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A NOVEL APPROACH TO ORAL AND RESPIRATORY HEALTH: GARGLE

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ABSTRACT

Upper and lower respiratory tract infections are common in all age groups. They start with a mild cold, sore throat & cough and may proceed to moderate to severe infection and inflammation. Gargling is a simple, inexpensive, and effective practice to maintain oral health and hygiene. It is effective against sore throat and coughs. Gargle-containing povidone-iodine is a popular choice these days. A newer gargle preparation with the combined benefits of traditional herbs and povidone-iodine may provide better oral care. A gargle preparation containing Povidone-iodine with a blend of herbal extracts of *Glycyrrhiza glabra* (Mulethi), *Andrographis paniculata* (Kalmegha), *Ocimum sanctum* (Tulsi), *Mentha piperita* (Pudina), and Himalayan black salt (Kala Namak) can be a novel approach to gargles. Povidone-iodine in gargles has antiseptic, antibacterial, antiviral, antifungal, and antiprotozoal properties. The herbal extracts mentioned above also have anti-inflammatory, antiviral, and antibacterial actions. These herbs and povidone-iodine, when used together, may provide synergistic effects against microbes causing upper respiratory tract infection with anti-inflammatory and analgesic effects.

Key words: Upper respiratory tract infections, Gargle, Herbs, Povidone-iodine, Salt, Glycyrrhiza glabra, Mulethi, Andrographis paniculata, Kalmegha, Ocimum sanctum, Tulsi, Mentha piperita, Menthol, Himalayan black salt.

INTRODUCTION

Herbal medicine is the basis of traditional medical science. The World Health Organization (WHO) estimates that 80% of the population in Asian and African countries currently uses herbal medicine for health benefits. Herbal medicines are long known to treat various health conditions long before the synthesis of chemicals in labs for the preparation of allopathic medicines [1]. Allopathic medicines use various plant compounds (or phytochemicals) for their healing properties. Some common examples of natural components used in allopathic medicine are digitalis (as a cardiac tonic agent), artemisinin (in the treatment of malaria), quinine (for malaria and babesiosis), ephedrine (as an antihistaminic agent), codeine (an analgesic and anti-tussive), cocaine (as a local anaesthetic), caffeine (as CNS stimulant and cough suppressor), et al. Some of these compounds can be synthesized in labs [2]. In the current era, many people rely on allopathic medicines for quick relief. But when it comes to long-term treatment, they find their way into Ayurveda because of the safety profile of the herbal medicines. We all know that allopathic medicines may show side effects when used for a long period, which may sometimes be irreversible. Today many people choose plant extracts in their foods, nutraceuticals, cosmetics, and even pharmaceuticals [3]. Lifestyle changes and urbanization may cause many conditions that can compromise health. Respiratory diseases are one of the most prominent among them. Despite their predominance, they are generally ignored or given minimal importance. Among all the conditions, the leading cause of morbidity and mortality is lower respiratory tract diseases such as asthma, pneumonia, bronchitis, COPD, emphysema, tuberculosis, and some flu infections. One of the best ways to prevent lower respiratory tract diseases is to manage or prevent the upper respiratory tract infections such as the common cold, sore throat, and sinusitis [4]. The gargling method, since ancient times, is in used to maintain good oral health and hygiene. Even a simple hot water gargle can manage upper respiratory tract infections [5]. Povidone-iodine in gargles has remarkable properties. Polyvinylpyrrolidone (PVP-I), also known as Povidone-iodine, is a broad-spectrum antiseptic. It shows superior antimicrobial activity compared to all other antiseptics [6]. Various natural ingredients such as Mulethi, Tulsi, and Kalmegha have also shown antibacterial, antiviral, and antifungal properties. A study evaluated the efficacy of herbal mouthwash containing Psidium guajava, Azadirachta indica, and Glycyrrhiza glabra over standard mouthwashes like povidone-iodine, chlorhexidine, and geofresh. The study concluded the herbal mouthwash was highly potent against E. coli and S. aureus with minimal side effects compared to other standard mouthwashes [7]. Another study determined the efficacy of Echinacea/sage versus chlorhexidine/lidocaine spray for treating acute sore throats. The study demonstrated Echinacea/sage to be equally effective and well-tolerated compared to chlorhexidine/lidocaine [8]. We are further trying to evaluate the efficacy of povidone-iodine with different herb extracts.

1. POVIDONE-IODINE TIED UP WITH HERBS FOR SYNERGISTIC ACTION

1.1. Povidone-iodine (PVP-I)

People have been using PVP-I-based gargles for decades. It has controlled the spread of infectious diseases with no reported bacterial resistance. Studies have shown that PVP-I-containing mouthwashes and gargles significantly reduce the viral load in the oral cavity. World Health Organization (WHO) has recognized the active ingredient of PVP-I as one of the Essential Medicines [9]. The different formulations of PVP-I first became available in 1955. PVP-I is available over the counter and is often considered a safe broad-spectrum antiseptic. Due to its broad-spectrum effects and excellent safety profile, clinicians recommend it for treating minor cuts and burns in surgical procedures and wound cleaning [9]. PVP-I shows potent antiviral, antibacterial and antifungal properties. Its antiviral potency is superior to other available antiseptics, such as chlorhexidine [9] Iodine, as a small molecule, penetrates microorganisms and causes cell death. PVP-I acts against Gram-positive and Gram-negative bacteria, including resistant strains of antibiotics and antiseptics; fungi, enveloped and non-enveloped viruses, protozoans, and some bacterial spores with higher exposure time [6]. Povidone-iodine has no reports of microbial resistance, which may be due to its action on multiple targets on pathogens. Other antiseptics like chlorhexidine and quaternary ammonium compounds have documented reports of antimicrobial resistance [10].

1.2. Licorice

Licorice (*Glycyrrhiza glabra*) belongs to the family *Fabaceae*. The word Glycyrrhiza is from the Greek words "glykos", meaning "sweet", and "rhiza", meaning "root". More than 20 triterpenoids and approximately 300 flavonoids are present in Liquorice. The principal active constituents of Licorice are glycyrrhizin, glabridin, 18β-glycyrrhetinic acid, glabrin A & B, liquiritigenin, licochalcone A, E, and flavonoids [3,12] Due to the antibacterial, antiviral, anti-inflammatory, anti-tussive and expectorant properties of the licorice roots, people take licorice for respiratory conditions, such as cold, cough, sinusitis, and bronchitis. Moreover, glycyrrhizic acid and flavonoids present in licorice have shown anti-asthmatic effects [13]. Licorice is a source of proteins, amino acids, polysaccharides and simple sugars, and mineral salts (such as calcium, phosphorus, sodium, potassium, iron, magnesium, silicon, selenium, manganese, zinc, and copper), and pectins, resins, starches, sterols, and gums [3,12,13]. A prospective, randomized, and single-blinded study evaluated the licorice gargle's efficacy in reducing postoperative sore throat in patients undergoing elective lumbar laminectomy. The study concluded that licorice gargling 5 minutes before surgery reduces the incidence and severity of postoperative sore throat [14]. Another study compared the effect of licorice and sugar-water gargle on a postoperative sore throat. This double-blinded, randomized study confirmed the reduction in sore throat after gargling with Licorice [15]. Various other studies have shown licorice gargle to be effective in reducing postoperative sore throat [16-18].

1.3. Indian Echinacea (Kalmegha)

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Indian Echinacea (*Andrographis paniculata)* belongs to the family *Acanthaceae*. It is popularly known as "Kalmegha" or "King of Bitters". The whole plant (roots, leaves, stem) constitutes various phytochemicals that exhibit pharmacological actions. Earlier phytochemical studies on Indian Echinacea reveal the presence of more than 55 ent- labdane diterpenoids, 30 flavonoids, 8 quinic acids, 4 xanthones,5 noriridoids and andrographidoids (A, B, C, D, and E). The major phytocompounds found in Indian Echinacea are diterpenoids, diterpene glycosides, lactones, flavonoids, and flavonoid glycosides [19]. Indian Echinacea plays an essential role in Siddha, Ayurveda, and the Traditional system of medicines in India. It can manage fever, sore throat, upper respiratory tract infections, and other chronic and infectious diseases. The astringent properties of this herb help treat bronchitis, inflammation, cholera, diabetes, influenza, piles, itching, gonorrhoea, liver disorders, jaundice, and dysentery [19]. It has many pharmacological effects, such as anticancer, antiviral, antimicrobial, antioxidant, anti-inflammatory, and immunomodulatory. Lactones (commonly known as andrographolides) have anti-inflammatory, antiviral, anti-allergic, and immune-stimulant effects. Kalmegha can manage the common cold, diarrhoea, fever due to different infections, and jaundice. It is a liver and cardiac health tonic, antioxidant, and antimicrobial agent [19-20]. A controlled, double-blinded study on standardized extracts of Indian Echinacea has proven to be effective in the initial treatment of common cold and uncomplicated sinusitis. Indian Echinacea is effective in reducing common cold symptoms and duration [20-21]. A thirty-three randomized controlled trials (n=7175) study showed that Indian Echinacea improved cough (n=596) and sore throat (n=314) when compared to placebo. Indian Echinacea improved the overall symptoms of acute respiratory tract infections compared to placebo, usual care, and other herbal therapies. Evidence suggested Indian Echinacea shortens the duration of cough and sore throat compared to regular management with no considerable side effects [22]. A systematic review of three RCT studies suggested that Indian Echinacea alone or in combination with A. senticosus extracts is more effective in the symptomatic treatment of uncomplicated acute res-

piratory tract infection (RTI) [23]. Another study that includes seven double-blind, controlled trials (n=896) suggests that Indian Echinacea is superior to a placebo in alleviating the symptoms of uncomplicated RTI [24].

1.4. Tulsi

Tulsi (*Ocimum sanctum)* belongs to the family *Lamiaceae*. It is known as "The Queen of Herbs" or "Mother Medicine of nature". Tulsi is effective against anxiety, cough, asthma, fever, diarrhoea, and arthritis [25]. In the Indian Materia Medica, the tulsi leaf extracts can effectively manage bronchitis, rheumatism, and pyrexia. Other therapeutic uses of tulsi include the treatment of asthma or dyspnea, epilepsy, hiccups, cough, inflammation, wounds, skin, and haematological diseases. Various in-vitro, animal, and human experiments have proved antimicrobial (including antibacterial, antiviral, antifungal, antiprotozoal, antimalarial, and anthelmintic), anti-inflammatory, antioxidant, chemopreventive, hepatoprotective, neuro-protective, mosquito repellent, cardio-protective, analgesic, antipyretic, anti-allergic, immunomodulatory, anti-asthmatic, anti-tussive and anti-ulcer properties. The Rama tulsi is effective for severe acute respiratory syndrome. A decoction of its leaves relieves cold, cough, fever, and bronchitis. It is the only plant that absorbs carbon dioxide throughout its life [26]. The broad-spectrum antibacterial activity of Tulsi is well known. It shows actions against *Streptococcus mutans*, the organism that causes tooth decay. Herbal mouthwash with Tulsi can relieve mouth ulcers, bad breath, and gum diseases [27-28]. Various clinical trials suggest rinsing the mouth with tulsi is as effective as 0.2% Chlorhexidine or Listerine for decreasing the microbial concentration (*Streptococcus mutans*) [29]. Tulsi mouthwash also has a better taste [27-29]. Water boiled with tulsi leaves can be used as a gargle for sore throat. A decoction of tulsi leaves with honey and ginger is effective against common colds, coughs, asthma, and bronchitis.

1.5. Black salt:

Black salt is popularly known as Himalayan black salt or Kala namak. It is a volcanic rock salt that is crystalline. The pinkish-grey colour of the salt is due to the presence of iron and other minerals. The Himalayan black salt contains minerals like iron, calcium, and magnesium that make it superior to conventional table salts for health benefits. In ancient Greek civilization, Halotherapy or salt therapy (wherein halo meant "salt") was common. According to ancient Ayurvedic culture in India, inhaling salt cleanses the nasal and throat areas. Inhaling black salt is effective for the common cold, sinusitis, asthma, allergies, hay fever, and other chronic inflammatory conditions. Salt therapy is a common practice these days. In this therapy, salt inhalation relieves many symptoms like a blocked nose and cold. Salt inhalation does not contain any pharmaceutical drug, therefore no side effects. Himalayan black salt has gained tremendous attention for its nutritional and medicinal value. It has antioxidant properties and contains less sodium than common sea salt and pink salt [30].

1.6. Pudina:

Pudina (*Mentha piperita*) belongs to the family *Lamiaceae*. It is popularly known as Peppermint, Brandy mint, Candy mint, Balm mint, or Vilayati pudina. It has flavouring and medicinal properties. The phytochemicals derived from pudina are menthol and menthone. Other components derived from pudina include menthyl acetate, 1,8-cineole, beta-pinene, limonene, and beta-caryophyllene. It contains terpenoids, glycosides, flavonoids, volatile oils, polyphenols, saponins, tannins, triterpenes, carotenoids, and much more. Peppermint is used in various forms to treat respiratory conditions. Peppermint oil vapor, when used as an inhalant, decreases nasal congestion. Tea prepared from peppermint relieves colds, coughs, bronchitis, and inflammation of the respiratory tract. Pudina

leaves are beneficial for respiratory conditions due to their antioxidant, antibacterial and anti-inflammatory properties. The antibacterial activity of pudina is due to the presence of phenolic compounds. Pudina contains the highest number of antioxidants compared to other plants. Due to its anti-inflammatory properties, pudina can reduce the inflammation of the respiratory tract. The oils present in pudina are widely known to resist certain chemicals that are responsible for seasonal allergies and hay fever. It shows soothing properties on the throat, nose, and airways. It is effective even when eaten raw or taken as a tea, which will help relieve cough, nasal and throat congestion, and the symptoms associated with allergies, asthma, bronchitis, and other respiratory conditions [31-32].

CONCLUSION

Gargling is a safe, inexpensive, and effective way to maintain oral health and hygiene. Povidone-iodine is among the most effective gargle formulations and has the most potent antiseptic action. But people are reluctant to use it because of its poor aftertaste. Improving the aftertaste of gargles containing povidone-iodine is a novel approach to gargles. Various studies on Mulethi, Kalmegha, tulsi, black salt, and pudina show the presence of phytochemicals that are useful in managing the symptoms of respiratory diseases. All herbs mentioned above are common in preventing and managing various respiratory conditions. Further, we may say that these herbs in a gargle solution may help improve the aftertaste of povidone-iodine gargle and maintain good oral health and hygiene. A concocting of povidone-iodine with these herbs can be a novel approach to maintaining good oral health. Additional clinical studies can further substantiate the effectiveness of this gargle solution.

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