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BALCHATURBHADRA CHOORNA: EFFECTIVE POLYHERBAL AYURVEDA COMPOUND DRUG FOR RESPIRATORY DISEASES IN CHILDREN

Sumod Khedekar*, Sumeet Goel and Sneha Khedekar*****

*M.D Kaumarabhritya, National Institute of Ayurveda, Jaipur.

**M.D Kaumarabhritya, National Institute of Ayurveda, Jaipur.

***M.D Dravyaguna, IPGT&RA Jamnagar Gujarat.

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***Corresponding Author**
Sumod Khedekar
M.D Kaumarabhritya,
National Institute of
Ayurveda, Jaipur.

ABSTRACT

Respiratory diseases are the most common teething troubles for which child is brought to pediatric consultation. Prevalence of respiratory illness in children are increasing due contributing factors like, instabilities in the environment due to modernization, pollution, disturbed immunity, altered food and life style. The study was done with the aim to review the various action on respiratory system of a poly-herbal Ayurveda compound drug *Balchaturbhadra Choorna* in children. Contents of *Balchaturbhadra Choorna* have been found to be effective against number of respiratory illness including respiratory infections, respiratory allergy, etc. by their anti-inflammatory, antitussive, expectorant and mast cell stabilizing activity. Toxicological analysis also proves the drug to be absolutely safe for use. Thus *Balchaturbhadra Choorna* can prove to be an effective drug both as a prophylactic and healing prescription for various respiratory illnesses among children.

KEYWORDS: Ayurveda, *Balchaturbhadra Choorna*, Respiratory diseases.

INTRODUCTION

Respiratory diseases are the most common cause of illness in children in developed countries and a leading cause of death in developing countries. The disorder contributes to variety of symptoms like sneezing, headaches and running nose, limit day to day activities, interferes with sleep and therefore leads to school absenteeism in children thereby leading to poor school performance. The respiratory health state of children is influenced by the interactions of different factors. These include modern nerve-wracking life style, wrong food habits

especially junk and fast food, sophisticated living conditions, lack of exercise and irrelevant use of antibiotics leading to immune dysfunction and hypersensitivity of airways. Such factors can determine not only children's respiratory health, but may have also magnitudes for respiratory health in later part of their life. Available management includes antibiotics, mast cell stabilizers, anti-inflammatory, antihistamines, bronchodilators, decongestants and corticosteroids. But, these are associated with many adverse effects and lack long-term sustained effect. Ayurveda explains the detailed *samprapti* (pathology) of various respiratory diseases and its management too. The main causative factors which are included are improper *Agni* (digestive capacity), formation of *Aam* (undigested food) *Viruddha aahar* and *Vihara* (Unhealthy food and life style) which alters immunity and some external allergens like *Raja* (Dust), *Dhooma* (smoke) etc. Ayurveda explains various potent drugs with qualities like, antitussive, expectorant, anti-inflammatory, anti-allergic, mucolytic and immune-modulatory effect which can be used for breaking the *samprapti* (pathogenesis) of the respiratory diseases at various levels, and giving symptomatic relief to the patient and thereby better quality of life. The Ayurveda also having unique concept of *Rasayana* (Immune enhancing majors) especially on *Pranavaha srotas*, which further helps to increase immunity and thereby reducing the respiratory morbidity in children. Thus, it is hypothetical that poly-herbal Ayurveda compound *Balchaturbhadra choorna* can ascertain advantageous and provide effective and long term solution to respiratory diseases and thereby may improve the quality of life and decrease the respiratory morbidity in children. Present paper reviews the evidences regarding the efficacy of *Balchaturbhadra choorna* in the management of respiratory diseases.

Aim and Objectives

This review aims at scanning the scattered literature on the Respiratory diseases in children of the contents of Ayurveda drug *Balchaturbhadra Choorna* and to provide their scientific evidences, so that the information can be used for planning further clinical studies and it can be inculcated as major prescribed medication for Respiratory problems among children as curative and preventive medication.

METHOD

Classical texts of Ayurveda as well as PUBMED, MEDLINE database were used for the search of relevant literature and research papers. The key words used for the search was 'Ayurveda', 'Respiratory System' *Balchaturbhadra choorna* etc. In-vitro analysis,

experimental trials as well as clinical studies were included in the review to search out the reported therapeutic potential of Ayurveda drugs. Only research articles published in English language were considered.

Balchaturbhadra choorna

It is mentioned in various classical Ayurveda text, like Chakradatta[1], Bhaishajya ratnavali[2] and Yog ratnakar[3], especially for respiratory diseases (Kasa, Shwasa) in children.

Table 1: Showing constituents of *Balchaturbhadra choorna*

S.N.	Name	Botanical Name	Parts Used	Ratio
1	*Musta*	*Cyperus rotundus*	Root	01 part
2	*Ativisha*	*Aconitum heterophyllum*	Root	01 part
3	*Karkatshrungi*	*Pistacia intergrima*	Gall	01 part
4	*Pippali*	*Piper longum*	Fruit	01 part

Table 2: Pharmacological properties of the contents of *Balchaturbhadra choorna as per Ayurveda*

Sr.No.	Drug Name	*Rasa*	Guna	Virya	Vipaka	Doshaghnata
1	*Musta*[4]	*Tikta, Katu.*	*Laghu*	*Sheeta*	*Madhur/Katu*	*Kaphahara Pittahara*
2	*Ativisha*[5]	*Tikta, Katu.*	*Laghu*	*Ushna*	*Katu*	*Kaphahara Pittahara*
3	*Katrkatshrungi*[6]	*Tikta, Kashaya*	*Laghu*	*Ushna*	*Katu*	*Kaphahara Vatahara*
4	*Pippali*[7]	*Katu*	*Ushna, Snigdha, Laghu*	*Ushna*	*Madhura*	*Kaphahara Vatahara*

1 Musta (Cyperus rotundus)

In-vitro antibacterial activity in the microorganism stains of human pathogenic bacteria both gram positive and gram negative bacteria such as *Bacillus subtilis, Staphylococcus aureus, Escherichia coli* and *Pseudomonas aeruginosa* were studied under agar well diffusion method. The methanol extract of *Cyperus roduntus* flower showed highly antibacterial activity[8]. The aqueous and ethanolic extracts of *Cyperus rotundus* was evaluated for in vitro antimicrobial activity against clinically important bacteria viz. *Alcaligenes faecalis, Bacillus cereus, Bacillus subtilis, Enterobacter aerogenes, Escherichia coli, Klebsiella pneumoniae, Proteus mirabilis, Proteus vulgaris, Pseudomonas aeruginosa, Pseudomonas pseudo alcaligenes, Salmonella typhimurium, Staphylococcus aureus, Staphylococcus epidermidis,*

Staphylococcus subfava and *Candida tropicalis* by agar disc diffusion and agar well diffusion method. The ethanolic extract of the plant was active against all the investigated bacterial strains while the aqueous extract was inactive for S. typhimurium. The oil and its fractions hydrocarbon-I and II extracted from *Cyperus rotundus* alcohol fraction-cyperol was found to possess significant antibacterial effect against *Staphylococcus Aureus*.[9]

The antibacterial activity of different extracts was determined by agar well-diffusion method[10].

The root extract of C. rotundus therefore had notable antibacterial activity against selected pathogens i.e. *H. influenzae, P. aeruginosa, S. aureus, S. pneumoniae and S. pyogenes*. In a similar study, an inhibitory effect of C. rotundus was observed against selected bacterial strains including *S. aureus, Salmonella enteritidis* and *Enterococcus faecalis* with total oligomers flavonoids and ethyl acetate extracts[11]. The decoction of C. rotundus tubers also showed anti-diarrheal activity and effect on adherence of entero pathogenic *E. coli, entero invasive E. coli and Shigella flexneri* to Hep-2 cells[12]. Tambekar et al, (2009) also reported that MeOH extract of the rhizomes of C. rotundus showed considerable antibacterial potential against *S. aureus, K. pneumoniae, S. typhi*, S. paratyphi, S. typhimurium, P. aeruginosa, E. *aerogenes*[13]. Maximum inhibition was found against *H. influenzae* (18.4±0.07 mm) followed by *S. pyogenes* (17.3±0.13mm), *P. aeruginosa* (16.2±0.07 mm) and *S. pneumoniae* (15.5±0.15 mm) and minimum against *S. aureus* (15.3±0.05 mm) respectively[14]. Immunomodulatory activity of extracted lectins from rhizome of *Cyperus Rotundus* was evaluated on phagocytic activity by carbon clearance test on Albinos Wistar mice at dose of 25mg/kg by intra-peritoneal injection (IP). In carbon clearance test, extracted lectins from rhizome of *Cyperus Rotundus* exhibited significantly dose-dependent phagocytic index indicating stimulation of the reticulo-endothelial system[15]. In vitro tests on the ethanol extracts of C. rotundus rhizomes shows the extract inhibited leukotrienes production by 66–91% at 30–300 µg/ml[16].

2. *Ativisha (Aconitum heterophyllum)*

Anti-inflammatory and analgesic activities of higenamine (constitute of Aconitum species) were evaluated by measuring paw oedema. It was found to possess significant anti-inflammatory activity in the dose range of 10-50 mg/kg (po) and good analgesic activity at the dose of 200 mg/kg.[17] The alkaloid extract *Aconitum heterophyllum* showed moderate to strong level of antibacterial activity against *S. aureus, B. bronchiseptica, B. subtilis, P. putida*

and *X. campestris* at higher concentration of 100 µg/ disc. The alkaloid extracts showed bactericidal effect against *S. aureus, B. bronchiseptica* and *B. subtilis,* whereas bacteriostatic effect was observed against P. putida and *X. campestris*[18]. The ethanolic root extract of *Aconitum heterophyllum* demonstrated the anti-inflammatory properties comparable to diclofenac sodium at dose of 900 mg/kg[19]. The ethanolic extract of A. heterophyllum tuber enhanced the phagocytic function and inhibited the humoral component of the immune system, thus showing immunomodulatory activity[20]. Aconitum has action on the CNS, CVS and respiratory system due to the presence of benzyl ester and - OH group in the Molecular structure[21]. A study shows its antibacterial activity against gram negative (diarrhea causing) bacteria *Escherichia coli, Shigella fl exineri, Pseudomonas aeruginosa* and *Salmonella typhi*[22]. Apart from anti bacterial properties A. hetrophyllum plant has been reported to hold antifungal cytotoxic, antiviral and immune-stimulant properties.[23-24-25]

3. *Karkatshrungi* (*Pistacia intergrima)*

Treatment with aqueous extract of galls showed a dose dependent effect on disruption rate of actively sensitized mesenteric mast cells of albino rats when challenged with antigen (horse serum along with triple antigen vaccine). Treatment of aqueous extract of galls for ten days resulted in significant protection against histamine aerosol-induced bronchospasm in guinea pigs and showed the spasmolytic activity against histamine induced contractions in isolated guinea pig tracheal chain preparation. It revealed the antiasthmatic activity of aqueous extract of P.integerrima galls.[26]

Essential oil of *Pistacia integerrima* J.L. Stewart ex Brandis galls (EOPI) was tested using in vitro studies such as antioxidant activity, mast cell degranulation, angiogenesis, isolated guinea pig ileum preparation and soyabean lipoxidase enzyme activity. In vivo studies included lipopolysaccharide-induced bronchial inflammation in rats and airway hyperresponsiveness in ovalbumin in sensitized guinea pigs using spirometry. EOPI (5-30 µg/ml) inhibits 5-lipoxidase enzyme activity with IC_{50} of 19.71 µg/ml and DPPH scavenging activity up to 100 µg/ml with maximum inhibition of 44.93 ± 2.53% at 100 µg/ml. Pre-treatment with EOPI inhibited erythropoietin-induced angiogenesis. It showed dose dependent (10, 30 and 100 µg/ml) anti-allergic activity by inhibiting compound 48/80 induced mast cell degranulation to an extent 19.08 ± 0.47%. The finding that essential oil induced inhibition of transient contraction of acetylcholine in calcium free medium, and relaxation of S-(-)-Bay 8644-precontracted isolated guinea pig ileum jointly suggests that the

L-subtype Cav channel is involved in spasmolytic action of EOPI. Treatment with EOPI dose dependently (7.5, 15 and 30mg/kg i.p.) inhibited lipopolysaccharide-induced increase in total cell count, neutrophil count, nitrate-nitrite, total protein, albumin levels in bronchoalveolar fluid and myeloperoxidase levels in lung homogenates. Roflumilast was used as a standard. EOPI reduced the respiratory flow due to gasping in ovalbumin sensitized guinea pigs[27]. Further, in another study, *Pistacia integerrima* leaves extracts showed significant response against chemically induced pain ($P<0.001$) whereas galls extracts had highly significant protection ($P<0.0001$) in a dose dependent manner. In thermally induced algesia, *Pistacia integerrima* galls extracts 200 mg/kg (p.o.), showed significant ($P<0.05$) response but less than pentazocine and diclofenac, positive references. The extracts of *Pistacia integerrima* 50-200 mg/kg (p.o.) had modest activity against hind paw acute and chronic inflammation induced by formalin ($P<0.01$).[28]

Pathogenic bacteria used were, *Escherichia coli, Klebsiella pneumoniae, Pseudomonas aeruginosa, Staphylococcus aureus (S. aureus),* methicillin resistant *S. aureus* and vancomycin resistant *S. aureus* along with standard bacterial strains. These MDR bacteria had been recorded to have significant inhibitions by galls extracts, obtained by extraction procedure with five solvents. The chloroform extract against *Staphylococcus aureus* had the highest inhibition zone-size (14 mm). Cefotaxime 30 µg/disc was the positive/reference control and the diluting solvent, 10% dimethyl sulphoxide was the negative control. Recorded MIC values of different extracts ranged between 0.48 and 13.20 mg/mL, and MBC values were 2.58 to 30.00 mg/mL, for these bacteria. Galls-extracts with water and chloroform had shown significant antibacterial activity against bacteria.[29]

In case of antibacterial assay, the tested oils showed outstanding effect against various Gram positive and Gram negative bacterial. The negative control used was DMSO and the positive control was taken as streptomycin (2 mg/ml). In comparison with negative control, almost all the tested bacteria exhibited promising antibacterial activities. The zone on inhibition against *Escherichia coli, Staphylococcus aureus, Klebsiella pneumonia, Straptodirimu, Bacillus stearothermophilus* and *Salmonella typhimurium* was 16, 18, 26, 22, 18 and 20 mm, respectively[30]. The analgesic activity of the *P. integerrima* using hot wire analgesia meter has been studied.[31] Anti-inflammation and analgesic activities of six tretracyclic, triterpenoids, pistaci gerrimones A, B, C, D, E, and F isolated from gall of *P. inegermina* was

studied. Piataci gerrimones C and D exhibited highly significant activities showing an inhibition of paw oedema between 30-70 % at a dose, 5 mg/kg.[32]

4. *Pippali (Piper longum)*

The essential oil of *P. longum* showed antibacterial activity against *B. cereus, B. subtilis, M. tuberculosis, Staph. albus, Staph. Aureus, and B. shigella dysenteriae, Esch.Coli, Sh. boydi, Sal. typhi and Vib. cholerae.* The oil was more active than the oils of *Alpinia galanga, Nigella sativa, Vateria indica* and *Saccopetalum tomentosum*.[33] *P. longum* essential oil was also inhibitory to *Sh. niger* and *Sal. paratyphi*. The oil revealed anti-fungal activity against *Aspergillus flavus, Trichoderma viridi, Curvularia lunata, Penicillium javanicum* and *P. striatu.*[34] A marked anti-inflammatory activity of *P. longum* fruit decoction against carrageenin induced rat paw oedema was reported[35]. Studies have shown that the milk extract of *P. longum* effectively reduced passive cutaneous anaphylaxis in rats and guina pigs; protected guinea pigs against antigen induced bronchospasm.[36-37] The petroleum ether extract of *P. longum* produced respiratory stimulation in smaller doses in various species. Morphine and pentobarbitone induced respiratory depression was antagonized by the extract. The study indicates the presence of some medullary stimulant factor in the extract[38]. The crude extract of *P. longum* as well as piplartine (one of its alkaloid) suppressed the ciliary movement of the oesophagus of frog; it is due to the suppression of cough reflex[39]. The interaction of piperine with enzymatic drug bio transforming reactions provides biochemical basis for the enhancement of the drug bioavailability[40].

Toxicological Assessment of the drug: Acute toxicity test: While analysing acute toxicity *Balacaturbhadrika churna* did not produce any signs or symptoms of toxicity or mortality up to a dose of 2000 mg/kg which is more than 20 times more than therapeutic equivalent dose in rats, clearly indicating that the formulation is unlikely to induce any drastic toxic effect in spite of containing *Aconitum heterophyllum*. Long-term toxicity test: The effect of *Balacaturbhadrika churna* on various parameters such as percentage change in body weight, on the hematological parameters, on serum biochemical parameters, on biochemical parameters, and histopathological studies showed no harmful effect and did not produce any adverse effect on the above parameters except heavy dosage which was very much larger than actual therapeutic dose.[41]

CONCLUSION: *Balchaturbhadra Choorna* is quite safe for administration among Children and can provide better result in diseases of Respiratory Allergic Disorders as well as number of common respiratory infections both as prophylactic and curative medication.

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