

COMPARATIVE EVALUATION OF CHLORHEXIDINE GLUCONATE AND Povidone Iodine MOUTHWASHES ON PLAQUE ACCUMULATION AND GINGIVAL INFLAMMATION AMONG ADULT POPULATION OF ALIGARH- A RANDOMIZED CONTROLLED TRIALNeha Agrawal^{*1}, Anshul Aggarwal², N. D. Gupta³, R. K. Tewari⁴, Juhi Gupta⁵ and Syed Amaan Ali⁶¹MDS Professor, Department of Periodontics and Community Dentistry, Dr. Ziauddin Ahmad Dental College and Hospital, Aligarh Muslim University, Aligarh, Uttar Pradesh, India.²MDS Professor, Department of Oral Medicine and Radiology/Oral Pathology, DR. Ziauddin Ahmad Dental College and Hospital, Aligarh Muslim University, Aligarh, Uttar Pradesh, India.³MDS Professor, Department of Periodontics and Community Dentistry, Dr. Ziauddin Ahmad Dental College and Hospital, Aligarh Muslim University, Aligarh, Uttar Pradesh, India.⁴MDS Professor, Department of Conservative Dentistry and Endodontics, Dr. Ziauddin Ahmad Dental College and Hospital, Aligarh Muslim University, Aligarh, Uttar Pradesh, India.⁵MDS Assistant Professor, Department of Oral Medicine and Radiology/Oral Pathology, Dr. Ziauddin Ahmad Dental College and Hospital, Aligarh Muslim University, Aligarh, Uttar Pradesh, India.⁶MDS Assistant Professor, Department of Periodontics and Community Dentistry, Dr. Ziauddin Ahmad Dental College and Hospital, Aligarh Muslim University, Aligarh, Uttar Pradesh, India.***Corresponding Author: Dr. Neha Agrawal**

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Article Received on 21/04/2022

Article Revised on 11/05/2022

Article Accepted on 01/06/2022

ABSTRACT**Context:** Dental plaque has been connected to the most frequent infectious oral diseases in humans: caries and periodontal disease. The removal of bacterial biofilm is an important part of preventing and treating oral diseases. Adjunctive antimicrobials have been shown to improve clinical indicators by interfering with metabolic activities.**Aims:** To compare the effect of Chlorhexidine gluconate and Povidone Iodine mouthwashes on plaque accumulation and gingival inflammation among the adult population of Aligarh. **Settings and Design:** A parallel-group double-blind Randomized controlled clinical trial was carried out on systemically healthy 100, 20-50yr old adult patients having gingival inflammation and coming to the OPD of Dental College, Aligarh. **Methods and Material:** Patients with plaque induced gingivitis, as defined by the American Academy of Periodontology (Mariotti 1999), involving five adjacent teeth (FDI teeth 31-35) were included. At the baseline, scaling was performed, and the patients were randomly allocated by the toss of a coin either to the Chlorhexidine gluconate or povidone-iodine mouthwash group. After 4 weeks of use of mouthwash, the gingival index and plaque index were measured using a Williams periodontal probe. Statistical analysis used: SPSS 16 software was used for analysis. An Independent sample t-test and Chi-square test were utilized. **Results:** None of the parameters were statistically significant, however, the mean Plaque Index (PI) and Gingival Index (GI) values in the Chlorhexidine gluconate group were greater than those in the Povidone Iodine group. **Conclusions:** Povidone Iodine had a better overall effect on plaque and gingival inflammation than Chlorhexidine digluconate.**KEYWORDS:** Chlorhexidine digluconate, Povidone-iodine Plaque, Gingivitis.**INTRODUCTION**

Dental plaque is linked to the most common infectious oral disorders in humans, caries and periodontal diseases. The elimination of bacterial biofilm is a critical component of oral disease prevention and treatment. Mechanical agents such as brush and floss are a simple, cost-effective, and efficient way to control gingivitis. However, the efficiency of this strategy is determined by the person's manual ability and motivation.^[1] It has been proven that adjunctive antimicrobials enhance clinical

indicators such as plaque and gingival indices by interfering with metabolic activities, which is an alternative or adjunctive treatment.^[2]

Chlorhexidine gluconate (CHX) is a dicationic, bis-biguanide with archived bacteriostatic and bactericidal impacts on Gram-positive and -negative microorganisms, fungi, and others. Because of its plaque inhibitory activity, CHX has been considered and suggested by researchers as a regime for the prevention

and treatment of periodontal diseases. Chlorhexidine gluconate binds to the oral mucosa from which it is gradually delivered, extending its antimicrobial impact.^[3]

Elemental iodine or its derivatives are probably the most broad-spectrum and potent antiseptics available. It can kill *Aggregatibacter actinomycetemcomitans*, *Porphyromonas gingivalis* and other periodontal pathogens in vitro and bacteria and yeasts in vivo. It is also effective against herpesviruses, which show resistance to Chlorhexidine digluconate, Short or long-term exposure to iodine does not induce bacterial resistance, are usually non staining and reasonably free of toxicity and irritancy.^[4,5]

Therefore, this study was carried out with the aim to compare the effect of Chlorhexidine gluconate and Povidone Iodine mouthwashes on plaque accumulation and gingival inflammation among the adult population of Aligarh

Objectives

1. To evaluate the effect of Chlorhexidine gluconate on plaque accumulation and gingival index among the adult population of Aligarh
2. To evaluate the effect of Povidone-Iodine mouthwash on plaque accumulation and gingival index among the adult population of Aligarh
3. To compare the effect of Chlorhexidine gluconate with Povidone-Iodine mouthwash on plaque accumulation and gingival index among the adult population of Aligarh

SUBJECTS AND METHODS

A parallel-group double-blind Randomized controlled clinical trial was carried out on systemically healthy 100, 20-50yr old adult male and female patients having gingival inflammation and coming to the OPD of Dental College, Aligarh. For selection, patients were required to have plaque induced gingivitis, as defined by the American Academy of Periodontology (Mariotti 1999), involving five adjacent teeth (FDI teeth 31–35). Patients with prosthetic/ orthodontic appliances, Periodontal disease, Systemic disease that would influence oral health, Patients on antimicrobial treatment/drugs, Pregnant women, Smokers were excluded from the study. On an individual basis, all patients were informed about the nature and scope of the proposed treatment and informed consent was obtained. The study protocols were presented to and approved by the institution's ethical committee.

Sample size determination- sample size was determined based on the 'average plaque score in each participant' (APS). By keeping the value of the power of study as 80%, the Average standard deviation in the two groups as 0.40, 5.0% margin of error, the required sample size obtained in each group was 15. Taking into consideration of drop outs, availability of sample and to increase the

validity of results, the sample size was increased to 50 in each group.

At the baseline, scaling was performed to make the dental plaque score zero. The patients were randomly allocated by the toss of a coin either to the Chlorhexidine gluconate (Chlorhexidine gluconate 0.2% w/v) or povidone-iodine (Macbery – Povidone iodine 0.5%w/v) mouthwash group. Patient allocation to the group was done by the toss of a coin. Patients were given instructions on how to use the mouthwash. The importance of actually using the mouthwash was impressed upon the patient. All information was given verbally as well as in writing. After one week of use of mouthwash, the gingival index and plaque index were measured using a Williams periodontal probe. The same measurement was repeated in the 4th week.

Gingival index (GI)^[6] and plaque index by Quigley and Hine, the Turesky modification were recorded. Adverse events like discoloration observed during the clinical examination (yes/no) and clinically visible oral mucosal reactions were registered. In addition to the plaque index by Quigley and Hine, the Turesky modification,^[7] was finally registered.

The same dentist performed all the clinical examinations after the standardization and calibration. The examining dentist was unaware of the group allocation of the participants. Only the statistician knew the group allocation as he had the codes.

Statistical analysis

The statistical analysis was conducted using the software of SPSS for Windows, Version 16.0 (SPSS Inc., Chicago, IL). Firstly the normality of data was analyzed using the Kolmogorov–Smirnov test Independent sample t-test was used to compare the mean plaque score and gingival score in two groups. Chi-square test was used to find out the association of particular adverse effects with mouthwash used.

RESULTS: The present study was carried out on 100 subjects distributed into two groups. Three subjects from the Chlorhexidine gluconate group and two subjects from the povidone iodine group were lost during the follow-up, making the final sample size 47 and 48 in group 1 and group 2, respectively, still leaving the sample size large enough for concluding. According to the results of the Kolmogorov–Smirnov test, the data was found to be normally distributed. The mean age of subjects was 36.78 ± 5.21 yrs and 39.21 ± 4.98 years in the Chlorhexidine gluconate group and Povidone-iodine group respectively.

Table 1 shows the results concerning Plaque index (Quigley and Hine). For the Quigley & Hein Index, mean values were 2.23 ± 1.06 and 2.10 ± 0.82 for the Chlorhexidine gluconate and povidone-iodine group, respectively. At the end of 4 weeks no statistically

significant difference was observed in plaque score between Chlorhexidine gluconate and povidone-iodine group

The results concerning the Gingival index (Loe and Silness) are demonstrated in Table 2. After four weeks, the group that rinsed with Chlorhexidine gluconate had a mean score of 1.27 ± 0.93 and povidone-iodine group had a mean score of gingival index as 2.10 ± 0.82 . These values were not statistically different.

Subjective complaints of discomfort and clinical adverse effects were recorded at the end of 4 weeks in both the groups. There were no statistically significant differences in self-reported taste sensations, soreness of oral mucosa, or feeling of dryness. However, statistically significant differences were observed with discoloration in the participants among the two groups. (Table 3).

Table 1: Plaque index (Quigley and Hine) after four weeks in Chlorhexidine gluconate and povidone-iodine group.

Group	N	Mean±SD	t	P value
Chlorhexidine gluconate	47	2.23±1.06	1.562	0.312
Povidone iodine	48	2.10±0.82		

$p \leq 0.05$ = statistically significant

Table 2: Gingival index (Loe and Silness) after four weeks in Chlorhexidine gluconate and povidone-iodine group.

Group	N	Mean±SD	t	P value
Chlorhexidine gluconate	47	1.27± 0.93	0.981	0.418
Povidone iodine	48	1.12±0.87		

$p \leq 0.05$ = statistically significant

Table 3: Subjective side effects as reported by the subjects.

Group	N	Taste: too strong/bitter	Taste: Good ("I like it")	Numb feeling in tongue and mouth	soreness in tongue and mouth	Subjective Discoloration	dry feeling
Chlorhexidine gluconate	47	7(14.89)	40(85.10)	3(6.38)	6(12.76)	34 (72.34)	5(10.63)
Povidone iodine	48	4(8.33)	44(91.66)	0(0)	0(0)	10(20.83)	0(0)

DISCUSSION

The present study evaluated Chlorhexidine gluconate and povidone iodine regimes as adjuncts for mechanical plaque control. This study revealed that none of the parameters were statistically significant, however, the mean Plaque Index (PI) and Gingival Index (GI) values in the Chlorhexidine gluconate group were greater than those in the Povidone Iodine group.

For the Quigley & Hein Index, mean values of plaque index were 2.23 ± 1.06 and 2.10 ± 0.82 for Chlorhexidine gluconate and povidone-iodine groups after four weeks, respectively. There was no statistically significant difference between the two. A study conducted by Fine PD showed substantial variance in gingival inflammation between hygienic treatment and a daily mouthwash with Chlorhexidine digluconate or povidone-iodine, but no significant difference in gingival inflammation between hygienic treatment and a daily mouthwash with Chlorhexidine digluconate or povidone-iodine.^[8] Another study conducted by Vasu N et al (2016) demonstrated that although none of the variables were statistically significant, the Chlorhexidine gluconate group had a higher mean Plaque Index (PI) (0.13 ± 0.094818) and Gingival Index (GI) (0.243382 ± 0.139457) than the Povidone Iodine group (PI- 0.081582 ± 0.076875 and GI - 0.223547 ± 0.112917).

The Plaque Index (PI) increased more in the Chlorhexidine gluconate group than in the Povidone Iodine group, but the Gingival Index (GI) decreased more in the Chlorhexidine gluconate group.^[9] The findings of these two studies were consistent with our results.

A Clinical and laboratory study was carried out to compare the antibacterial properties of two antiseptic mouthwashes, namely 1% povidone iodine and 0.2% Chlorhexidine digluconate. The findings imply that, unlike Chlorhexidine digluconate, povidone iodine as a mouthwash has only a short-term antibacterial action and is not persisted at antibacterial levels within the oral cavity after expectoration. Povidone iodine's lack of sustained effect in the oral cavity appears to be related to its reported lack of antiplaque activity.^[10] These results were in contrast to our study results.

The effect of three mouthrinses, Listerine Antiseptic (thymol), Peridex (Chlorhexidine digluconate), Perimed (povidone iodine and hydrogen peroxide), and a placebo (water), on the formation of dental plaque and gingivitis when used as the sole oral hygiene routine for 14 days was investigated. Peridex and Perimed were beneficial in reducing plaque and gingivitis when used as a two-time daily mouth rinse by subjects who did not use other oral

care products. When inhibition was obtained with Perimed at the same or larger dilution than with povidone-iodine alone in vitro, a synergistic action was hypothesised.^[11]

Self-reported side effects included discoloration as the most common Frequent complaint, and the complaint of "discoloration" was statistically significant in 0.2% CHX group than povidone-iodine group. This finding is in line with previous studies.^[3,9,12]

Povidone-iodine is perhaps the most widely used antiseptic in medical practice, with an impeccable safety record, broad-spectrum antibacterial action, and low cost.^[13] Povidone-Iodine was found to be more effective in reducing infection at surgical sites. However, it lacks the long-lasting effect of Chlorhexidine digluconate, and considerable levels of Iodine absorption via the oral mucosa may render this compound unsuitable for long-term use in the mouth. In comparison to Chlorhexidine digluconate, it has a larger microbicidal effect, notably on spore-forming bacteria.^[8] Therefore the use of povidone iodine as antiplaque agent could be investigated further.

CONCLUSION

The mean values of PI and GI in the CHX group were greater than in the Povidone Iodine group, implying that Povidone Iodine had a better overall effect on plaque and gingival inflammation than Chlorhexidine gluconate. Future studies on the efficacy of iodophore solutions in the treatment of disease and the therapeutic importance of the investigated treatment should be based on these findings.

ACKNOWLEDGEMENT: nil.

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