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NATURAL PRODUCTS AS DENTAL PROPHYLACTIC AGENTS - A REVIEW

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ABSTRACT

Oral diseases bear a significant health burden for several countries and affect people throughout their lifetime, causing pain, discomfort, disfigurement and even death. Natural phytochemicals isolated from plants utilized in traditional medicine are considered as good alternatives to synthetic chemicals and improve dental health and promote oral hygiene. Herbal dentifrices act as antiplaque and also helpful in preventing gingivitis. The present study is aimed at reviewing various extracts and their effects on dental diseases. The articles were collected from pubmed, scopus and google scholars. The outcome is based on the studies which discuss the efficacy of various natural products used as oral prophylactic agents. The natural agents used are miswak, sesame seed, neem, Aloevera, turmeric, tea, pot marigold and coconut. Their formulations as Dental prophylactic agents are herbal stick, oil, gel, mouthwash and toothpaste. The main advantages of using these natural agents include good antiplaque activity and protection against gingivitis. We conclude that Natural products

as dental prophylactic agents are more beneficial in dentistry. Despite various herbal products investigated, Neem is more widely researched due to its antimicrobial property.

INTRODUCTION

Oral diseases bear a significant health burden for several countries and affect people throughout their life, causing pain, discomfort, disfigurement and even death (1) . In the USA, 90% of late adolescents and young adults have dental caries, while 94% of all dentate adults had evidence of treated or untreated coronal caries (2). In Tamil Nadu, the prevalence of dental caries was 34.72% and the gingivitis was (41.28%) among school going children (3). Oral hygiene plays an important role within the prevention of oral diseases, including periodontitis, dental caries, tooth sensitivity, pigmentation of tooth and oral thrush (4–6). Dental caries and periodontal diseases are the foremost important global oral health problems, although conditions like squamous cell carcinoma (oral and pharyngeal cancers) and oral tissue health lesions also are a burden (7,8). Oral health is integral to general well-being and relates to the standard of life that extends beyond the functions of the craniofacial complex (9). There is considerable evidence lacking poor oral health to chronic conditions, for instance, there is a robust association between severe periodontal diseases and diabetes (10).

Gingivitis is reversible through plaque control; however, it's going to proceed with inadequate oral hygiene and it meanwhile affects the whole periodontal attachment apparatus of the involved teeth, leading to harmful consequences, like periodontitis, loss of tooth and worse quality of life (11). Thus, effective plaque control plays an important role in resolving and preventing gingivitis and related conditions (12). Periodontitis may be a chronic non-communicable disease (NCD) that shares social determinants and risk factors associated with diabetes, heart condition, cancer and chronic respiratory illness. Tobacco smoking, obesity, poor nutrition (both in terms of caloric intake and quality of the nutritional components) and physical inactivity have all been related with an increased risk of periodontitis (13).Loss of tooth accompanied with poor oral health and periodontitis also plays a role in impacting forensic odontology (14–17).

The global need for alternative prevention, treatment options and products for oral diseases that are safe, effective and low economic (18). Sodium hypochlorite (NaOCl), 2% chlorhexidine (CHX) and lime possess varying degrees of antibacterial activity. Despite NaOCl has been widely used as a root canal irrigating solution, it has several undesirable characteristics like tissue toxicity, risk of emphysema when overfilled, allergic potential, disagreeable smell and taste and inability to get rid of the smear layer (19). Although several chemicals are commercially available, these chemicals can change oral microbiota and have undesirable adverse effects like vomiting, diarrhoea and tooth staining (20,21). Natural phytochemicals isolated from plants utilized in traditional medicine are considered nearly as good alternatives to synthetic chemicals (22). Usage of plant products improves dental health and promotes oral hygiene.

In previous literature, (Waghmare, 2011) Turmeric mouthwash shows more effectiveness in preventing plaque and gingivitis (23). (Suhang, 2007) 1% curcumin solution shows better resolution of inflammation than chlorhexidine and saline. It acts as a sub gingival irrigant (24). Stannous fluoride as a fluoride-based prophylactic or therapeutic agent allowed rock bottom loss of enamel tissue in erosive conditions (25). Herbal tooth powder which comprises 91% of acacia catechu, 2.7% of methanol and 6.3% of camphor which shows more reduction in plaque, gingivitis and prevent dental calculus within 15 days (26). Kaur et al. compared the antiplaque effect of green tea catechin mouthwash with chlorhexidine. This tea catechin mouthwash shows Antiplaque activity almost like chlorhexidine. Additionally, it doesn't have the bitter taste and side effects like chlorhexidine, including tooth discoloration and supra-gingival calculus formation related its long-term use (27). Herbal products like clove and clove oil, copra oil, pomegranate, green tea, *Salvadora persica* (meswak*), Aloe vera*, *Acacia arabica*, *Melaleuca alternifolia* (tea tree), *Azadirachta indica* (neem), and licorice are used to promote oral hygiene, and their inhibitory effect on biofilm formation is shown in several studies. In these species antibacterial, anti-inflammatory, astringent and anti-carcinogenic activity were observed. If such herbal products are often formulated effectively, this might cause an improvement within the general dental health of the population (4). Numerous surveys have been done to analyse oral health and oral disease (28–34). This study is aimed at reviewing various extracts and their effects on dental diseases which can be more useful in treating dental diseases.

MATERIALS AND METHODS

The present study is a review. The published literature on recent developments in research on natural products as dental prophylactic agents including original articles and papers in pubmed, scopus and google scholar were taken into study for the review. The articles were collected between the year 1991 and 2020. The outcome of this study is based on the previous studies which discuss the efficacy of various natural products used as oral prophylactic agents. This data is analyzed by using the proper statistical tools. The Randomized control trial and Invitro studies were included in this study. The Review based articles, retracted articles and articles in other languages other than english were excluded from this present study. The outcome measures were Natural agents used in the studies and advantages and disadvantages of the agents (Table 1)

DISCUSSION

In the present review study, the articles were collected from the year 1991 to 2020 which is depicted in (Fig-1) and (Table-1). For this review study, 16 articles were collected; these databases are searched from the pubmed, scopus and google scholar. The natural agents commonly used in Dental prophylactic agents are miswak, sesame seed, neem, Aloevera, turmeric, tea, pot marigold and coconut which is depicted in (Fig-2) and (Table-1). Among these Neem is most commonly used in dental prophylactic agents. The formulation of natural agents as dental prophylactic agents is depicted in (Fig-3) and (Table-1). These formulations are herbal stick, oil, gel, mouthwash and toothpaste.

Among these neem and miswak is in the form of herbal stick; sesame seed and coconut is in the form of oil; turmeric and neem is in the form of gel; pot marigold, tea, aloe vera is in the form of mouthwash. Aloe Vera is also used in the form of toothpaste. Among these natural agents, neem is used as herbal stick, gel and mouthwash. The number of studies advocating the advantage and disadvantage of dental prophylactic agents which is depicted in (Table-1). The thirteen article proves the advantages of natural agents; disadvantage is proved by four articles whereas both advantage and disadvantage is proved only by one article. The action of dental prophylactic agents in oral health is depicted in (Table-1). In which miswak, sesame seed, tea has only antiplaque activity. While turmeric, neem, pot marigold, coconut and aloe vera act as antiplaque activity as well as protect against gingivitis. Among these neem and turmeric employed has good antiplaque activity and protects against gingivitis.

Table 1: Summary table showing the articles included in the review with the natural products along with their advantages and disadvantages

Name of the author	**Year**	**Article Title**	**Natural agent**	**Formulation**	**Type of study**	**Advantage and Disadvantage**	**Conclusion**
Almas K et al (37)	2002	The effect of miswak and toothbrush filaments end-surface texture on enamel. A SEM pilot study	miswak	Herbal stick	in vitro	Adv: miswak showed lesser adverse effect on enamel	miswak showed lesser adverse effect on enamel
Eid MA et al(44)	1991	The relationship between chewing sticks (Miswak) and periodontal health. 3. Relationship to gingival recession	miswak	Herbal stick	Retrospectivestudy	Disadvantage: Miswak users had significantly more sites of gingival recession than did the toothbrush users	the severity of the recession was significantly more pronounced in the Miswak users than it was in the toothbrush users.
Asokan S et al (79)	2009	Effect of oil pulling on plaque induced gingivitis: a randomized, controlled, triple-blinded study	Sesame seed	Oil	Randomised controlled trial	statistically significant reduction of the pre- and post- values of the plaque and modified gingival index scores	oil pulling therapy showed a reduction in the plaque index, modified gingival scores, and total colony count of aerobic microorganisms in

							the plaque of adolescents with plaque- induced gingivitis.
Al-Otaibi M et a (38)l	2003	Comparative effect of chewing sticks and toothbrushing on plaque removal and gingival health	Miswak	Herbal Stick	Randomised controlled trial	the use of the miswak resulted in significant reductions in plaque	The miswak appeared to be more effective than toothbrushing for removing plaque from the embrasures, thus enhancing interproximal health
Ajay Bhambal et al (97)	2011	A Comparative effect of neemstick and toothbrush on plaque removal and gingival health: A Clinical trial	Neem	Herbal stick	Randomised controlled trial	No significant difference has been found between toothbrush and neem stick	Neem stick is equally effective as a tooth brush in order to remove plaque and improve gingival health
Faizal C. Peedikayil et al (89)	2015	Effect of coconut oil in plaque related gingivitis — A preliminary report	Coconut	Oil	Prospective interventional study	A statistically Significant decrease in the plaque and gingival indices was noticed from day 7	Oil pulling using coconut oil could be an effective adjuvant procedure in decreasing plaque formation and plaque was noticed induced gingivitis.
Pai MR et al (51)	2004	Evaluation of antiplaque activity of Azadirachta indica leaf extract gel--a 6-week clinical study.	Neem	Gel	Randomised controlled trial	neem extract has significantly reduced the plaque index and bacterial count than that of the control group	Good antiplaque activity

Chatterje e A et al (98)	201 1	To evaluate the antigingivitis and antiplaque effect of an Azadirachta indica (neem) mouthrinse on plaque induced gingivitis: A double-blind, randomized, controlled trial	Nee m	Mouth wash	Randomi sed controlle d trial	decrease in mean Plaque index	0.19% neem has significant anti-inflammatory property. effective and inexpensive oral health intervention for low socio-economic communities.
Aravind Tatikond a et al((99)	201 4	Effects of herbal and non-herbal toothpastes on plaque and gingivitis: A clinical comparative study	udin a satv a , Tom ar beej and laun g ka tel	Toothpaste	Randomi sed controlle d trial	18.8% reduction of plaque	herbal dentifrice was as effective as non-herbal dentifrices in the control of plaque and gingivitis.
Ozaki F et al (100)	200 6	Efficacy of a herbal toothpaste on patients with established gingivitis--a randomized control trial	Herb	Toothpaste	Randomi sed controlle d trial	19.9% reduction in plaque levels and 28.4% in gingival Bleeding index	effective in reducing plaque and gingivitis
de Oliveira SM et al (69)	200 8	Effect of a dentifrice containing Aloe Vera on plaque and gingivitis control. A double-blind clinical study in humans	Aloe vera	Toothpaste	Randomi sed controlle d trial	Advantage: significant reduction on plaque and gingivitis in both groups. Disadvantage: did not show any additional effect on plaque and gingivitis	Good antiplaque agent

Chandra has B et al (65)	2012	A randomized, double-blind clinical study to assess the antiplaque and antigingivitis efficacy of Aloe vera mouth rinse	Aloe vera	Mouth wash	Randomised controlled trial	Disadvantage: Less significant reduction of plaque and gingivitis when compared to chlorhexidine	Aloe vera mouthwash can be an effective antiplaque agent and with appropriate refinements in taste and shelf life can be an affordable herbal substitute for chlorhexidine
Bailappanavar AY et al (55)	2013	Comparison of the effectiveness of 0.5% tea, 2% neem and 0.2% chlorhexidine mouthwashes on oral health: a randomized control trial	Tea Neem	Mouth wash	Randomised controlled trial	Tea showed the highest Antiplaque effect	The effectiveness of 0.5% tea was more compared to 2% neem and 0.2% chlorhexidine Mouth rinse
Khairnar MS et al (86)	2013	Evaluation of Calendula officinalis as an anti-plaque and antigingivitis agent	Pot marigold	Mouth wash	Randomised controlled trial	Statistically significant reduction in the scores of PI, GI, SBI	Pot marigold mouthwash is effective in reducing dental plaque and gingivitis adjunctive to scaling.
Waghmare PF et al (23)	2011	Comparative evaluation of turmeric and chlorhexidine gluconate mouthwash in prevention of plaque formation and gingivitis: a clinical and microbiological study	Turmeric	Mouthwash	Randomised controlled trial	Disadvantage: Less significant reduction of plaque and gingivitis when compared to chlorhexidine	chlorhexidine gluconate as well as turmeric mouthwash can be effectively used as an adjunct to mechanical plaque control methods in prevention of plaque and gingivitis

Farjana HN et al (60)	2014	Effect of oral curcuma gel in gingivitis management - a pilot study	Turmeric	Gel	Randomised controlled trial	Significant decrease in gingivitis	gel containing curcuma longa extract was efficient in treating gingivitis by reducing its inflammatory components

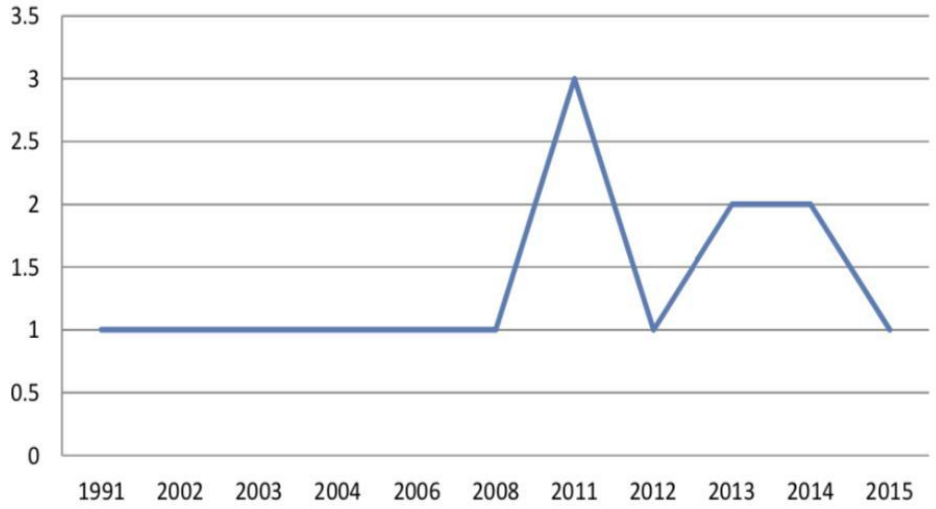

Figure 1: Graph representing the distribution of articles related to Natural products used as dental prophylactic agents collected from the year 1991 to 2020. X axis depicting the year and Y axis depicting the number of articles. More number of studies were done in the year 2011.

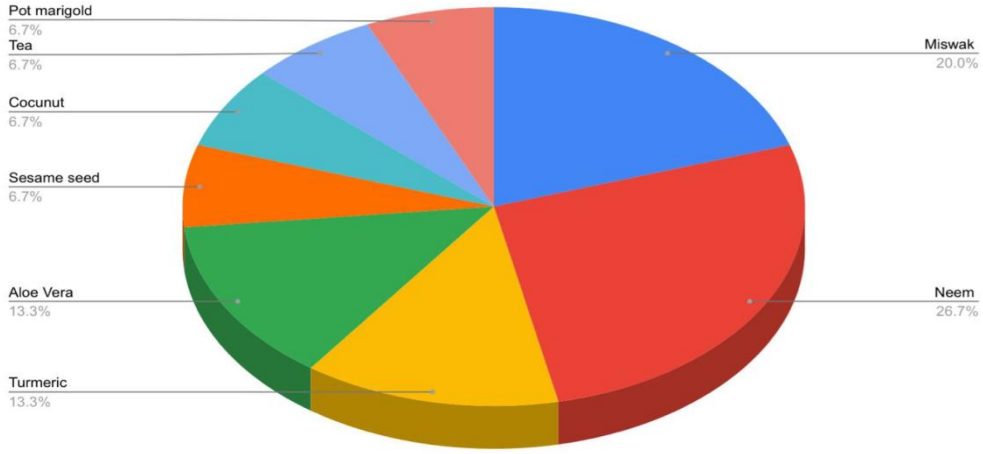

Figure 2: Pie chart representing the Natural products which are commonly used as dental prophylactic agents based on the data exported from the studies. 26.7% Neem (red) ; 20% Meswak (dark blue); 13.3% Aloe Vera (green), 13.3% Turmeric (yellow), 6.7% sesame seed (orange), 6.7% coconut (pale blue), 6.7% tea (light blue) and 6.7% Pot marigold (brown)

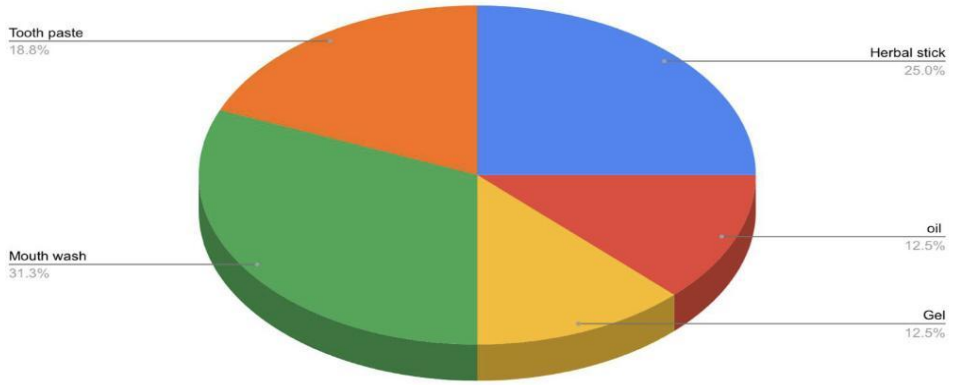

Figure 3: Pie chart represents the formulation of the natural dental prophylactic agents based on the data exported from the studies. 31.3% mouthwash (green), 25% herbal stick (blue), 18.6% toothpaste (orange), 12.5% oil (red) and 12.5% gel (yellow).

MISWAK

Miswak, belongs to the Salvadora species of Salvadoracea family. The Traditional meaning of miswak is “tooth cleaning stick” or “stick used on teeth and gums to wash them”. Scientifically referred to as tooth brush tree or Salvadora persica . In Indian subcontinent, it’s also called by the names like Arak tree; Peelu; Kharjal or Jhank. It possesses antibacterial, anti-caries, anti-neuropathic disinfectants having anti-plaque and antifungal properties (35). Several studies have also claimed that miswak has antioxidant, analgesic and

anti inflammatory effects (36). Almas.et.al., reported that miswak showed a lesser adverse effect on enamel (37). These natural agents seemed to be simpler than tooth brushing for removing plaque from embrasures, thus enhancing interproximal health (38). Bhat.et.al. reported that miswak extract rinse shows a big reduction in both S. mutans and Lactobacilli count (39). Ezoddini.et.al. reported that dental caries rate was slightly less within the case group due to its antimicrobial activity of Miswak (40). Sabbagh.et.al. reported that toothbrush tree and brushing with Fluoridated toothpaste (FTP) significantly reduced plaque scores among schoolchildren. Although, it had been also found to vary the proportions of salivary bacteria in favour of species with less risk of inducing caries (41). Raina.et.al., evaluated the efficacy of miswak impregnated with 0.5% NaF and plain miswak sticks which shows significant reduction in Streptococcus mutans counts in saliva (42). Gazi.et.al. reported that if Meswak is employed five times a day, might offer an appropriate alternative to a toothbrush for reducing plaque and gingivitis. However, meswak might not be sufficient for maintaining interproximal dental health when used without the support of other oral hygiene aids (43). Eid.M.A. et.al., detected that miswak users had significantly more sites of gingival recession than the toothbrush users (44).

NEEM

Neem tree is also known as Azadirachta indica belongs to botanic family Meliaceae and is usually referred to as "Village Dispensary" (45,46). It has been utilized in India and South Asia for thousands of years as an ideal tool for maintaining healthy periodontium. The practice of using neem sticks is being followed in many remote areas and villages. Neem has been long considered to possess an astringent, antiseptic, insecticidal, antiulcer and for medical properties. Neem leaves have been used in the treatment of gingivitis and periodontitis (47). Neem acts as an oral deodorant, toothache reliever. It has better antibacterial activity than other natural agents (48). Neem extract is additionally used as potent passage irrigant (49). Neem extracts from herbal sticks or bark are shown to inhibit the expansion of *Streptococcus mutans* and significant reductions in bacterial adhesion *in vitro*, suggesting that it can reduce the power of some streptococci to colonize tooth surfaces (50). It can also protect against chemically induced carcinogenesis and liver damages by increasing the antioxidant levels of the body (49). Pai.M.R.et.al., reported that Dental gel which contains neem extract shows significantly reduced plaque index and bacterial count than that of chlorhexidine (51). SajanKumar et.al., Aqueous extract of Neem extract exhibited the very best antimicrobial activity compared with Babool and chlorhexidine mouthwash (52). Chatterjee.et.al., reported that Neem based mouth rinse is very efficacious which it's going to be used as an alternative therapy within the treatment of periodontal disease (53). The 2% of neem extracts were used in order that the taste shouldn't be a hindrance for its use with maximal inhibition of bacteria and plaque. By using this meswak, the oral hygiene status also changed from fair to good (54)(55). Several studies reported that Herbal extracts of Neem showed lesser effects compared to other herbal products. Panchal.et.al., reported that Cinnamon extract irrigant shows better reduction in E. faecalis as compared to three percent of sodium hypochlorite and neem extract irrigant (56). Gupta.et.al., reported that both Neem and clove have strong antifungal and antibacterial

activity. However, the antibacterial and antifungal properties of neem were like chlorhexidine and therefore the antimicrobial properties of the clove were lower (46). Dhimole.et.al. Neem maintains the PDL cell viability as comparable as milk but better than turmeric (57).

TURMERIC

Turmeric is a member of the Zingiberaceae family, is indigenous to Southeast Asia and has long been of about 2,500 years cultivated and utilized in India. Turmeric (haldi), a rhizome of Curcuma longa, may be a flavourful yellow-orange spice. Curcumin, which comprises 0.3-5.4% of raw turmeric (curcuma longa) is used for inflammation of oral mucosa. Curcumin (active constituent of turmeric) has been used for thousands of years as a dye, flavouring, and medicinal herb (58,59). Waghmare.et.al. reported that Turmeric mouthwash are often effectively used as an adjunct to mechanical plaque control methods in prevention of plaque and gingivitis (23). Farjana.et.al. reported that Gel containing turmeric extract was efficient in treating gingivitis by reducing its inflammatory components (60). Roobal et al., they performed evaluation of a local drug-delivery system containing 2% of whole turmeric gel used as an adjunct to scaling and root planning in chronic periodontitis (61). Patil.K.et.al. reported that Curcumin was found to be better than chlorhexidine mouth wash in terms of rapid wound healing and better patient compliance in management of radio-chemotherapy induced oral mucositis. No oral or systemic complications were observed (62). Krishnaswamy.et.al., reported that two percent of turmeric extract gel showed a big reduction in erythematous halo, ulcer size, and pain intensity (63). Chandrahas.et.al., reported that Turmeric mouthwash shows lesser reduction in plaque and gingivitis in comparison to chlorhexidine ((64)).

ALOEVERA

Aloe vera may be a cactus-like plant, which may be a member of the Lilaceae family. Aloe vera has anti-inflammatory properties, antiulcer activity, astringent effect, and possibility of reducing scars and enhancing wound healing (65). Kanika.et.al., reported that Aloevera containing toothpaste showed significant improvement in gingival and plaque index scores. These results were compared with close up containing tooth gel. Both toothpastes showed significant reduction in plaque and gingivitis. Hence, Aloevera toothpastes may be a useful herbal formulation for plaque control agents and improve plaque and gingival status (66). Aloe vera gel was effective in maintaining the viability cells. Hence, aloevera gel could be used as a storage media for avulsed teeth in situations (67). Aloe Vera is an easily affordable product (68). Meanwhile no adverse effects are seen in Aloe Vera. de.Oliveira.et.al., reported that Aloe Vera based toothpaste shows significant reduction in plaque and gingivitis(69). Chandrahas.et.al., reported that Aloe Vera mouthwash are often an effective Antiplaque agent and with appropriate refinements in taste and time period are often a reasonable herbal substitute for chlorhexidine. However it shows a lesser reduction in plaque and gingivitis in comparison to chlorhexidine (64). Similarly de.oliveira.et.al., reported that Aloe Vera toothpaste didn't show any additional effect on plaque and gingivitis (69). But several studies reported that Aloe Vera mouthwash is

equally effective as chlorhexidine in reducing plaque and gingivitis. It promises to be a far better preventive home care therapy in developing countries like India where accessibility, affordability, availability and sustainability are important issues (70). Leiva.et.al., reported that Aloe Vera gel administration in patients with fixed orthodontic appliances could be important for effective prevention of traumatic ulcer (71). Poor.et.al., reported that Salicept patch a freeze-dried pledget contains acemannan hydrogel which is obtained from the clear inner gel of Aloevera that performs a significant reduction in alveolar osteitis in compared to clindamycin soaked gel foam (72). Jornet.et.al., Aloe Vera gel is effective within the treatment of burning mouth syndrome (73). Aloevera gel tends to prove favorable outcomes in terms of clinical signs and symptoms and radiological features like ferric sulphate and will be a far better and cheap alternative to other medicaments in future and may be used safely for pulpotomy (74).

SESAME SEED OIL

Oil pulling is an Archaic Ayurvedic therapeutics for maintaining oral hygiene. Oil pulling is mentioned in the Ayurvedic text Charak Samhita and Sushruta Samira as" Kavala Graha" or "Kavala Gandoosha" (75). Oil pulling prevents dental caries, gingivitis, oral candidiasis and periodontitis from occurring, helps to scale back tooth pain, fixes mobile teeth and achieves vigorous oral hygiene. Oil pulling has also been claimed to cure several diseases such as arthritis, allergies, asthma, migraine headaches, nerve paralysis, kidney and heart disorders. Although it's not scientifically proven (76). Sesame seed oil and related cosmetic ingredients are derived from Sesame seeds. It functions as a cleanser, emulsifying agent, and a nonaqueous viscosity increasing agent(77). Sesame oil (Vegetable oil) contains sesamin, sesaminol and antibiotic actions. Also the value of vegetable oil is 5-6 times cheaper than Chlorhexidine (78). Asokan.et.al., conducted a Randomized controlled triple blind study involving 20 age matched adolescents, the effect of sesame oil pulling on plaque induced gingivitis and its efficiency in comparison to 0.12% chlorhexidine mouthwash was evaluated for a period of 10 days. This study observed statistically significant reduction in the pre and post values of the plaque and modified gingival index scores in both groups (79). Vadhana.et.al., Oil pulling therapy using sesame oil (SO) and ozonated sesame oil (OSO) showed a big improvement in oral hygiene. It doesn't have any side effects like staining, lingering, aftertaste and allergy (80). More beneficial effects were observed on sesame oil due to saponification, emulsification and mechanical cleansing action (81). There is a scarcity of studies regarding the consequences of sesame seed oil on oral health.

POT MARIGOLD

Calendula officinalis Linn. (Asteraceae) is employed medicinally in Europe, China and India amongst several places within the world. It is also referred to as "African marigold". It's utilized in traditional medicine, especially for wound healing, jaundice, blood purification, and as an antispasmodic (82)(83). This plant is traditionally used in the treatment of hysteria. Anita.et.al., reported that pot marigolds showed significant anti-anxiety activity (84). Mahtani.et.al., reported that Polyherbal mouthwash containing hydroalcoholic extracts of Z. officinale , R. officinalis and C. officinalis was effective in the

treatment of gingivitis and its efficacy was like that of chlorhexidine mouthwash. There was no significant difference between the polyherbal and chlorhexidine groups, neither at day 7 nor day 14 of the trial (85). Khaimar.et.al. reported that Pot marigold based mouthwash is effective in reducing dental plaque and gingivitis adjunctive to scaling (86). A phytochemical-based toothpaste containing pot marigold, broad- leaved plantain, Cochlearia armoracia, Virginian witch hazel was found to possess a possible soothing activity. This herbal toothpaste may relieve the discomfort related to radiation-induced mucositis (87).

COCONUT OIL

Oil pulling or oil switching is an ancient natural healing practice originated in India (75). It's believed that the act of switching oil draws out microbes from various parts of the mouth and detoxifies the toxins (81,88). Coconut oil has a high saponification index. It contains dodecanoic acid which reduces plaque adhesion and accumulation, and possesses cleaning action. Dodecanoic acid also has antimicrobial, anti inflammatory properties, prevents cavities and is useful to oral health (78,89). Peedikayil et.al. Oil putting therapy using copra oil might be an effective adjuvant procedure in decreasing plaque formation and plaque induced gingivitis. It doesn't have adverse effects produced by chlorhexidine like brown staining and altered taste sensation (89). It also possesses a pleasant taste (90). Dodecanoic acid in coconut is effective against mouth sores (91). Copra oil was effective against both S.mutans and C.albicans(92). Kalia Moorthy.et.al., Oil pulling is an efficient oral Hygiene practice alongside routine oral hygiene practice. In which copra oil is very effective compared to vegetable oil within the reduction of severity of gingivitis (93). Verallo et.al., reported that presence of monolaurin within the coconut oil, shows broad- spectrum activity against Staphylococcus aureus, fungi, and viruses and established its usefulness in treating atopic dermatitis (94). Peedikayil.et.al., They Compared the antibacterial efficacy of copra oil with chlorhexidine on S.mutans and observed a significant decrease in the S.mutans count in both coconut oil and chlorhexidine groups. However copra oil is also effective as chlorhexidine in its antibacterial efficacy against S.mutans (95). Rukmini.et.al., reported that there was no antimicrobial efficacy in fresh and pasteurized tender coconut milk against S. mutans despite having dodecanoic acid (96).

LIMITATIONS AND FUTURE SCOPE

In our study, only limited articles are collected and it is based on selection bias. Further studies can be done to assess the various natural agents which can be used as antimicrobial and anti-inflammatory agents in order to replace chemical agents.

CONCLUSION

Natural products as dental prophylactic agents are more beneficial in dentistry. The major advantages of using natural dental prophylactic agents are easy availability, cost-effectiveness, increased time period and low toxicity. These natural agents reduce inflammation, have good antimicrobial activity, antiseptics, antioxidants, and analgesic property. They are also effective in

microbial plaque control in gingivitis as well as periodontitis and helpful in the wound healing process. They have the capacity to replace chemical agents in the near future.

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