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Ethnobotanical treatments for earache and sore throat

Behrooz Farzan[1], Saber Abbaszadeh[2,3,4], Hassan Teimouri*[1]

[1]Department of Anesthesiology, Lorestan University of Medical Sciences, Khorramabad, Iran
[2]Razi Herbal Medicines Research Center, Lorestan University of Medical Sciences, Khorramabad, Iran
[3]Student Research Committee, Lorestan University of Medical Sciences, Khorramabad, Iran
[4]Social Determinants of Health Research Center, Lorestan University of Medical Sciences, Khorramabad, Iran

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ABSTRACT

Different organs of the body may develop complications for various reasons and cause pain. The pain may also occur in the ear and throat, and cause discomfort in the patient. In traditional medicine, medicinal plants are used to treat these complications. Therefore, in this review, the medicinal plants used for the treatment of ear pain and sore throat in the Iranian ethnobotanical studies will be reported. The information obtained in this review article was obtained by searching for relevant materials using keywords such as ear pain, sore throat, pain, ethnobotany, phytotherapy, medicinal plants and Iran in articles indexed in databases such as *Megiran*, *Scientific Information Database*, *PubMed*, *ScienceDirect*, and *ISI*. Artemisia, pumpkin, *Quarcus brantii*, sheng, barangan, *Solanum nigru*, *Mentha pulegium*, hashshir, sage, eucalyptus, currant, bullfish, cannabis and cumin are among the most important medicinal plants used to treat sore throat and ear pain in Iranian traditional medicine.

* Corresponding Author

Name: Hassan Teimouri
Email: hassan_teimouri@yahoo.com

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INTRODUCTION

When a tissue injury occurs, pain is felt and develops. In the pathophysiology of pain, there is a very complex relationship between the peripheral and central structures of the skin from the surface of the skin to the cerebral cortex, so that it can be argued that pain is a response involving sensory, excitatory and emotional regions (Berne *et al.,* 2004). Different organs of the body may develop complications for various reasons and cause pain. The pain may occur in various areas of the body, including the ear and the pharynx. The human ear consists of three parts: outer, middle and internal (Carol *et al.,* 2010). Earache may be considered a simple pain, but this pain can lead to many illnesses. Earn pain can be caused by the ear or the structures of the receptor nerves from these nerves (Han, 2010; Chen *et al.,* 2009). In cases where the pathology exists in the ear structure, it is referred to as primary pain, and in cases where the pain is related to surrounding structures, it is referred to as recurrent pain. In children, ear pain is mostly primary and in adults of recurrent type (Neilan and Roland, 2010). Ear pain is a common complaint of patients attending ENT clinics (Ely *et al.,* 2008). The use of acetaminophen, antibiotics, hot or cold-water compresses and physiotherapy has a substantial effect of relieving ear pain. Earache due to the cold will go away with the disease. But if the cold is improved, and ear pain does not go away, you may have an ear infection (Charlett and Coatesworth, 2007; Kim *et al.,* 2007; Jaber *et al.,* 2008). A sore throat refers to pain or irritation in the throat. Sore throat is a common symptom of the disease, and usually due to pharyngitis, and can also be a sign of trauma and diphtheria. The sore throat can be mild or severe. In other words, sore throats are said to be painful in the lower throat

(Thomas *et al.,* 2000). Sore throat is usually referred to throat pain that is a symptom of the cold, streptococcal sore throat, and a sore throat caused by tonsillectomy. The sore throat can be caused by lesions affecting tonsils, epiglote, larynx and trachea. The sore throat depends on the amount of laryngoscopy blade exposure to the pharynx, the size of the tracheal tube, the frequency of laryngoscopy, the use of scoline, the patient's topical anaesthesia, inhalation of dry inhaled gases, the use of anticholinergic drugs and the use of oropharyngeal airways. Drugs such as non-steroidal anti-inflammatory drugs and acetaminophen can help relieve a sore throat. Steroids are also useful to this end (Schams *et al.,* 2012; Jadhav *et al.,* 2015; Kadar *et al.,* 2015). However, control and treatment of pain are still one of the most challenges issues in drug therapy. Most analgesic treatments are limited to two main groups, i.e., opioids and non-steroidal anti-inflammatory drugs. Both groups of analgesic drugs have several side effects, such as digestive disorders, non-steroidal anti-inflammatory renal lesions, respiratory muscle weakness, and potential opioid-dependence; and access to anti-inflammatory agents with lower side effects is desirable (Dahl and Reader; 2004; Da Costa *et al.,* 2017). In this regards, many approaches such as massage therapy, hypnotherapy, aromatherapy, yoga, use of medicinal plants, etc. have been used for decreasing pain and implications of various diseases (Nikfarjam *et al.,* 2013; Dehkordi, 2014; Solati, 2016; Hosseini *et al.,* 2017; Solati *et al.,* 2017). Medicinal plants and herbal drugs are most commonly used approaches that their effects have been evaluated in the various studies (Abbasi *et al.,* 2007; Bahmani *et al.,* 2018; Mohsenzadeh *et al.,* 2016; Kooti *et al.,* 2014). Studies have shown that infectious, non-infectious, and chronic diseases are also controlled and treated by using herbal drugs (Parsaei.*et al.,* 2016). The beneficial therapeutic effects of medicinal plants have been demonstrated in pharmacological studies, so that medicinal plants have medicinal and therapeutic applications in the treatment of neurological, cardiovascular, digestive, endocrine and many other disorders (Abbasi *et al.,* 2017; Tajbakhsh *et al.,* 2018; Faryadyan *et al.,* 2014; Shokri *et al.,* 2018). In this study, the medicinal plants used in Iranian ethnobotanical studies for the treatment of ear pain and sore throats were reviewed and reported.

RESULTS AND DISCUSSION

The results of various studies in Iran suggest that plants from the Asteraceae and Lamiaceae families are more frequently used in treating ear pain and sore throat. Other plants and additional information are shown in Table 1.

Herbal drugs have traditionally been used to treat ear pain and sore throats. They are somehow the oldest drugs used by humans, and they still retain their position in today's medicine in addition to their position in traditional medicine. Herbal drugs are often used for minor and common diseases in the form of home remedies or supplementary pharmaceutical products. Although all medicinal plants that are traditionally used do not have sufficient clinical evidence according to the current standards, many of them are used extensively, and people have a special belief in traditional medicine and herbalism. Alternative treatments such as the use of medicinal plants for patients with pain has two main advantages. First, the patients regard them as more natural and safe than synthetic drugs, and secondly, they think they do not need to go to a doctor to use them. It is often easier to access these treatments for patients with (mild and severe) pain, disorders and complications for which they cannot refer to a physician. In addition, the reported treatments for many other patients replace unsuccessful attempts to relieve pain and to treat the complication or disorder (ear pain and sore throat) using more conventional treatments. The pain is primarily a defensive mechanism and occurs when the tissue is injured and causes the person to react and eliminate the pain-producing stimulus. Pain is caused for various reasons, for example, due to heat, trauma, rupture, stretching, electric current, necrosis, inflammation, spasm and infection (Saarto, 2010). The action mechanisms of some of the plants introduced in the present study have been confirmed in laboratory works and clinical trials. For example, Artemisia species produce analgesic effects by inhibiting calcium release, the synthesis of NO, cytokines and prostaglandin E2, as well as by stimulating $GABA_A$ receptors (Dashti *et al.,* 2012; Sadeghifard and Zareian, 2009). Chamomile produces an analgesic effect by influencing inflammatory processes (Heidari *et al.,* 2002). *Allium* species produces central analgesic effects and also affects opioid receptors (Khaksarian *et al.,* 2008). *Glycyrrhiza glabra* causes an analgesic effect by inhibiting the migration of white blood cells and producing inflammatory mediators in neutrophils (Zareian *et al.,* 2003). *Sambucus ebulus* produces an analgesic effect by inhibiting the synthesis of prostaglandins (Ebrahim Zadeh *et al.,* 2006). *Mentha pulegium* exerts analgesic effect by inhibiting NO synthesis, inflammatory mediators and NMDA receptors, as well as by stimulating opioid receptors (Mokhtari *et al.,* 2009). Other studies have also shown that stimulating some regions of the brainstem can reduce or control pain. These regions include the far ventricular area, the periaqueductal

Table 1: Medicinal plants effective on ear pain and sore throat in Iran

Scientific name	Family name	Domestic name	Used organs
Artemisia annua	Asteraceae	Dermaneh	Leaf and stem
Alyssum minus	Brassicaceae	Ghodameh	Fruit
Rhamnus pallasii	Rhamnaceae	Arzhan	Fruit
Artemisia scoparia	Asteraceae	Salmaneh	Flowered flower
Atriplex leucoclada	Chenopodiaceae	Solmaki saghesefid	Leaf
Echinops viscidulus	Asteraceae	Shekar tiqal	Bulb
Malva neglecta	Malvaceae	Panirak	Leaf and flower
Quercus brantii	Fagaceae	Balout	Fruit
Tragopogon graminifolius	Asteraceae	Sheng	Root and flower
Amygdalus arabica	Rosaceae	Badameh kouhi	Fruit
Ruta graveolens	Rutaceae	Sopdab	Aerial parts
Anthemis cotula	Apiaceae	Babouneh bahari	Aerial parts
Plantago major	Plantaginaceae	Barhang	Seed
Echinops ritrodes	Asteraceae	Shekartighal	Stem
Allium haemanthoides	Amaryllidaceae	Ben sorkh	Leaf
Lamium amplexicaule	Amaryllidaceae	Gazaneh sefid	Aerial parts
Glycyrrhiza glabra	Pappilionaceae	Shirin bayan	Root
Acinus graveolens	Lamiaceae	Sheng	Fruit and seed
Lallemantia royleana	Lamiaceae	Balango	Fruit and seed
Malva sylvestris L.	Malvaceae	Panirak	Leaf and flower
Plantago lanceolata	Plantaginaceae	Barhang neyzehei	Leaf and seed
Sambucus ebulus	Adoxaceae	Palam	Root and stem
Artemisia scoparia	Asteraceae	Dermaneh sharghi	Leaf
Descurainia Sophia	Brassicaceae	Khakeshir Irani	Seed
Phragmites australis	Poaceae	Ney	Root
Solanum nigrum	Solanaceae	Tajrizi	flowered flower
Phlomis cancellata	Lamiaceae	Maryam goli	Leaf and flowered flower
Mentha pulegium	Lamiaceae	Pouneh	Aerial parts
Alyssum bracteatum	Brassicaceae	Ghodoumeh	Fruit
Eucalyptus camaldulensis	Myrtacea	Okaliptus	Leaf
Ricinus communis	Euphorbiaceae	Karchak	Seed
Cannabis sativa	Cannabaceae	Shahdaneh	Aerial parts and seed
Echium amoenum	Boriganaceae	Gavzaban	Flower
Bunium persicum	Umbelliferae	Zireh	Seed
Ferula assa-feotida	Umbelliferae	Anghouzeh	Resin and root
Juniperus excelsa	Cupressaceae	Abras	Leaf and fruit
Ziziphus nummularia	Rhamnaceae	Ramalik	Leaf and fruit
Anchusa italica	Boraginaceae	Gavzaban	Flower
Pistacia atlantica	Anacardiaceae	Baneh	Leaf and fruit

gray, and the midline nuclei in the brainstem (Sepehri *et al.,* 2011). Meanwhile, medicinal plants can exert their effects by affecting pain mediators including serotonin, substance P, glutamate, histamine, nerve growth factor, adenosine and adenosine phosphate. In fact, their active ingredients on pain can produce analgesic effects, including flavonoids, quercetin, volatile oils, monoterpenes and sesquiterpenes, phenolic compounds such as thymol and carvacrol, coumarin, tannins, essential oils such as pinenes, limonene and cineol, monoterpenes, diterpenoids, riboflavin, terpenes, resins, iridoids, alcoholic compounds and organic acids, such as caffeic acid, rosmarinic acid, nicotinic acid, phenolic acid, GABA, and glycine (Nasri *et al.,* 2012). Therefore, the use of medicinal plants containing active and antioxidant substances can be used to reduce the pain caused by the disease (Sepehri *et al.,* 2011). In addition, the results of the present study indicate that plants from the Asteraceae and Lamiaceae families are more commonly used in treating ear pain and sore throat, and studies have shown that phenolic and flavonoid compounds are among the main compounds of these plant families that can be the reason for the antioxidant and anti-inflammatory effects of the plants.

CONCLUSION

In this review, which was conducted with the aim of identification and introduction of medicinal plants used for the treatment of ear pain and sore

Table 2: Medicinal plants effective on ear pain and sore throat in Iran (Contd….)

Traditional used	Therapeutic effects	Region (reference)
Edible	Earache	Arim neka (Rojni *et al.*, 2017)
Decoction	Sore throat	Dehloran and Abdanan (Ghasemi Pirbalouti *et al.*, 2013)
Decoction	Sore throat	Dehloran and Abdanan (Ghasemi Pirbalouti *et al.*, 2013)
Decoction	Sore throat	Dehloran and Abdanan (Ghasemi Pirbalouti *et al.*, 2013)
Decoction	Sore throat	Dehloran and Abdanan (Ghasemi Pirbalouti *et al.*, 2013)
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Decoction	Sore throat	Dehloran and Abdanan (Ghasemi Pirbalouti *et al.*, 2013)
Decoction	Sore throat	Dehloran and Abdanan (Ghasemi Pirbalouti *et al.*, 2013)
Decoction	Sore throat	Dehloran and Abdanan (Ghasemi Pirbalouti *et al.*, 2013)
Edible	Earache	Dehloran and Abdanan (Ghasemi Pirbalouti *et al.*, 2013)
Decoction and edible	Earache	Behbahan (Razmjoue *et al.*, 2018)
Decoction and edible	Sore throat	Behbahan (Razmjoue *et al.*, 2018)
Decoction and edible	Sore throat	Behbahan (Razmjoue *et al.*, 2018)
Decoction	Sore throat	Urmia (Asadbeigi *et al.*, 2014)
Decoction	Sore throat	Khuzistan (Khodayari *et al.*, 2013)
Decoction	Sore throat	Razojergelan Khorasan-shomali (Abedi *et al.*, 2017)
Edible	Sore throat	Razojergelan Khorasan-shomali (Abedi *et al.*, 2017)
Decoction	Sore throat	Sirjan (Sharififar *et al.*, 2010)
Decoction	Sore throat and sputum	Sirjan (Sharififar *et al.*, 2010)
Decoction and brewed	Sore throat and sputum	Sistan (Ranmanesh *et al.*, 2010)
Decoction and brewed	Sore throat and sputum	Sistan (Ranmanesh *et al.*, 2010)
Decoction and brewed	Sore throat	North Iran (Mozaffari Nejad *et al.*, 2013)
Decoction and edible	Sore throat	North Iran (Mozaffari Nejad *et al.*, 2013)
Decoction and edible	Sore throat	North Iran (Mozaffari Nejad *et al.*, 2013)
Tail	Sore throat	North Iran (Mozaffari Nejad *et al.*, 2013)
Decoction and edible	Sore throat	North Iran (Mozaffari Nejad *et al.*, 2013)
Tail	Sore throat	Shirvan (Habibi *et al.*, 2017)
Decoction	Sore throat	Mobarakeh Isfahan (Mardaninejad *et al.*, 2013)
Decoction	Sore throat	Mobarakeh Isfahan (Mardaninejad *et al.*, 2013)
Rinse with boiled	Earache	Mobarakeh Isfahan (Mardaninejad *et al.*, 2013)
Oil	Earache	Mobarakeh Isfahan (Mardaninejad *et al.*, 2013)
Rinse with boiled	Earache	Mobarakeh Isfahan (Mardaninejad *et al.*, 2013)
Decoction	Sore throat	Hezarjarib mazandaran (Shahraki *et al.*, 2016)
Decoction	Earache	Hormozgan (Safa *et al.*, 2012)
Powder	Earache	Hormozgan (Safa *et al.*, 2012)
Decoction and brewed	Earache	Hormozgan (Safa *et al.*, 2012)
Decoction and brewed	Sore throat	Hormozgan (Safa *et al.*, 2012)
Decoction	Sore throat	Hormozgan (Safa *et al.*, 2012)
Decoction and brewed	Sore throat	Hormozgan (Safa *et al.*, 2012)

throat in the Iranian ethnobotanical, different plants used in Iran that are used in different cultures and areas for ear pain and sore throat were reported. Many of these plants are also used in different cultures and traditional medicine of other countries. However, some species reported in the present study were introduced for the first time and can be further investigated for their potential analgesic effects in laboratory works and clinical trials. In addition, many of these plants are used in different regions in pharmaceutical forms other than the forms presented in this study, and also their different organs or parts are used. These organs and parts can have various efficacy, which needs to be taken into consideration. Despite the numerous differences in the organs and methods of use of the plants, it is, however, clear that the phenolic and flavonoid compounds in these plants can relieve pain in the patients and produce therapeutic effects due to their antioxidant and anti-inflammatory properties.

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