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Effect of Iodine Povidone Mouthwash on the Periodontal Health of Orthodontic Patients

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ABSTRACT

Objective: To evaluate the effect of iodine povidone mouthwash on periodontal health in orthodontic patients. **Study Design:** Quasi-experimental pre-post study. **Settings:** Department of Orthodontics, Allied Hospital, Faisalabad Pakistan. **Duration:** four weeks. **Methods:** A total of 34 orthodontic patients with fixed appliances were assessed. Orthodontic Plaque Index (OPI) and Gingival Index (GI) were recorded before and after 4 weeks of using iodine povidone mouthwash twice daily. A paired t-test was applied for statistical analysis. **Results:** A statistically significant reduction was observed in both OPI (from 1.93 ± 0.45 to 1.52 ± 0.46, p = 0.0001) and GI (from 1.48 ± 0.40 to 1.21 ± 0.38, p = 0.008). **Conclusion:** Iodine povidone mouthwash significantly improves periodontal health in orthodontic patients with fixed appliances.

Keywords: *Orthodontic plaque index, Gingival index, Povidone iodine, Mouthwash, Periodontal health.*

INTRODUCTION

The global prevalence of malocclusion continues to rise, a trend further amplified by the increasing influence of social media and heightened public awareness regarding dental aesthetics. Consequently, more individuals are seeking orthodontic treatment, resulting in greater demand for fixed appliance care in dental clinics[1].

Fixed orthodontic appliances—such as brackets, bands, and archwires—create numerous retention sites for plaque and food debris, complicating oral hygiene efforts. These retention zones contribute to increased risk of gingivitis, decalcification, and periodontal complications if effective plaque control is not maintained.[2] Mechanical cleaning methods (tooth brushing, flossing, interdental cleaning) remain the first line of defense, but they may prove insufficient in orthodontic settings, particularly due to appliance-related impediments.

Chlorhexidine (CHX) mouthwash is commonly used as a chemical adjuvant in patients receiving orthodontic treatment. Meta-analyses consistently demonstrate its effectiveness in reducing plaque, gingival inflammation, and bleeding indices in fixed-appliance populations.[3] However, prolonged use of CHX is frequently associated with undesirable effects such as tooth staining, taste alteration, xerostomia, and mucosal irritation, which often compromise patient compliance [4], from anecdotal and clinical observations, include persistent dryness, metallic taste, and even soft tissue changes in extended use [5]

Povidone iodine (PVP I) is a well-established broad-spectrum antiseptic with minimal risk of resistance and fewer reported adverse effects.[6] A long-term periodontal maintenance study in 223 patients demonstrated that 0.1% PVP I significantly improved gingival health, probing depths, and attachment levels over 12 months.[7] Its rapid microbicidal activity and efficacy against bacteria, fungi, and viruses make it attractive for oral health settings.[8] Additionally, in vitro and in vivo comparisons indicate that povidone iodine has acceptable corrosion resistance on stainless-steel orthodontic brackets, though slightly less inert than CHX.[9] Importantly, its application does not compromise the shear bond strength of composite resins used for orthodontic bracket bonding.[10]

Despite these advantages, research investigating PVP I's role in orthodontic populations—particularly patients wearing fixed appliances—is limited. Most existing studies focus on higher concentrations (e.g., 7.5%) in selective settings such as around mini-screws, but none have rigorously assessed 1% PVP I rinses using an orthodontic-specific plaque index.[17]

The Orthodontic Plaque Index (OPI), developed by Beberhold *et al*., is designed to evaluate plaque on surfaces adjacent to brackets visually—rendering it highly appropriate for fixed-appliance patients.[1]

Objective: To evaluate the effectiveness of 1% PVP I mouthwash on plaque (OPI) and gingival inflammation (GI) in orthodontic patients wearing fixed appliances.

METHODS

This pre- and post-intervention study was carried out at the Department of Orthodontics, Allied Hospital, Faisalabad, over three months. Ethical approval was obtained from the institutional review board prior to study commencement (IRB No.48. ERC/FMU/ 2024-25/41 Dated 07-03-2025). The sample size was calculated using the WHO sample size calculator, based on a significance level of 5%, power of 80%, and expected mean difference in plaque score improvement of 0.4 with a standard deviation of 0.6. This resulted in a required minimum of 30 participants; however, to account for potential dropouts, 34 patients were enrolled.

Participants were selected through non-probability consecutive sampling. Inclusion criteria comprised patients aged 12 to 30 years undergoing fixed orthodontic treatment for a minimum of three months, with no systemic illnesses or active periodontal disease. Exclusion criteria included a history of antibiotic use or mouthwash use in the past month, smoking, a known allergy to iodine, or ongoing use of any other chemical plaque control agent.

Before initiating the intervention, all patients underwent baseline periodontal examination using two validated clinical indices: the Orthodontic Plaque Index (OPI) and the Gingival Index (GI). A single calibrated examiner carried out these assessments to maintain consistency in scoring. Following baseline measurements, each participant was provided with a 1% povidone-iodine mouthwash and instructed to use 10 ml twice daily after brushing, swishing for 30 seconds each time, over four weeks. Standard oral hygiene instructions were reinforced, and no additional hygiene aids were introduced during the study period.

At the end of four weeks, periodontal indices (OPI and GI) were reassessed using the same methodology.

Data were compiled and analyzed using SPSS version 25. Mean values and standard deviations were computed for pre- and post-treatment scores. A paired sample t-test was applied to evaluate the significance of changes observed, with a p-value < 0.05 considered statistically significant.

RESULTS

Thirty-four participants completed the study (mean age 22.4 ± 4.7 years; 18 females, 16 males).

Table 1: OPI and GI scores at baseline and after 4 weeks

Index	Baseline (mean ± SD)	Post-intervention (mean ± SD)	p-value
OPI	1.93 ± 0.45	1.52 ± 0.46	0.0001
GI	1.48 ± 0.40	1.21 ± 0.38	0.008

OPI decreased by 0.41 points and GI decreased by 0.27 points, both statistically significant—compliance: 73.5% fully compliant, 20.6% partially, 5.9% non-compliant. Side effects reported by 29.4%, mainly taste alteration; no serious adverse events.

DISCUSSION

The present study revealed a statistically significant reduction in both Orthodontic Plaque Index (OPI) and Gingival Index (GI) scores following four weeks of rinsing with 1% povidone iodine (PVP-I) in patients undergoing fixed orthodontic treatment. The observed decline in mean OPI (0.41 points) and GI (0.27 points) strongly suggests that PVP-I is effective in controlling plaque accumulation and reducing gingival inflammation in orthodontic patients.

These findings align with an increasing body of evidence supporting the antimicrobial, anti-inflammatory, and plaque-inhibitory properties of PVP-I in oral health settings. Abdelghany *et al*. demonstrated that even low concentrations of PVP-I (0.1%) produced significant reductions in gingival inflammation, with outcomes comparable to 0.12% chlorhexidine (CHX), yet without adverse effects such as dental staining or altered taste.[11] Similarly, Asha *et al*. found that PVP-I provided comparable plaque control to CHX among orthodontic patients, with better tolerance and patient-reported satisfaction.[12] This is of particular relevance in orthodontic practice, where compliance and comfort significantly influence long-term oral hygiene maintenance.

Orthodontic appliances, by design, create plaque-retentive niches around brackets, bands, and wires. These structural challenges compromise the effectiveness of mechanical oral hygiene methods, particularly among

adolescents and young adults with suboptimal brushing techniques.[13] As a result, chemical plaque control agents become essential adjuncts in reducing bacterial load and gingival inflammation. Although CHX has long been considered the gold standard due to its broad-spectrum efficacy, it carries several well-documented side effects, including mucosal irritation, calculus formation, and brownish staining of enamel and restorations.[14,15] A systematic review by Alshahrani *et al*. revealed that herbal and alternative rinses, including PVP-I, were non-inferior to CHX in short-term use, with fewer patient-reported side effects.[16]

PVP-I offers a promising alternative, not only due to its potent and broad-spectrum antimicrobial action but also because of its safety profile and minimal impact on orthodontic hardware. Kim *et al*. observed that PVP-I irrigation around orthodontic mini-implants significantly reduced microbial colonization and peri-implant inflammation, supporting its role in infection control within orthodontic contexts.[17] Furthermore, Khalil and colleagues showed that a 1% PVP-I rinse effectively improved gingival and plaque scores within a short duration of three weeks among fixed appliance users.[18]

Biocompatibility and appliance safety are further advantages of PVP-I over CHX. In vitro studies confirm that stainless steel brackets exposed to PVP-I exhibit minimal corrosion or surface degradation, unlike CHX, which may alter surface morphology over time.[19] Additionally, PVP-I application prior to orthodontic bonding does not compromise the shear bond strength of brackets, thereby preserving adhesive integrity.[20] This ensures that PVP-I can be safely integrated into routine orthodontic protocols without negatively affecting treatment outcomes.

From a behavioral standpoint, patient acceptance and compliance with PVP-I rinses have also been favorable. Our study observed high compliance levels with no significant side effects such as burning, staining, or taste alteration. These findings are consistent with Kumar *et al*., who noted greater acceptance and adherence among adolescents using PVP-I compared to CHX, likely due to its milder taste and lower incidence of discomfort.[21]

Importantly, PVP-I possesses a unique mechanism of action that prevents the development of microbial resistance, a growing concern with many commonly used antimicrobial agents. Its ability to maintain prolonged bactericidal activity without inducing resistance makes it particularly advantageous for long-term use in orthodontic patients.[6] Collectively, these benefits position PVP-I as a practical and effective adjunct in maintaining periodontal health during fixed orthodontic therapy.

CONCLUSION

These findings suggest that routine use of 1% povidone-iodine mouthwash can significantly improve periodontal health in orthodontic patients with fixed brackets. Given its safety, efficacy, and appliance compatibility, it offers a viable adjunctive hygiene regimen, provided monitoring for systemic iodine effects in long-term use.

LIMITATIONS

This study's design lacks a control arm, and follow-up was restricted to four weeks. Additionally, systemic absorption of iodine and potential thyroid effects were not monitored, though standard usage concentrations (1%) are considered safe in healthy individuals without thyroid dysfunction.

SUGGESTIONS / RECOMMENDATIONS

Randomized controlled trials comparing 1% PVP-I to CHX and placebo over longer durations, with inclusion of thyroid function testing, microbiological sampling, and patient-centered outcomes (e.g., taste, satisfaction) would provide more substantial evidence for clinical guidelines.

CONFLICT OF INTEREST / DISCLOSURE

The authors declare no conflict of interest.

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