ROLE OF HERBAL MEDICINE IN DENTAL HEALTH- A DETAILED REVIEW

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ABSTRACT

Dental Disease is one of globally affecting diseases. Oral bacteria involved within the bloodstream are linked to coronary artery disease, atherosclerosis and stroke. Oral hygiene plays an important role within the prevention of oral diseases, including periodontitis, cavity and oral candidiasis. Consequently, the utilization of both chemical and mechanical plaque control is suggested for optimal oral hygiene. Sodium hypochlorite it's not only irritant to the periapical tissues but also possesses disadvantages such of instruments, blazing of surrounding tissues, undesirable taste, high toxicity, corrosive to instruments, inability to get rid of the smear layer, reduction in coefficient of elasticity and flexible strength of dentin. As well as Antibiotics like tetracycline, penicillin, amoxicillin, metronidazole and antiseptics like chlorhexidine which are commonly used in dentistry, but they have many side effects. While herbal medicine is so effective in oral diseases and has less side effects. The present study is aimed at reviewing various extracts of herbal products and their effects on dental health. The articles were collected from pubmed, scopus and google scholars. The outcome is predicted on the previous studies which debate the role of herbal products in dentistry and this collected data is analyzed by using appropriate statistical tools. The use of herbal medicine in dentistry is helpful in reducing inflammation and controlling plaque formation. From this review study, it is evidenced that Ginger, Garlic, Aloe Vera and Miswak showed better results than conventional denitrificans in dental plaque and gingival inflammation reductions. The disadvantages of using herbal medicine like Clove oil is meant to cause serious problems like pharyngitis, vomiting, cytotoxicity, kidney failures, damage to the liver, seizures, difficulty in breathing and others if used in higher doses. Therefore, the Preclinical and clinical trials are needed to gauge biocompatibility and safety before herbal medicine are often recommended conclusively for oral care.

Keywords: Bacterial plaque; Dental health; Gingivitis; Herbal medicine; Root canal irrigant.

INTRODUCTION:

Dental disease is one of globally affecting diseases. Dental health is integral to general well-being and relates to the standard of life that extends beyond the functions of the craniofacial complex (Torwane *et al.*, 2014). Systemic conditions can modulate the connection between biofilm and the inflammatory response and may alter the progression and severity of the periodontal disease. This process may ultimately end in the loss of the diseased teeth (Wolf and Papapanou, no date). Cavity may be a localized, progressive decay of the teeth and one among the foremost common sorts of plaque-related disease.
Streptococcus mutans have long been implicated within the formation of bacterial plaque and cariogenicity*(Prabu, Gnanamani and Sadulla, 2006)*. Chemical control of bacterial plaque is an adjunct

therapy which can facilitate the removal and stop the buildup of microbial plaque, potentially reducing the dependence on mechanical oral care behaviours(Janakiram *et al.*, 2020). Oral hygiene plays an important role within the prevention of oral diseases, including periodontitis, cavity and oral candidiasis. Consequently, the utilization of both chemical and mechanical plaque control is suggested for optimal oral hygiene (Janakiram *et al.*, 2020). Sodium hypochlorite (NaOCl) has remained as gold standard for passage irrigation due to its antimicrobial potential and its ability to dissolve organic matter. Nevertheless, it's not only irritant to the periapical tissues but also possesses disadvantages such of instruments, blazing of surrounding tissues, undesirable taste, high toxicity, corrosive to instruments, inability to get rid of the smear layer, reduction in coefficient of elasticity and flexible strength of dentin (Tyagi *et al.*, 2013).
Antibiotics like tetracycline and metronidazole, antiseptic like chlorhexidine are used for a very while but many side effects are observed (Taheri *et al.*, 2011). Herbal medicine with medical properties has been used for an extended period to prevent and treat various diseases of dental disease. Research on Goitre (Samuel and Devi, 2015), obesity in relation to infertility (Baheerati and Gayatri Devi, 2018), thyroid function test in obesity (Fathima and Preetha, 2016), sleep patterns (Rj and R, 2016), Asthma (Dave and Preetha, 2016), management of neonatal jaundice and prevention of kernicterus (Harsha *et al.*, 2015), muscular endurance among dentists (Abigail *et al.*, 2019), physical fitness (David *et al.*, 2019), tongue exercises in habitual snorers (Shruthi and Preetha, 2018), nonalcoholic fatty liver disease (Choudhari and Jothipriya, 2016), Onychocryptosis (Iyer, Gayatri Devi and Jothi Priya, 2019), evaluating adenoids by oronasal and nasal spirometry (R and Sethu, 2018), acupuncture and lower back pain (Swathy and Gowri Sethu, 2015), regeneration after myocardial infarction (Renuka and Sethu, 2015), evaluating peak expiratory flow rate in pet owners (Timothy, Gayatri Devi and Jothi Priya, 2019) improved my passion for research. In dentistry, phytomedicine has been used as anti inflammatory, antibiotic, analgesic, sedative agents and also as endodontic irrigants (Sinha and Sinha, 2014). Herbal medicine is available at low cost and fewer toxic than chemical drugs (Hardinge, 2001). In previous literature, Neem bark has antibacterial properties, it's quite useful in dentistry for curing gingival problems and maintaining oral health in a natural way. Neem twigs are used as oral deodorant, toothache reliever and for cleaning of teeth (Lakshmi *et al.*, 2015). Herbal medicine is useful in preventing cavity, toothache, gingivitis, mouth ulcers, swollen tonsil, oral thrush and hairy tongue (Al-Somaiday, Al-Samaray and Al-Samydai, 2020). The formulation of neem, eucalyptus, Tulsi, clove and Punica has good antibacterial activity against dental pathogens (Rao *et al.*, 2014). *Malus Domestica* (apple) are often utilized in titanium implant coating in dental implantology, and *Cissusquadrangularis* (veldt grape) and *Carthamustinctorius* (safflower) are recommended for periodontal filler in periodontal regeneration (Nahar, 2016). The heartwood of Cutch tree (Acacia Chundra Willd.), Malabar nut leaf (Adhatoda vasica Nees.), Spanish cherry bark (Mimusops elengi L.), Black pepper (Piper nigrum L.), Pongam oil tree root (Pongamia pinnata(L.) Pirerre), Aleppo oak galls (Quercus infectoria Olivier.), Clove (Syzygium aromaticum L.), Myrobalan fruit (Terminalia chebula Retz.), and Ginger (Zingiber officinale Roscoe) are used traditionally in Ayurveda for oral care. This product has been examined in two separate randomized double-blind placebo-controlled clinical trials. In one human trial, the consequences of this herbal extract on oral hygiene and gingival health showed powerful reduction in gingival bleeding, bacterial plaque formation and salivary anaerobic bacterial counts as early as 4 weeks of its use compared to the placebo group. Moreover a follow-up clinical test investigating these therapeutic benefits for patients with gingivitis confirmed these results, reporting a reduction in gingival bleeding, plaque score, total salivary anaerobic bacterial counts and probing pocket depth (Chang *et al.*, 2020). Guava and chlorhexidine mouth rinse groups at 1st and 3rd month intervals, shows similar functional activity between the two mouth rinses in lowering the Gingival Index (GI) scores which resulted in clinical improvements in both the experimental groups. This might be attributed to the presence of bioactive ingredients in guava, which contributed to its anti-inflammatory activity. Additionally, it's the power to inhibit prostaglandins, kinin and histamines, which successively substantiates the gingival health (Nayak *et al.*, 2019). The extracts of Azadirachta Indica, Ocimum sanctum, Murraya koenigii L., Acacia nilotica, Eucalyptus camaldulensis, Hibiscus sabdariffa, Mangifera Indica, Psidium guajava, Rosa Indica and Aloe barbadensis Miller have all been found to inhibit certain cavity and periodontal pathogens (Chandra Shekar *et al.*, 2015). The antimicrobial efficacy of methanolic extracts of selected medicinal plants like *A. Indica* (Neem) and *M. elengi* (Bakul), alongside 2%

chlorhexidine gluconate against polymicrobial biofilm formed on root canal walls of extracted human teeth (Mistry *et al.*, 2015). The present study is aimed at reviewing various extracts of herbal products and their effects on dental health.

METHODOLOGY:

This review was done based on the articles obtained from Various platforms like Pubmed, scopus and google scholar. They were collected with a restriction in time basis between 2006-2020. The inclusion criteria were original research papers, inVitro studies among various herbal products and articles that contain pros and cons whereas Exclusion criteria were review articles, retracted articles and articles in other languages aside from english were omitted. All the articles were selected based on Herbal products in dentistry.

They are determined by article title, abstract and complete article. When article holder websites were analyzed on the topic of Herbal products in dentistry, more than 1000 articles and based articles were found, when it was shortlisted based on the inclusion and exclusion criteria, the number of articles were lowered to 110 articles. When timeline and other factors were quoted, only 33 articles were finalised. This article is reviewed from the 33 articles collected. Quality of articles used was assessed using a quality assessment tool and graded as strong, moderate and weak. The data was collected and the level of evidence of the reviewed articles were categorized as per the criteria of the Centre for Evidence- Based Medicine, Oxford, UK (Howick, 2011)and the collected data was shown in a tabular column (Table-1). The knowledge at the current point of time was analysed and the consensus was established.

TABLE-1: QUALITY ANALYSIS OF THE STUDIES REFERRED:

S.No	AUTHOR	YEAR	QUALITY ANALYSIS
1	Rayati.et.al (57)	2017	Strong
2	Zare Javid.et.al (79)	2019	Moderate
3	Shrimathi,S.et.al. (67)	2019	Moderate
4	Fulzele,P.et.al. (18)	2016	Moderate
5	Sayar.et.al(64)	2019	Strong
6	Jose,J.et.al. (28)	2016	Moderate
7	Khatri,S.G.et.al. (30)	2017	Moderate
8	Jayanti.et.al(27)	2019	Moderate

9	Yap.P.S.et.al. (78)	2013	Weak
10	Yadav.H.K.et.al. (77)	2016	Moderate
11	Elheeny.et.al(15)	2019	Moderate
12	Kshirsagar,M.et.al. (31)	2018	Moderate
13	Pakdel.et.al(51)	2017	Moderate
14	Morris.J.et.al. (42)	2019	Moderate
15	Arévalo-Híjar *et al.*, (6)	2018	Moderate
16	Niazi.et.al(46)	2018	Moderate
17	Kaur.S.et.al. (29)	2004	Moderate
18	Gupta.P.et.al. (21)	2012	Strong
19	Nurdiana.N.et.al (47)	2016	Moderate
20	Rai.A.et.al. (55)	2019	Strong
21	Lolayekar .et.al(35)	2019	Moderate
22	Ahmed.S.et.al. (3)	2017	Moderate
23	Megalaa.N.et.al (38)	2018	Moderate
24	Charu Marya.et.al (37)	2012	Moderate
25	Athbi Alquareer.et.al (4)	2006	Strong
26	Panchal, V.et.al (52)	2020	Moderate

27	Zhu. M.et.al (80)	2011	Strong
28	Saquid.et.al(63)	2019	Moderate
29	Mamajiwala.et.al(36))	2018	Strong
30	Chirkova.N.V.et.al (48)	2018	Moderate
31	M.C.Fronco.et.al (17)	2020	Strong
32	Grover.S.et.al (20)	2016	Strong
33	Thaweboon.et.al.(71)	2011	Moderate

DISCUSSION:

GINGER:
Ginger is as effective as ibuprofen in controlling postoperative sequelae, especially pain and it is often an efficient substitute for these synthetic agents (Rayati, Haj Manouchehri and Najafi, 2017). Ginger supplementation alongside Non surgical periodontal therapy (NSPT) could also be effective within the improvement of inflammation, oxidative and periodontal status in Type-2 diabetes mellitus patients with chronic periodontitis (Zare Javid *et al.*, 2019). Ginger was effective in reducing Colony Forming Unit (CFUs/uL) of S. mutans to a degree almost like the present gold standard for oral rinses, chlorhexidine. A rinse derived from ginger was equally efficacious in reducing the CFUs/uL of Lactobacillus. Ginger may be a promising anticariogenic and antimicrobial mouth rinse with active ingredients and may offer a lower-cost yet safe caries inhibitory agent compared to traditional mouth rinses (S *et al.*, 2019).

ALOEVERA:
Aloevera gel was effective in maintaining the viability of Periodontal Ligament (PDL) cells (Fulzele *et al.*, 2016). Aloe Vera toothpaste may have an equivalent effect on periodontal index and gingival scores as the Fluoride toothpaste, So it is often used rather than conventional chemical toothpaste (Sayar *et al.*, 2019). Guava leaf extract showed significant inhibitory effects against Enterococcus faecalis and Candida albicans compared to extract of Aloe Vera (Jose, 2016). Toothpaste containing Aloe vera was powerful in reducing plaque, gingivitis and overall candidal counts compared to triclosan. Moreover, individuals treated with aloe vera experienced improved oral health status with non negative side effects (Khatri *et al.*, 2017).

EUCALYPTUS:
Eucalyptus performs a significant maximum zone of inhibition against A. actinomycetemcomitans and P. gingivalis. Eucalyptus globulus also plays an effective promising alternative to antibiotics within the prevention of oral infections due to the natural phytochemicals existing in them (Jayanti *et al.*, 2019). Serafino et al. demonstrates that eucalyptus EO (Essential Oil) can stimulate the innate cell-mediated immune response suggesting its use as adjuvant in immunosuppression, in communicable disease, also as in tumor chemotherapy (Yap *et al.*, 2013). Xylene was the foremost effective in dissolving root canal sealers than eucalyptus oil. Eucalyptus oil was found similar in their ability to dissolve Apexit Plus and

Endomethasone N (Yadav *et al.*, 2016).

GARLIC:
There is no statistically significant difference between extract of Garlic as an irrigant and sodium hypochlorite in 12 months follow-up period. Garlic extract provides an honest natural and potent antibacterial agent which will be used safely for irrigation of root canals of primary molars (Elheeny, 2019). Hard neck garlic extract showed the maximum zone of inhibition or antibacterial activity against cariogenic organisms as Streptococcus mutans and Lactobacillus acidophilus, followed by soft neck garlic extract and Chlorhexidine mouthwash. Its action against these organisms raises the likelihood that garlic may have therapeutic use for cavities and possibly other oral infection (Kshirsagar *et al.*, 2018). The aqueous and methanolic extracts of garlic had no antibacterial effects on S. aureus and P. aeruginosa (Pakdel *et al.*, 2017)

NEEM:
Azadirachta indica has been reported to possess antiviral, antibacterial, antisclerotic and antiinflammatory properties. The highly pure supercritical O_2 Neem leaf extract prevents initiation and progression of Oral epithelial cell carcinoma through downregulation of intra tumour pro inflammatory pathways, which promote tumorigenesis (Morris *et al.*, 2019). Azadirachta demonstrated an antibacterial effect against E.faecalis with non toxicity using low concentration. Therefore, they might be considered as alternative microbial agents to use within the root canal therapy field in Odontology (Arévalo-Híjar *et al.*, 2018). Salvadora persica miswak-based mouthwash showed a maximum reduction within the plaque scores among orthodontic patients compared to Azadirachta indica (Niazi *et al.*, 2018)

MESWAK:
It is scientifically proven to scale black tartar and plaque, fights germs and bacteria to stay the gum healthy, helps prevent cavities, eliminates bad breath and ensures strong teeth (Ahmad, 2012). Commercially available miswak chewing sticks contain high amounts of calcium and chloride which can possibly release phosphate and thiocyanate into whole saliva that would influence the state of oral health (Kaur, Abdul Jalil and Akmar, 2004). The herbal dentifrice which contains miswak as a main ingredient shows significant reduction in plaque index scores compared to standard denitrifice (Gupta *et al.*, 2012).

TURMERIC:
The prosperity of turmeric includes analgesic, antibacterial, anti-inflammatory, anti-tumor, anti-allergic, antioxidant, antiseptic, antispasmodic, appetizer, astringent, cardiovascular, carminative, cholagogue, digestive, and diuretic. Turmeric extract gel showed a big reduction in erythematous halo, ulcer size, and pain intensity (N. and Krishnasamy, 2016). Curcumin showed preferable results in the management of oral submucous fibrosis as compared with the systemic form alone or antioxidants. Curcumin has the potential to emerge as an effective alternative to conventionally prescribed medications (Rai *et al.*, 2019).

TULSI:
Tulsi against oral flora have proven that the utmost numbers of secondary metabolites found in these plants have the potential for development of antimicrobial agents against oral microorganisms, to be used in toothpaste, mouthwash for preventing and treating oral infections (Lolayekar and Kadkhodayan, 2019). Herbal mouth rinses consisting tulsi and honey as a main ingredient is not as effective as chlorhexidine in its antimicrobial property, have its own value and it are often effectively utilized in areas where people cannot access to chlorhexidine (Ahmed *et al.*, 2017). Herbal ethanolic extracts of Tulsi (4%) and Black myrobalans (2.5%) were prepared as herbal mouthrinses. These herbal mouthrinses might be tried as an adjunctive anticaries agent against cavities causing microorganisms (Megalaa *et al.*, 2018).

CLOVE:

The principal phenolic components of clove volatile oil, eugenol and eugenyl acetate have been shown to vary some physical properties of resin composite like the adverse effect on surface roughness, transverse strength and surface hardness (Reisbick and Brodsky, 1971; Grajower, Hirschfeld and Zalkind, 1974; Lingard, Davies and Fraunhofer, 1981; Millstein and Nathanson, 1983; Paige, Hirsch and Gelb, 1986). However, clove oil is meant to cause serious problems like pharyngitis, vomiting, cytotoxicity, kidney failures, damage to the liver, seizures, difficult breathing and others if used in higher doses. Therefore, in the previous study small doses showing least cytotoxic effects of this oil are used. It has been observed that the Clove volatile oil inhibits the decalcification and promotes the remineralization caused by the apple juices (Marya *et al.*, 2012). Clove gel might pose a possibility to exchange benzocaine as a topical agent before needle insertion and there was no significant difference observed between clove and benzocaine regarding pain scores (Alqareer, Alyahya and Andersson, 2006).

CINNAMON ZEYLANICUM:

Cinnamon extract irrigant shows better reduction in E. faecalis as compared to three percent of sodium hypochlorite and neem extract irrigant (Panchal, Gurunathan and Muralidharan, 2020). The sugar-sweetened cinnamon chewing gum may benefit halitosis by reducing volatile sulfur compounds producing anaerobes within the mouth (Zhu *et al.*, 2011). The Ethanolic extracts which are prepared from Tooth brush tree (Miswak) and Cinnamomum zeylanicum (Ceylon cinnamon), by the soxhlet method showed variable antibacterial activity against periodontal pathobionts (Saquib *et al.*, 2019). Both Cinnamomum and chlorhexidine used as an irrigant through Dental Unit Water lines (DUWL) effectively helped within the reduction of bacterial count in dental aerosols during Ultrasonic scaling (Mamajiwala *et al.*, 2018).

CHARCOAL:

Charcoal denitrificans remove stains, acidic plaque, and provide fresh breath, aiding in good dental health. The microbiological studies with charcoal-infused tooth bristles also claim lesser oral bacterial contamination (Thakur, Ganesh Parkar and Jaiswal, 2020). Charcoal toothpaste showed good cleaning results after first usage and possesses excellent remineralization effect. Usage of this toothpaste lowers dental caries in a short term period (2 month). During their research no negative side effects were observed on any of the volunteers (Nv and Chirkova, 2018). The charcoal based powder didn't seem to possess any bleaching effect (Franco *et al.*, 2020).

PHYLLANTHUS EMBLICA:

Emblica officinalis berry possesses varied medicinal properties including cytoprotective, antimicrobial, antioxidant, antiresorptive and antiinflammatory activity. Locally delivered ten percent of E. Officinalis gel used as an adjunct to Scaling and root planing (SRP) could also be simpler in reducing inflammation and periodontal destruction in patients with chronic periodontitis in compared with SRP alone (Grover *et al.*, 2016). The Ethanolic extract of Phyllanthus emblica performs significantly lower numbers of all strains of yeasts adhering to human buccal epithelial cells (BECs) and acrylic strips compared with Normal saline solution (NSS) (Thaweboon and Thaweboon, 2011).

The present review revealed a usage of herbal products in dentistry, particularly in periodontal diseases as well as root canal irrigant. There are a variety of herbal products that have many uses in dental treatment as well as maintaining oral hygiene. Argemone Mexicana.L is a plant used as a reliable anaesthetic in treatment of dental pain (Cruz Martínez, Diaz Gómez and Oh, 2017). The presence of procyanidins, tannic acid and naringin can effectively seal dentinal tubules, which provided a basis for clinical treatment of dentin hypersensitivity (Li *et al.*, 2020). U.tomentosa paste is simpler in decreasing pulp inflammation and promoting dental reformation (Valerio and Gonzales, 2005). Pelargonium Zonale may be a plant that acts as a local hemostatic and is employed in dental surgery (Páez and Hernández, 2003). The alcohol-free chitosan–curcuminoid (CHI-CUR) mouthwash may function as a secure and potential topical therapeutic alternative in treating generalized or candida-associated Denture stomatitis (Mustafa *et al.*, 2019). Chitosan based polyherbal toothpaste helps in esthetic and maintains Oral hygiene (Mohire and Yadav, 2010). Noni

mouthwash acts as a non-destructive prophylactic agent for orthodontic treatment (Dilipkumar *et al.*, 2017). Triphala mouthwash was as effective as chlorhexidine mouthwash in its ability in reducing plaque accumulation, gingival inflammation and bleeding (Penmetsa *et al.*, 2019). In this regard, we infer that many herbal products have wide uses in dental treatment as well as maintaining oral hygiene. The usage of Herbal products in Dentistry shows anti-inflammation, antimicrobial plaque agents, antiseptics, antioxidants, antimicrobials, antifungals, antibacterials, antivirals and analgesics. From this review study, it is evidenced that Ginger, Garlic, Aloe Vera and Miswak showed better results than conventional denitrificans in dental plaque and gingival inflammation reductions. In which Garlic extract provides an honest natural and potent antibacterial agent which will be used safely for irrigation of root canals of primary molars. The gel which contains Turmeric as the main ingredient plays a crucial role in reducing erythematous halo, ulcer size, and pain intensity. We acknowledge in our study, only limited articles were collected and it is selection bias. In further studies, to assess various herbal medicine in oral health and it might be useful in dentistry.

CONCLUSION:

Within the limitations of this present study, it can be concluded that herbal dentifrice has potential benefits in plaque and inflammation control as supplements to the daily oral hygiene of patients with gingivitis. The main advantages of using herbal medicine are easy availability, cost-effectiveness, increased time period and low toxicity. The disadvantages of using herbal medicine like Clove oil is meant to cause serious problems like pharyngitis, vomiting, cytotoxicity, kidney failures, damage to the liver, seizures, difficulty in breathing and others if used in higher doses. Therefore, the Preclinical and clinical trials are needed to gauge biocompatibility and safety before Herbal medicine are often recommended conclusively for oral care.

AUTHOR CONTRIBUTION:

Collection of literature and drafting of manuscript was done by Anusuya and revising and the final approval of manuscript was done by Jothi Priya and Lakshminarayanan Arivarasu.

CONFLICT OF INTEREST: The author declares that there was no conflict of interest in the present study.

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