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Antiplaque Efficiency of Aloevera Containing Toothpaste in Periodontally Compromised Patients : A Clinical Trial

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KEYWORDS
Aloe vera, Plaque, Triclosan, toothpaste, oral hygiene.

ABSTRACT:
Introduction: In the recent years, there is a revival of interest in traditional medicine because it is safe, economical, dependable and has withstood the test of time. Hence, there is also a need to develop a naturally occurring, indigenous and cost-effective oral hygiene aid. One such aid could be in the form of Aloe vera extract. **Aim**: To evaluate the effectiveness of Aloe vera containing toothpaste in the reduction of established plaque in patients with Type-2 non-insulin dependent diabetes mellitus. **Methodology**: The study population comprised of 120 type II diabetes mellitus patients in the age group of 40-60yrs who were divided into two groups: group A, Aloe vera containing toothpaste and group B, fluoridated toothpaste containing triclosan. Subjects were asked to brush their teeth with the control or test dentifrice, twice a day during a 30-day period. Clinical evaluation was undertaken using a modification of the Quigley-Hein index at baseline, 14th day and 21st day. **Results**: Both the toothpastes showed significant improvement in plaque index scores. No statistically significant differences were observed among them with respect to plaque scores ($p>0.05$). **Conclusion**: Toothpaste containing Aloe vera may be a useful herbal formulation for chemical plaque control agents and improvement of plaque status.

Introduction

In the recent years, there is a revival of interest in traditional medicine because it is safe, economical, dependable and has withstood the test of time. In fact, WHO in 2009 gave a universal call to all member states to promote safe and effective use of traditional system of medicine.[1] Hence, there is also a need to develop a naturally occurring, indigenous and cost-effective oral hygiene aid. One such aid could be in the form of Aloe vera extract. Aloe vera is a cactus-like plant, which is a member of the *Lilaceae* family. It is rightly called the "plant of immortality" in the Egyptian culture owing to its diverse therapeutic application.[2] It grows mainly in dry regions of Africa, Asia, Europe and America. In India, it is found in Rajasthan, Andhra Pradesh, Gujarat, Maharashtra and Tamil Nadu.[3]

Aloe vera has anti-inflammatory properties, antiulcer activity, an astringent effect and may have the ability to reduce scars and enhance wound healing.[4,5] The above mentioned properties, along with the ease of availability, no known adverse effects and cost effectiveness, made Aloe vera an ideal

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candidate for plaque control, thereby reducing gingivitis and most likely eventual periodontitis.

The increased prevalence and severity of periodontitis commonly seen in patients with diabetes, especially those with poor metabolic control, led to the designation of periodontal disease as the "sixth common complication of diabetes." The glucose content of gingival fluid and blood is higher in individuals with diabetes than without, with similar plaque scores, leading to qualitative changes in bacteria that could account for the severity of periodontal disease observed in individuals with diabetes. The cumulative effect of altered cellular response to local factors, impaired tissue integrity and altered collagen metabolism undoubtedly plays a significant role in the susceptibility of individuals with diabetes to infections and destructive periodontal disease.[6]

To the best of our knowledge, till present date, there is no reported controlled trial evaluating the efficacy of a dentifrice containing Aloe vera in the control of plaque in patients with Type II diabetes mellitus. So the present study was conducted with an aim to evaluate the effectiveness of Aloe vera containing toothpaste in the reduction of established plaque in patients with Type-2 non-insulin dependent diabetes mellitus.

Methodology

The study was carried out in the month of January 2021 to June 2022 in Jaipur city by conducting home to home visit to all the participants.

The subjects were randomly selected from the OPD of few private clinics and hospitals who were diagnosed of type II diabetes mellitus and were undergoing treatment for the same.

Pilot Study

A pilot study was designed and carried out to check the feasibility of the study among a total of 32 type II diabetes mellitus patients in the age group of 40-60 yrs and for the estimation of sample size for the main research.

Study population and Sampling Procedure

The study population comprised of Type-2 diabetes mellitus patients in the age group of 40-60yrs.

A total of 134 patients in the age group of 40-60 yrs were screened from the OPD of private clinics and hospital and those fulfilling the inclusion criteria were selected for the study.

Thus a sample of 120 patients was obtained which fulfilled all the inclusion criteria of the study.

- *Inclusion Criteria*
- All patients with Type-2 Non-insulin dependent diabetes mellitus in the age group of 40-60 yrs who signed the informed consent voluntarily.
- Subjects having at least 20 natural teeth
- Base line scores of plaque index (Turesky-Gilmore-Glickman modification of the Quigley-Hein Plaque Index, 1970) [7] should be >0

- *Exclusion Criteria*
- Patients with the habit of using tobacco in any form.
- Individuals under anti-microbial therapy atleast 1 month prior to the study.
- Patients on drugs like:- Phenytoin, Cyclosporine, Calcium channel blockers.

The toothpaste tubes were colour coded by marking their cap with two colours namely Red and White.

The study participants were divided into two groups (Group A and group B) such that the mean baseline plaque scores of both the groups were approximately the same.

The test (Aloe vera containing tooth paste) and control (Fluoridated tooth paste containing triclosan) toothpastes were distributed to the appropriate groups in identical plain, white tubes, to ensure that neither the subjects nor the examiners knew the identity of the dentifrices.

The dentifrices were supplied in a regular, scheduled manner throughout the course of the study. At the final visit, all remaining dentifrice tubes were collected back from the subjects.

Subjects assigned to the test and control groups were provided with Medium textured toothbrushes and

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plain white dentifrice tubes and were instructed to brush their teeth twice a day for two minutes each. All the groups were asked to continue brushing their teeth using Modified Stillman's technique which was demonstrated to them by the examiner.

The examination was carried out using specific recording proforma designed for the study, comprising of recording format for the Turesky modification of Quigley Hein Plaque Index, 1970 along with name, age and duration of diabetes of the subjects All the teeth, excluding the 3rd molars satisfying the inclusion criteria for the respective indices were included in the study and examined when recording the indices.

Clinical evaluation was undertaken using a modification of the Quigley-Hein index at baseline, 14th day and 21st day.

Results

Plaque index

Comparison of changes in mean PI scores in group A

The mean difference in the plaque scores between baseline examination and first follow up was 1.07. The change in the plaque was statistically significant ($p< 0.05$). The mean difference between baseline examination and second follow up was 1.13 and the change in the plaque was also statistically significant ($p< 0.05$).

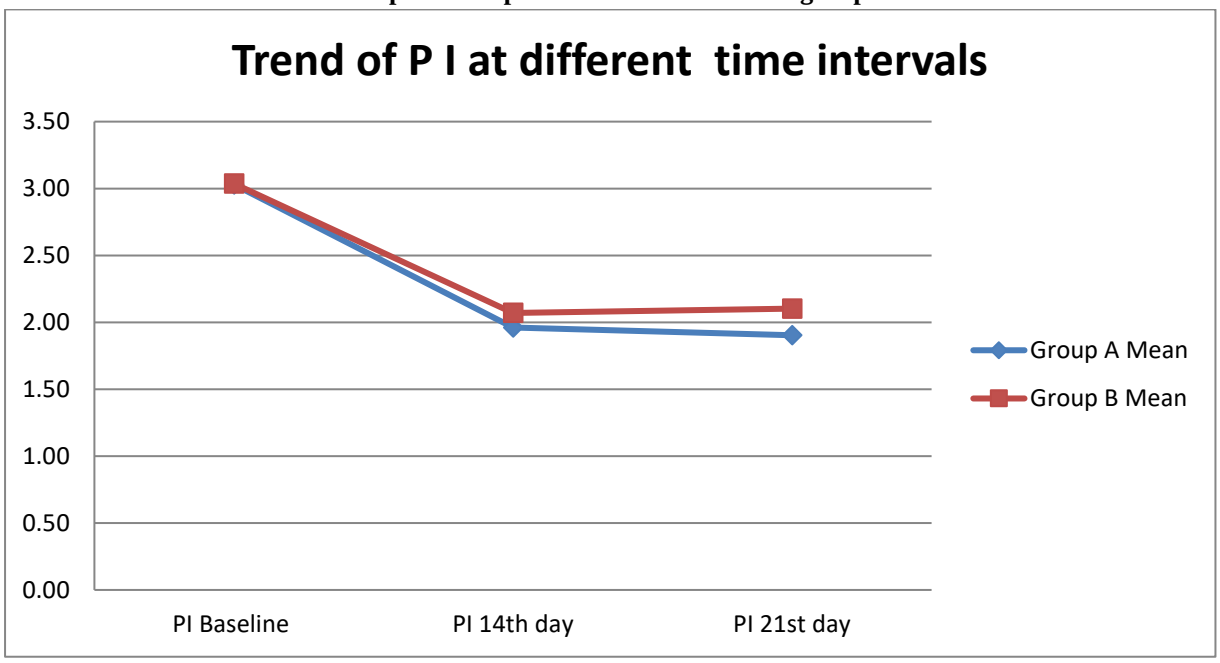
Comparison of changes in mean PI scores in group B

The mean difference in the plaque scores between baseline examination and first follow up was 0.97. The change in the plaque was statistically significant ($p< 0.05$). The mean difference between baseline examination and second follow up was 0.94 and the change in the plaque was statistically significant ($p< 0.05$).

Comparison of changes in mean PI scores between the groups (Table II, Graph I)

Student "t" test was applied to know the difference in the plaque index scores between the two groups. The test suggested that the change in plaque scores between the two groups was statistically insignificant ($p> 0.05$) for the difference between first follow up and second follow up, conducted at 14th and 21st day respectively.

Graph I. Comparison of PI between the groups



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Discussion

The remarkable healing property of Aloe vera was observed by Davis et al in 1989 [8] who noted that aloe vera is effective by both topical and oral routes of administration and aloe vera gel improved wound healing by increasing blood supply, which increased oxygenation as a result. It has a positive influence on the collagen content and stability in a wound and therefore, a beneficial role in wound healing. It was found that compounds in Aloe vera inhibited cyclooxygenase-2 (Cox 2) and thromboxane (Tx) A_2 synthase, which explains the healing effects of Aloe vera. Oral activity of Aloe vera is also dependent on the presence of anthraquinones. All these constituents may be affecting the healing of inflamed gingiva by their effects at the cellular level. [9-12]

The findings of the present study are in agreement with that of Arundathy A Nair et al [13] who observed a significant reduction in plaque after a 30 day period use of Aloe vera containing mouthwash. There was significant reduction in plaque in both the groups, but no statistically significant difference was observed between them which is in affirmation with our present study in which no statistically significant difference was observed between the test and the control group.

Doaa Mhd Adnan Alnouri et al [14] evaluated the effect of a mouthwash containing high concentrations of Aloe vera on the reduction of plaque for a period of 5 days and found that mouthwash containing Aloe vera and chlorhexidine mouthwash resulted in a significant reduction of plaque, but no statistical significant difference was observed between them. These results are similar to those found in the present study.

Shireen Nazir et al [15] also compared the effect of aleovera gel in the reduction of plaque among fourty patients for a period of thirty days and found improvements in plaque scores which was at par with the results of the present study.

Sadeq A.Al-Maweri,[16] Kanika M.[17] and Gupta RK et al[18] also found that mouthwash containing Aloe vera was effective in reduction of plaque.

Danish P et al,[19] Yavagal PC et al [1] and Jain S et al[20] had shown in vivo antimicrobial effect of Aloe vera against various microorganisms which is in accordance with our present study in which Aloe vera containing toothpaste showed marked reduction in plaque accumulation.

George D et al [21] had demonstrated enhanced antibacterial effect of Aloe vera tooth gel against S. mitis in an in vivo study while Bertolini et al [22] showed that after tooth brushing, the Aloe vera dentifrice reduced the contamination of toothbrush bristles by streptococcus mutans.

Antimicrobial efficacy of Aloe vera has also been demonstrated by Pareek S et al [3] where Aloe vera solution showed significant reduction in microbial contamination of dental unit water lines (DUWLs) for a period of one week.

The results of the present study showed that the fluoridated toothpaste was as effective as Aloe vera containing toothpaste which could be understood by the fact that the home-use dentifrice studies are often influenced by a number of factors which can mask the superiority of a test agent over the controls. Participants in clinical trials may experience some improvement associated not specifically to the therapeutic properties of the test agent but rather related to a behavior change-Hawthorne effect. Subjects enrolled in oral hygiene studies usually improve their tooth brushing, irrespective of the product they receive.

Although the volunteers of the present study were not aware of which dentifrice they were using, another important factor is the Novelty effect, which is the motivation of oral hygiene practice by the use of a new substance.

Conclusion

The use of natural herbal preparations in oral health improvement continues to be popular, and aloe vera dentifrice may be a useful addition. Within the limits of the study, its efficacy is comparable to the toothpaste containing triclosan in reducing plaque and showed enhanced improvement in gingival health compared to the control toothpaste.

Further long-term studies must be performed to evaluate the anti-plaque and anti-gingivitis effects of

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this herbal dentifrice. If its real benefit is confirmed, the use of Aloe vera should be advantageous in cases where patients have little motor skills and tooth brushing is compromised.

References

[1] Yavagal PC, Svaswamy S, Nagesh L. Evaluation of antibacterial potential of Aloe vera extracts against streptococcus mutans and lactobacillus acidophilus- An invitro study. JIAPHD 2012 (19):77-82

[2] Joseph B, Justin Raj S. A comparative study on various properties of five medicinally important plants. Int J of Pharmacology. 2011; 7(2): 206-11

[3] Pareek S, Nagaraj A, Sharma P, Naidu S, Yousuf A. Aloe vera: A herb with medicinal properties. IJOCR Jul-Sep 2013; 1(1):47-50

[4] Nogueira-Filho GR, Toledo S, Cury JA. Effect of 3 dentifrices containing triclosan and various additives. An experimental gingivitis study. J Clin Periodontol 2000;27(7):494-498

[5] Lee SS, Zhang W, Li Y. The antimicrobial potential of 14 natural herbal dentifrices:Results of an in vitro diffusion method study. J Am Dent Assoc 2004; 135(5): 1133-1141.

[6] Newman, Takei, Klokkevold, Carranza. Carranza's clinical periodontology. 10th ed. St Louis: Saunders; 2010

[7] Turesky S, Gilmore ND, Glickman I. Reduced plaque formation by the chlormethyl analogue of victamine C. J Periodontol 1970; 41:41-3

[8] Davis RH, Leitner MG, Russo JM, Byme ME. Wound healing. Oral and topical activity of Aloe vera. J Am Podiatr Med Assoc 1989; 79:559-562

[9] Jain S, Rai R. Aloe vera: A boon in management of dental disease. Int J Pharm Res Sci. 2014; 2(1):18-24

[10] Sajjad A, Sajjad SS. Aloe vera: An ancient herb for modern dentistry- A literature review. J Dent Surg. 2014:1-6

[11] Vazquez B, Avila G, Segura D, Escalante B. Antiinflammatory activity of extracts from aloe vera gel. J Ethnopharmacol. 1996 Dec; 55(1):69-75

[12] Pandarinathan C, Sajithlal GB, Chandrakasan G. Influence of aloe vera on collagen characteristics in healing dermal wounds in rats. Molecular and Cellular biochemistry. 1998 April; 181(1-2):71-76

[13] Arundhathy A Nair et al. The comparison of the antiplaque effect of Aloe Vera, Chlorhexidine and placebo mouthwash on gingivitis patients. J. Pharm. Sci. & Res. 2016; 8(11);1295-1300

[14] Doaa Mhd Adnan Alnouri et al. Effect of Aloe Vera mouthwash on dental plaque and gingivitis indices in children.: A randomized controlled clinical trial. February 2020; Pediatric Dental Journal 30(2020) 1-8.

[15] Nazir S et al. The effect of Aloe Vera in patients with chronic periodontitis. Pakistan Journal of Medicine and dentistry 2018; 7(4):45-49.

[16] Maweri S. A. et al. Efficacy of aloe vera mouthwash versus chlorhexidine on plaque and gingivitis: A systemic review. Int J Dent Hygiene. 2019;1-8

[17] Kanika M. Efficacious evaluation of Aloe vera tooth gel and commercially available tooth gel on patients with gingivitis. J Oral Health Dent Sci 2018. 2:203

[18] Gupta RK, Gupta D, Bhaskar DJ, Yadav A, Obaid K, Mishra S. Preliminary antiplaque efficacy of Aloe vera mouth wash on a 4 day plaque re-growth model: Randomized control trial. Ethiop J Health Sci.2014 April; 24(2):139-44

[19] Danish P et al. Antifungal and antibacterial activity of Aloe vera plant extract. Biolohical and clinical sciences research journal. 2020:e004; 1-8

[20] Jain S et al. Antibacterial effect of aloe vera gel against oral pathogens: An in-vitro study. Journal of clinical and diagnostic research 2016 Nov: 10(11) ZC41-ZC44.

[21] George D, Bhatt SS, Antony B. Comparative evaluation of the antimicrobial efficacy of Aloe vera tooth gel and two popular commercial toothpastes: An in vitro study. Gen Dent. 2009 May-Jun; 57(3):238-41

[22] Bertolini PFR, Biondifilho O, Pomilio A, Pinheiro SL, Carvalho MS. Antimicrobial

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(4), 526-531 | ISSN:2251-6727

capacity of Aloe vera and propilis dentifrice against Streptococcus mutans strains in toothbrushes: an in vitro study. J Appl Oral Sci. 32-37

Table I: Demographics of the participants

	Group A	Group B	p-value
Mean age of the participants	51.0	50.8	0.9084
Gender of the participants			
Male	24	28	0.6023
Female	32	32	
Mean Duration of diabetes (yrs)	6.2	6.8	0.4975

Table II. Comparison of PI scores between the groups

	Mean		
	Group A	**Group B**	**p-Value B/W Groups**
PI Baseline	3.03	3.04	0.9698
PI 14th day	1.96	2.07	0.4659
PI 21st day	1.90	2.10	0.1917