



## Research Article

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### EVALUATION OF THE EFFICACY OF MUSTADI YOG IN CHILDREN SUFFERING FROM DISEASE KASA

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#### ABSTRACT

The aim of study was clinical, antibacterial evaluation of efficacy of Mustadi Yog in the children suffering from kasa. For clinical study 60 children of the age group of 6 months to 5 years were selected and divided in 3 groups. Group I (Trial group) received Mustadi Yog in syrup form, Group II (Control group) received Salbutamol in syrup form and Group III received combination of Mustadi Yog and Salbutamol; duration of study was 14 days with subsequent follow ups, Assessment in improvement or deterioration in kasa symptoms was done by the scoring system and changes in laboratory parameters. Statistical evaluation of clinical features shown good result in Group III patients, treated with combination of Syrup Mustadi Yog and syrup Salbutamol. Effect of Mustadi Yog with Salbutamol was seemed to be significant in reducing the symptoms of Kasa. Mustadi Yog in combined therapy has beneficial therapeutic results to reduce/cure the Kasa. For antibacterial study, *Proteus Spp.* and *Pseudomonas aeruginosa* was sensitive to alcoholic extract of all 5 test drugs whereas staphylococcus aureus was sensitive to Musta, Pippali, Karkatshringi and Vasa.

**Keywords:** Kasa, Mustadi Yog, Salbutamol, Ayurveda, HPLC.

#### INTRODUCTION

Respiratory complaints are well defined clinical conditions in the contemporary medical science. They are classified under the broader heading of Respiratory Tract Disorders, which is a group of different symptoms and diseases. In developing and even developed countries, paediatric Outdoor Patients Department (OPD) have more than 50% of patients having respiratory tract complaints<sup>1,2</sup>As cough is the most frequent symptom of respiratory diseases in which majority patients having recurrent cough as the manifestation of recurrent respiratory disease. In classics, descriptions of disease Kasa clearly correlate with cough and its Pathophysiology exactly correlates with the mechanism of cough reflex<sup>3</sup>. Poor housing, fire-wood, coal, cooking in open, sanitary condition are causes of respiratory infections in rural India while in urban area pollution from industry, vehicles, tobacco smoke, exposures to air, exposure to allergens have been correlated with airway hyperactivity. In which cough is a preventable condition but there is, till date, no cure for it in the contemporary medical science.

Non judicious use of antibiotics and corticosteroids<sup>4</sup> in contemporary system of medicines during present era has led to iatrogenic suppression of host immunity and birth of multidrug resistant traits of pathogens<sup>5</sup>. This phenomenon in turn results in the recurrence of Respiratory Tract Infection (RTI)<sup>6</sup>. In modern system of medicine, antibiotics, anti-histamines, bronchodilators, cough expectorants etc. are commonly used for the management of RTI. Although, they all are effective in reducing the severity of the RTI and suppressing the symptoms, yet, none of these modalities of treatments provide a permanent cure, and have limitations owing to their effects.

Though, to achieve the best result out of this holistic approach it is essential to understand completely the basic fundamentals and also, the approach of that system.

While reviewing of latest Government data, in the last decade, year by year mortality rate due to diseases of respiratory system is increasing<sup>7</sup> It was 4.3% in year 2002, 5.7% in 2006, 9.5 % in 2009 and reached to 10.6 % in year 2010<sup>8</sup>.

Kasa is the most frequently encountered problem in the Balyavastha (Pediatric age). Since Kapha is the main culprit in production of Kasa(cough) and Kapha Dosha is dominating in Balyavastha, the incidence is more in this age group. Early intervention is necessary in case of Kasa as it may produce Kshaya<sup>9</sup>(Tuberculosis). Also it is important to treat any Balaroga at the earliest as it may hamper the proper Vriddhi (Growth and development) of child which is clearly described by Charaka, that Avighata (non obstruction) as Shareera Vriddhikara Bhava (i.e. Vighata hinders Shareera Vriddhi)<sup>10</sup>. Thus in the present work Kasa was taken as the subject of intervention with drug Mustadi Yog.

#### MATERIAL AND METHODS

Total number of 60 patients were registered from the O.P.D of Kaumarbhritya /Bal- Roga, O.P.D no. 25, S.S. Hospital, Ayurveda wing, I.M.S, B.H.U, Varanasi (EC Registration No. ECR/526/Inst/UP/2014Dt.31.1.14) after proper screening on the predesigned proforma. The cases were selected on the basis of following exclusion and inclusion criteria.

## Consent

A voluntary, signed, witnessed consent/assent was obtained from the participant/ parent's/Guardians prior to the start of clinical trial.

## Inclusion criteria

- Age between 6 months to 5 years.
- Case of productive and dry cough.
- Case of acute or chronic cough.
- Associated with or without blood.
- Pain in chest present or absent.
- Occasionally vomiting.
- Not associated with life threatening disease.

## Exclusion criteria

- Sign of severe dehydration or shock
- Not accepting orally
- Suffering with any severe systemic disease e.g. septicemia, meningitis associated with diarrhea, high grade fever.
- Age less than 6 months and more than 5 years
- Persistent vomiting, huge distension of abdomen, severe abdominal pain

Then all the cases were screened for other possible causes of cough before including in final groups. To ensure follow ups, only the patients of Varanasi district preferably of city were registered for the study.

All 60 registered cases were divided randomly into three groups and each group contains 20 patients as follows-

- Group I: Those put-on Syrup Mustadi Yog (M).
- Group II: Those put-on Syrup Salbutamol(SBM).
- Group III: Those put-on Syrup Mustadi Yog and Syrup Salbutamol (M +SBM).

## Investigations

The following investigations were used during the study

- Routine blood examination [Hemoglobin (Hb)%, Total Leukocyte Count (TLC), Differential Count (DLC), Erythrocyte Sedimentation Rate (ESR)]
- Absolute Eosinophil Count (AEC).
- Stool routine and microscopy
- Sputum for AFB and Montoux test.
- X-ray of chest PA view.

## Collection and Preparation of medicines

This study has been done to evaluate the effect of 'Mustadi Yoga' in Kasa. It includes -Ativisha, Karkatshringi, Musta, Pippali and Vasa. The study drug Mustadi Yog was selected from Yog Ratnakar-Bal Rogadhikar, Kasa Chikitsa<sup>11</sup>The drug was collected from Haridwar, Uttarakhand. The plant was identified and authenticated by the Prof. N. K. Dubey Department of Botany, Banaras Hindu University, Varanasi Varanasi with the voucher specimen no. as given:

1. *Pistacia integerrima* Stewart ex Brandis- Anacard. 2015/1
2. *Cyperus rotundus* L.- Cyper 2015/1
3. *Piper longum* L. – Piper 2015/1
4. *Aconitum heterophyllum* Wall. Cat.- Ranun 2015/1
5. *Adhatoda vasica* Nees -Acanth. 2015/3

Medicine was prepared in Endovedic Pharmacy, Ramnagar Varanasi, as recommended by the Sharangdhara samhita. The

idea to have trial of the drugs in syrup form is for pediatric age group only.

## Management

In the clinical study, following drugs were selected based on the reference of ancient *Ayurvedic* literature as well as modern science.

- Syp. Mustadi Yog given in 8-10mg/kg/dose thrice in a day.
- Syp. Salbutamol (2mg/5ml) given in 0.1-0.4mg/kg/dose thrice in a day.

To assess the effect, drugs were given randomly to the patients, without selection of patients on the basis of Features.

## Follow up

Every effort was made to get information from the patient's nearest attendant of each group at each follow up. They were asked for first follow up at 8hrs, 2<sup>nd</sup> follow up on day 3<sup>rd</sup>, 3<sup>rd</sup> follow up on day 7<sup>th</sup> and 4<sup>th</sup> follow up on day 14<sup>th</sup>. On each follow up, complete clinical examination of patient was done. Patients were asked also for the improvement in cough characteristics and clinical features. Finally, the findings were noted on the proforma.

## Assessment of improvement in condition

Assessment in improvement or deterioration in cough is done by the scoring system.

1. Subsidence of the clinical signs and symptoms.
2. Absence of recurrence during follow-up.
3. Changes in general health conditions.
4. Changes in haematological parameters.

A special scoring pattern was devised to assess the overall effect of therapy incorporating both subjective and objective parameters. Each symptom/sign was given a grading in increasing order of severity. Evaluation for recurrence of the signs and symptoms of Kasa, general health status and systemic examination were conducted during the follow up period.

## Method of statistical analysis

The data collected were transferred on master chart showing various items/variables in columns and subjects in rows. The analysis of data was done using statistical software SPSS version 16.

## Antibacterial assay

For antibacterial study, Alcoholic extract was prepared by Soxhlet method of extraction. The extract was collected in separate sterile vials and preserved at 4°C temperature. Anti-microbial susceptibility testing was carried out by-

- Dilution method
- Diffusion method  
Diffusion method was done by two methods
  - Stoke's method
  - Kirby – Bauer method

In routine laboratory modified Kirby-Bauer method was used as suggested by NCCLS (National Committee for Clinical Laboratory Services), USA, 2000.

The MIC of active alcoholic extracts was determined by tube dilution method. The tubes were incubated at 37°C in an

incubator and observed for change in turbidity after 24 h. A tube containing nutrient broth without extract was taken as control. The least extract concentration which inhibited the growth of the test organisms was taken as MIC.

**OBSERVATION AND RESULT**

In present Study showed that, incidence of kasa was more in males than females maximum cases were belonging to middle socioeconomic status and 30 – 49 months age group was the most affected group. (Table 1)

Statistical evaluations of clinical features showed good results in Group III treated with Combination of Syrup Mustadi Yog and Syrup Salbutamol. intra group comparison showed highly significant result in dry cough, productive cough, sore throat, hoarseness of voice, breathlessness, blocking of nose and wheezing. whereas significant improvement was seen in crepitation. (Table 2)

In Intergroup comparison, highly significant result was seen in blocking of nose during first and second follow up, significant improvement was seen in wheezing after second follow up whereas in productive cough significant improvement was seen after third follow up not significant result found in dry cough, sore throat, hoarseness of voice, breathlessness and crepitation. (Table 3)

Evaluation by laboratory parameter showed good result in group III, intra group comparison showed highly significant improvement in Eosinophil count, Monocyte count, ESR, Absolute Eosinophil count whereas significant improvement

seen in Hb% and TLC. Not significant result found in Neutrophil count and lymphocyte count. (Table 4)

Intergroup comparison showed that highly significant improvement showed in Hb% and Eosinophil count whereas significant result seen in TLC, Monocyte count and AEC. (Table 5)

In antibacterial study, amongst different bacteria included in the study some pathogens i.e. *Proteus* spp. Was sensitive to alcoholic extract of all 5 test drugs with MIC value of Musta (35.15µg/ml), Pippali (2156.25µg/ml), Ativisha (625µg/ml), Karkatshringi (105.46µg/ml), Vasa (14.64µg/ml). *Pseudomonas aeruginosa* were inhibited by alcoholic extract of Musta (8.78µg/ml), Pippali (134.76µg/ml) Ativisha (9.766µg/ml), Karkatshringi (7.324µg/ml), Vasa (105.46µg/ml).

*S. aureus* was inhibited by Musta (1125µg/ml), Pippali (34500µg/ml) Karkatshringi (1687.5µg/ml) and Vasa (3.662µg/ml). *Salmonella Typhi* was inhibited by Musta (17.578µg/ml) and Pippali (2156.25µg/ml). The Above finding suggests that Mustadi Yoga has got definite antibacterial activity on different bacteria.

In **phytochemical study**, Out of the 8 phenolic standards used, Ativisha contained only one phenolic compound i.e. Shikimic acid whereas Musta and Pippali contained 5 compounds as shown in the table. Syringic acid was not detected in Musta and Quercetin was not detected in Pippali. Only two phenolic compounds i.e. Syringic and Cinnamic acids were detected in Karkatshringi. Four phenolic compounds i.e. Shikimic acid, Gallic acid, Rutin and Ferulic Acid were detected in Vasa (Table 6).

**Table 1**

Groups	Male (% of Male)	Female (% of female)	Low SES (%)	Middle SES (%)	High SES (%)	Mean Age ±SD (months)
Group-I (M) (n=20)	12 (60%)	8 (40%)	2 (10%)	16 (80%)	2 (10%)	39.25 ± 17.11
Group-II (SBM) (n=20)	10 (50%)	10 (50%)	4 (20%)	11 (55%)	5 (25%)	41.55 ± 16.86
Group- III (M+SBM) (n=20)	15 (75%)	5 (25%)	3 (15%)	17 (85%)	0 (0%)	36.50 ± 16.52

\*n' denotes total number of cases.

**Table 2: Statistical presentation of Intra group Comparison after treatment (Friedman's Test)**

Sr.No.	Clinical features	Group I	Group II	Group III
1	Dry Cough	$\chi^2=25.390$ P=0.000	$\chi^2=20.463$ P=0.000	$\chi^2=14.755$ P=0.002
2	Productive Cough	$\chi^2=33.811$ P=0.000	$\chi^2=34.327$ P=0.000	$\chi^2=44.889$ P=0.000
3	Sore Throat	$\chi^2=35.769$ P=0.000	$\chi^2=37.976$ P=0.000	$\chi^2=37.909$ P=0.000
4	Hoarseness of voice	$\chi^2=9.000$ P=0.029	$\chi^2=9.000$ P=0.029	$\chi^2=16.286$ P=0.001
5	Blocking of Nose	$\chi^2=33.725$ P=0.000	$\chi^2=36.475$ P=0.029	$\chi^2=53.488$ P=0.000
6	Breathlessness	$\chi^2=28.213$ P=0.000	$\chi^2=28.213$ P=0.000	$\chi^2=32.205$ P=0.000
7	Wheezing	$\chi^2=19.714$ P=0.000	$\chi^2=12.000$ P=0.007	$\chi^2=38.000$ P=0.000
8	Crepitation	$\chi^2=14.625$ P=0.002	$\chi^2=17.778$ P=0.007	$\chi^2=8.561$ P=0.036

**Table 3: Statistical presentation of Inter group Comparison after treatment (Pearson chi square test)**

Sr.No.	Clinical features	At time of registration	First follow up	Second follow up	Third follow up
1	Dry Cough	$\chi^2=1.76$ P=0.415	$\chi^2=1.05$ P=0.592	$\chi^2=2.00$ P=0.367	$\chi^2=4.20$ P=0.122
2	Productive Cough	$\chi^2=2.00$ P=0.367	$\chi^2=1.32$ P=0.517	$\chi^2=5.47$ P=0.762	$\chi^2=6.00$ P=0.050
3	Sore Throat	$\chi^2=2.00$ P=0.367	$\chi^2=2.00$ P=0.367	$\chi^2=2.00$ P=0.367	$\chi^2=0.00$
4	Hoarseness of voice	$\chi^2=1.88$ P=0.392	$\chi^2=0.288$ P=0.866	$\chi^2=0.00$	$\chi^2=0.00$
5	Blocking of Nose	$\chi^2=2.19$ P=0.334	$\chi^2=10.900$ P=0.004	$\chi^2=15.0$ P=0.001	$\chi^2=0.00$
6	Breathlessness	$\chi^2=0.549$ P=0.766	$\chi^2=4.85$ P=0.089	$\chi^2=4.91$ P=0.086	$\chi^2=0.00$
7	Wheezing	$\chi^2=9.33$ P=0.009	$\chi^2=1.05$ P=0.592	$\chi^2=6.89$ P=0.032	$\chi^2=3.56$ P=0.168
8	Crepitation	$\chi^2=0.196$ P=0.906	$\chi^2=0.186$ P=0.911	$\chi^2=0.786$ P=0.675	$\chi^2=2.03$ P=0.362

**Table 4: Laboratory parameters after treatment by intra group comparison (Paired 't' test)**

Sr.No.	Laboratory Findings	Group I	Group II	Group III
1	Hb %	-0.5200±0.8924 t = -2.606 P = 0.017	-0.1450±1.1067 t = -0.586 P = 0.565	-0.3500±0.7352 t = -2.129 P = 0.047
2	Total Leucocyte Count	1806±1317.48 t = 6.131 P = 0.000	2144±1610 t = 5.951 P = 0.000	1160±2330.76 t = 2.226 P = 0.038
3	Neutrophil Count	3.950±7.515 t = 2.351 P = 0.030	8.300±8.298 t = 4.473 P = 0.000	0.806±8.835 t = 0.405 P = 0.690
4	Lymphocyte count	-2.950±8.420 t = -1.567 P = 0.134	-3.550±9.676 t = -1.641 P = 0.117	-3.550±7.964 t = -1.994 P = 0.061
5	Eosinophil Count	1.850±1.565 t = 5.286 P = 0.000	1.650±2.134 t = 3.457 P = 0.003	1.300±1.380 t = 4.212 P = 0.000
6	Monocyte Count	1.150±3.329 t = -1.545 P = 0.139	-1.800±4.514 t = -1.783 P = 0.091	1.900±2.049 t = 4.146 P = 0.001
7	ESR	3.900±1.619 t = 10.773 P = 0.000	3.700±1.490 t = 11.103 P = 0.000	3.600±1.536 t = 10.485 P = 0.000
8	Absolute Eosinophil Count	Z = -3.920 P = 0.000	Z = -3.771 P = 0.000	Z = -3.920 P = 0.000

**Table 5: Laboratory parameters after treatment by inter group comparison (one way ANOVA test)**

Sr.No.	Laboratory Findings	At Registration	At Last follow up
1	Hb %	F=5.449 P= 0.007	F=8.104 P= 0.001
2	Total Leucocyte Count	F=1.186 P=0.313	F=3.065 P=0.050
3	Neutrophil Count	F=0.460 P=0.633	F=1.574 P=0.216
4	Lymphocyte count	F=0.988 P=0.378	F=1.182 P=0.314
5	Eosinophil Count	F=5.951 P=0.004	F=9.897 P=0.000
6	Monocyte Count	F= 4.115 P=0.021	F=3.810 P=0.028
7	ESR	F=1.266 P=0.290	F=0.608 P=0.548
8	Absolute Eosinophil Count	$\chi^2=6.347$ P=0.042	$\chi^2=8.943$ P=0.011

**Table 4: Concentration of the phenolic compounds in the five plants**

SN	Phenolic compounds	Pippali	Musta	Ativisha	Karkatshringi	Vasa
1.	Shikimic acid	1068µg/ml	140µg/ml	498.5 µg/ml	-	846.9 µg/ml
2.	Gallic acid	265µg/ml	31.9µg/ml	-	-	24.26 µg/ml
3.	Syringic acid	4.5µg/ml	-	-	38.6 µg/ml	-
4.	Quercetin	-	8.3µg/ml	-	-	-
5.	Cinnamic acid	1.4 µg/ml	10.9µg/ml	-	22.5 µg/ml	-
6.	IAA	92.8 µg/ml	46.5µg/ml	-	-	-
7.	Rutin	-	-	-	-	21.72 µg/ml
8.	Ferulic Acid	-	-	-	-	12.99 µg/ml

## DISCUSSION

Kasa has been considered as a disease in Ayurveda with elaborate description of separate etiology, pathogenesis, premonitory symptoms, signs with symptoms and treatment<sup>12</sup>. It is also considered as mere symptom of other diseases mainly the diseases of Pranavaha and Annavaha Srotas (Respiratory and Gastrointestinal system). The disease Kasa explained in Ayurvedic classics includes many of the upper and lower respiratory diseases as it is evident by the vast collection of signs and symptoms. The diseases of systems other than respiratory are dealt as the symptom Kasa described at the context of respective diseases. Since Kasa is a Vata -Kapha dominated disease, its incidence should be witnessed more during the childhood, which is the normal time of Kapha dominance. Balyavastha is Kapha dominant age group, so the incidence is found more in this age group. In addition to above data the description of the Samprapti (manifestation) of Kasa almost exactly correlates with the mechanism of cough reflex<sup>13,14</sup>. Thus beyond doubt, Kasa can be considered as 'Cough' in modern terms.

Mustadi yog contains Mustaka, Ativisha, Vasa, Pippali, and Karkatshringi. Majority of the ingredients having Tikta (Bitter), Kashaya (Astringent) and Katu Rasa (Pungent taste). Katu and Tikta Rasa drugs are known for its Deepana (digestion capacity) and Pachana (Digestive strength) properties. Due to Pachana properties drug makes Pachana of Ama (digestion of undigested food material) along with its Deepana property. These both properties breaks the root cause of disease kasa i.e. Mandagni (lowering down of digestive strength) and Katu and Kashaya Rasa due to its Shodhana property purifies the body<sup>15-18</sup>. By these means the overall immunity is increased and in this way the capability of body to fight against pathogens gets naturally increased.

Age group 6 months 5 years has been included in the present study as the condition is most prevalent among them<sup>19</sup>. Maximum number of patients in age group 3-5 years found as they are more susceptible for infections from play schools, schools and unhygienic eating habits<sup>20</sup>.

The male children tend to suffer more, since they have smaller airways for a given lung size, which is independently inherited in addition to the fact that boys have a higher incidence of respiratory infections during childhood<sup>21</sup>.

Maximum number of patients are from middle class family, where the child is pampered more and improper food habits like more of ice-creams, chocolates etc are given which lead to Nidanasevana (causative factors) and lead to recurrent health problems.

Improvement in cough may be because of pacification of vata & kapha dosha and removal of obstruction from pranavaha Srotas

due to antitussive and mucolytic properties of the ingredients of Pippali and Vasa as potent expectorant liquefies the thick viscid sputum<sup>22,23</sup>.

Blocking of nose, Sore throat and hoarseness of voice are because of edematous and later on inflammatory changes in various target organs in the disease process. The trial drug show significant anti-inflammatory effect<sup>24</sup>.

Relief from Breathlessness and reduction in Wheezing and crepitations was because of relieving the obstruction in passage of prana vayu by sama kapha, the probable action of drug was because of its kapha vathara effect & Usna, Teeksa guna. The relief might be result of bronchodilator action of Pippali acts by inhibiting the contractile action of Histamine by glycoside saponin.<sup>25</sup>

There is improvement in TLC, Differential Leucocyte count, and Absolute Eosinophil count but this mean decrease in count was also in normal range.

Improvement in status of leucocyte count shows the anti-inflammatory effect of trial drug. It may be attributed to immunomodulatory and its anti inflammatory effects of various components such as Pippali, Ativisha and Karkatshringi<sup>26</sup>

In antibacterial study, *Proteus* Spp. and *Pseudomonas aeruginosa* was sensitive to alcoholic extract of all 5 test drugs whereas staphylococcus aureus was sensitive to Musta, Pippali, Karkatshringi and Vasa. The present study has revealed encouraging results but study needs further evaluation in large sample size.

## CONCLUSION

In short, it can be concluded that Effect of Mustadi Yog with Salbutamol was seems to be significant in reducing the symptoms of Kasa. i.e. role of Mustadi Yog in combined therapy has beneficial therapeutic results to reduce/cure the Kasa. Mustadi Yog needs further evaluation in large sample study. All 5 trial drugs possess definite in-vitro antimicrobial property against *Proteus* spp. and *pseudomonas aeruginosa*.

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