Original Article

Comparative Evaluation of Honey and Chlorhexidine Mouthwash based on the Clinical Levels of Probing Pocket Depth in Non-Surgical Periodontal Therapy

Zaman MSU[1], Abdin MJ[2], Thabassum N[3], Sumi FA[4], Bhuyan MTR[5], Afroze YJ[6]

ABSTRACT

Traditional non-surgical periodontal therapy (NSPT) is based on debriding supra-gingival and sub-gingival calculus and providing advice regarding oral health care techniques. Chlorhexidine is used as a mouthwash to prevent plaque and bacterial accumulation. Honey is used to treat periodontitis, inflammation of the gingiva, plaque development, and odor management. A quasi-experimental study was conducted in the Department of Dental Pharmacology, Department of Periodontology, and the Outpatient Department of Dentistry of Bangladesh Medical University (BMU), Dhaka, Bangladesh, between January and December of 2024, to evaluate the efficacy of honey comparing to chlorhexidine mouthwash in non-surgical periodontal therapy. A total of 66 participants were enrolled in this study based on inclusion and exclusion criteria. Among them, 33 participants were in the intervention group (treated with honey), while the rest 33 participants were in the control group (treated with chlorhexidine mouthwash). Oral health status, periodontal condition, and other study-related information were collected through a data collection sheet. Probing pocket depth (PPD) was measured at baseline, 3 months, and 6 months to compare outcomes in both groups to compare the efficacy of honey and chlorhexidine. Participants of the control group had a mean age of 39.7±13.2 years, while the participants of the intervention group had a mean age of 40.5±11.7 years. A male predominance was observed in both groups with 19(57.6%) and 20(60.6%) male patients respectively. Regarding PPD, at baseline examination, there was no difference between two groups (3.35±0.67 vs. 3.14±0.56; p=0.19). However, after 3 months (3.07±0.91 vs. 2.65±0.68; p=0.04) and after 6 months (3.03±1.13 vs. 2.43±0.91; p=0.02), statisticaly significant differences were observed. Overall, honey worked better than chlorhexidine to reduce probing pocket depth. Moreover, adverse drug reactions were observed more in the control group (39.4%) than that of the intervention arm (9.1%) (p=0.004). Honey's natural antimicrobial and anti-inflammatory properties contributed to significant reductions in probing pocket depth (PPD) and showed less adverse effects compared to chlorhexidine mouthwash.

Keywords: *Honey, chlorhexidine mouthwash, periodontitis, non-surgical periodontal therapy*

Mugda Med Coll J. 2025; 8(2): 145-149.
DOI: https://doi.org/10.3329/mumcj.v8i2.85809

1. Dr. Mir Sadik-Uz-Zaman, Resident, Department of Dental Pharmacology, Bangladesh Medical University (BMU), Dhaka-1000. Email: drsadik.r22@bsmmu.edu.bd (Corresponding author)
2. Dr. Md. Joynal Abdin, Associate Professor, Department of Conservative Dentistry & Endodontics, Bangladesh Medical University (BMU), Dhaka-1000.
3. Dr. Nowsheen Thabassum, Dental Surgeon, Outpatient Department (OPD), Saphena Women's Dental College, Malibagh, Dhaka-1217.
4. Dr. Fahmida Akter Sumi, Resident, Department of Periodontology, Bangladesh Medical University (BMU), Dhaka-1000.
5. Maj. (Dr.) Md.Tauhidur Rahman Bhuyan, Dental Surgeon, Outpatient Department (OPD), Military Dental Centre, Dhaka Cantonment, Dhaka-1206.
6. Dr. Yeasmin Jahan Afroze, Registrar, Department of Dental & Facio-Maxillary Surgical Oncology, National Institute of Cancer Research & Hospital (NICRH), Dhaka-1212.

INTRODUCTION

Periodontal disease, characterized by inflammation and destruction of the supporting structures of teeth, remains a global public health concern. If untreated, it may lead to tooth loss and systemic health complications, such as cardiovascular diseases and diabetes.[1] Non-surgical periodontal therapy (NSPT), which includes scaling and root planing (SRP), is the cornerstone of treatment. However, adjunctive therapies, such as antimicrobial mouthwashes, are often required to enhance clinical outcomes by reducing bacterial load and inflammation[2]. Chlorhexidine (CHX) is the gold standard among mouthwashes; however, its long-term use is associated with side effects, including tooth staining,

altered taste perception, and mucosal irritation.[3] These limitations have prompted the exploration of alternative adjunctive therapies, including natural agents like honey. Honey, a natural substance derived from the nectar of flowers, has been historically recognized for its therapeutic properties. Modern research has validated honey's antibacterial, anti-inflammatory, and wound-healing properties, attributed to its high sugar content, low pH, and hydrogen peroxide and phenolic compounds.[4] Several studies have demonstrated its efficacy in promoting wound healing and reducing microbial load in various clinical settings, including oral health.[5] Its unique composition makes it a promising candidate for managing periodontal disease, where microbial biofilms play a pivotal role. Studies comparing honey with conventional antimicrobial agents in periodontal therapy are limited but promising. Evidence suggests that honey not only reduces plaque and gingival inflammation but also aids in tissue repair without the adverse effects commonly associated with chemical agents like chlorhexidine.[6] Given its affordability, accessibility, and biocompatibility, honey represents a potential alternative adjunct to NSPT, particularly in resource-constrained settings. An accumulation of plaque and calculus can lead to gingivitis, an infection of the gingiva. If gingivitis is left untreated, it can develop into periodontitis. The supporting tissues of the teeth are impacted by the chronic inflammatory illness known as periodontitis.[7] A more severe kind of illness is marked by a loss of alveolar bone and characterized by increased probing depth, attachment loss, and bone loss signs. Reducing the quantity of periodontal bacteria and stopping the inflammatory process are the primary objectives of periodontal therapy. NSPT, which uses both manual and machine-driven (sonic or ultrasonic) devices for SRP, is the gold standard of modern periodontal therapy for improving patient safety and reducing co-morbidities both promptly and over time[2] Traditional non-surgical periodontal therapy (NSPT) is based on the debridement of supra- and sub-gingival plaque and calculus and providing instructions regarding oral health care techniques. Lowering bacterial burdens and changing the microbial composition to a more health-promoting flora are the goals of these strategies.[8] Subgingival applications of (CHX) gel are commonly used as an adjunct in NSPT.[9] Besides, the most effective anti-plaque agent to date is chlorhexidine.[10] Tooth discoloration and altered taste perception are two disadvantages of several mouthwashes currently on the market, including CHX. The World Health Organization (WHO) has recommended looking into the potential use of natural medicines (plant and herb extracts) to combat these negative effects.[11] Certain modalities, like honey, have been found in the past to be effective in treating periodontal disease. Honey has several beneficial effects on wound healing, including promoting the growth of epithelium, enhancing angiogenesis, making wound closure easier, and increasing collagenases.[12] One way to describe honey is as a supersaturated sugar solution. Natural honey comprises several minor compounds, minerals, amino acids, organic acids, vitamins, and phenols, and 82.4 percent carbohydrates, 38.5 percent fructose, 31% glucose, 12.9 percent other sugars, 17.1 percent water, and 0.5 percent protein. Additionally, trace amounts of healthy substances, including tocopherol, flavonoids, and phenolic acid, are present in honey. Additionally, ascorbic acid, proteins, carotenoids, and enzymes like catalase and glucose oxidase found in honey have been shown to have good health effects.[13] Besides, new research indicates that honey exhibits strong antibacterial activity against the microorganisms responsible for carious lesions, supra and subgingival plaque formation, periodontitis, pharyngitis, Recurrent aphthous stomatitis (RAS) ulcers, and gingival inflammation.[14] Honey can be used as a medium for NSPT based on results from earlier studies. Many researchers use honey to treat periodontal disease because of its high osmolarity, acidic nature, hydrogen peroxide, and non-peroxide components, which have antibacterial and anti-inflammatory properties.[15] Previous pilot studies demonstrated the promising potential of Manuka honey for use as an adjunct therapy to NSPT[16]. In Bangladesh, the most common type of honey is multifloral honey, also known as wildflower honey. Bangladesh has a rich diversity of flora, which contributes to the variety of flowers from which bees can collect nectar, making multifloral honey widely available and popular. Additionally, honey from specific floral sources such as mustard, blackseed (kalijira), and litchi is also common in Bangladesh, depending on the season and region.[17] However, there is currently insufficient evidence to support the claim that honey applied locally can affect the healing of periodontal tissue. The effectiveness of honey in treating periodontal disease is still debatable and not

fully proven. Therefore, the present study aims to assess the efficacy of honey compared to chlorhexidine (CHX) mouthwash in NSPT.

METHODS

This quasi-experimental study was conducted in the Department of Dental Pharmacology, Department of Periodontology, and the Outpatient Department (OPD) of Dentistry of Bangladesh Medical University (BMU), Dhaka, Bangladesh, between January and December of 2024. The study population was all patients referred to the OPD of Dentistry for non-surgical periodontal therapy (NSPT). Our inclusion criteria for this study were: patients aged ≥18 years of both genders, and met certain criteria for disease severity (e.g., probing pocket depth, bleeding on probing, clinical attachment level). Exclusion criteria included patients using other types of oral rinses, patients having severe comorbidities, and pregnant or lactating women. A total of 66 patients were finally enrolled in the study. In the intervention group, 33 of them were given honey with NSPT, while the rest 33 were given chlorhexidine as part of the control group. For randomization, odd number of people were put in the intervention arm, and even number of people were put in the control arm. The intervention arm received honey 1 tea spoon full (TSF) orally, and rubbed honey all over the gingiva twice daily, while the control arm received 10-15 ml of 0.2% chlorhexidine (CHX) as mouthwash twice daily.

A questionnaire was used to find out clinical details about the patients, such as their age, gender, income, how they take care of their teeth (e.g., how long and how they brush, what kind of toothpaste they use), how often they go to the doctor, and whether they smoke or chewing betel nuts/leaf. At the start, three months later, and six months later, the probing pocket depth (PPD) was checked. A clinical record form was used to keep track of everything that was oberved.

Data was checked and scrutinized before input was given to the computer. MS-Excel 2019 sheet was used for data input and analysis. Chi-square test was applied to see the difference between two groups. A p-value less than 0.05 was considered statistically significant.

The study was approved by the Institutional Review Board (IRB) of Bangladesh Medical University (BMU), Dhaka, Bangladesh.

RESULTS

Participants of the control group had a mean age of 39.7±13.2 years, while the participants of the intervention group had a mean age of 40.5±11.7 years. A male predominance was observed in both groups with 19(57.6%) and 20(60.6%) male patients respectively. In the control group, 8(24.2%) and 12(36.4%) were in habits of betel nuts/leaf chewing and smoking respectively. In the intervention group, 11(33.3%) and 10(30.3%) were in habits of betel nuts/leaf chewing and smoking respectively. In the control group, 16(48.5%) and 17(51.5%) patients were from urban and rural areas respectively, while in the intervention group, 14(42.4%) and 19(57.6%) patients were from urban and rural areas respectively (Table-I).

Table-I: *Demographic characteristics of participants (N=66)*

Variables	Control group (n=33)	Intervention group (n=33)
Age (in years) Mean±SD	39.7±13.2	40.5±11.7
Gender		
Male	19 (57.6%)	20 (60.6%)
Female	14 (42.4%)	13 (39.4%)
Habits		
Betel nut/leaf	8 (24.2%)	11 (33.3%)
Smoking	12 (36.4%)	10 (30.3%)
No addiction	13 (39.4%)	12 (36.4%)
Residence		
Urban	16 (48.5%)	14 (42.4%)
Rural	17 (51.5%)	19 (57.6%)

In the intervention group, the PPD was found much more improved than that of the control group. At baseline examination, there was no difference between two groups (3.35±0.67 vs. 3.14±0.56; p=0.19). After 3 months, it was observed 3.07±0.91 and 2.65±0.68 in control and intervention group respectively (p=0.04). After 6 months, it was observed 3.03±1.13 and 2.43±0.91 in control and intervention group respectively (p=0.02). Overall, honey worked better than chlorhexidine to reduce probing pocket depth (Table-II).

Table-II: *Comparison of probing pocket depth (PPD) between control and intervention groups (N=66)*

Probing Pocket Depth	Control group (n=33) (Mean±SD)	Intervention group (n=33) (Mean±SD)	p-value
Baseline	3.35±0.67	3.14±0.56	0.19^{NS}
3 months	3.07±0.91	2.65±0.68	0.04^{S}
6 months	3.03±1.13	2.43±0.91	0.02^{S}

p-value reached from Chi-square test; S=significant, NS = not significant.

More adverse drug reactions (ADRs) happened in the control group 13(39.4%) than that of the intervention group 3(9.1%). The difference was found statistically significant (p=0.004) (Table-III).

Table-III: *Adverse drug reactions between control and intervention groups (N=66)*

Adverse effects	Control group (n=33)	Intervention group (n=33)	p-value
Yes	13 (39.39%)	3 (9.09%)	0.004
No	20 (60%)	30 (90.9%)	

12(36.4%) patients in the control group and only 1(3%) in the intervention group reported alteration of taste (p=0.001), while 8(24.2%) and 1(3%) in the control and the intervention group respectively reported staining (p=0.012). Irritation was observed by 4(12.1%) and 2(6%) in the control and the intervention group respectively (p=0.64). 6(18.2%) and 1(3%) in the control and intervention group respectively felt nausea (p=0.045). (Fig.-1).

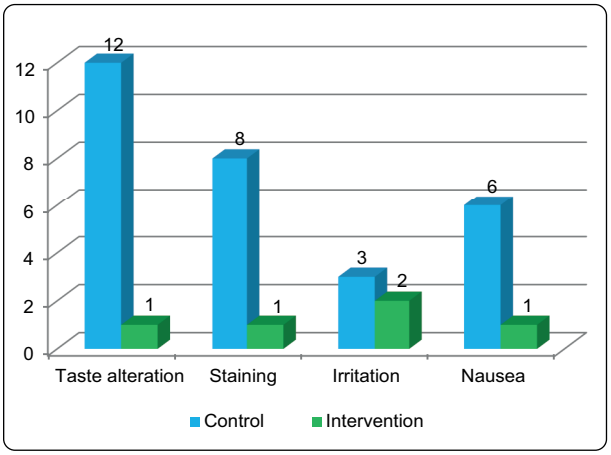

Fig.1: *Bar diagram of adverse effects between control and intervention groups (N=66)*

DISCUSSION

The comparative analysis of honey-based intervention and chlorhexidine (CHX) for oral health improvement revealed significant findings across key clinical parameters including probing pocket depth (PPD). It turns out that honey was better for oral health than CHX, particularly in reducing plaque accumulation and gingival inflammation. One important way to tell if periodontal tissues are healthy is to measure probing pocket depth (PPD). At first (baseline observation), there was no significant difference in PPD between the two groups (p=0.19). Both groups got better after 3 months; however, the intervention group's PPD went down more than that of the control group's PPD (p=0.04). After 6 months, reduction of PPD in the intervention group was found much more compared to the control group (p=0.02). Opsivac et al. reported a significant reduction of PPD by Manuka honey at 3, 6, and 12 months. However, they did not compare honey with CHX.[16] Taib et al. showed that Tualang honey reduced PPD significantly (p=0.02) at 6 weeks.[18] Those findings suggest that honey has a more lasting effect on periodontal health, contributing to a reduction in pocket depth over time. Adverse drug reactions were more in the control group compared to the intervention group (p=0.004). Adverse effects like taste alteration, staining of teeth, and nausea were significantly more in the control group (p=0.001, p=0.012 and p=0.045 respectively). However, there was no difference in local irritation (p=0.64). Opsivac et al. reported generalized dentin hypersensitivity in one patient, which recovered spontaneously as followed up after one-month.[16] In a similar study, Lee et al. reported that natural alternatives like honey resulted in fewer gastrointestinal side effects and irritation; therefore, honey might be a potential alternative to CHX.[19]

Our study has some limitations. Only probing pocket depth (PPD)was analyzed; other parameters like plaque index, gingival index, and clinical attachment level were not analyzed. The relatively small sample size may limit the generalizability of the findings to a broader population of the country. Further studies with larger samples and multi-centre settings are warranted.

CONCLUSION

Our data suggests that in a non-surgical periodontal therapy, honey is more effective in improving oral health over three and six months compared to

chlorhexidine mouthwash. Honey's natural antimicrobial and anti-inflammatory properties contribute to notable reductions in probing pocket depth (PPD). Therefore, honey promotes a healthier oral environment compared to chlorhexidine mouthwash.

REFERENCES

1. Pihlstrom BL, Michalowicz BS, Johnson NW. Periodontal diseases. Lancet. 2005;366(9499): 1809-20.
2. Sanz M, Herrera D, Kebschull M, Chapple I, Jepsen S, Beglundh T, et al. Treatment of stage I-III periodontitis – the EFP S3 level clinical practice guideline. J Clin Periodontol. 2020;47(Suppl 22): 4-60.
3. Varoni E, Tarce M, Lodi G, Carrassi A. Chlorhexidine (CHX) in dentistry: state of the art. Minerva Stomatol. 2012;61(9):399-419.
4. Molan PC. The evidence supporting the use of honey as a wound dressing. Int J Low Extrem Wounds. 2006;5(1):40-54.
5. Mandal MD, Mandal S. Honey: its medicinal property and antibacterial activity. Asian Pac J Trop Biomed. 2011;1(2):154-60.
6. Ajmera N, Chatterjee A, Goyal V. Honey is a natural agent in the treatment of periodontal disease. J Indian Soc Periodontol. 2018;22(6):514-9.
7. Chapple ILC, Mealey BL, Van Dyke TE, Bartold PM, Dommisch H, Eickholz P, et al. Periodontal health and gingival diseases and conditions on an intact and a reduced periodontium: Consensus report of workgroup 1 of the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions. J Periodontol. 2018;89(Suppl 1):S74-84.
8. Kotwal B. Non-surgical periodontal therapy – revisited. IOSR J Dent Med Sci. 2013;9(4):15-9.
9. Zhao H, Hu J, Zhao L. Adjunctive subgingival application of chlorhexidine gel in nonsurgical periodontal treatment for chronic periodontitis: a systematic review and meta-analysis. BMC Oral Health. 2020;20(1):34.
10. Zanatta FB, Antoniazzi RP, Rösing CK. The effect of 0.12% chlorhexidine gluconate rinsing on previously plaque free and plaque covered surfaces: a randomized, controlled clinical trial. J Periodontol. 2007;78(11):2127-34.
11. Gupta D, Bhaskar DJ, Gupta RK, Karim B, Gupta V, Punia H, et al. Effect of Terminalia chebula extract and chlorhexidine on salivary p^H and periodontal health: 2 weeks randomized control trial. Phytother Res. 2014;28(7):992-8.
12. Seraglio SKT, Schulz M, Brugnerotto P, Silva B, Gonzaga LV, Fett R, et al. Quality, composition and health-protective properties of citrus honey: a review. Food Res Int. 2021;143:110268.
13. Pasupuleti VR, Sammugam L, Ramesh N, Gan SH. Honey, propolis, and royal jelly: a comprehensive review of their biological actions and health benefits. Oxid Med Cell Longev. 2017;2017:1259510.
14. Otrêba M, Marek £, Tyczyñska N, Stojko J, Rzepecka-Stojko A. Bee venom, honey, and royal jelly in the treatment of bacterial infections of the oral cavity: a review. Life (Basel). 2021;11(12):1311.
15. Javaid Z, Rashid U, Saif S, Qamar L, Ahmad M, Rafiq S. Honey as a Medium of Non-Surgical Periodontal Therapy. Pak J Med Health Sci. 2022;16(5):1597-1601.
16. Opšivač D, Musić L, Badovinac A, Šekelja A, Bozić D. Therapeutic manuka honey as an adjunct to non-surgical periodontal therapy: a 12-month follow-up, split-mouth pilot study. Materials. 2023;16(3): 1248.
17. Bangladesh Standards and Testing Institution (BSTI). List of Bangladesh Standards (BDS) on Agricultural and Food Products. Dhaka: BSTI; 2022.
18. Taib H, Kamarulzaman N, Min HJ, Berahim Z, Zainuddin SLA. Evaluation of the complementary effect of Tualang honey to non-surgical periodontal therapy: clinical application. J Int Dent Med Res. 2018;11(2):650-5.
19. Lee MJ, Park JH, Kim H, Choi Y. Comparative evaluation of natural and chemical mouthwashes on oral health and side effects. Int J Dent Stud. 2020;28(2):87-99.