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Ethnomedicinal studies on selected medicinal plants for treatment of asthma from Palakkad District of Kerala State

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Abstract

A survey was undertaken to collect the ethnomedicinal knowledge from local health healers on the use of herbal plants in Attappadi hills at Palakkad district of Kerala state, India. The information on traditional knowledge about ethnomedicinal practices from local vaidias was collected through face to face interview method. The findings showed that the local health healers are using 16 species of herbal plants belonging to ten families to treat Asthma. From the findings it was observed that the most of the herbals (*Aplinia officinaru*, *Curcuma aromatica*, *Datura metel*, *Elettaria cardamomum*, *Solanum trilobatum*, *Solanum xanthocarpum* and *Zingerber officinale*) which were used for preparation of these medicines are belonging to *Zingiberaceae* and *Solanaceae* families. The parts of the plants like fresh leaves (tender and matured), flowers (fresh and dried), raw fruit (dry), dried fruit, dried rhizome and dried root were used for the asthma treatment. The information on method of preparation, mode of purchase, duration for preparing the medicine, cost and administration were also documented.

Keywords: Ethnomedicinal practices, Asthma, Formulations, Attappadi tribal, Kerala

Introduction

Ethnomedicine is the study of traditional, culture-specific medical practices, beliefs, and knowledge systems used by indigenous or ethnic groups to diagnose, treat, and prevent illness. It encompasses herbal medicine, spiritual healing, and holistic approaches passed down through generations, often acting as primary healthcare for, or in addition to, modern medicine (Narayanan *et al.*, 2018) [5].

The term ethno-medicine is recently defined as “Medical system of the primitive that has been evolved in their own cultural milieu and recognized as the method of diagnosis and treatment which are natural or not”. Documentation and scientific validation of traditional claims are necessary and any give valuable clues to new drug development. Intensive field surveys among traditional practitioners for ethno-medicinal practices done time-to-time explored the wealth of traditional information for treatment of different diseases (Kabir, 2014) [3]. Most of the ancient knowledge systems have continued to survive only by oral communication from generation to generation in rural as well as in tribal communication. About 85 per cent of the rural population of India depends on wild plants for the treatment of various ailments. WHO estimates about three quarters of world population using herbs and other forms of medicines to treat various diseases using about 7500 plant species. However, with increasing modernization, rich cultural heritage and traditional knowledge is fast declining in many parts of world. Hence, an attempt has been made to document the ethno-medicinal practices by tribal community for the treatment of asthma (Thomas, 2012) [11].

Ethnomedicine studies identify over 176 plant species across 63 families, particularly in Asia, Africa, and India, for treating asthma through decoctions, powders, and pastes. Leaves and roots are the most common parts used, with notable plants including *Achyranthes aspera*, *Alstonia scholaris*, and *Zingiber officinale* (Prasad, 2019) [7].

Asthma is a chronic disease of the respiratory system in which the airway occasionally constricts,

becomes inflamed, and is lined with excessive amounts of mucus, often in response to one or more triggers. These episodes may be triggered by such things as exposure to an environmental stimulant (or allergen), cold air, warm air, moist air, exercise or exertion, or emotional stress (Amuthavalluvan, 2020) ^[1]. In children, the most common triggers are viral illnesses such as those that cause the common cold. This airway narrowing causes symptoms such as wheezing, shortness of breath, chest tightness, and coughing (Sivarajan, 2013) ^[10]. The airway constriction responds to bronchodilators. Between episodes, most patients feel well but can have mild symptoms and they may remain short of breath after exercise for longer periods of time than the unaffected individual (Rahmatullah, 2012) ^[8].

The treatment of asthma in the modern medicine is based on the use of beta agonists, leukotriene modifiers and inhaled corticosteroids that allowed an acceptable control of the main symptoms. However, this therapy could not suppress all the symptoms although the better understanding of the pathophysiology of the disease (Yang *et al.*, 2016) ^[13].

Materials and Methods

For the present study Attappadi Hills at Palakkad district of Kerala state was selected. Attappadi is an extensive mountain valley at the headwaters of the Bhavani River nestled below the Nilgiri Hills of the Western Ghats. Attappadi reserve forest is a protected area comprising of 249 km² of western most part of the Attappadi Block (745 km²) of Mannarghat Taluk in Palakkad district of Kerala, South India. It is a tribal abode. Irular, mudugar and kurumbar are the main tribal groups. They live in forest in

closely built huts called 'Ooru' (hamlets) (Giovannini, 2017) ^[2]. They depend mostly on forest resources for their existence. They collect different plants and use them for various purposes including maintaining their health. They are still practicing the herbal medicines for curing fever, cough, cold, asthma, diarrhea, dysentery, diabetes mellitus, arthritis, asthma, blood pressure, bone fracture, cuts, wounds, headache, joint pain, scabies, psoriasis, dandruff, stone problem, snake bite etc (Manikandan, 2015) ^[4].

Ethno-medicinal information was gathered from tribals by contacting local health healers through personal interview along with informal discussion. Information of medicinal plants regarding vernacular name, part/parts used, quantity, method of preparation, cost and administration were gathered carefully at the site. The information gathered was entered in the investigators field note books. Plant specimens were collected and identified by referring to standard books such as "Guide to the Economic Plants of South India, 1959" and "Prajapat and Kumar's Agro's Dictionary of Medicinal Plants, 2005" and voucher specimens were processed methodologically as suggested by The Rapinat Herbarium and Centre for Molecular Systematic, Trichy, Tamil Nadu and preserved at the herbarium sheet. The herbarium sheet contained information such as common name and scientific name of herbal, used parts, utility of herbal, source and location etc. The prepared herbarium such as *Adhatoda vasica*, *Eclipta alba*, *Ocimum sanctum*, *Piper nigrum*, *Solanum xanthocarpum* and *Zingerber officinale* were arranged alphabetically based on the botanical name of the species (Naseef, 2018) ^[6].

Table 1: Preparation of Asthma powder-Name of the herbals used

S. No.	Botanical name	Family	Common name	Tamil name	Malayam name
1.	<i>Soalnum trilobatum</i>	Solanaceae	Climbing brinjal	Thoothuvilai	Tudavalam
2.	<i>Ocimum sanctum</i>	Labiatae	Sacred basil	Thulasi	Krishna thulasi
3.	<i>Adhatoda vasica</i>	Acanthaceae	Malabar nut	Adathodai	Atalotakam
4.	<i>Solanum xanthocarpum</i>	Solanaceae	Kantakari	Kanttankathiri	Kantakari
5.	<i>Eclipta alba</i>	Compositae	--	Karisalaankanni	Kayyani
6.	<i>Cynodon dactylon</i>	Graminae	Hariali	Arugumpul	Karukapul
7.	<i>Curcuma aromatica</i>	Zingiberaceae	Turmeric	Manjal	Manjal
8.	<i>Glycyrrhiza glabra</i>	Leguminosae	Liquorice	Adhimathuram	Iratti mathuram
9.	<i>Aplinia officinarum</i>	Zingiberaceae	Galangal	Chitharathai	Aratha
10.	<i>Piper nigrum</i>	Piperaceae	Pepper	Milagu	Kurumilagu
11.	<i>Aegle marmelos</i>	Rutaceae	Bael	Vilvam	Koovalum

The herbal leaves such as *Ocimum sanctum*, *Soalnum trilobatum*, *Adhatoda vasica*, *Solanum xanthocarpum*, *Eclipta alba* and *Cynodon dactylon* leaves were washed with water and shade dried for five hours. The dried ingredients such as *Glycyrrhiza glabra* (dry root), *Aplinia officinarum* (dry root), *Curcuma aromatica* and *Piper nigrum* were ground along with dried leaves into a coarse powder by using mixie and sieved. Both powders were mixed together and the asthma powder will be stored in glass bottles and it can be used upto three months.

Results and Discussion

Based on the investigation, it was found totally 16 species of medicinal plants belonging to ten families were used to treat asthma. The medicinal plants are administered internally in the form of decoction, herbal tea and powder. For decoction, *Adhatoda vasica* leaves; for tea, *Aegle marmelos*, *Ocimum sanctum*, *Adhatoda vasica*, *Solanum trilobatum*, *Solanum xanthocarpum*, *Elettaria cardamomum*, *Cassia auriculata*, *Emblica officinalis*, *Curcuma aromatica*, *Zingerber officinale*, *Glycyrrhiza glabra*, *Aplinia officinarum* and *Piper nigrum*; for

powder 1, *Soalnum trilobatum*, *Ocimum sanctum*, *Adhatoda vasica*, *Solanum xanthocarpum*, *Eclipta alba*, *Cynodon dactylon*, *Curcuma aromatica*, *Glycyrrhiza glabra*, *Aplinia officinarum* and *Piper nigrum*; for powder 2, *Datura metel* were used. For the preparation of different forms of medicine for the treatment of asthma; medicinal plants were belonging to the family such as Zingiberaceae and Solanaceae were used frequently. The parts of the plants like leaves, flowers, unripe fruit, fruit, rhizome and root were used for the treatment (Thomas, 2018) ^[12]. The formula of different medicine for the asthma with ingredients, dosage and mode of administration and cost of medicine were given in Table 3. All the herbs were collected from in and around area of Attappadi hills. During the season, the required herbs for the preparation of medicine like powder were collected in bulk quantity and they were cleaned, dried and then stored in jute covers or plastic covers for future use whereas the fresh medicinal plants which are used in the preparation of decoction were collected at the time of availability. Some times, *Curcuma aromatica* (Turmeric), *Elettaria cardamomu* (Cardamom), *Piper nigrum* (Pepper) and *Zingerber officinale* (Ginger) were

purchased from local shops at Attappadi hills. In the form of herbal powders, it were prepared once in a month and stored in glass bottles where as decoction, extract, juice etc. were prepared at the time of medication only.

It can be concluded that majority of tribal population gives first preference for traditional system of medicine for treating the ailments because of their cultural rooted reasons, faith in the system, and easy and cheap availability of that system. Among the tribal community, a wealth of traditional knowledge is available for the treatment of asthma also. Existence of treatment for a large numbers of medical problems may be due to faith and conviction about the treatment process and easy approachability to this kind of treatment. Pharmaceutical researches acknowledge that screening plants on the basis of information derived from

traditional knowledge saves time and resources. Therefore, detailed studies on these folklore claims regarding validation, isolation of active principles, pharmaco-toxicological test and clinical trials to assess efficacy and safety of uses are required. These may bring to light new drugs of herbal origin. So, there is urgency of recording information of plants used for medical purpose by tribals before depletion of this traditional knowledge. It is also clear that there is a wide usage of local flora by the tribal, which suggests that the cultivation and conservation of such indigenous plants should be encouraged by helping them grow these plants on the barren hill slopes and along the ravine belts. The cultivation would also reduce the area prone to such natural calamities landslides and soil erosion.

Table 3: Use of combination of plants for curative practices for asthma

S. No.	Medicine name	Ingredients	Preparation of medicine	Dosage and Mode of administration
1.	Adathodai decoction	1. <i>Adhatoda vasica</i> (Acanthaceae)	- One hundred gram of <i>Adhatoda vasica</i> leaves was cleaned with water and cut into small pieces. - Boiled with one litre of water and reduce to one fourth and filtered by using thin cloth. - Sugar was added to the extract and filtered again and boiled till it attains syrup consistency. - The decoction was stored in a glass bottles. This can be stored maximum for a period of two month.	Ten to 20 ml of Adathodai decoction was mixed with boiled and cooled water. This may be consumed three times in a day. There is no need of any food restriction.
2.	Herbal tea powder	1. <i>Adhatoda vasica</i> (Acanthaceae) 2. <i>Aegle marmelos</i> (Rutaceae) 3. <i>Aplinia officinarum</i> (Zingiberaceae) 4. <i>Cassia auriculata</i> (Leguminosae) 5. <i>Curcuma aromatica</i> (Zingiberaceae) 6. <i>Elettaria cardamomum</i> (Zingiberaceae) 7. <i>Embllica officinallis</i> (Euphorbiaceae) 8. <i>Glycyrrhiza glabra</i> (Leguminosae) 9. <i>Ocimum sanctum</i> (Labiatae) 10. <i>Piper nigrum</i> (Piperaceae) 11. <i>Solanum trilobatum</i> (Solanaceae) 12. <i>Solanum xanthocarpum</i> (Solanaceae) 13. <i>Zingerber officinale</i> (Zingiberaceae)	- The herbals such as <i>Aegle marmelos</i> leaves, <i>Ocimum sanctum</i>, <i>Soalnum trilobatum</i>, and <i>Adhatoda vasica</i> leaves were washed with water and shade dried for five hours. The other ingredients such as <i>Elettaria cardamomum</i>, <i>Cassia auriculata</i> flower, <i>Embllica officinallis</i>, <i>Curcuma aromatica</i>, <i>Zingerber officinale</i>, <i>Glycyrrhiza glabra</i>, <i>Aplinia officinarum</i> and <i>Piper nigrum</i> were (without oil) roasted (light brownish colour) to prevent insect attack during storage. - The roasted ingredients were ground along with dried leaves into a coarse powder by using mixie and sieved using 80 mm sieve. - All powders were mixed together and stored in glass bottles. It can be used up to six mon	One teaspoon of herbal tea powder and 25g of jaggery were boiled with 200 ml of water and reduced upto 100 ml and boiled herbal tea was consumed twice a day (before food) for a period of ten days. The patient was advised to avoid fried foods and they were advised to consume easily digestible foods.
3.	Asthma powder	1. <i>Adhatoda vasica</i> (Acanthaceae) 2. <i>Aplinia officinarum</i> (Zingiberaceae) 3. <i>Curcuma aromatica</i> (Zingiberaceae) 4. <i>Cynodon dactylon</i> (Graminae) 5. <i>Eclpta alba</i> (Compositae) 6. <i>Glycyrrhiza glabra</i> (Leguminosae) 7. <i>Ocimum sanctum</i> (Labiatae) 8. <i>Piper nigrum</i> (Piperaceae) 9. <i>Solanum trilobatum</i> (Solanaceae) 10. <i>Solanum xanthocarpum</i> (Solanaceae)	- The herbal leaves such as <i>Ocimum sanctum</i>, <i>Solanum trilobatum</i>, <i>Adhatoda vasica</i>, <i>Solanum xanthocarpum</i>, <i>Eclpta alba</i> and <i>Cynodon dactylon</i> leaves were washed with water and shade dried for five hours. - The dried ingredients such as <i>Glycyrrhiza glabra</i> (dried root), <i>Aplinia officinarum</i> (dried root), <i>Curcuma aromatica</i> and <i>Piper nigrum</i> were ground along with dried leaves into a coarse powder by using mixie and sieved. - Both powders were mixed together and the asthma powder will be stored in glass bottles and it can be used upto three months.	Half teaspoon of asthma powder is consumed with 5ml of honey once in a day for ten days in empty stomach. Because the absorption of asthma powder was very quickly by the duodenum with empty stomach. There is no food restriction.

Table 4: Literatures reporting on relevant ethno medicinal uses, toxicity and immune modulatory studies on the most important plants used to treat asthma

Species	Relevant ethnobotanical citations	Toxic effects	Relevant pharmacological reference to immune modulatory citations
<i>Abrus precatorius</i>	Asthma (Sonibare and Gbile, 2008; Olowokudejo, Kadiri and Travih, 2008; Emmanuel nouri, 2009; Makinde <i>et al.</i> , 2015).	Chloroform and ethanol extracts of leaves tested for <i>in vitro</i> cytotoxic activity by MTT assay on human cancer cell lines, (A549) lung cancer, (hepG2) liver cancer, (HCT116) colon cancer, (HeLa) cervical cancer (Scudiero <i>et al.</i> , 1988) The ethanol extract	The ethanol extract of leaves showed marked effect on milk-induced leukocytosis and eosinophilia in the management of asthma (Choi <i>et al.</i> , 1989; Anant Solanki and Maitreyi Zaveri, 2012). The ethanol extract of leaves significantly decreased milk-induced leukocytosis and eosinophilia in mice in a

		showed better cytotoxic effect than chloroform extracts against the above mentioned cancer cell lines (Manoharan <i>et al.</i> , 2011).	dose dependent manner when compared with control group (Yadava and Reddy, 2002; Taur and Patil, 2011; Solanki and Zaveri, 2012). Evaluation of the methanol extract of the leaves for bronchodilator activity by using various <i>in vivo</i> and <i>in vitro</i> models in guinea pigs (Mensah <i>et al.</i> , 2011; Solanki and Zaveri, 2012). The extract offered a maximum degree of protection comparable to that of salbutamol (Wingard <i>et al.</i> , 1991). The methanol extract produced dose-dependent bronchodilator activity (Wambebe and Amosun, 1984).
<i>Allium cepa</i> L. (Liliaceae/Alliaceae)	-	-	Reduction in the production of inflammatory cytokines, a relaxation of tracheal rings, and a reduction in total number of cells in broncho-alveolar lavage and eosinophil peroxidase in lungs by treatment (Oliveira <i>et al.</i> , 2015).
<i>Allium sativum</i> L. (Liliaceae/Alliaceae)	Asthma (Sonibare and Gbile, 2008; Olowokudejo <i>et al.</i> , 2008; Noumi, 2009).	-	-
<i>Caricapapaya</i>	-	Not toxicity effect (Afzan <i>et al.</i> , 2012). No significant toxic effect of the oral administration of the aqueous extract of leaves (Ismail <i>et al.</i> , 2014)	-
<i>Desmodium gangeticum</i>	Asthma (Mainen <i>et al.</i> , 2006; Towns <i>et al.</i> , 2014)	Toxicity against brine shrimp larvae, with LC50 values equal to 33.1 µg/ml (Mainen <i>et al.</i> , 2006)	-
<i>Euphorbia hirta</i>	Asthma (Sonibare and Gbile, 2008; Noumi, 2009; Mohammed <i>et al.</i> , 2014).	Effects of extracts on the ultrastructure of the murine liver (Wong <i>et al.</i> , 2013); acute and subchronic toxicity of methanol extract in rats (Yuet Ping <i>et al.</i> , 2013); Cytotoxicity (Kwan <i>et al.</i> , 2015); leucocytosis, dullness, anorexia, stairhaircoat and 20% mortality in rat (Adedapo <i>et al.</i> , 2004; Tangjitman <i>et al.</i> , 2015)	Ethanol extract of whole aerial part of the plant at doses (100-1000 mg/kg) shows antihistaminic and antiallergic activity by inhibiting inhibited the passive cutaneous anaphylaxis and paw anaphylaxis reaction; protection of mast cell from degranulation (Youssef <i>et al.</i> , 2007).
<i>Guiera senegalensis</i>	Asthma (Fatou <i>et al.</i> , 2010)	-	Effect of <i>in vitro</i> exposure of the leaves of <i>Guiera senegalensis</i> , at 0.01 mg/ml or 0.1 mg/ml for 30 min on acetylcholine-induced contraction of isolated rat trachea (Fatou <i>et al.</i> , 2010).
<i>Piper guineense</i>	Asthma (Towns <i>et al.</i> , 2014)	-	Ethanol and aqueous extract of leaves at doses 100 and 200 mg/kg possesses antiasthmatic activity on histamine induced bronchoconstriction in guinea pig and histamine induced dose dependent contraction of guinea pig tracheal chain and isolated guinea pig ileum preparation (Jawale <i>et al.</i> , 2009).
<i>Zingiber officinale</i>	Asthma (Sonibare and Gbile, 2008; Olowokudejo, Kadiri and Travih, 2008; Emmanuel noumi, 2009).	Embryo toxic to pregnant rats (Weidner and Sigwart, 2001; Tangjitman <i>et al.</i> , 2015).	-

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