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Effectiveness of Magnetized Water and 0.2% Chlorhexidine as a Mouth Rinse in Young Adults Aged 15–20 Years for Plaque and Gingivitis Inhibition During 3 Weeks of Supervised Use: A Randomized Control Study

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Abstract

Background: Maintaining oral hygiene is crucial, for one's overall health; plaque induced gingivitis is a common concern. Chlorhexidine (CHX) is widely recognized as the solution, for controlling plaque and gingivitis. It has drawbacks because of its side effects. There has been a suggestion to explore water as a substitute that may offer antibacterial benefits.

Aim: The goal of this research was to assess how magnetized water and 0.2% of chlorhexidine mouthwash could decrease plaque and gingivitis in young adults aged 15 to 20 years, over a period of three weeks.

Methods: This study was carefully designed to reduce bias and increase accuracy; 40 subjects were included in this study. They were divided into two groups. Group A used magnetized water and Group B used 0. 2 % CHX solution. Each group followed a rinsing regimen of 10 ml daily for 30 seconds over a period of three weeks. The levels of plaque (PI) and gingival health (GI) were evaluated at baseline , two weeks and three weeks. To analyze the data various statistical methods such, as paired and unpaired t tests were employed with significance set at p values less than 0.05.

Results: Both the group using magnetized water and the group using CHX displayed decreases, in PI and GI scores compared to the initial readings; however, by the end of the third week CHX demonstrated a slightly more prominent drop in GI (statistically significant, with p value of 0.007). There were no reports of any reactions observed during the study period and participants responded positively to the use of magnetized water.

Conclusion: Magnetized water showed effectiveness same as CHG in decreasing plaque and gingival inflammation, in oral care practices—an efficient alternative worth considering for maintaining long term oral health in young adults.

Keywords: Magnetized water, chlorhexidine, plaque control, gingivitis, mouth rinse,

Introduction

Good oral hygiene plays a role, in one's health and quality of life as it affects physical well-being as well, as self-esteem and social interactions greatly.[1] Gingivitis which is commonly caused by plaque (biofilm) is widespread and can impact 90% of individuals at some stage irrespective of age or background. [2] Among young adults the numbers are quite high, with research showing a frequency of 61. 5 % In the USA 80 percent in Australia and up to 95 percent, in India. The advancement of this illness is directly tied to the accumulation of plaque that if not properly controlled can result in periodontal problems and tooth decay. [3]

To prevent gingivitis and diseases caused by plaque build-up in the mouth health experts often recommend using cleaning techniques such, as brushing and flossing as the effective methods. [4] However for some individuals who are prone to plaque or have limited access to regular dental checkups relying solely on these methods may not be enough to maintain optimal oral hygiene.[3,5] As a valuable addition to oral care practices, products like chlorhexidine (CHX) mouthwashes have been found to possess antibacterial properties. [5] Both the FDA and the American Dental Association (ADA) have endorsed the efficacy of CHX mouth rinse, in reducing plaque formation and treating gingivitis. While CHX is effective, in its purpose; it has its downsides such as leaving a taste behind and staining teeth that might not make it ideal for continuous use due to possible oral discomfort and altered taste perceptions. [6,7]

Considering these limitations mentioned above has led researchers to delve into finding more natural options for maintaining oral health on a day, to day basis.[8] Particularly for young adults one such alternative that has caught the attention of many is magnetized water treatment. This process entails exposing water to magnetic fields that modify its characteristics by raising its alkaline levels and reducing its surface tension. [6-9] These modifications render the water gentle, in nature, easier to absorb and also potentially increasing its ability to break through plaque build ups and effectively deliver essential nutrients.[10] Initial results suggest that magnetized water could offer benefits as a solution, however studying its efficiency and safety as a mouthwash is still in the phases, with scarce clinical information accessible. [11]

The use of magnetized water, as an addition to oral care is an interesting advancement in preventive dentistry that could work alongside regular methods, for controlling plaque without relying heavily on chemicals.[12] The research seeks to assess how magnetized water can be us ed as a substitute, for 0.2% CHX mouth rinse in decreasing plaque and gingivitis in young adult of 15 to 20 yrs during a timeframe offering information on secure and convenient preventive dental care.

Methodology

A total of 20 young adults, aged between 15 to 20 years were chosen for the study. After taking a written informed consent and approval from the ethical committee. They were divided into two groups of 10 each. Group A utilized magnetized water while Group B used a mouthwash containing 0. 2 % Chlorhexidine (CHX).

The following were the selection criteria.

1.They should have plaque induced gingivitis (GI score of ≥ 1(Loe & Silness).

2.No history of systemic illnesses.

3. Participants who had used mouthwash during the last 6 months or undergone oral prophylaxis were excluded

4. Those who were undergoing orthodontic treatment were excluded.

A computer-generated random sequence was used to assign the participants to either the magnetized water or CHX group.

The process involved in making the magnetized water was done by preparing water weekly by exposing osmosis water to a 1000 gauss magnet for 24 hours to reach a pH level of 7.8 and electrical conductivity of 24.6. The magnetized water and CHX were kept in indistinguishable labeled bottles to ensure blinding throughout the study period so that neither the participants nor the examiner knew which mouthwash was being used; a third party unassociated, with the study managed the labeling and distribution.

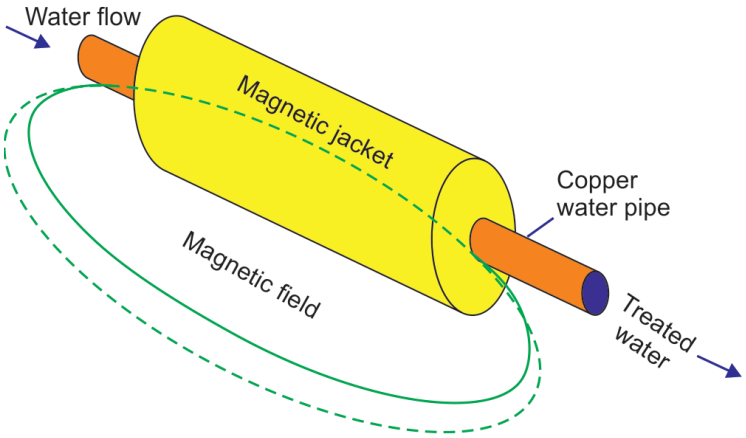

Fig 1: Image of magnetized water preparation (Adopted from Nezam S et.al.[10])

Instructions for Use and Monitoring Adherence:

Each participant received 140 ml of their assigned mouthwash, for home use. They were instructed to rinse with undiluted 10 ml of the given mouthwash for 30-60 seconds twice a day and not to eat or drink for half an hour after rinsing the mouth. A printed schedule was provided to the participants to note down each instance of usage for monitoring compliance.

Assessment of Clinical Factors:

Initial examination of periodontal health and follow ups at the 2nd week and 3rd week marks were assessed using the Turesky Gilmore modification of Quigley and Hein's index for evaluation of plaque score after applying the disclosing solution. Gingival inflammation was evaluated using the Loe and Silness index. This was performed in the clinics by a single examiner at the given intervals to minimize any bias in the results.

Statistical Analysis; The data was analyzed by comparing differences, within and, between groups using paired and unpaired t tests with a significance threshold set at p value less than 0.05. Throughout this study period no negative reactions were found. The participants were instructed to maintain their routine oral hygiene habits with the incorporation of the given mouthwash. In this organized method a deliberate evaluation was carried out to compare the impact of magnetized water and CHX mouthwash, in reducing plaque and gingivitis within a given timeframe.

Result

In this research study there were 40 participants, between the ages of 15 and 20 years. 20 individuals in each group as detailed in Table 1 showcasing the profiles of the participants in the study groups. For Group A (Magnetized Water) the average age was 15.8 Years (with a deviation of ±0.5) while for Group B (Chlorhexidine) it was 15.7. Years (with a deviation of ±0.6.). This indicates that there was no difference in age, between the two groups. Both groups had an equal distribution of genders; Group A had 60 % males and 40 % females while Group B had 55 % males and 45 % females. This balanced gender representation helped in ensuring that any variations seen in the study results are not influenced by age or gender discrepancies and thereby enables a comparison, between the two treatment groups.

In Table 2 represents the plaque index (PI) scores and gingival index (GI) scores, in group A and group B. In Group A the initial score for plaque index was 1.52 (± 0.47) and an average gingival index of 1.04 (± 0.06) while Group B had an average plaque index score of 1.30 (± 0.32) and an average gingival index score of 1.06 (± 0.09).The statistical analysis indicated that there were no variations, between the groups at the beginning regarding both PI (with a p value of 2.1) and GI (with a p value of 7.6) indicating the initial oral health in both the groups. This similarity enhances the credibility of the observed results being linked to the interventions rather than existing disparities beforehand.

The PI scores decreased over time, for both groups during the intervention period with Group 1 (Magnetized Water) PI dropping from 1. 52 (±0. 47) At the beginning to 1. 17 (±0. 37) In the 2nd week and then, to 0. 86 (±0. 19). In the 3rd week. In Group B (CHX), the Plaque Index (PI) which was 1.30 (+/ 0.32), at the beginning of the study period decreased to 1.02 (+/ 0.21) by the 2nd week and further decreased to 0.76 (+/ 0.11) by the 3rd week. However, both the groups exhibited a decrease in PI at each follow up assessment (p value=0.0001). This persistent decrease in plaque scores indicates that magnetized water and chlorhexidine are effective, in controlling plaque formation throughout the study duration as shown in Table 3.

The changes, in GI scores over time are detailed in Table 4 which shows how the decrease in gingival inflammation in each group. The group using Magnetized Water (Group A) showed a decrease in GI from 1·04 (± 0·06) at the beginning to 0·79(± 0·09) in the 2nd week and 0·64 (± 0·13) in the 3rd week.

Group B (Chlorhexidine) also displayed a decrease, in gingival inflammation from 1·06 (± 09) initially to 0.83 (± 0.08) by the 2nd week and 0.48 (± 0.09) by the 3rd week; These reductions were statistically significant within each group (p=0.0001). While both groups showed effective reduction in gingival inflammation, chlorhexidine was notably more effective by the 3rd week with a statistically significant difference, between the two groups (p=0.007). It seems that although using magnetized water has its benefits, chlorhexidine still remains a gold standard to control gingival inflammation.

Table 1: Distribution of study groups as per gender and age

Group	Mean Age ± SD (years)	Male (%)	Female (%)
A (Magnetized Water)	15.8 ± 0.5	60	40
B (Chlorhexidine) CHX	15.7 ± 0.6	55	45

Table 2: Mean PI and GI scores among group A and group B

Group	Baseline PI Mean ± SD	Baseline GI Mean ± SD	p-value (PI)	p-value (GI)
A (Magnetized Water)	1.52 ± 0.47	1.04 ± 0.06	0.21	0.76
B (Chlorhexidine) CHX	1.30 ± 0.32	1.06 ± 0.09		

Table 3: Correlation of PI scores among group A and Group B at different time interval

Group	Baseline PI Mean ± SD	2nd Week PI Mean ± SD	3rd Week PI Mean ± SD	p-value (2nd Week)	p-value (3rd Week)
A (Magnetized Water)	1.52 ± 0.47	1.17 ± 0.37	0.86 ± 0.19	0.0001	0.0001
B (Chlorhexidine)	1.30 ± 0.32	1.02 ± 0.21	0.76 ± 0.11	0.0001	0.0001

Table 4: Correlation of GI among group at different time interval

Group	Baseline GI Mean ± SD	2nd Week GI Mean ± SD	3rd Week GI Mean ± SD	p-value (2nd Week)	p-value (3rd Week)
A (Magnetized Water)	1.04 ± 0.06	0.79 ± 0.09	0.64 ± 0.13	0.0001	0.007
B (Chlorhexidine)	1.06 ± 0.09	0.83 ± 0.08	0.48 ± 0.09		

Discussion

This study examined whether magnetized water could effectively be used as a mouth rinse, in comparison to 0.2 % Chlorhexidine (CHX). to reduce plaque scores and gingivitis within a three-week period in young adults aged 15–20 years old. This group was selected to monitoring oral health among young adults using the magnetized water and Chlorhexidine (CHX) mouth wash . The decision to use 0.2 % Chlorhexidine as a control was influenced by its recognized position as a gold standard for reducing plaque and gingivitis.

In this research study conducted with CHX solution (chlorhexidine) there was a decrease, in both plaque and gingival scores at the beginning and the 3rd week of the study period—a trend that echoes findings from a study by Lone et al., 2016. [13] These results are in line with the research of Shyam and Fareed who also found that CHX exhibits anti-plaque and anti-gingivitis properties compared to a placebo. [14] Moreover Lang et al. and Santos studies highlight that regular use of 0. 1% to 0. 2 % CHX mouthwash effectively manages plaque and gingivitis issues reinforcing its effectiveness, in dental care. [15]

In our research project testing the effectiveness of CHX mouthwash at a concentration of 0.2% (Menendez et al. and Addy and Moran).[16] The decision to conduct the study for three weeks was influenced by the research of Bhattacharjee et al.,[17] who observed that a noticeable decrease, in plaque and gingivitis typically happens within this timeframe in cases due, to its practicality and affordability.

Although CHX is very efficient, in its function it does come with some drawbacks such, as causing stains taste change and irritation of the mucosal lining on prolonged use .[18] This has sparked curiosity in seeking out other options. Magnetized water was investigated as a replacement harnessing its characteristics to hinder bacteria from attaching to the teeth through magnetohydrodynamic mechanisms.[19] This could potentially stop plaque from forming.[10] The outcomes, for magnetized water looked encouraging as there was a decrease in both plaque and gingival scores throughout the study duration. By the second and third weeks of the study

period it was observed that magnetized water exhibited a reduction in plaque index (PI) with a similar decline noted in gingival index (GI). These results align with earlier studies conducted by Lone et al., [13] where it was found that magnetized water yielded comparable reductions in plaque and gingivitis, as CHX when used for a short period of time.

While the participant groups were compared regarding plaque reduction effectiveness, between magnetized water and CHX (chlorhexidine) it was found that there was no much difference between the two , suggesting that magnetized water is as effective as CHX as an anti- plaque agent. When looking at gingivitis specifically; after 2 weeks of follow up observations between the groups showed no difference in effects on gingival inflammation (GI scores). However, by the 3rd week period there was a distinctive reduction of gingival scores with CHX compared to magnetized water (with a p value of 0.007).This finding indicates that magnetized water does help in controlling plaque formation and gingivitis; however, CHX is more effective, for short term management of gingivitis. Both groups did not experience any adverse effects during the study period. The participants showed positive acceptance, towards magnetized water as a viable and safe option compared to CHX for young adults who are sensitive to the side effects of chemical substances. Future research could delve into investigating the lasting effectiveness of magnetized water to solidify its potential as an adjunct to oral care routines.

Conclusion

This research showed that magnetized water and 0.2% chlorhexidine mouth rinses successfully decreased plaque formation and gingival inflammation, in young adults over a three weeks span. Chlorhexidine(CHX) proved to be very good as chemical plaque control agent and reduce gingivitis with maximum reduction in gingival inflammation by the third week. However magnetized water emerged as an option, with plaque reduction benefits and no negative side effects. Considering its safety record and positive reception, among users ,magnetized water presents an organic addition for oral care needs in young adults and also for those who are susceptible to the adverse effects of CHX. An in-depth investigation with increased participant numbers and extended observation periods is necessary to solidify magnetized water as a viable choice, for maintaining oral health over the long haul.

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