

# Efficacy of 4 Different Mouthwashes in Moderate Gingivitis Patients to Reduce Oral Malodour – A Comparative Study

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## Abstract:-

**OBJECTIVE:** The goal of this study was to examine the efficacy of different mouthwashes (alcohol and non-alcohol based) in reducing oral malodour in moderate gingivitis patients.

**MATERIALS & METHODS:** Forty patients with moderate gingivitis were randomly assigned to one of four groups: group 1 (Peridex-alcohol based), group 2 (hiora-non alcohol based), group 3 (orofresh-non alcohol based), and group 4 (orofresh-non alcohol based) (control group). After 15 days and 30 days, clinical measures such as the Oral hygiene index – simplified (OHI-S- Green and Vermillion), Plaque index (PI- Sillness and Loe), Modified sulcular bleeding index (MSBI-Mombelli et al), and Organoleptic score were evaluated. At baseline and after 30 days, microbiologic examination by colony counting was performed.

**RESULTS:** The one-way Anova test was used for statistical analysis, followed by the Post Hoc Tukey test. The results revealed no differences in the OHI, PI and MSBI in the four groups at baseline while after 15 days and 30 days evaluation there was significant reduction in group 1 and 2 however there was an increase in values with group 3. Comparison of halitosis in different groups at base line, 15 days and 30 days were done by chi square test. Results revealed a significant difference between all groups with reduction of halitosis at 30 days of evaluation. Microbial analysis by colony counting revealed significant reduction in early colonizers with predominant reduction of *Porphyromonasgingivalis* in group I at 30 days evaluation.

**CONCLUSION:** Herbal mouth rinses can be used as a supplement to periodontal therapy, however more research into the therapeutic effects of herbal mouth rinses in reducing periodontal infection and inflammation in a broad population is needed.

**Keywords:-** oral malodour, volatile sulphur compounds, mouth washes.

## I. INTRODUCTION

Plaque accumulation and oral bacteria are the primary predisposing factors for many orodental infections, so focusing on them can be an efficient method to combat these infections. <sup>1</sup>Any disagreeable bad or unpleasant odour emerging from the mouth air and breath is referred to as halitosis, a latin word derived from halitus (breathed air) and osis (pathologic modification). Other words for halitosis in

the literature include fetor exore, fetor oris, and stomatodysodia (dysodia in Greek translates to smell).<sup>2</sup>Halitosis is a broad term that refers to an unpleasant odour emerging from the mouth. Approximately 90% of all bad breath is caused by bacteria in the mouth. Oral halitosis is a phrase used to describe halitosis that begins in the mouth.

In independent studies, Rosenberg<sup>4</sup> and Tonzetich<sup>5</sup> found that the odour of foul breath originates in the mouth in as many as 85 percent of patients. Oral malodor is induced by the proteolytic breakdown of sulfur-containing peptides and amino acids in saliva, gingival crevicular fluid, blood, and desquamated epithelial cells by oral bacteria, resulting in the creation of volatile sulphur compounds (vsc).<sup>6</sup> The so-called periodontopathogens, *Porphyromonasgingivalis*, *Prevotella intermedia*, *Fusobacterium nucleatum*, and *Treponema denticola*, are prominent providers of volatile sulphur compounds among gram-negative bacteria.<sup>7</sup>Based on the etiology the treatment for malodour varies at large. However, oral malodour with local etiology can be controlled by use of antimicrobial mouthrinse.

Mouthwashes (mouthrinses) are solutions or liquids used to rinse the mouth for a variety of reasons, including (a) removing or killing bacteria, (b) acting as an astringent, (c) deodorising, and (d) treating infection or avoiding dental caries. Chemical plaque control agents are the broad group in which they fall. Artificial medications on the market have terrible side effects, and the number of drug-resistant bacteria is on the rise<sup>8</sup>.

Many plant-derived drugs have been documented in pharmacopoeias as anti-infective agents, and a number of these chemicals have recently been tested for their efficacy against oral microbial illnesses. When taken alone or in combination, natural herbs like neem, tulsi, triphala, clove oil, ajwain, and others have been scientifically proven to be safe and effective treatments for a variety of oral health issues like bleeding gums, halitosis, mouth ulcers, and decay. The fundamental benefit of these natural herbs is that no harmful side effects have ever been associated to them.

## II. METHODS AND MATERIALS

The following criteria were used to assess 40 participants aged 19 to 25 years (25 males and 15 females) from the outpatient Department of Periodontics, A.J. Institute of Dental Sciences, Mangalore.

### A. Criteria for inclusion

Patients with gingivitis that is moderate The 19-to-25-year-old age group.

**B. Exclusion criteria**

- History of systemic diseases or conditions
- Patients who have undergone oral prophylaxis in last 3 months
- Non compliant patients

Forty patients with moderate gingivitis were randomly divided into 4 groups- Group I (Chlorhex group-alcohol based)  
 Group II (HiOra group-non alcohol based)  
 Group III (Orofresh group- non alcohol based)  
 Group IV (Control group- Saline water)



Fig. 1

ALCOHOL BASED (PERIDEX)	NON ALCOHOL BASED (HIORA)	NON ALCOHOL BASED (OROFRESH)	NON ALCOHOL BASED
CHLORHEXIDENE GLUCONATE (0.2%)	PILU (Salvadora persica- bactericidal and stimulatory action on gingiva)  BIBHITAKA (astringent)  NAGAVALLI (antimicrobial and antifungal)  GANDHAPURA TAILA  ELA (flavouring agent)  PEPPER MINT SATVA  YAVANI SATVA (thymol)	CUMINUM CYMINUM (jeera) PIPER NIGRUM (black pepper) ZINGIBER OFFICINALE (ginger)  CURCUMA LONGA (turmeric)  SYZIGIUM AROMATICUM (clove)  CINNAMUM ZEYLANICUM (cinnamon)  OCIMUM SANCTUM (tulsi)  AZADIRACTA INDICA (neem)	SODIUM CHLORIDE

Table 1: List of Mouthwashes: Alcohol based, Non Alcohol based

Subjects of each group were asked to rinse with 10ml of mouthrinse for 60 sec twice daily after half an hour of brushing for 30 days. At baseline, a clinical examination was performed followed by oral prophylaxis, and after 15 and 30 days, clinical parameters such as the Oral hygiene index – simplified (OHI-S- Green and Vermillion 1964), Plaque index (PI- Silness and Loe 1963), Modified sulcular bleeding index (MSBI- Mombelli et al 1987), and

Organoleptic scoring were evaluated. Nasal sniffing, also known as organoleptic assessment, was used to detect the presence or absence of oral malodour. A single operator performed the organoleptic estimations. The subjects were told to exhale quickly through their lips at a distance of about 10 cm from the operator's nose, and the outcomes were graded on a scale of 0-5. Microbiologic analysis by Colony counting was done at baseline and after 30 days.

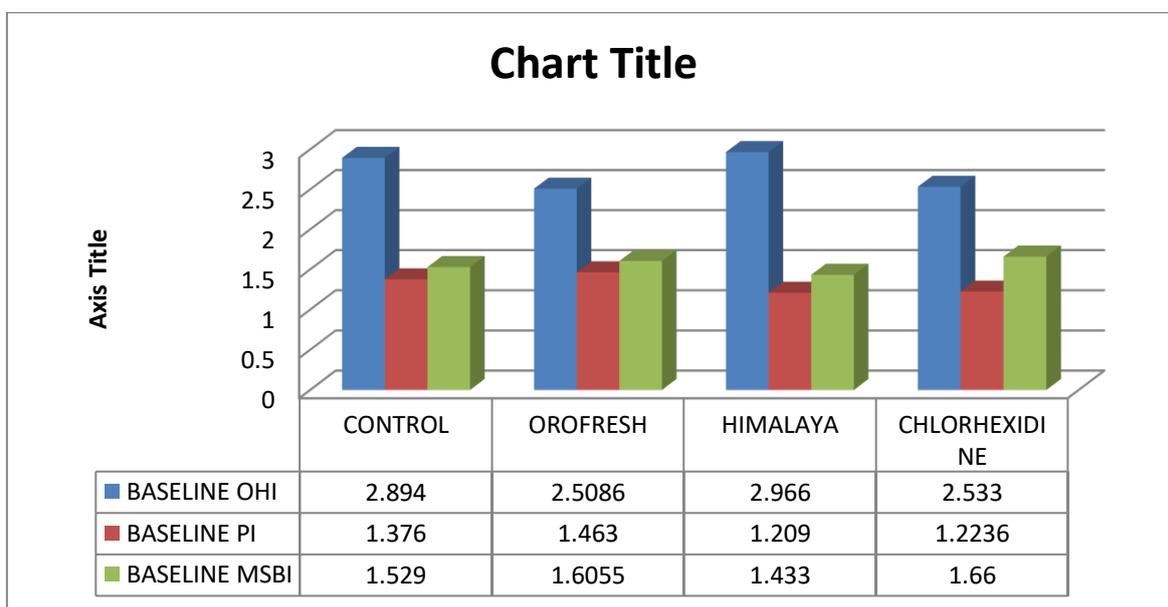
0	Absence of odour
1	Barely noticeable odour
2	Slight but clearly noticeable odour
3	Moderate odour
4	Strong offensive odour
5	Extremely foul odour

Table 2: Organoleptic scoring (Rosenberg and Mc Culloch)

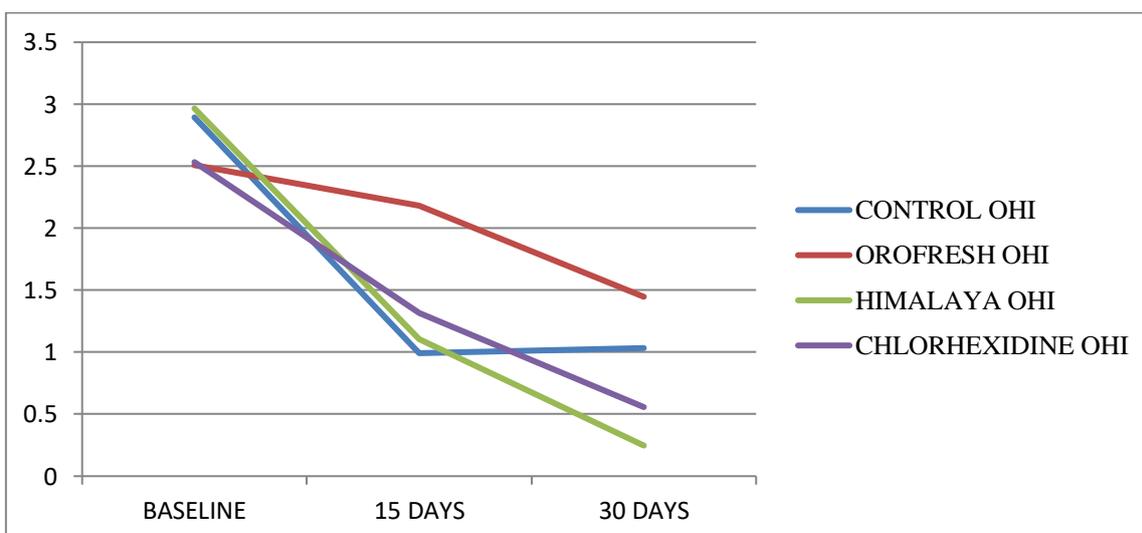
**III. RESULTS**

Statistical analysis was done by One way Anova test followed by Post Hoc Tukey test for the confirmation of the results. There was no differences in the OHI, PI and MSBI in the four groups at baseline while after 15 days and 30 days reevaluation there was significant reduction in group I and II however there was an increase in values with group III.

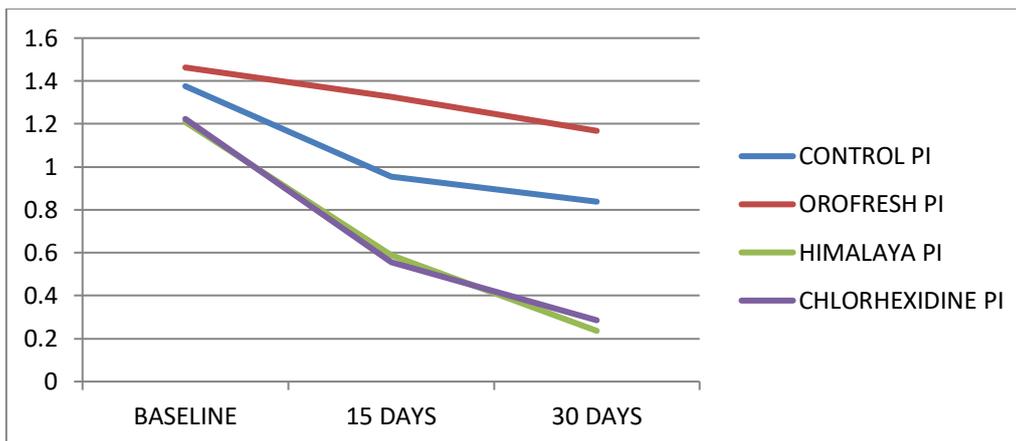
Comparison of halitosis in different groups at base line, 15 days and 30 days were done by chi square test. Results revealed that there was a significant difference between all groups with reduction of halitosis at 30 days of evaluation. Microbial analysis by colony counting revealed significant reduction in early colonizers with predominant reduction of Porphyromonasingivalis in group I at 30 days evaluation.



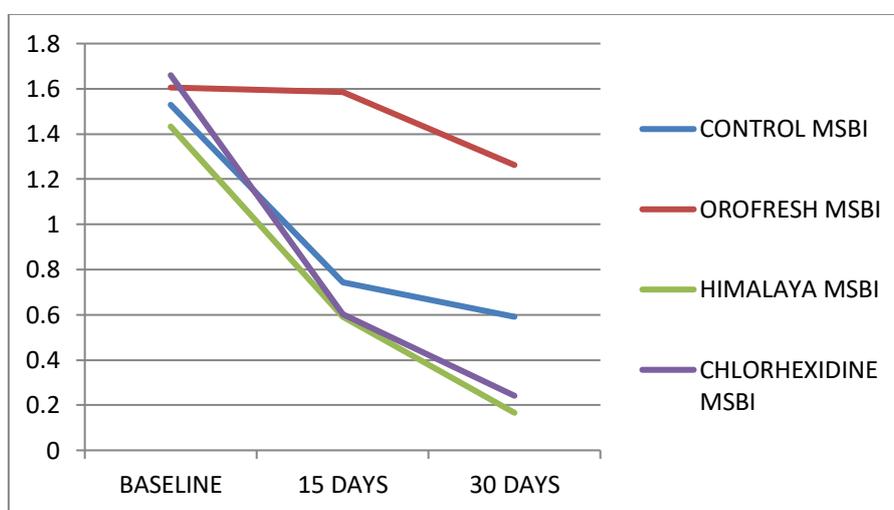
Graph1: Baseline values of clinical parameters are almost same in all four groups



Graph 2: OHI values of all groups at baseline, after 15 days and 30days



Graph 3: PI values all groups at baseline, after 15 days and 30days



Graph 4: MSBI values all groups at baseline, after 15 days and 30days

In 30 days, the values of clinical parameters showed a significant reduction in group 1 and 2 however there was an increase in values with group 3.

Chi square test for comparison of halitosis-

Crosstab			GROUP				Total
			CONTROL	OROFRESH	HIMALAYA	CHLORHEXIDINE	
BASELINE HALITOSIS	1	Count	3	5	5	4	17
		% within BASELINE HALITOSIS	17.6%	29.4%	29.4%	23.5%	100.0%
		% within GROUP	30.0%	50.0%	50.0%	40.0%	42.5%
	2	Count	7	5	5	6	23
		% within BASELINE HALITOSIS	30.4%	21.7%	21.7%	26.1%	100.0%
		% within GROUP	70.0%	50.0%	50.0%	60.0%	57.5%
Total	Count	10	10	10	10	40	
	% within BASELINE HALITOSIS	25.0%	25.0%	25.0%	25.0%	100.0%	
	% within GROUP	100.0%	100.0%	100.0%	100.0%	100.0%	

Table 2: Baseline halitosis group

	Value	Exact Sig. (2-sided)
Fisher's Exact Test	1.223	.895
N of Valid Cases	40	

Table 3: Chi-Square Tests

At 15 days evaluation

		Crosstab					Total
		GROUP					
		CONTROL	OROFRESH	HIMALA YA	CHLORHEXI DINE		
15 DAYS HALITOSIS	0	Count	0	5	6	2	13
		% within 15 DAYS HALITOSIS	0.0%	38.5%	46.2%	15.4%	100.0%
		% within GROUP	0.0%	50.0%	60.0%	20.0%	32.5%
	1	Count	6	4	4	8	22
		% within 15 DAYS HALITOSIS	27.3%	18.2%	18.2%	36.4%	100.0%
		% within GROUP	60.0%	40.0%	40.0%	80.0%	55.0%
	2	Count	4	1	0	0	5
		% within 15 DAYS HALITOSIS	80.0%	20.0%	0.0%	0.0%	100.0%
		% within GROUP	40.0%	10.0%	0.0%	0.0%	12.5%
Total		Count	10	10	10	10	40
		% within 15 DAYS HALITOSIS	25.0%	25.0%	25.0%	25.0%	100.0%
		% within GROUP	100.0%	100.0%	100.0%	100.0%	100.0%

Table 4:

Chi-Square Tests

	Value	Exact Sig. (2-sided)
Fisher's Exact Test	15.074	<b>.006</b>
N of Valid Cases	40	

Table 5

**At 30 days evaluation**

		Crosstab				Total	
		GROUP					
		CONTROL	OROFRESH	HIMALAY A	CHLORHEXIDI NE		
30 DAYS HALITOSIS	0	Count	2	7	10	10	29
		% within 30 DAYS HALITOSIS	6.9%	24.1%	34.5%	34.5%	100.0%
		% within GROUP	20.0%	70.0%	100.0%	100.0%	72.5%
	1	Count	8	2	0	0	10
		% within 30 DAYS HALITOSIS	80.0%	20.0%	0.0%	0.0%	100.0%
		% within GROUP	80.0%	20.0%	0.0%	0.0%	25.0%
	2	Count	0	1	0	0	1
		% within 30 DAYS HALITOSIS	0.0%	100.0%	0.0%	0.0%	100.0%
		% within GROUP	0.0%	10.0%	0.0%	0.0%	2.5%
Total		Count	10	10	10	10	40
		% within 30 DAYS HALITOSIS	25.0%	25.0%	25.0%	25.0%	100.0%
		% within GROUP	100.0%	100.0%	100.0%	100.0%	100.0%

Table 6

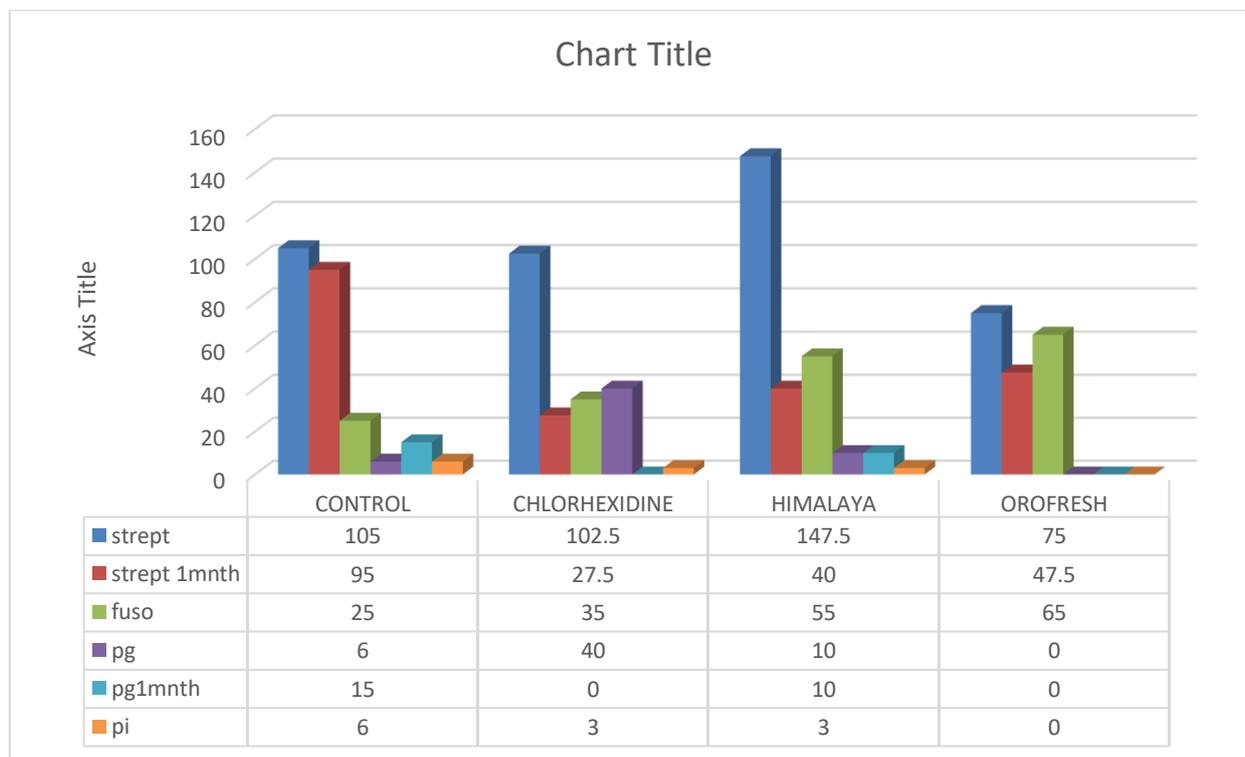
**Chi-Square Tests**

	Value	Exact Sig. (2-sided)
Fisher's Exact Test	22.653	<b>&lt;0.001</b>
N of Valid Cases	40	

Table 7

Values of halitosis showed no differences at baseline while there was a significant difference in 30 days evaluation.

Microbial analysis at baseline and after 30days



Graph 5

At 30 days evaluation, microbial analysis by colony counting revealed significant reduction in early colonizers with predominant reduction of *Porphyromonasgingivalis* in group I.

#### IV. DISCUSSION

Until now, chlorhexidine has been the most widely used and researched chemical agent for plaque control. Despite its antibacterial and antiplaque capabilities, local side effects limit its widespread and long-term use. Herbal medicine has a preventative and promotional approach<sup>10</sup>. It is a complete approach that employs a variety of treatments derived from plants and their extracts to treat and maintain health<sup>11</sup>. The main advantage of these natural herbs is that they have never been linked to any negative side effects. Apart from that, all herbal mouthrinses are free of alcohol and/or added sugar, which are two of the most prevalent substances in most over-the-counter medications that reduce halitosis. The goal of this study was to see how effective two herbal mouthrinses (*Hiora* and *Orofresh*) with 0.2 percent Chlorhexidine Gluconate were. Haffajee et al<sup>12</sup> investigated the effects of herbal, essential oil, and chlorhexidine mouthrinses

on the composition of the subgingival microbiota and clinical periodontal parameters in periodontal maintenance participants and found that all mouthrinses examined improved clinical metrics. This in accordance with present study which showed statistically significant difference in all groups of mouthwashes. Chlorhexidine considered as a gold standard has significant role in reducing plaque microorganisms. Based on the limited evidence available till date, the herbal mouthrinses have shown antimicrobial efficacy against periodontal and cariogenic pathogens both in vivo and in vitro<sup>13</sup>. The present study also showed findings similar to that observed in the above studies. The

reduction of total bacterial counts in the oral cavity is the primary goal of treatment options for controlling oral malodor. Mouth rinsing has been a prevalent oral hygiene procedure since the dawn of civilization. Although the plaque and gingivitis-reducing effects of many mouth rinses have been emphasised in recent years, oral malodour<sup>14</sup> is one of the major concerns that leads to frequent mouth rinse use. Nasal sniffing was utilised in this investigation to detect the presence or absence of oral malodour, often known as organoleptic assessment. Organoleptic estimations were carried out by a single operator. Statistically significant differences between the organoleptic scoring were seen between all four groups at 30 days evaluation. Rosenberg and colleagues<sup>15</sup> found that using a mouthwash containing 0.2 percent chlorhexidine (CHX) reduced peak VSC values by 43% and reduced organoleptic mouth smell ratings by 50%. Gram-negative bacteria such as *Treponema denticola*, *Porphyromonasgingivalis*, *Porphyromonasendodontalis*, *Prevotella intermedia*, *Bacteroides loescheii*, *Enterobacteriaceae*, *Tannerellaforsythensis*, *Eikenellacorrodens*, and *Fusobacterium nucleatum* are the most likely to produce oral malodor.<sup>16</sup> These VSCs are known to be produced in significant quantities by bacteria associated with gingivitis and periodontitis, such as *Porphyromonas gingivalis*<sup>17</sup> and *Prevotella intermedia*<sup>18</sup>. However, there is no clear link between halitosis and any specific bacterial illness, implying that poor breath is the result of complicated interactions between multiple oral bacterial species.<sup>19</sup> The increased species diversity found in halitosis samples suggests that halitosis may be the result of complex interactions between several bacterial species.<sup>20</sup> In the present study, microbiological results revealed a significant difference in early colonizers count, in all four groups with *Porphyromonasgingivalis* being most significant in the chlorhexidine group at 30 days evaluation.

- Microbial culturing showed the presence of black pigmented colonies of *Porphyromonasgingivalis* at baseline and the reduction in number of colonies after 30 days



Black pigmented colonies of *Porphyromonasgingivalis*

Fig. 2



Reduction in the number of black pigmented colonies of *Porphyromonasgingivalis*

Fig. 3

## V. CONCLUSION

In this study it was seen that Orofresh, a locally made indigenous mouthwash with extracts being comparable to other herbal mouthwash was highly patient compliant. Evidence in dental literature support the efficacy of chlorhexidine as antiplaque agents but the long term use is limited by its side effects. Herbal products, though negate these effects and can be used safely for a longer time period, still need to establish the property of substantivity in order to compare with that of chlorhexidine. Thus it could be safely concluded that herbal mouthrinses can be used as an adjunct to periodontal therapy, however long term research on therapeutic effects in controlling periodontal infection and inflammation in large population is recommended.

## ACKNOWLEDGEMENT

Our heartfelt thanks to Dr Kishore bhat(Professor and Head, Department of Microbiology, Maratha Mandal Institute Of Dental Sciences, Belgaum) for helping us in microbiological analysis.

### • Foot notes

Source of Support: Nil

Conflict of interest: None declared.

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