INTRODUCTION

Mouth is home to hundreds of bacterial species that produce several fetid substances as a result of protein degradation. Periodontal bacteria produce several malodorous volatile sulfur compounds (VSCs) such as Hydrogen sulfide (H₂S), Methyl mercaptan (CH₃SH) and Dimethyl sulfide (CH₃)₂S. Bacteria in dental plaque are major etiologic agent initiating gingivitis and periodontitis. During maintenance phase, chemical plaque control products slow down formation of dental plaque reducing risk for periodontal disease. Stabilized chlorine dioxide is a compound with antimicrobial properties essentially eliminates oral malodor. It exerts its bactericidal effect by fixing cellular membrane proteins.

Aim: To evaluate clinical effects of Chlorine dioxide mouthrinse on plaque induced gingivitis and oral malodor.

Materials and methods: 30 patients were included in the study and they were divided into 3 groups.
Group-I: 10 patients using 10 ml ClO₂ mouthrinse for 30 seconds only
Group-II: 10 patients using ClO₂ + SRP (scaling and root planning).
Group III: 10 Patients with SRP only
Gingival Index (Silness & Loe 1964), Plaque Index (Loe & Silness 1963) and Organoleptic measurements were recorded at baseline, 7 and 14 days.

Statistical analysis: Groups were compared by repeated measures analysis of variance (ANOVA) using general linear models (GLM).

Results: Statistically significant reduction from baseline in mean PI, GI and organoleptic measurements observed in Group II and Group III at 7th and 14th day whereas no statistically significant difference observed in Group I but only in case of organoleptic measurements.

Conclusion: Clinical parameters of gingivitis reduced with the experimental mouthwash used for 14 days. Mouthwash containing ClO₂ improved halitosis.

Key words: Oral Malodour, Stabilized Chlorinedioxide, Organoleptic Measurements

INTRODUCTION

Mouth is home to hundreds of bacterial species that produce several fetid substances as a result of protein degradation. Periodontal bacteria produce several malodorous volatile sulfur compounds (VSCs) such as Hydrogen sulfide (H₂S), Methyl mercaptan (CH₃SH) and Dimethyl sulfide (CH₃)₂S. Bacteria in dental plaque are major etiologic agent initiating gingivitis and periodontitis. During maintenance phase, chemical plaque control products slow down formation of dental plaque reducing risk for periodontal disease. Stabilized chlorine dioxide is a compound with antimicrobial properties essentially eliminates oral malodor, reduces the signs of gingival diseases and does not stain teeth or have a harsh taste as seen in case of Chlorhexidine mouthrinse. Stabilized chlorine dioxide has marked bactericidal effects against oral bacteria associated with gingivitis and periodontitis.

Mechanism of action for reducing oral malodor

ClO₂ and the chlorite anion directly oxidizes VSCs to non malodourous products. Through this oxidation, it consumes aminoacids such as cysteine and methionine which act as precursor to VSCs.

Mode of action of antimicrobial activity

Sodium chlorite is a MMS (miracle mineral supplement) with superior antimicrobial activity. NaClO₂, combined with 5 drops of 10% citric acid releases ClO₂ gas and destroys anaerobic microbes and parasites, it penetrates bacterial cells, react with vital aminoacids in the cytoplasm to kill organism. It exerts its bactericidal effect by fixing cellular membrane proteins.

Aim

To evaluate clinical effects of Chlorine dioxide mouthrinse on plaque induced gingivitis and oral malodor.

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Group III: 10 Patients with SRP only

Inclusion Criteria

Patients with 20-45 years of age were included with minimum 20 teeth present and Oral malodor present.

Exclusion criteria

Females, Smokers, subjects with Oral malodor caused by food, Subjects using mouthrinse within last 4 weeks, antibiotic therapy or periodontal treatment for last 3 months were excluded from the study.
Indices recorded for measurement of Periodontal status.

Gingival Index (Silness & Loe 1964), Plaque Index (Loe & Silness 1963) and Organoleptic measurements were recorded at baseline, 7 and 14 days.

Organoleptic Measurements
OM score was measured after subjects closed their mouth for 3 minutes.
Malodor was rated on a 0-5 scale
0 = absence of odor
1 = barely noticeable odor
2 = slight malodor
3 = moderate malodor
4 = strong malodor
5 = severe malodor

Statistical analysis
Data were summarized as Mean ± SD. Groups were compared by repeated measures analysis of variance (ANOVA) using general linear models (GLM).

<table>
<thead>
<tr>
<th>Result</th>
<th>BASELINE</th>
<th>7 DAYS</th>
<th>14 DAYS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PLAQUE INDEX</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GROUP-I ClO₂</td>
<td>1.45±0.25</td>
<td>1.38±0.22</td>
<td>1.39±0.16</td>
</tr>
<tr>
<td>Group-II ClO₂+SRP</td>
<td>1.56±0.31</td>
<td>0.35±0.10</td>
<td>1.15±0.30</td>
</tr>
<tr>
<td>Group-III SRP</td>
<td>1.59±0.21</td>
<td>1.10±0.14</td>
<td>1.13±0.40</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GINGIVAL INDEX</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>GROUP-I ClO₂</td>
<td>1.56±0.21</td>
<td>1.51±0.33</td>
<td>1.52±0.33</td>
</tr>
<tr>
<td>GROUP-II ClO₂+SRP</td>
<td>1.66±0.23</td>
<td>1.09±0.13</td>
<td>1.18±0.13</td>
</tr>
<tr>
<td>GROUP-III SRP</td>
<td>1.39±0.26</td>
<td>1.10±0.19</td>
<td>1.09±0.11</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ORGANOLEPTIC MEASUREMENTS</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>GROUP-I ClO₂</td>
<td>2.1±0.12</td>
<td>1.43±0.13</td>
<td>1.31±0.19</td>
</tr>
<tr>
<td>GROUP-II ClO₂+SRP</td>
<td>2.8±0.21</td>
<td>1.32±0.16</td>
<td>1.29±0.15</td>
</tr>
<tr>
<td>GROUP-III SRP</td>
<td>2.5±0.17</td>
<td>1.38±0.12</td>
<td>1.33±0.12</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% DIFFERENCE FROM BASELINE</th>
<th>GROUP-I</th>
<th>GROUP-II</th>
<th>GROUP-III</th>
</tr>
</thead>
<tbody>
<tr>
<td>PI</td>
<td>ClO₂</td>
<td>ClO₂+SRP</td>
<td>SRP</td>
</tr>
<tr>
<td>7 DAY</td>
<td>5.01%</td>
<td>78.6%(p&lt;0.05)</td>
<td>30.5%(p&lt;0.05)</td>
</tr>
<tr>
<td>14 DAY</td>
<td>4.08%</td>
<td>29.5%(p&lt;0.05)</td>
<td>29%(p&lt;0.05)</td>
</tr>
<tr>
<td>GI</td>
<td>9.4%</td>
<td>34.2%(p&lt;0.05)</td>
<td>29.1%(p&lt;0.05)</td>
</tr>
<tr>
<td>7 DAY</td>
<td>8.1%</td>
<td>29.3%(p&lt;0.05)</td>
<td>30.4%(p&lt;0.05)</td>
</tr>
<tr>
<td>14 DAY</td>
<td>32.6%(p&lt;0.05)</td>
<td>54.4%(p&lt;0.05)</td>
<td>45.2%(p&lt;0.05)</td>
</tr>
</tbody>
</table>

DISCUSSION
Statistically significant reduction from baseline in mean PI, GI and organoleptic measurements observed in Group II and Group III at 7th and 14th day whereas no statistically significant difference observed in Group I but only in case of organoleptic measurements.

Chlorinedioxide mouthwash with SRP was more effective than SRP alone which was in turn found to be more effective than Chlorinedioxide rinse alone. Shinada et al 2010 reported that the ClO₂ mouthwash was effective at reducing oral malodor for 4 hours when used by healthy subjects. The results of his study demonstrated that rinsing with a mouthwash containing ClO₂, used over a 7-day period, was effective in reducing oral malodor, plaque which is in accordance with our study. Fraschella 1998 tested the effectiveness of a ClO₂-containing mouthwash at different points of time for a total of 96 hours after rinsing. The results showed a significant improvement in OM scores. Although chlorhexidine is gold standard, Acidified Sodium Chlorite rinses have equivalent plaque inhibitory action to chlorhexidine. ASC does not contain alcohol and it can be used immediately after dentrifices. 6
Since in our study we have considered only gingivitis patients, other studies have been done in periodontitis patients. The ClO2 rinse and toothpaste together between dental hygiene recall visits, showed an average reduction of bleeding sites of 71.85%. A significant percentage of the probe scores (67.4%) were reduced from $ \geq 4 \text{ mm}$ to $\leq 3 \text{ mm}$ in an average of 3.4 months after use of chlorinedioxide mouthrinse.

**CONCLUSION**

Clinical parameters of gingivitis reduced with the experimental mouthwash used for 14 days. Mouthwash containing ClO2 improved halitosis. Future studies are required to examine more long term effects of the mouthwash in gingivitis and halitosid patients with larger sample size.

**REFERENCES**


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Email: benazir65@yahoo.com
LIST OF PHOTOGRAPHS

Group-I-CHLORINE DIOXIDE

Pre

Post

GROUP-II-CHLORINE DIOXIDE+SRP

Pre

Post

GROUP-III-SRP

Pre

Post