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Zingiber Officinale, A Herbal Drug for Xerostomia

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ABSTRACT

Pain in orofacial region is frequently observed in dentistry due to dryness of mouth (Xerostomia). The commonly used drugs like antihistamines, antihypertensives etc and disease like diabetes may induce dryness of mouth. Treatment with conventional drugs has side effects. Hence, natural remedy with herbal drugs mainly *Zingiber officinale* a well known hepatoprotective, antiemetic and antiarthritic drug as a possible alternative in treatment of Xerostomia has been viewed in this paper.

Key words: Dryness of mouth, *Zingiber officinale*, salivary secretion

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INTRODUCTION

Saliva plays a trivial role in the prevention of periodontal diseases. Saliva contains electrolytes, peptides, glycoprotein, enzymes, immunoglobulin A, growing factors, amines and leucocytes that aids in tooth remineralization. The diminution of salivary secretion enhances the risk of dental caries, gingival mucosal erosions and ulcerations. Furthermore, patients are more prone to candidiasis and denture discomfort [1, 2].

Dryness of mouth or Xerostomia is the consequence of hypofunctioning of salivary glands. The prevalence of Xerostomia is mainly observed in elderly and patients under multiple drug therapy[3]. Conversely, Xerostomia also occurs in children under antihistamines, antidepressants and attention deficit disorder therapy[4,5] . The symptoms of xerostomia includes pain in the orofacial region, taste disorders (dysgeusia), a painful tongue (glossodynia), speech, feeding and severe oral infections[5,6]. The psycho-social aspects of xerostomia includes low self-esteem, poor oral health, mental disturbances leading to frustration, unhappiness, or substantial disruptions in daily living.[7,8].

Xerostomia sometimes result due to systemic diseases e.g., Sjo¨ gren syndrome(an autoimmune disease that affects saliva flow), diabetes, hypothyroidism, emotional stress, abuse of drugs, Human Immunodeficiency Virus (HIV) infection[9], radiation of the head and neck [10] or chronic use of several medications[11-16] .

Drug induced Xerostomia

Drugs that induce dryness of mouth includes antihistamines, antidepressants, anticholinergics, anorexiants, antihypertensives, antipsychotics, antiparkinsonian drug, diuretics, antiemetics, antianxiety agents, decongestants, analgesics, antidiarrheal, bronchodilators, skeletal muscle relaxants and sedatives [17- 21].

Treatment for Xerostomia

Drugs can transiently or reversibly alter the quantity and quality of saliva. The present therapeutic procedures for xerostomia aim at stimulating the salivary secretion (sugar free gum or pilocarpine and cevimeline drops) or supplemental use of artificial saliva [22]. Treatment procedure includes palliative therapy, stimulation of cholinergic system and prophylaxis.

Palliative therapy includes drinking of water.

Hydration is essential for palliation and frequent sipping of water is the drink of choice. Artificial saliva (substitutes) can be used when activation of salivary function is not possible. Artificial salivary substitutes contain carboxymethyl cellulose, sorbitol, electrolytes and animal mucins.

newer oral moisturizing gels contains the salivary enzymes such as glucose oxidase, lactoperoxide, lysozyme and lactoferrin to provide moisturisation and to improve the oral health. The moisturising gel can be applied by fingertip over the tongue.

Saliva substitutes are used regularly throughout the day by the patient for the comfort during meals, to reduce pain, fissuring of tissue and to prevent salivary stagnation on the teeth. In severe cases, artificial saliva should be given in combination with topical fluoride treatment to reduce the incidence of caries. However, patient compliance is poor. So many of them discontinue.

Treatment for stimulating salivary gland functions:

If the salivary gland function is not lost completely then it can be stimulated normally by improving the taste.

To stimulate salivary gland function, sugarless chewing gums, candies or chewing gums containing a combination of Casein Phosphopeptide and Amorphous Calcium Phosphate are used.

Sugarless lemon flavoured candies are used commonly by the Xerostomia patients. The presence of citric acid is a powerful stimulant of salivary flow.

Muscarinic receptor agonist are used as sialogogues to stimulate salivary flow from partly functioning salivary glands (Pilocarpine a nonselective and cevimeline M_1 and M_3 agonists). M_2 and M_4 receptors are located on cardiac and pulmonary tissues. Treatment with cevimeline enhances salivary secretions thereby diminishing adverse effects on pulmonary and cardiac function[23].

Pilocarpine and cevimeline are used for treating xerostomia of sjogren's syndrome. Pilocarpine eye drops (2%) applied topically in the mouth or oral administration of Cevimelline(10mg) is preferred in short term management of xerostomia.

Prophylaxis Therapy

Xerostomia is common during head and neck radiation therapy [24-29]. Prophylactic use of drugs will reduce the incidence of Xerostomia. Xerostomia is reduced with a prophylactic use of Pilocarpine(5mgTDS, orally). Similarly, prior administration of amifostine, a cytoprotectant drug (200mg/m^2 IV infusion for 3 min OD, 20 – 30 min before radiation will reduce the risk of xerostomia.

Pilocarpine and Amifostine, protects only the parotid gland function but not the sublingual or submandibular gland functions.

However, the drugs used for the treatment of xerostomia have its own side effects. Hence, the naturally occurring compound is preferred which will reduce the incidence of xerostomia as well as possess no or minimal side effects.

Using herbs and plants for medicinal purposes date back thousands of years in India and China. Once believed as "traditional medicine" used by native or ancient people, herbal medicine has emerged as a popular alternative or supplement to current drugs. As per World Health Organization report above 4 billion people i.e 70% of the world population, depend on herbal medicine for primary health care [30]. Understanding of role of herbs is the essential basis for rational clinical diagnosis, treatment of diseases.

Zingiber officinale :

Zingiber officinale is the botanical name of Ginger belonging to the family Zingiberaceae., a largest families of the plant kingdom with 53 genera and over 1300 species[31]. The taxonomic study of the family Zingiberaceae was first carried out by Kai Larsen [32]. WHO proposed the key to genera of Thai Zingiberaceae.

Zingiberaceous plants are distributed throughout Bangladesh. These plant species are most commonly observed in hilly areas like in Chittagong and Sylhet [33].

The active constituents in ginger are gingerols [1- (3′- methoxy- 4′- hydroxyphenyl)- 5- hydroxyalkan- 3- ones] and shogaols, dehydration products of these chemicals are responsible for sharp taste of ginger [34] .

Zingiber officinale is a potent inhibitor of thromboxane synthetase, which increases prostacyclin level without affecting prostaglandin E2 or prostaglandin F2 alpha altering bleeding times. Interestingly, patients at cancer centre use ginger to prevent the nausea due to chemotherapy.

Research carried out at AIIMS confirms the antioxidant, antiemetic activities of *Zingiber officinale* undergoing cisplatin chemotherapy. Its adsorbent aromatic and carminative properties on entero-intestinal tract causes adsorption of toxins and acids enhanced gastric motility. *Zingiber* has been demonstrated to be effective in the prevention of postoperative nausea and vomiting after outpatient gynecologic surgery[34,35].

***Zingiber Officinale* in Xerostomia**

Herbal medications that are useful in xerostomia include *Cetraria islandica*, Bakumondo-to, LongoVital, hot aqueous extract of the rhizome of *Anemarrhena asphodeloides* and Byakko-ka-ninjin-[36-40].

Previously, the study conducted by Goli Chamani with natural extract of *Zingiber officinale* revealed the dramatical increase of salivary secretion after injection[41]

As mentioned earlier, ginger (rhizome of *Zingiber officinale*) has been widely used for centuries in gastrointestinal disorders [42], particularly dyspepsia, but its precise mode of action has to be elucidated. Ghayur and colleagues showed that aqueous-methanolic extract of ginger 70% (Zo.Cr)

exhibits prokinetic activity in rats via activation of post-synaptic muscarinic M3 receptor in rat stomach fundus [43]. Prokinetic activity of ginger extract (Zo.Cr) was also confirmed in an *in vivo* test. This study reveals the cholinergic, spasmogenic effect of Zo. Cr extract on stomach fundus preparations due to the prokinetic action of ginger [44].

Although research studies have widely been performed about different pharmacological properties of *Zingiber officianale*, there is little evidence about its effect(s) on saliva secretion in the literature[45]. It has been determined that parasympathetic stimulation causes a copious flow of saliva with low outputs of protein and sympathetic nerve stimulation which *per se* causes less fluid secretion, due to exocytosis of secretory granule of acini and granular tubules[46]. Since the prokinetic effect of ginger has been revealed in earlier studies[43,44], the sialogogue effect of ginger may be attributed due to cholinergic activity. However, the exact mechanism is not completely understood, future research with atropine will aid in detecting the exact pathway. Further investigations on different constituents of *Zingiber officianale* in different doses also seem to be essential to identify the responsible constituent and the optimum effective dose for saliva secretion.

CONCLUSION

The herbal formulations are more widely used than allopathic drugs. The use of herbal remedies throughout the world exceeds that of the conventional drugs by two to three times. The ever increasing use of herbal products has some very important implications for the older population and for those heading towards their senior years. Geriatrics has a higher incidence of illness and chronic conditions and generates a higher per capita number of different prescription medications. This renders them to be more cautious when adding herbal medications to their health regime. Nowadays diabetes is common in all population and its known compliance is dry mouth. In future the use of natural products especially gingers in candy or chewing gums would enable them to easily overcome this compliance. Addition of natural products like ginger will increase the salivation and possibly minimize the side effects.

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