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### RESEARCH ARTICLE

#### COMPARATIVE EVALUATION OF ANTI PLAQUE AND ANTI-INFLAMMATORY EFFICACY OF MOMORIDCA CHARANTIA AND 0.2% CHLORHEXIDINE GLUCONATE MOUTHWASHES IN PATIENTS WITH GINGIVITIS: A DOUBLE-BLIND RANDOMIZED CONTROL TRIAL

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Momordica Charantia, Mouthwash, Gingivitis, Chlorhexidine Gluconate

#### Abstract

**Background:** The prevalence of gingivitis is present worldwide. Therefore, the primary goal in patients with gingivitis is to control plaque formation & build-up to prevent gingivitis. Chemical agents have been advocated as adjuncts to mechanical methods to augment the plaque control. The global need for alternative treatment modalities, safe, effective, and economical products is the need of time. Bitter melon is a medicinal plant which has the medicinal value. Studies evaluating its effects on gingivitis are scarce. Hence the present study was aimed to compare and evaluate the efficacy of Momordica charantia (Bitter melon) as an anti-inflammatory agent with chlorhexidine gluconate in the treatment of plaque induced gingivitis.

**Materials and method:** In this randomized controlled clinical trial, 66 subjects were randomly assigned to two groups with 33 subjects in each group, Group I received Scaling+ Momordica Charantia mouthwash and Group II received Scaling + Chlorhexidine mouthwash. Clinical parameters Plaque index (PI), Gingival index (GI), were assessed at baseline and after 3 weeks.

**Results:** The results of the current study showed that the mean scores of PI, GI, at baseline and after 3 weeks had consistently decreased in both Groups ( $P < 0.001$ ), which was statistically significant on intragroup analysis. The results from baseline to 3 weeks were comparable on intergroup analysis with no statistically significant difference.

**Conclusion:** Momordica charantia mouthwash exhibited almost similar anti-plaque and anti-gingivitis effect and can be used as an adjunct to scaling in the treatment of chronic generalised gingivitis.

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#### Introduction:-

The prevalence of gingivitis is present worldwide about 80% of the population is affected and is characterized as the world's most predominant inflammatory periodontal disease.<sup>1</sup> Gingivitis is an inflammatory process limited to the epithelial tissues surrounding the coronal portion of the teeth and it is one of the most common diseases of the oral cavity.<sup>2</sup> Gingivitis is majorly induced by bacteria present in the microbial biofilm and is the most common etiological factor for initiation and progression of periodontal disease.<sup>3</sup> Therefore, the primary goal in patients with gingivitis is to control plaque formation & build-up to prevent gingivitis.

Though bacterial plaque can be removed effectively by mechanical plaque control, at present mechanical methods of dental plaque removal are widely regarded as effective means of control progression of periodontal diseases.<sup>4</sup> Mouthwashes are being used as an adjunct to mechanical plaque control therapy to get better results.<sup>5</sup>

Mouthwashes of herbal origin may offer noteworthy recompenses over the chemical ones like Listerine and chlorhexidine due to their adverse effects. Herbal medicine is an ancient system of medicine which is rich in reservoir of resources even for the dental sciences and has got various procedures for maintaining oral hygiene.<sup>6</sup> Among these phytotherapeutic preparations, Bittergourd is one among them which has been used for treatment of many diseases such as diabetes mellitus, cancer, piles, leprosy, jaundice, snake bite, measles and infections.<sup>7</sup>

Momordica Charantia (MC), a member of the Cucurbitaceae family, is known as bitter gourd has shown promising effects with all its important biochemical elements, like triterpene, protein, steroid, alkaloid, and phenolic compounds, rich in vitamin C and it is responsible for various biological and pharmacological actions such as anti-diabetic, anti-oxidant, anti-cancerous, anti-microbial, anti-inflammatory and immunomodulatory action.<sup>8</sup> "Charatin" is considered as an active ingredient and its anti-bacterial effect has been explored *in vitro* against *Streptococcus mutans* and *Lactobacillus acidophilus* earlier, in the form of a gel.<sup>9</sup>

Chlorhexidine Gluconate as the gold standard due to its diverse properties and substantivity, however due to their adverse effects like staining of teeth, desquamation, irritation, dry mouth and unpleasant taste, often deters its use for long periods.<sup>3</sup> Hence, there is a need to develop a naturally occurring, indigenous and cost-effective oral hygiene aid.

As there is paucity in literature regarding therapeutic benefits of Bittergourd, this study was conducted to evaluate the anti-plaque and anti-inflammatory effects of 10% Momordica Charantia mouth wash and compare it with 0.2% chlorhexidine gluconate mouthwash in treatment of gingivitis.

### **Material And Methods:-**

This study was a randomized controlled clinical trial carried out at, Dept. of Periodontics, Dayananda Sagar college of Dental sciences, Bangalore, India. The study protocol was approved by the ethical committee of the institution. The patients were explained about the study and a written informed consent was obtained from all the patients prior to the intervention.

Total number of 68 subjects were screened for the eligibility, out of which 66 patients met inclusion criteria and were included in the study. Of these, only 50 subjects completed the study with a drop out of 16 subjects. (Due to COVID lockdown)

Following a detailed medical and dental history, systemically healthy participants of age 25-50 years with a minimum of twenty teeth and with chronic gingivitis were included for the study. The exclusion criteria were the presence of any systemic disease, pregnancy and lactation, allergy to either CHX and/ or Bitter gourd, participants on antibiotics for the past 3 months, participants with a history of oral prophylaxis within 3 months previous to this study, mentally challenged participants, and habits like mouth breathing, smoking that might alter the result of the study.

The mouthwash was prepared at the Department of Pharmacology, Dayananda Sagar pharmacy college. Bitter gourd mouthwash was prepared by dissolving 5ml of bitter gourd extract in 100 ml of distilled water followed by adding 10mg stevia powder dissolved in 10 ml of distilled water as sweetening agent and 0.005% of flavoring agent (peppermint oil) added to the mixture.

At the baseline, standardized oral hygiene procedures were performed on all patients. The patients were provided with the mouthwashes of their respective group. Same set of oral hygiene maintenance instructions were given to the patients. The patients were recalled after 3 weeks from baseline. The clinical parameters such as Plaque index, Gingival index were recorded at baseline and 3 weeks.

### **Statistical Analysis**

Statistical analysis was done using SPSS software version 22.0. Independent Student t Test was used to compare the mean PI and GI values between 2 groups during baseline and 3 weeks period. Student Paired t Test was used to

compare the mean PI & GI values between baseline and 3 weeks period in the Test and Control Group. The level of significance was set at  $P < 0.05$ .

### Results:-

The values of Plaque index (PI), Gingival index (GI) are depicted in Table 1 at baseline and at 3 weeks of time interval. Independent student t test was performed to compare the mean value of the indices at baseline and at 3 weeks period between test and control group. The test results revealed that there was no statistically significant difference demonstrated between test and control group at baseline and 3 weeks for PI and GI.

The intragroup comparison of the mean scores are depicted in Table 2 at baseline and 3 weeks of interval. Student paired t test was performed to compare the mean PI, GI between baseline and 3 weeks within test and control group. The test results demonstrated a statistically significant difference in mean PI, GI in the post intervention period compared to the baseline period in both test and control group at  $P < 0.001$ . Hence, we can theorize that both Bittergourd (*Momordica charantia*) mouthwash and Chlorhexidine is equally potent in significantly reducing the clinical parameters during 3 weeks period of time.

### Discussion:-

India has enormous resources for herbal medicines. The reputation of Indian herbal medicines market is worth around - 1 billion US dollars worldwide.<sup>10</sup> Herbal medicines have been used for many years, but its application in dentistry has not been explored fully.<sup>11</sup> In the recent years, interest in herbal alternatives to treat gingivitis has skyrocketed as these naturally occurring compounds not only achieve the desired effect but also have no significant side effects.

Mouth washes provide a means of depositing an active material for slow release in the mouth thus they can inhibit bacterial colonization, growth, and metabolism, and consequently interrupt the formation of mature bio-film, changing it at biochemical and ecological level.<sup>5</sup> and contribute to the anti-inflammatory and antiplaque result for a long phase of time.

In short-term investigations, chemical plaque control (oral rinsing twice a day with 0.2% CHX gluconate solution) has been effective in the prevention of gingivitis. The effect of CHX on plaque and its property of slow release have made it as the panacea in the adjunctive treatment to gingivitis.<sup>12</sup> Hence Chlorhexidine (CHX) is considered as the gold standard chemical plaque control agent, with high substantivity.

The antibacterial effect of *Momordica charantia* is well documented and includes a plethora of microorganisms. G. Leelaprakash, Jet al.<sup>13</sup> have shown that the antibacterial activity against *E. coli*, *Pseudomonas*, *Klebsiella*, *Bacillus subtilis*, *Staphylococcus*, *Salmonella*, *Streptococcus*, *Entamoeba histolytica*. K Umesh et; al.<sup>7</sup> in invitro study have shown that the antimicrobial activity against both *S. mutans* and *Lactobacillus*.

Present study individual group comparison between baseline and 3 weeks, significant independent reduction in PI was seen in both the groups and reduction in GI scores were seen in both CHX and *M. charantia* groups. The intergroup comparison of PI, GI, at baseline and at 3 weeks, showed no significant difference between both the groups.

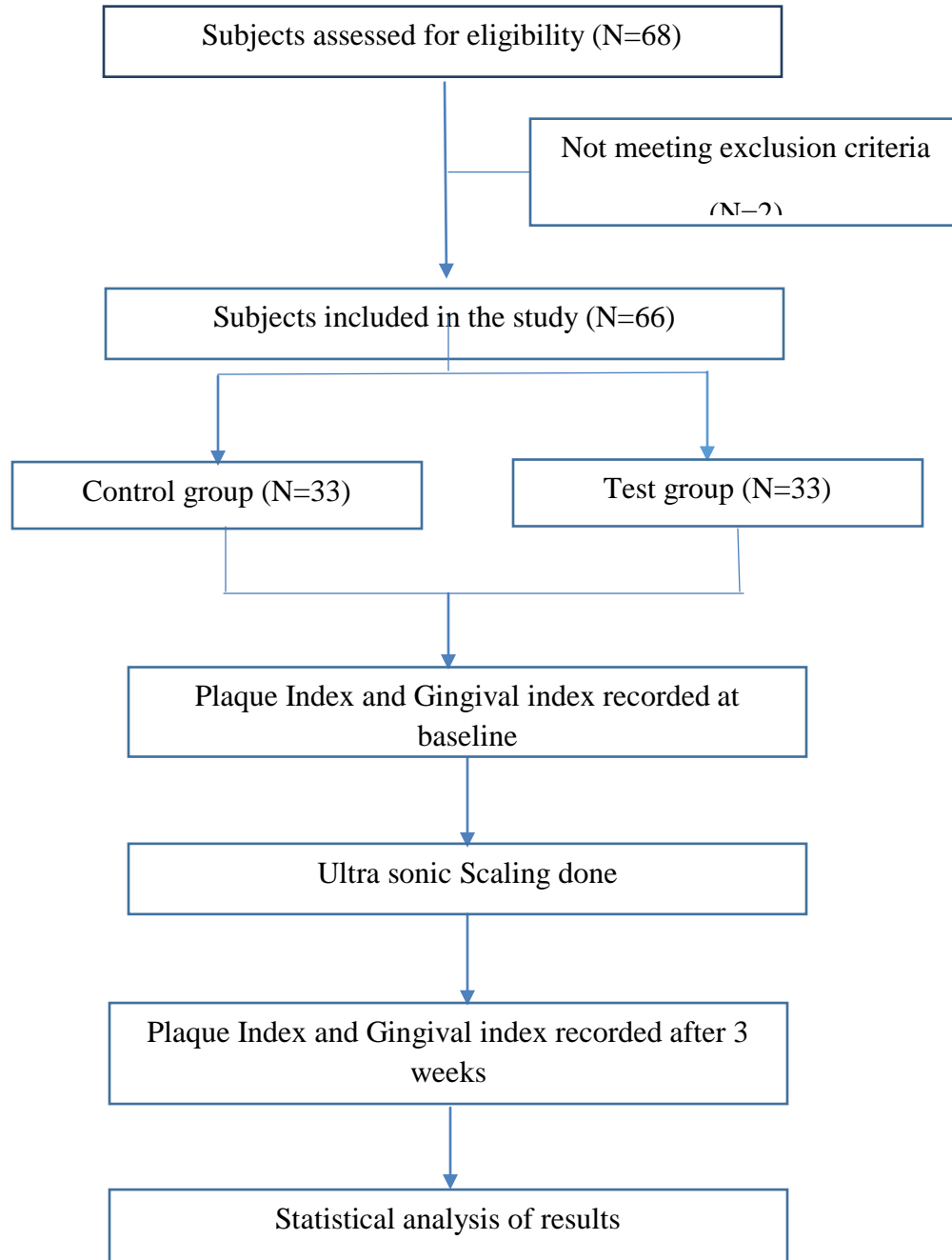
The results of the current study have shown that the mean scores of PI, GI at baseline and at 3 weeks had consistently decreased to lower values in both Bittergourd mouthwash and Chlorhexidine mouthwash which was statistically significant on intragroup analysis. The results from baseline to 3 weeks were comparable on intergroup analysis which showed improvement on clinical parameters but not statistically significant.

In this current study *Momordica charantia* resulted in significant reduction in gingival index, which can be attributed to its anti-inflammatory, antibacterial properties which was proved in invitro study conducted by Armis et al (2019).<sup>14</sup> concluded that ethanolic extract of *Momordica charantia* has an anti-inflammatory effect and prevents the activation of NF- $\kappa$ B in rat gingiva induced by periodontitis.

Our results are in contradictory with Mali et al,<sup>15</sup> showed improved results on clinical parameters in both the test and control group using 1% Curcumin mouthwash as well as 0.2% CHX mouthwash were reported. Whereas our results

are in concordance with Singh et al.<sup>16</sup>2015 wherein reduction in PI at end of 2<sup>nd</sup> and 3<sup>rd</sup> week was better in CHX group. Similarly, the decrease of mean GI was evidently higher in Group CHX than M. Charantia Group.

Both CHX and Momordica charantia groups had good patient compliance and no adverse effects were reported in both the groups. However, the limitations of the study were, the shorter duration of the clinical trial and due to covid 19 scenario follow up after 3 weeks was not done.



**Fig 1:-** Study Design Flow Chart.

**Table 1:-** Comparison of mean PI & GI values between 2 groups during baseline at 3 weeks period using Independent Student t Test.

Time	Parameters	Group	N	Mean	SD	Mean Diff	P-Value
I)	II. PI	Test	29	2.85	0.92	0.11	0.59

2) 3) <b>BASELINE</b>	III. GI	Control	32	2.74	0.62	0.18	0.43
		Test	29	2.58	0.96		
		Control	32	2.40	0.77		
1) 2) <b>AFTER 3 WEEKS</b>	IV. PI	Test	24	0.87	0.35	- 0.04	0.73
		Control	26	0.90	0.38		
	V. GI	Test	24	0.73	0.36	- 0.07	0.43
		Control	26	0.80	0.26		

**Table 2:-** Intragroup comparison of mean scores of PI and GI at baseline and at 3 weeks within each study group using Student paired t test.

Group	Parameters	Time	N	Mean	SD	Mean Diff	P-Value
VI. VII. TEST GROUP	VIII. PI	Baseline	24	2.86	0.88	2.00	<0.001*
		3 Weeks	24	0.87	0.35		
	IX. GI	Baseline	24	2.64	0.97	1.91	<0.001*
		4 Weeks	24	0.73	0.36		
X. XI. CONTROL GROUP	XII. PI	Baseline	26	2.66	0.62	1.53	<0.001*
		3 Weeks	26	0.90	0.38		
	XIII. GI	Baseline	26	2.32	0.75	1.76	<0.001*
		4 Weeks	26	0.80	0.26		

\* - Statistically Significant

### Conclusion:-

The test groups showed significant reductions on plaque and gingivitis at the end of 3 weeks of trial. Bittergourd group had good patient compliance and no adverse effects were reported. It was found that Bittergourd mouthwash had a comparable efficacy with chlorhexidine. Based on these results, the present study indicates that 10% Bitter gourd mouthwash can be used as an adjuvant in reducing plaque-induced gingivitis. Additional studies are required to corroborate whether the effect is clinically and statistically significant over a longer duration of time.

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