Efficacy of Triphala extract, Manuka honey, and Chlorhexidine Mouthrinse against Plaque Accumulation and Gingival Inflammation among Undergraduates: - A Randomized Controlled Trial

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Abstract:

Objectives:- This study aims to assess the efficacy of Triphala extract, manuka honey, and chlorhexidine mouth rinse against plaque accumulation and gingival inflammation among undergraduates. **Materials and Methods**:- A randomized controlled trial was conducted on Teerthanker Mahaveer University undergraduate students, in Moradabad The study participants were divided into four groups, each consisting of a total of 25 individuals. Using a lottery system, Group A (placebo mouth rinse), Group B (Triphala Extract mouth rinse), Group C (Manuka Honey mouth rinse). and Group D (0.2%o chlorhexidine mouth rinse) were chosen. The plaque index and gingival index were measured at baseline**. Results:** The result showed that the Triphala extract and Manuka honey statistically significantly decreased PlI and GI at the end of 28 days, whereas CHX mouth rinse showed a statistically significant decrease in PlI. **Conclusion:** Manuka honey mouthwash highly significantly decreased the amount of plaque and gingival scores.

Keywords: dental plaque, gingivitis, honey, mouthwash.

INTRODUCTION

Oral health is increasingly recognized as equally vital concerning overall health and well-being. Dental caries and periodontal conditions are the two most common oral pathologies that affect practically every individual throughout their lives.[1]

The World Health Organization widely recognizes that a large majority of people in developing nations, roughly 80%, primarily depend on traditional forms of medicine for their basic healthcare

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requirements. This is often due to the scarcity of modern medical facilities and the affordability of traditional remedies.[2] Traditional medicine includes a variety of practices such as plant-based treatments, acupuncture, and other healing methods rooted in cultural traditions. These practices have been handed down over many generations. The WHO advocates for incorporating traditional medicine within national health systems when they are verified to be safe and effective, aiming to provide accessible healthcare for all. Mouthwash has been used for therapeutic and aesthetic purposes for generations, but in recent years, the reasoning for using chemical compounds has been submitted to scientific studies and clinical studies. Ayurveda is considered as the "science of life." The ancient Indian system of health care focused on views of man and his illness.[3] Triphala is a classic herbal formula in the Ayurvedic system of medicine, treasured for centuries for its therapeutic effects. Triphala consists of equal parts of the Emblica officinalis (Amalaki), Terminalia chebula (Haritaki), and Terminalia belerica (Bibhitaki).[4] Dental plaque naturally forms on every tooth surface and acts as a protective barrier, preventing foreign microbial species from colonizing. However, the low pH of plaque causes a change in the microbial flora from commensal to pathogenic, which leads to the development of caries and periodontal disease. The use of mechanical and chemical agents has helped manage dental plaque. One common chemical agent is Chlorhexidine (CHX), which has traditionally been considered the gold standard for plaque control. However, CHX has some drawbacks, including an unpleasant taste, tooth staining, and the risk of microbial resistance.[5] Certainly, Honey, a natural product with a rich history of use, has been recognized for its medicinal properties for thousands of years. Honey's antibacterial qualities are ascribed to its content of hydrogen peroxide, flavonoids, and bee defensin-1. These traits are enhanced with dilution.[6] Hence, this study was undertaken to evaluate the effect of Triphala extract, Manuka Honey, and Chlorhexidine mouth rinse against plaque accumulation and gingival inflammation among undergraduates.

MATERIALS AND METHODS

A randomized controlled trial was conducted on undergraduate students of Teerthanker Mahaveer University, Moradabad. The study participants were divided into four groups, each consisting of a total of 25 individuals. Using a lottery

system, Group A (Placebo mouth rinse), Group B (Triphala Extract mouth rinse), Group C (Manuka Honey mouth rinse), and Group D (0.2% chlorhexidine mouth rinse) were chosen. Before the start of the study, the plaque index and gingival index were measured at baseline.

INCLUSION CRITERIA:

1. Participants with the age group of 18–24 years undergraduates with a minimum of 20 teeth.
2. Participants with Gingival Index (GI) and Plaque index (PlI) scores of ≥1 in 10% of the sites.
3. Participants who are willing to comply with the appointment schedule.

EXCLUSION CRITERIA:

1. Participants with any systemic conditions.
2. Participants with any allergy or infectious diseases.
3. Participants receiving antibiotic therapy or any medication within the past 6 months.
4. Participants already using any mouth rinse.
5. Participants wearing an orthodontic appliance or removable partial denture.

METHOD OF PREPARATION OF TRIPHALA EXTRACT MOUTHWASH

Triphala extract, traditionally available as a finely sieved powder known as Churna, which has a shelf life of six months, was used in the present study to create a 6% Triphala mouthwash. To make this mouthwash, 60 grams of pure Triphala Churna were dissolved in 1 liter of distilled water. To enhance patient compliance, 2 milliliters of glycerine (for sweetness) and 1 milliliter of Pudin Hara (for flavor) were added to the mixture. The solution was then boiled for 10 minutes, cooled, and filtered.[7]

METHOD OF PREPARATION MANUKA HONEY MOUTHWASH

Nearly 10 grams of commercial Manuka honey was mixed with 100 mL of boiling distilled water, and the mixture was heated for an extra 30 minutes. To achieve a 100% (w/v) concentration, the solution was reduced to 10 mL. Before being used, the Manuka honey solution was cooled to room temperature and stored in separate sterile containers.[8]

METHOD OF DATA COLLECTION

The demographic data and oral examinations were conducted to record the gingival index (GI) and plaque index

(PlI) using the criteria established by Loe and Silness and Silness and Loe, respectively. This was done to evaluate plaque accumulation and gingival inflammation at the beginning of the study.

Throughout the trial, individuals followed their regular self-performed oral hygiene procedures. To avoid potential bias between groups, no participants received particular oral hygiene instructions. After 21 days of mouthwash administration, the Plaque index (Silness and Loe, 1964) and Gingival index (Silness and Loe, 1963) were reassessed on the 22nd day and 28th day.

Intervention

Group A (Placebo) n = 25

Group B (Triphala extract) n = 25

Group C (Manuka Honey) n = 25

Group D (Chlorhexidine) n = 25

All the participants administered mouthwashes according to the group they were assigned to, twice daily for 28 days. The students were educated and trained to use of mouthwash. All participants were instructed not to eat before 30 minutes before using the mouthwash. Before using the mouthwash, gargling with plain water was done to remove debris. The study participants were instructed to use 10 ml of mouthwash by holding it in their mouth and swishing the mouthwash for 30 seconds, then spit it out. They were advised not to eat or rinse for the next 30 min. They were given a compliance checklist to tick mark after every rinse. The emptiness of the mouthwash bottle was correlated with the number of mouth rinses done.

STATISTICAL ANALYSIS

Data was tabulated and statistically analyzed using Statistical Package for Social Science (SPSS) 24.0 software. Descriptive statistics were used to calculate frequencies, percentages, and mean values. One-way ANOVA and chi-square test followed by Tukey's post hoc test were carried out to determine the difference between and within groups, respectively.

RESULT

At the onset of the study, there were 135 participants, 25 from the placebo group, 25 from the triphala extract group, 25 from the manuka honey group, 25 from the chlorhexidine group, and 35 were excluded, who were not fulfilling the inclusion criteria. Figure 1 shows the distribution of study participants according to age and gender. In this study, the maximum number of participants were female (n=56) followed by male (n=44).While proceeding with the study,

the baseline data was obtained in all the four groups. There was no statistically significant difference in 4 groups at the baseline according to age and gender.

Intragroup comparison by repeated measure One Way ANOVA and Chi-square test followed by Tukey's post hoc test. There is a statistical reduction ($P<0.001$) in plaque index and gingival index at 22 days and 28th days for all four mouthwash groups (A, B, C, D).

The mean plaque score for Group A (placebo) reduced from 1.744±0.501 at baseline to 1.0264±0.277 on the 22ndday and to 1.0264 ± 0.277 on the 28th day. The mean gingival score for Group A (placebo) reduced from 1.971±0.416 at baseline to 1.9600 ± 0.393 on the 22nd day and to 1.0264 ± 0.277on the 28th day.

The mean plaque score for Group B (Triphala extract) reduced from 1.910±0.564 at baseline to 1.4852±0.500 on the 22nd day and to 1.4004 ± 0.514 on the 28th day. The mean gingival score for Group B (Triphala extract) reduced from 1.915±0.517 at baseline to 1.5580 ± 0.450 on the 22nd day and to 1.5532 ± 0.449 on the 28th day.

The mean plaque score for Group C (Manuka Honey) reduced from 2.024 ±0.334at baseline to 1.2616±0.348 on the 22nd day and to 1.2616±0.348 on the 28th day. The mean gingival score for Group C (Manuka Honey) reduced from 2.126±0.492 at baseline to 1.3600 ± 0.473 on the 22nd day and to 1.0108 ± 0.439 on the 28th day.

The mean plaque score for Group D (Chlorhexidine) reduced from 2.020 ± 0.458 at baseline to 1.0916±0.226 on the 22nd day and to1.0548±0.267 on the 28th day. The mean gingival score for Group D (Chlorhexidine) reduced from 2.174 ±0.470at baseline to 1.5388± 0.414 on the 22nd day and to 1.4456 ± 0.390 on the 28th day.

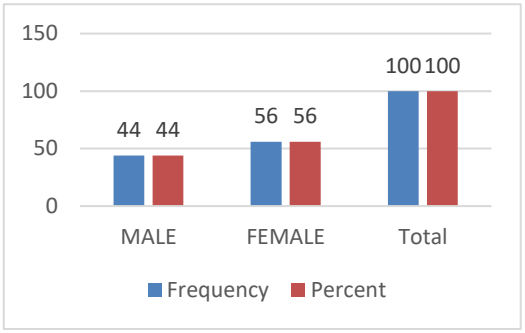

Figure 1: Gender-wise distribution of participants

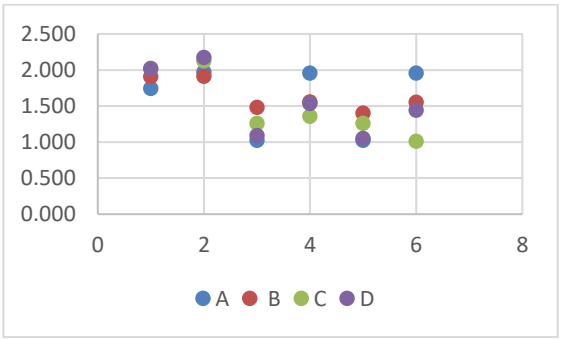

Figure 2: PlI and GI scores at the respective duration of all 4 groups [A = Group A, B = Group B, C = Group C , D = Group D ,1 = PlI at baseline, 2 = GI at baseline, 3= PlI at 21 days, 4=GI at 21

days, 5=PI at 28 days, 6= GI at 28 day

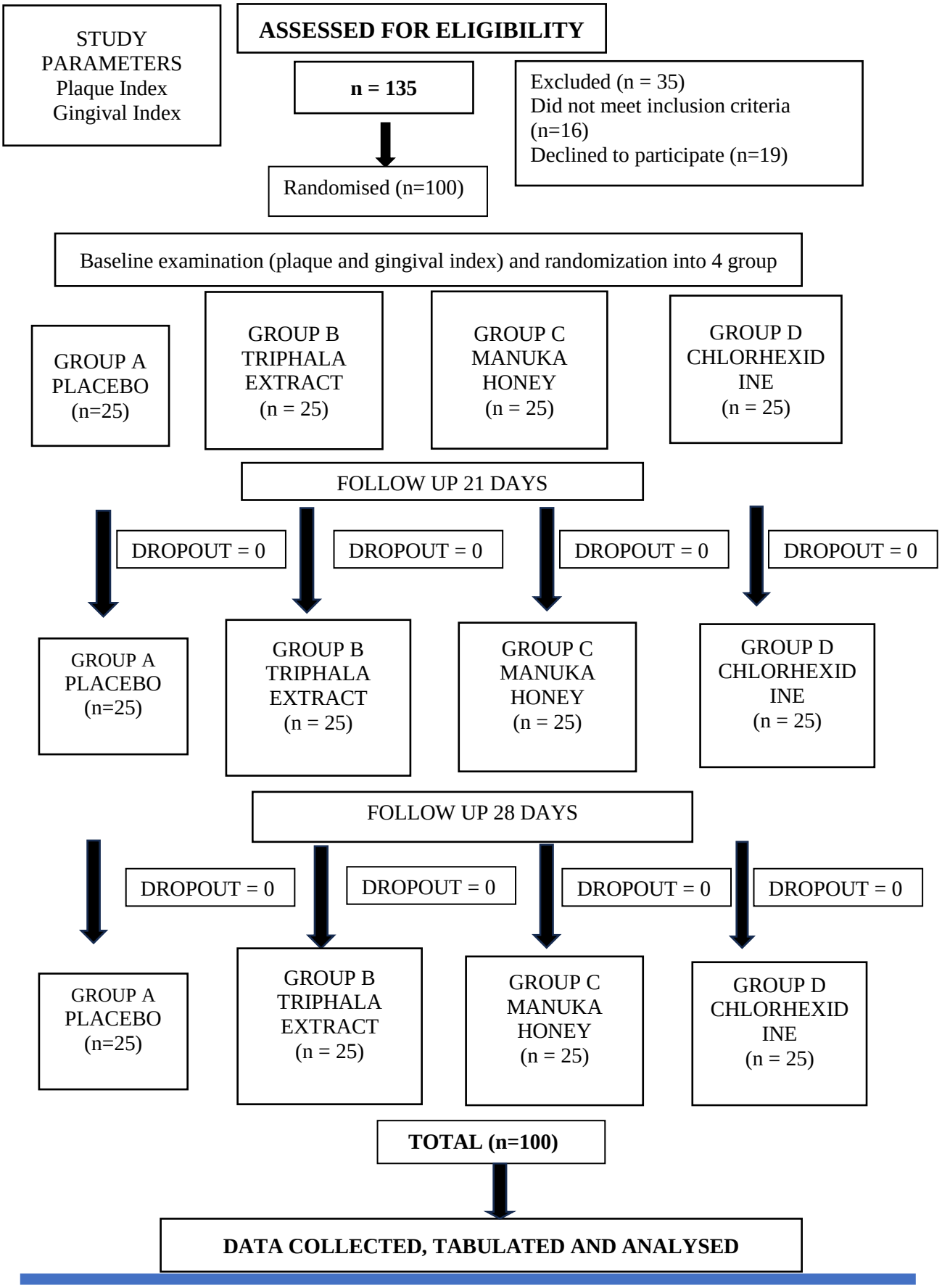

Table 1: Visit-wise comparison of p-values in Group A (Placebo)

Visits	p-value
1st visit- 2nd visit	0.233(non-significant)
2nd visit – 3rd visit	0.699 (non significant)
1st visit – 3rd visit	0.445 (non significant)

Table 2: Visit-wise comparison of p-values in Group B (Triphala Extract)

Visits	p-value
1st visit- 2nd visit	0.005(significant)
2nd visit – 3rd visit	0.045 (non -significant)
1st visit – 3rd visit	0.003 (significant)

Table 3: Visit-wise comparison of p-values in Group C (Manuka Honey)

Visits	p-value
1st visit- 2nd visit	0.002(significant)
2nd visit – 3rd visit	0.004 (significant)
1st visit – 3rd visit	0.000 (highly - significant)

Table 4: Visit-wise comparison of p-values in Group D (Chlorhexidine)

Visits	p-value
1st visit- 2nd visit	0.045(non-significant)
2nd visit – 3rd visit	0.054 (non - significant)
1st visit – 3rd visit	0.005 (significant)

DISCUSSION

The study evaluated the effectiveness of various mouthwash solutions, including a placebo, Triphala extract, manuka honey, and chlorhexidine, on plaque index (PlI) and gingival index (GI) scores over 28 days. The findings indicate a significant reduction in both PlI and GI scores across all four groups, suggesting that each mouthwash solution positively impacted oral hygiene.

In the placebo group (Group A)[Table 1] showed there was a reduction in both PlI and GI scores from baseline to the 28th day, the changes were not statistically significant. This suggests that the placebo mouthwash had minimal effect on plaque and gingival health compared to the active interventions.

In contrast, Groups B (Triphala Extract), and Group C (Manuka Honey), [Table 2 and 3] showed significant reductions in both PlI and GI scores from baseline to the

28th day. Triphala extract and manuka honey demonstrated significant reductions even as early as the 22nd day, indicating their relatively rapid efficacy. Chlorhexidine, a commonly used antimicrobial agent in mouthwash, also [Table 4] showed significant reductions in PlI and GI scores, albeit with a slightly delayed onset compared to the natural extracts.

In line with previous research, natural extracts such as Triphala and manuka honey effectively reduced plaque and gingival inflammation. Triphala, a traditional Ayurvedic formulation comprising three fruits, has been historically lauded for its antimicrobial and anti-inflammatory properties, making it a promising candidate for oral health promotion (Jagadish et al., 2012).[9] Similarly, manuka honey, known for its antibacterial and wound-healing properties, has shown promising results in improving oral hygiene (Gethin et al., 2008).[10] Triphala's recognition for its antimicrobial properties and manuka honey's potent antibacterial effects, attributed to unique components like methylglyoxal (MGO), underscore their potential in combating oral pathogens and promoting overall oral health. The intragroup comparison further elucidates the effectiveness of each mouthwash solution over time. Group B (Triphala Extract) and Group C (Manuka Honey) exhibited significant reductions in both PlI and GI scores from the 1st to the 3rd visit, indicating sustained effectiveness throughout the study period. Group D (Chlorhexidine) also showed significant reductions from the 1st to the 3rd visit, albeit with a slightly lower significance level at the 2nd visit, suggesting a progressive improvement in oral health with continued use.

Comparing our findings with prior research, Gupta et al. (2011)[11] conducted a study evaluating the antiplaque effectiveness of green tea catechin mouthwash versus chlorhexidine gluconate. While our study focused on natural extracts like Triphala and manuka honey, Gupta et al. highlighted the comparable efficacy of green tea catechin mouthwash to chlorhexidine, suggesting the potential of natural alternatives in oral care. Similarly, Sood et al. (2016)[12] conducted a randomized controlled clinical trial assessing the anti-plaque efficacy of Triphala, Aloe vera, and chlorhexidine mouth rinse in patients with gingivitis, reporting significant reductions in plaque accumulation and inflammation with the use of natural extracts. These studies

support our findings regarding the effectiveness of natural extracts in improving oral health.

Chlorhexidine, a commonly used antimicrobial agent in mouthwash, also exhibited significant reductions in PlI and GI scores in the present study. This finding aligns with previous literature highlighting the efficacy of chlorhexidine in reducing plaque and gingivitis (Chatterjee et al., 2011). [13] However, it's important to note that chlorhexidine is associated with potential side effects such as tooth staining and altered taste perception, which may limit its long-term use.``

These results highlight the potential of natural extracts such as Triphala and manuka honey as effective alternatives to traditional antimicrobial agents like chlorhexidine in promoting oral health. Moreover, the findings underscore the importance of regular use of mouthwash in reducing plaque and gingival inflammation, ultimately contributing to overall oral hygiene and potentially preventing periodontal diseases. However, further research is warranted to explore these natural extracts' long-term effects and potential side effects compared to conventional mouthwash solutions.

The results of this study suggest that natural extracts like Triphala and manuka honey hold promise as effective alternatives to conventional mouthwash solutions in enhancing oral health. Nonetheless, further investigation is warranted to elucidate their long-term effects and potential adverse reactions compared to traditional antimicrobial agents.

CONCLUSION

As per our current study, we could see that both manuka honey and chlorhexidine have proven efficient in reducing plaque and gingival scores. A more elaborate study including combinations of each of them and other studies taking into consideration other types of honey as well will help us in getting more clear results. A large study done on those samples which include a variety of populations can help get more refined results.

FINANCIAL SUPPORT AND SPONSORSHIP

Nil

CONFLICTS OF INTEREST

There are no conflicts of interest.

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