

## Original Research

### A Clinical Study to Evaluate the Effectiveness of two antimicrobial topical agents in the treatment of Chronic Gingivitis

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#### ABSTRACT:

The aim of this study is to evaluate the effectiveness of two topical antimicrobial gels- chlorhexidine alone and chlorhexidine plus ornidazole as an adjunct to mechanical plaque control over a period of 4 weeks in treatment of chronic gingivitis patients. Material and Methods: This clinical study included 50 Subjects comprising of both the sexes with a chief complaint of bleeding gums after meeting inclusion and exclusion criteria were randomly divided into two groups; Group I (Chlorhexidine gluconate gel ) and Group II (Chlorhexidine gluconate plus Ornidazole gel. ) For both groups, the following clinical parameters were recorded at baseline, 2 weeks and 4 weeks: Gingival Index and Modified Sulcus Bleeding Index with a conventional William's calibrated periodontal probe gentle on gingival margins of indexed teeth with no repeated gingival probing being done. Intra and inter-group comparisons of clinical parameters were done using appropriate statistical tests. Results: There was high significant reduction in Gingival Index and Modified Sulcus Bleeding Index scores at the end of 2 weeks and 4 week period in both the groups. Further, combination gel of Group II (Chlorhexidine gluconate plus Ornidazole gel. ) was found to be statistically more effective as compared to Group I (Chlorhexidine gluconate gel) used alone. Conclusions: Our study suggests that Chemotherapeutic agents like Chlorhexidine gluconate alone and combination Chlorhexidine gluconate plus Ornidazole Gel are clinically effective as adjunct to Scaling and Root Planning (SRP) in treatment of Chronic Gingivitis.

**Key words:** Scaling and Root Planning (SRP), Chronic Gingivitis, Chlorhexidine Gluconate ,ornidazole

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#### INTRODUCTION

Periodontal diseases are infections initiated by bacterial biofilms that form on the surfaces of teeth in close proximity to the supporting tissues. The susceptibility to periodontitis is influenced by many factors such as smoking, diabetes and genetics, and prevention of gingival inflammation prevents periodontitis.<sup>1</sup> Gingivitis is the inflammation of gingiva commonly characterized by redness and bleeding from gums. It is a reversible condition and also one of the most common inflammatory and prevalent disease in humans.<sup>2</sup> Epidemiological studies have estimated that the prevalence of adult gingivitis varies from approximately 50- 100% in dentate

patients.<sup>3</sup> It is caused by aggregation of bacterial biofilm that can be managed by either mechanical removal of this biofilm or by improving oral health status.<sup>4</sup>

Plaque control procedures comprises of several mechanical and chemical methods. Mechanical plaque control aids include SRP (Scaling and Root planning), brushing, interdental cleaning aids, flossing and dentifrices. Over a period of time, these methods have proved to be insufficient due to either being technique sensitive or dependent on the skill of the operator.<sup>5</sup> This has led to the use of antiplaque agents as adjunctive to mechanical plaque control. The rationale for the use of antiplaque agents

as adjuncts to mechanical cleaning methods is based on two factors. First, plaque is the major etiological factor in gingivitis.<sup>6</sup> Second, the prevalence of gingivitis and evidence from studies suggest that mechanical cleaning methods are inadequate.<sup>7</sup> This can be achieved either by systemic or local administration of antimicrobial agents. A prolonged administration of systemic dose would increase the risk of problems such as antibiotic resistance and adverse drug reactions like nausea, diarrhea and pseudo membranous colitis.<sup>8</sup>

Hence, to avoid these complications, wide usage of local administration of antimicrobial agents came into existence. These agents can be used for rinsing, irrigation, systemic administration or local application. Success of any drug delivery system depends upon its ability to deliver antimicrobial agents in sufficient concentration to exert their effects. The medicament must remain at local site long enough to ensure an efficacious outcome. A hundred fold higher concentration of antimicrobial agent can be achieved by the local route of drug delivery as compared to the systemic drug administration.<sup>9</sup>

Various chemotherapeutic agents including tetracycline, minocycline, doxycycline, metronidazole, ornidazole, chlorhexidine etc. are available for local application. They come in form of gels, paste, films, strips and fibers.<sup>10-14</sup>

Chlorhexidine (CHX) remains the gold standard of chemical antiplaque agents and remains one of the most effective topical antiseptics reported to date that has been successfully used for treating plaque-related gingivitis.<sup>15,16</sup> Chlorhexidine has been reported to have some reversible local side effects, such as staining of the teeth and tongue and desquamation of the oral mucosa. Staining is largely dose-dependent, whereas desquamation of the oral mucosa and perturbation of taste is largely concentration-dependent.<sup>17</sup>

Ornidazole (Nitroimidazole compound) acts by inhibiting DNA synthesis. It works on the principle that inactive form passively diffuses into cell where it is activated by chemical reduction. The nitro group gets reduced to anion radicals which causes oxidation of DNA leading to strand breakage and cell death.<sup>18</sup> Hence, it has both antimicrobial and mutagenic effect. This effect is primarily seen on obligate gram negative anaerobes and the gram-positive anaerobes, which are implicated in periodontal disease.

This present study was conducted to evaluate the efficacy of chlorhexidine and Ornidazole Gel as a local application to reduce gingival inflammation after the phase-I therapy over a period of 4 weeks in subjects with gingivitis.

#### AIMS AND OBJECTIVES

To evaluate the therapeutic effectiveness of chlorhexidine containing gel as an adjunct to oral prophylaxis in chronic gingivitis patients

To evaluate the therapeutic effectiveness of Ornidazole containing gel as an adjunct to oral prophylaxis in chronic gingivitis patients

To compare the therapeutic effectiveness of chlorhexidine and ornidazole containing gel as an adjunct to oral prophylaxis in chronic gingivitis patients

#### MATERIALS AND METHODS

##### SAMPLE SIZE

50 Subjects comprising of both the sexes, visiting outpatient Department of Periodontology, Govt. Dental College and Hospital Srinagar, with a chief complaint of bleeding gums were considered for the present clinical study after meeting inclusion and exclusion criteria. The study protocol was approved by the Institutional Ethical Committee.

##### INCLUSION CRITERIA

The criteria for inclusion in the study was:-

1. Systemically healthy subjects ranging between 18-45 years of age.
2. chronic generalized gingivitis (GI>1),
3. probing depth  $\leq$  3mm and zero clinical attachment loss
4. With no evidence of radiographic bone loss.

##### EXCLUSION CRITERIA

1. A history of antibiotic intake within last three months preceding the study,
2. Pregnant or lactating women.
3. Smokers.
4. Chronic alcoholics.
5. Known allergies to chlorhexidine gluconate or ornidazole were excluded from the study.
6. With history of periodontal surgery.
7. Haematological disorders, other systemic illnesses and immunocompromized subjects
8. Subjects undergoing orthodontic treatment

Only the patients who gave written consent and fulfilled all the qualifying criteria were taken up for the study and randomly divided into two groups.

- Group I: Chlorhexidine gluconate gel .
- Group II: Chlorhexidine gluconate plus Ornidazole gel.

For both groups, the following clinical parameters were recorded at baseline, 2 weeks and 4 weeks:

- a) Gingival Index<sup>19</sup>.
- b) Modified Sulcus Bleeding Index<sup>20</sup>.

A conventional William's calibrated periodontal probe was used to evaluate the inclusion eligibility criteria in subjects by assessing clinical attachment level and probing depth. The dental indices were recorded by a single examiner performing gentle probing of gingival margins of indexed teeth with no repeated gingival probing being done.

After giving Phase I therapy (SRP), the patients were educated to apply a pea nut sized amount of gel gently with the index finger to the gums twice a day,

30 minutes after brushing and to leave it for 5 minutes before rinsing. The patients were instructed to follow this regime for 4 weeks. Subjects were asked to refrain from all other unassigned forms of oral hygiene aids, including dental floss, chewing gum or oral rinses during the study.

**STATISTICAL ANALYSIS:**

Data comparison was done by applying specific statistical tests to find out the statistical significance of the comparisons. Quantitative variables were compared using mean values and qualitative variables using proportions. Unpaired student’s t-test was used for comparative evaluation between Group I and Group II using Gingival index and Modified Sulcus Bleeding Index at base line, after 2 weeks and 4 weeks among chronic gingivitis patients. Paired student’s t-test was used for evaluation of Gingival index and Modified Sulcus Bleeding Index from baseline, 2 weeks and 4 weeks within Group I and Group II chronic gingivitis patients. P-value of > 0.05 is not significant and *p* <0.01 is highly significant.

**RESULTS**

Table 1 reveals comparative evaluation of Gingival Index between Group I and Group II at base line, after 2 week and after 4 weeks among chronic gingivitis patients. At baseline there was no significant difference found in gingival index value between Group I and Group II. It was 1.857 ±0.257 & 1.140 ±0.398 amongst Group I and Group II respectively. After 2 week of follow up patients oral hygiene was improved and gingival index value was significantly reduced to 1.435±0.333 in group I and to 1.049±0.373 in Group II patients. After 4 week of follow up patients oral hygiene was improved and gingival index value was significantly reduced to 1.201±0.201in group I and to 1.345±0.146 in Group II patients. On application of Unpaired student‘t’ test there was statistically high significant difference found in gingival index value among Group I and Group II patients after two and four week of

application (*P*=0.000). Table 2 reveals comparative evaluation of Modified Sulcus Bleeding Index (MSBI) between Group I and Group II at base line & after 2 week among chronic gingivitis patients. At baseline there was no significant difference found in Modified Sulcus Bleeding Index (MSBI) value between Group I(1.747±0.157 )& Group II patients (1.130± 0.298 ) respectively. After 2 week of follow up patients oral hygiene was improved and gingival index value was significantly reduced to 1.324 ±0.222 in group I and to 1.038 ±0.262 in Group II patients. After 4 week of follow up patients oral hygiene was improved and gingival index value was significantly reduced to 1.101±0.200 in group I and to 1.234±0.135 in Group II patients. On application of Unpaired student‘t’ test there was statistically high significant difference found in gingival index value among Group I and Group II patients after two and four week of application (*P*=0.000). Table 3 reveals evaluation of gingival Index from base line to 2 week within Group I & II Chronic Gingivitis Patients. After 4 week of follow up patients oral hygiene was improved and gingival Index value was significantly reduced from 1.846±0.246 to 1.131±0.122 within Group I patientsand 1.030±0.387 to 1.024±0.115 within Group II patients. Paired student‘t’ test was applied to calculate the *p* value (*P*=0.001).

Table 4 reveals evaluation of Modified Sulcus Bleeding Index from base line to 4 weeks within Group I & II Chronic Gingivitis Patients. After 2 week of follow up patients oral hygiene was improved and Modified Sulcus Bleeding Index (MSBI) value was significantly reduced from 1.656±0.204 to 1.120±0.022 within Group I patients and 1.003±0.440 to 1.013±0.101 within Group II patients . Paired student‘t’ test was applied to calculate the *p* value (*P*=0.001).

**Table 1:** Comparative evaluation of Gingival Index between Group I (chlorhexidine) and Group II (chlorhexidine and ornidazole) at base line, after 2 weeks and 4 weeks among chronic gingivitis patients.

Groups	N	Base line Gingival index (GI) value		Post 2 weeks Gingival index (GI) value		Post 4 weeks Gingival index (GI) value	
		MEAN	SD	MEAN	SD	MEAN	SD
Group I (chlorhexidine)	25	1.857	0.257	1.435	0.333	1.201	0.201
Group II (chlorhexidine and ornidazole)	25	1.140	0.398	1.049	0.373	1.345	0.146
Unpaired Student ‘t’ test		1.293		3.716		2.605	
Significance ‘p’ Value		0.132(NS)		0.000(HS)		0.000(HS)	

**Table 2:** Comparative evaluation of Modified Sulcus Bleeding Index between Group I (chlorhexidine) and Group II (CHX and ornidazole) at base line, after 2 weeks and 4 weeks among chronic gingivitis patients.

Groups	N	Base line Gingival index (MSBI) value		Post 2 weeks Gingival index (MSBI) value		Post 4 weeks Gingival index (MSBI) value	
		MEAN	SD	MEAN	SD	MEAN	SD
Group I (chlorhexidine)	25	1.747	0.157	1.324	0.222	1.101	0.200
Group II (chlorhexidine and ornidazole)	25	1.130	0.298	1.038	0.262	1.234	0.135
Unpaired Student 't' test		1.182		2.605		1.504	
Significance 'p' Value		0.121(NS)		0.000(HS)		0.000(HS)	

**Table 3:** Evaluation of Gingival Index from base line to 4 weeks among Group I (chlorhexidine) and Group II (chlorhexidine and ornidazole) among chronic gingivitis patients.

Groups	Base line Gingival index value		Post 2 weeks Gingival index value		Post 4 weeks Gingival index value		Paired Student 't' test	p Value
	MEAN	SD	MEAN	SD	MEAN	SD		
Group I (chlorhexidine)	1.846	0.246	1.424	0.232	1.131	0.122	11.050	0.001 (HS)
Group II (chlorhexidine and ornidazole)	1.030	0.387	1.038	0.272	1.024	0.115	12.066	0.001 (HS)

**Table 4:** Evaluation of Modified Sulcus Bleeding Index from base line to 4 weeks among Group I (chlorhexidine) and Group II (chlorhexidine and ornidazole) among chronic gingivitis patients.

Groups	Base line Gingival index value		Post 2 weeks Gingival index value		Post 4 weeks Gingival index value		Paired Student 't' test	p Value
	MEAN	SD	MEAN	SD	MEAN	SD		
Group I (chlorhexidine)	1.656	0.204	1.342	0.188	1.120	0.022	9.050	0.001 (HS)
Group II (chlorhexidine and ornidazole)	1.003	0.440	1.043	0.201	1.013	0.101	11.066	0.001 (HS)

**DISCUSSION**

In gingivitis, successful outcome of periodontal therapy depends upon the elimination of pathogenic organism found in dental plaque film associated with the tooth surface.<sup>21</sup> The present study was conducted to evaluate the effectiveness of adjunctive use of two antimicrobial topical gels (Chlorhexidine Gel alone and Combination of Chlorhexidine–Ornidazole gel) administered on patients of chronic gingivitis. Traditional therapy for periodontal disease include mechanical scaling and root planning (SRP), which removes the deposits from the tooth surface and shifts the pathogenic microbiota to one compatible with periodontal health <sup>22-25</sup>. However, the pocket anatomy is a significant limiting factor in

mechanical access, and sufficient reduction of the bacterial load is difficult to achieve.<sup>26</sup> An increased interest in antibiotic therapy as an adjunct to standard periodontal treatment regime began in the late 1970's with the realization that certain bacteria are frequently associated with the disease process. Thus, emerging evidence of bacterial specificity in certain types of periodontitis has led to treatment strategies, which are primarily aimed at suppression or elimination of specific periodontal pathogens. These therapeutic rationales rely heavily on systemic or local administration of antimicrobial agents. Since use of systemic antibiotics is associated with some disadvantages such as inability of systemic drugs to achieve high gingival crevicular fluid concentration,<sup>27</sup> an increased risk of adverse drug reactions,<sup>28</sup>

increased selection of multiple antibiotic-resistant micro-organisms<sup>29</sup> and uncertain patient compliance,<sup>30</sup> the local administration of drugs is recommended.

Chlorhexidine (CHX) Local Drug Delivery regime is considered as a Gold Standard in Chemotherapeutic Plaque control due to its anti-plaque properties and substantivity in oral cavity. CHX has a broad spectrum of antimicrobial activity covering both Gram Positive and Gram Negative Bacteria.<sup>31</sup> Its proposed mechanism of action includes reduction in pellicle formation, alteration of bacterial adherence to teeth, and alteration of bacterial cell wall permeability which leads to ultimately cell lysis. Commercially chlorhexidine gel is available in 1%, 0.2% and 0.12% concentrations.<sup>5</sup> Ornidazole specifically acts on Gram-negative anaerobic, facultative bacteria which are responsible for periodontal disease. Ornidazole requires a very low minimum inhibitory concentration to inhibit the growth of periodontal pathogens as compared to that of metronidazole. The antimicrobial activity of ornidazole has been proposed due to the reduction of nitro group to a more reactive amine that attacks microbial DNA, inhibiting further synthesis and causing degradation of existing DNA.<sup>32-34</sup>

In the present study, there was reduction in gingival index scores in both the groups which was highly statistically significant. This may be due to elimination of local etiological factors like plaque and calculus after SRP. This was in accordance with the study done by Hinrichs et al.<sup>35</sup> and Cugini et al.<sup>36</sup>, which showed statistically significant reduction in GI score, following SRP. In our study, statistically high significant reduction in Modified Sulcus Bleeding Index from base line after 4 weeks was recorded within Group I and Group II but an overall comparative statistical evaluation between Group I and Group II revealed high significant reduction in Modified Sulcus Bleeding Index scores in Group II as compared to Group I. These findings are well consistent with the studies of Pradeep *et al.*<sup>37</sup> and Mishra *et al.*<sup>5</sup> as well.

In the present study, overall comparative evaluation between Group I and Group II statistically reported high significant reduction in Group II as compared to Group I for both GI and MSBI Scores. Thus, our study results are strongly indicative to the fact that gel combination drug regime, having the conjoined properties of both components is more efficacious than chlorhexidine gel used alone in chronic Gingivitis patients. which is in accordance with the study done by Adinarayan R et al.<sup>38</sup> and M.Nagasreeth al.<sup>39</sup> The limitations of this study are small sample size and a short term clinical trial,

## CONCLUSION

The study showed that ornidazole –chlorhexidine combination used as an adjunct to phase 1 therapy

has shown improved results on the clinical parameters of gingival index and modified sulcus bleeding index on gingivitis patients on a short-term basis.

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