkara after discontinuation of Trisugandha Arka mouth rinse.

- Future studies can incorporate advanced periodontal assessment tools such as microbial plaque analysis, salivary biomarkers, gingival crevicular fluid analysis, and quantitative bacterial culture techniques to obtain a more objective evaluation of treatment outcomes.
- Comparative clinical studies with established chemical mouth rinses such as chlorhexidine and other commercially available oral hygiene formulations can be conducted to determine the relative efficacy, safety, and patient acceptability of Trisugandha Arka.
- Further analytical studies employing advanced gas chromatographic and spectroscopic techniques may be carried out for identification, quantification, and standardization of the bioactive phytoconstituents responsible for the therapeutic action of Trisugandha Arka.
- Experimental and molecular studies can be undertaken to understand the mechanism of action of Trisugandha Arka on oral biofilm formation, bacterial adhesion, quorum sensing pathways, inflammatory mediators, and periodontal tissue response.
- The role of Trisugandha Arka as a preventive oral healthcare measure can be explored in high-risk populations such as orthodontic patients, individuals with recurrent plaque accumulation, smokers, and patients with systemic diseases such as diabetes ,hypertension etc.
- Use in Recurrent Aphthous Ulcers and Oral Mucositis-The formulation may be explored for other oral conditions where antimicrobial and healing properties are desirable.
- The present findings provide a foundation for developing standardized Ayurvedic oral care products such as mouth rinses, sprays, and oral hygiene formulations based on Trisugandha Arka for wider clinical application and public health use.

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