Clinical Research

Role of Kasahara Dashemani Vati in Kasa and Vyadhikshamatva in children with special reference to recurrent respiratory tract infections

Nayan Kumar Subrahmanya, Kalpana Shanthibhai Patel¹, Virendra Kumar Kori², Rajagopala Shrikrishna²

Assistant Professor, Department of Kaumarabhritya, SDM College of Ayurveda and Hospital, Hassan, Karnataka, Associate professor and Head¹, Assistant Professor², Department of Kaumarabhritya, Institute for Post Graduate Teaching and Research in Ayurveda, Gujarat Ayurved university, Jamnagar, Gujarat, India.

Abstract

The present single-centered randomized control trial (RCT) was carried out with the prime aim of assessing the effect of Kasahara Dashemani Vati (trial drug) on Kasa and Vyadhikshamatva in the children suffering from recurrent respiratory tract infections and comparing it with the efficacy of Indukanta Vati. The clinical trial included 40 patients belonging to age group of 3-12 years. The drugs were administered in a daily dose fixed as per “Clark’s Rule” along with honey for duration of 60 days. The effect of treatment on the signs and symptoms of Kasa was assessed on the 15th day, whereas the effect on Vyadhikshamatva was assessed on the 60th day. The patients were under follow-up for a period of 60 days after completing the treatment course for evaluation of any recurrence. Effect of the therapy on the individual signs and symptoms of Kasa, laboratory parameters, immunoglobulin (Ig) biomarkers, status of Atura Balo, and prevention of recurrence during follow-up period were the parameters used to assess the overall effect of therapy. The observed data were subjected to appropriate statistical analysis for testing the statistical significance. Kasahara Dashemani provided relief in all symptoms of Kasa irrespective of Doshic involvement and on the parameters of Atura Balo. All the changes were statistically highly significant. The control group also showed similar effects which were statistically highly significant. The trial group was found to have a direct influence on serum Ig status. No patient has reported any adverse drug reactions during the treatment and follow-up periods.

Key words: Immunoglobulin, Indukanta Vati, Kasahara Dashemani Vati, Recurrent respiratory tract infection, Vyadhikshamatva

Introduction

Respiratory system is in continuous contact with the external environment since birth until one’s lifetime, so it is most vulnerable to infections and considered as the prime victim of hyper sensitization in most of the circumstances.[1] Thus respiratory tract infections (RTI) account for more than 50% of patients attending the pediatric OPD in developing and even developed countries worldwide.[1,2] Kasa is a disease explained in Ayurveda which involves most of the presentations of a respiratory tract disease. In the pathogenesis of disease Kasa, vitiated Kapha obstructs the free flow of Prana Vata in Kantha and Uras.[9] Since Kapha is the main culprit in production of Kasa and Kapha is the dominating Dosha in Balyavastha (during childhood), the incidence is more in this age group. Pediatric age group is more vulnerable because of anatomical and physiological peculiarities (hypertrophied lymphoid tissues,[1] mucous hyper secretion,[9] peculiarities of Eustachian tube,[7] etc.), immunological considerations[8] (first exposure, immature immunological defenses, etc.), and social factors (attending school,[9] improper food and eating habits,[9] etc.). Recurrent cough is the common manifestation of recurrent respiratory tract infections (RRTI) which is more akin to the disease Kasa delineated in Ayurvedic classics.

Early intervention is necessary in case of Kasa as it is a potential Nidantarbakara Vyadhí (disease having tendency to produce secondary diseases) to produce Kshaya[10] (a disease characterized with severe emaciation). It is noted that children suffering from recurrent RTI exhibit significantly hampered growth and development (including intellectual and social up-gradation).[11]
In above condition of recurrent Kasa, the treatment should fulfill duel targets; one which subsides the disease Kasa and the other which promotes the immune system. Ayurveda has many drugs that act on complaints of respiratory system and simultaneously act as immunomodulators as well. Kasahara Dashemani[12] is a group of 10 herbs where in half are acting on the presenting complaint of Kasa to subside it and rest are proven immune-modulators for preventing the recurrence, thus fulfilling the above objectives. It is also accountable to note that these drugs have the capability to subside all the three types of Doshic entities. The control drug Indukanta Vati[13] is frequently used in the southern part of the country in a broad spectrum of diseases, especially in RRTIs; its immunomodulatory action in children has been proved by a number of previous studies.

The present study was carried out with the prime aim of assessing the effect of trial formulation Kasahara Dashemani Vati on Kasa and Vyadhikshamatva Shakti in children against Indukanta Vati as the control.

This clinical trial has been cleared by Institutional Ethics Committee Vide Ref-PTG/7-A/Ethics/2010-2011/1558/32 dated 01/09/2010 and the trial has been registered in Clinical Trial Registry of India (CTRI), ref. no. CTRI/2011/10/002062 [Registered on: 13/10/2011].

Materials and Methods

Forty patients fulfilling the inclusion criteria were recruited from the Kasumarabhritya OPD of the institute. Informed consent of the parent/guardian has been taken prior to the inclusion of the patient in the trial. The trial duration was from 10/2010-08/2011.

Inclusion criteria

Patients of either sex belonging to age group of 3-12 years presenting with classical signs and symptoms of Kasa with at least one episode a month for a minimum duration of 6 months were included in the trial.

Exclusion criteria

Patients with bronchial asthma, tuberculosis, severe lower RTI (pneumonia, emphysema, bronchectasis, etc.), or associated with other systemic illnesses were not included in the trial.

Grouping and design

Recruited patients were allotted in the trial by randomized allocation method. In the present study, the powdered tablets were administered in three divided doses given after food along with honey (quantity sufficient) for duration of 60 days. The daily dose was calculated based on the body weight (Clark’s Rule), with adult dose as 12 g[14] per day. The effect of treatment on the signs and symptoms of Kasa was assessed on the 15th day after starting the treatment, whereas the effect on Vyadhikshamatva Shakti was assessed on the 60th day (after completion of the treatment). All the patients were under regular follow-up for examination of any recurrence in the signs and symptoms of Kasa for a period of 60 days after completing the treatment course.

Laboratory investigations

Routine blood, urine, and stool examinations were carried out before treatment to rule out any major associated diseases and after treatment to screen for significant hematological or biochemical changes. Total leukocyte counts (TLC) and absolute eosinophil count (AEC) were taken as the indicators of infection and allergy respectively. Serum Ig-Ε and IgG were estimated as immunological bio-markers for evaluating the drug action on humoral immunity.

Assessment criteria

Effect of the therapy on the individual signs and symptoms of Kasa, routine laboratory parameters, immunoglobulin (Ig) biomarkers IgG and IgE, status of Bala (Agni, Deha, and Satva), and prevention of recurrence in the signs and symptoms of Kasa during the follow-up period were the parameters used to assess the overall effect of therapy on Kasa and Vyadhikshamatva. The overall effect of the therapy was derived by a specially designed scoring system by considering both subjective and objective parameters of assessment.

Statistical analysis

The individual and overall effect of therapy of each group (within group) was tested for statistical significance by using paired Student “t”-test, whereas the comparative effect of trial and control groups (between two groups) was tested by using unpaired Student “t” test. Wilcoxon Signed Rank Test was done wherever Student “t”-test was not possible. The results were interpreted at P < 0.05, P < 0.01, and P < 0.001 significance levels. The obtained results were interpreted as: Insignificant P > 0.05, significant P < 0.05, highly significant P < 0.01 or P < 0.001.

Results

Trial drug

Kasahara Dashemani Vati on Vataja symptoms provided 65% relief in Shushka Kasa, 73% relief in Shirashoola, 75% relief in Hritshoola and 53% relief in Daturabalya. Provided 100% relief on Jwara and 75% of relief on Peeta Nishtheevana which are Pittaja symptoms. On Kaphaja symptoms it provided 64% relief in Swetakapha, 57% in Mandagni, 79% in Peenasa, 59% in Aruchi, and 100% relief in Vamana. All the changes were statistically highly significant with P < 0.001. The formulation also showed statistically highly significant relief in the duration of each bout, daily frequency of bouts, and the nature of sputum parameters [Table 1]. On Atura Bala the trial drug provided 45% improvement in the Agnibala, 50% improvement in the Dehabala, 6.5% in the Sharira Upachaya, and 36% improvement in the Satvabala. All the above changes were statistically highly significant [Table 2].

On the laboratory parameters, the trial drug showed a decrease of 2.67% in TLC, a decrease of 5.39% in total polymorphs, a decrease of 3.21% in AEC, and a decrease of 3.42% in the erythrocyte sedimentation rate (ESR). It is also observed that there was an increase of 5.27% in absolute lymphocyte count (ALC). All the changes were statistically insignificant. There was increase in serum albumin, whereas globulin and total proteins showed a decrement. The changes were statistically insignificant except in globulin which was statistically

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Table 1: Effect on symptoms of *Kasa* in group A (Kasahara Dashemani Vati treated)

| Features          | N  | BT | AT | % of relief ±SE | T    | P       |
|-------------------|----|----|----|-----------------|------|---------|
| Shushka Kasa      | 06 | 2.83 | 1.00 | 64.71 ± 0.16 | 11.05 | <0.001 |
| Shirashoola      | 05 | 2.20 | 0.60 | 72.73 ± 0.21 | 6.41  | <0.001 |
| Hrit Shoolo       | 07 | 2.29 | 0.57 | 75.00 ± 0.17 | 10.04 | <0.001 |
| Daurbalya         | 07 | 2.14 | 1.00 | 53.33 ± 0.22 | 4.66  | <0.001 |
| Peetanishtheeva   | 08 | 2.50 | 0.63 | 75.00 ± 0.28 | 6.79  | <0.001 |
| Jwara             | 12 | 1.75 | 0.00 | 100 ± 0.13    | 14    | <0.001 |
| Swetakapha        | 06 | 2.33 | 0.83 | 64.29 ± 0.20 | 7.06  | <0.001 |
| Mandagni          | 07 | 2.00 | 0.86 | 57.14 ± 0.13 | 8.64  | <0.001 |
| Aruchi            | 13 | 2.23 | 0.92 | 58.62 ± 0.13 | 10.18 | <0.001 |
| Vamana*           | 09 | 2.00 | 0.00 | 100.00 ± 0.00 | -     | <0.01  |
| Peenasa           | 14 | 1.00 | 0.21 | 78.57 ± 0.10 | 8.33  | <0.001 |
| Duration of each bout | 20     | 01.30 | 00.29 | 77.88 ± 0.13 | 7.78  | <0.001 |
| No. of bouts      | 20  | 18.20 | 04.1 | 77.47 ± 1.21 | 11.62 | <0.001 |
| Sleep disturbance | 11  | 01.55 | 00.27 | 82.35 ± 0.14 | 9.04  | <0.001 |
| Nature of sputum  | 20  | 01.95 | 00.65 | 66.67 ± 0.16 | 7.93  | <0.001 |

*Wilcoxon signed rank test was done as t test was not possible. AT: After treatment, BT: Before treatment, SE: Standard error

Table 2: Effect on *Aturabala* in Group A (KD Vati treated)

| Features          | N  | BT | AT | % of relief ±SE | T    | P       |
|-------------------|----|----|----|-----------------|------|---------|
| Agnibala          | 20 | 08.55 | 04.70 | 45.03 ± 0.34 | 11.16 | <0.001 |
| Dehabala          | 20 | 04.80 | 02.40 | 50.00 ± 0.13 | 18.09 | <0.001 |
| Sharira upachaya/Wt | 20 | 19.90 | 21.19 | 6.48 ± 0.11  | 10.93 | <0.001 |
| Satvabala         | 20 | 07.45 | 04.80 | 35.57 ± 0.23 | 11.06 | <0.001 |

AT: After treatment, BT: Before treatment, SE: Standard error

significant. Both the biomarkers IgG and IgE showed a decrease of 6.66% and 37.85% respectively. The changes were statistically not significant [Table 3]. The overall effect of treatment in Group A was 53.82%, which was statistically highly significant.

Control drug

On Vataja symptoms, Indukanta Vati provided a relief of 56% in Shushka Kasa, 60% relief in Shirashoola, 76.47% in Hrit Shoolo, and 67% relief in Daurbalya. On Pittaja, symptoms, it showed 64% relief in Peetanishtheeva and 100% relief in Jwara. On Kaphaja symptoms the drug showed 74% relief in Shvetakapha, 73% on Mandalagni, 67% relief in Aruchi, 100% relief in Vamana, and 92% relief in Peenasa. The results were statistically very highly significant except in Shirashoola and Swarabhaeda where it was statistically insignificant. It was also observed that the drug provided statistically highly significant relief in duration of each bout, daily frequency of bouts and the nature of sputum parameters [Table 4].

On Aturabala, the control drug provided 39% improvement in Agnibala, 47% improvement in Dehabala 6.4% improvement in Sharira Upachaya, and 29% improvement in Satvabala. The changes were statistically highly significant [Table 5].

On laboratory parameters, Indukanta Vati group showed a decrease of 13.22% in TLC and a decrease of 11.51% in polymorphs, 2.7% in AEC, 2.21% in ALC, and a decrease of 35.84% in ESR. The changes were statistically insignificant except in neutrophil which was significant. There was 2.38% increase in serum albumin, whereas globulin and total proteins showed a decrement of 7.25% and 1.67% respectively. The changes were statistically insignificant except in globulin which was highly significant. Both the biomarkers IgG and IgE showed mild decrease. The changes were statistically insignificant [Table 6]. The overall effect of treatment in Group B was 52.06%, which was statistically highly significant.

When the individualized overall effect of therapy were considered, 65% of patients in Group A and 60% of patients in Group B reached moderate improvement zone (50-75% improvement), 30% of Group A and 35% of Group B reached mild improvement zone (25-50% improvement) and 5% of the patients in each group showed no improvement. On follow-up, 65% of the patients from Group A and 60% of patients from Group B had no recurrence of the symptoms. 30% of the patients from Group A and 40% of patients from Group B had recurrence but with lesser frequency and intensity. 5% of the patients from Group A had recurrence with same frequency but lesser intensity.

No adverse drug reactions have been reported by any of the patients during the treatment or follow-up periods.

Discussion

On clinical symptoms of Kasa, Kasahara Dashemani Vati provided relief in all the cardinal and associated symptoms of Kasa irrespective of their Doshic presentations. All the changes were statistically highly significant. Even though it is effective in all types of Kasa, there is a slope in the curve of efficacy in all types of Kasa. The control drug, Indukanta Vati also showed improvement in all the clinical symptoms of Kasa. The changes were statistically highly significant. When compared, among Vataja symptoms, the trial group showed better results on Shushka Kasa and Shirashoola, whereas control drug was better on Daurbalya. Shushka Kasa is the main diagnostic feature of Vataja Kasa, and it can be said as trial group has better effect on Vata predominant Kasa. In modern perspective, Shushka Kasa and Shirashoola (Vataja Shirashoola) can be co-related to allergic conditions. Daurbalya is more common in infectious conditions rather than in allergy. Trial group was found to be more effective on Pittaja Kasa, because of the ingredient drugs such as Draksha, Amalaki, Duralabha, and Bhumyamalaki which provide an additional Pittachara property. On all symptoms of Kaphaja Kasa control drug showed far better results than the trial drug with a statistically significant better effect on Shvetakapha. This is at par with the additional Kaphahara property of Indukanta Vati because of the presence of Panchakola [Table 7].

Parameters of Bala

Even though both the trial and control drugs showed marked improvement on the parameters of Bala (Agnibala, Dehabala, Satvabala, and Shreeropachaya) which was statistically highly significant; the trial drug showed marginally better results which may be because of additional Rasayana effect of Kasahara Dashemani [Table 7].
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Table 3: Effect on laboratory parameters in Group A (KD Vati treated)

| Parameters      | N  | BT     | AT     | % change | ±SE  | T     | P     |
|-----------------|----|--------|--------|----------|------|-------|-------|
| Total WBC       | 20 | 8425   | 8200   | 02.67↓   | 425.99| 0.53  | >0.05 |
| Neutrophil (%)  | 20 | 52.85  | 50.00  | 05.39↓   | 2.81 | 1.01  | >0.05 |
| AEC             | 20 | 489.65 | 473.95 | 03.21↓   | 113.99| 0.14  | >0.05 |
| ALC             | 20 | 3164.95| 3331.80| 05.27↑   | 213.06| 0.78  | >0.05 |
| ESR (mm/1st h)  | 20 | 21.90  | 14.80  | 32.42↓   | 3.76 | 1.89  | >0.05 |
| Albumin (g/dL)  | 20 | 4.01   | 4.02   | 0.37↑    | 0.04 | 0.36  | >0.05 |
| Globulin (g/dL) | 20 | 3.15   | 2.90   | 8.10↓    | 0.11 | 2.37  | <0.05 |
| Total protein (g/dL) | 20 | 7.16 | 6.92 | 3.35↓ | 0.12 | 2.03 | >0.05 |
| IgG (mg/dL)     | 20 | 1017.70| 949.90 | 6.66↓   | 45.94| 1.48  | >0.05 |
| IgE (IU/mL)     | 20 | 418.92 | 260.34 | 96.99↓  | 3.75 | 1.90  | >0.05 |

↑: Increase, ↓: Decrease, AT: After treatment, BT: Before treatment, SE: Standard error

Table 4: Effect on symptoms of Kasa in Group B (Indukanta Vati treated)

| Features          | N  | BT     | AT     | % of relief | ±SE  | T     | P     |
|-------------------|----|--------|--------|-------------|------|-------|-------|
| Shushka Kasa      | 04 | 2.25   | 1.00   | 55.56       | 0.25 | 5.00  | <0.001|
| Shirashoola®      | 03 | 1.67   | 0.67   | 60.00       | 0.00 | -     | >0.05 |
| Hrit Shoola       | 09 | 1.89   | 0.44   | 76.47       | 0.18 | 8.22  | <0.001|
| Daurbalya         | 03 | 2.00   | 0.67   | 66.67       | 0.33 | 4.00  | <0.001|
| Peetanishtheeva   | 09 | 2.78   | 1.00   | 64.00       | 0.15 | 12.09 | <0.001|
| Jwara             | 08 | 1.88   | 0.00   | 100.00      | 0.13 | 15.00 | <0.001|
| Swetakapha        | 08 | 2.88   | 0.75   | 73.91       | 0.13 | 17.00 | <0.001|
| Mandagni®         | 11 | 1.36   | 0.36   | 73.33       | 0.00 | -     | <0.001|
| Aruchi            | 12 | 2.50   | 0.83   | 66.67       | 0.14 | 11.73 | <0.001|
| Vamana            | 07 | 2.14   | 0.00   | 100.00      | 0.14 | 15.00 | <0.001|
| Peenasa           | 13 | 1.00   | 0.08   | 92.31       | 0.08 | 12.00 | <0.001|
| Duration of each bout | 20 | 1.18 | 0.29 | 75.74 | 0.12 | 7.45  | <0.001|
| No. of bouts      | 20 | 17.50  | 4.70   | 73.14       | 1.37 | 9.33  | <0.001|
| Sleep disturbance | 12 | 1.08   | 0.08   | 92.31       | 0.13 | 13.31 | <0.001|
| Nature of sputum  | 20 | 2.45   | 0.75   | 69.39       | 0.13 | 13.31 | <0.001|

Wilcoxon signed rank test was done as t test was not possible. AT: After treatment, BT: Before treatment, SE: Standard error

Table 5: Effect on Aturabala in Group B (Indukanta Vati treated)

| Features          | N  | BT     | AT     | % of relief | ±SE  | T     | P     |
|-------------------|----|--------|--------|-------------|------|-------|-------|
| Agnibala          | 20 | 07.05  | 04.30  | 39.01       | 0.23 | 12.06 | <0.001|
| Dehabala          | 20 | 04.30  | 02.30  | 46.51       | 0.16 | 12.33 | <0.001|
| Sharira upachaya/Wt | 20 | 21.64 | 23.03 | 6.42 | 0.15 | 9.25 | <0.001|
| Satvabala         | 20 | 06.30  | 04.50  | 28.57       | 0.14 | 13.08 | <0.001|

AT: After treatment, BT: Before treatment, SE: Standard error

Laboratory parameters

Control drug showed better results in decreasing TLC, polymorphs, and ESR; indicating better effect in infectious conditions. The trial group there was moderate decrease in AEC which shows decrease in the magnitude of allergy so it may be inferred that it is more effective in allergic conditions. 5.27% of increase in ALC in the trial group suggests an increased lymphocytic recruitment, when it is associated with decreased ESR (rules out the chronic infection/inflammation).

The possible explanation is the increased cell-mediated immunity (Table 8).

Serum proteins and biomarkers

Trial drug showed a marked decrease in IgG and IgE. Decrease in IgG within normal limits (highly above the cut off mark of < 200 mg/dL to consider the person as immune compromised) suggests the subsidence of infection as there is lesser requirement of IgG after subsidence of infection. There was a marked decrease noted in the serum IgE levels in the trial group which indicates a definite role of the drug against allergy phenomenon. On serum proteins, the drug showed a statistically significant decrease in the serum globulins which may be because of decrease in various Ig levels (mainly IgE and IgG). The control drug had minimum effect on the Ig parameters. On serum proteins, the control drug also showed a statistically significant decrease in the serum globulins, this can also be attributed to a decrease in various Ig levels. On the contrary, there was marginal increase in serum albumin levels in the control group which may be the indication of improved nourishment and metabolic status. From the above data, it may be inferred that the trial drug probably reached
Table 6: Effect on laboratory parameters in Group B (IK Vati treated)

| Parameters         | N  | BT        | AT        | % of relief | ±SE  | T     | P     |
|--------------------|----|-----------|-----------|-------------|-----|-------|-------|
| Total WBC          | 20 | 8395      | 7285      | 13.22       | 285.15 | 3.89  | <0.001|
| Neutrophil (%)     | 20 | 50.40     | 44.60     | 11.51       | 2.36 | 2.45  | <0.05 |
| AEC                | 20 | 322.80    | 314.10    | 2.70        | 36.70 | 0.24  | >0.05 |
| ALC                | 20 | 3585.45   | 3506.25   | 2.21        | 169.52 | 0.47  | >0.05 |
| ESR (mm/1st h)     | 20 | 17.30     | 11.10     | 35.84       | 3.51 | 1.77  | >0.05 |
| Albumin (g/dL)     | 20 | 4.00      | 4.09      | 7.25        | 0.06 | 1.73  | >0.05 |
| Globulin (g/dL)    | 20 | 2.90      | 2.69      | 1.67        | 0.09 | 1.31  | >0.05 |
| Total protein (g/dL) | 20 | 6.89     | 6.78      | 0.05        | 4.32 | <0.001|
| IgG (mg/dL)        | 20 | 916.15    | 897.00    | 2.09        | 36.55 | 0.52  | >0.05 |
| IgE (IL/mL)        | 20 | 187.17    | 179.70    | 1.14        | 50.20 | 0.04  | >0.05 |

Table 7: Comparative effect on signs and symptoms of Kasa and Aturabala in Group A and Group B

| Features             | df | % of relief | Mean | t   | P   |
|----------------------|----|-------------|------|-----|-----|
| Shushka Kasa         | 08 | 64.71       | 56.56| 0.58| 2.03| >0.05|
| Shirasohola          | 06 | 72.73       | 40.00| 0.60| 1.13| >0.05|
| Daurbalya            | 8  | 53.33       | 66.67| 0.19| 0.42| >0.05|
| Peetanishtheeva      | 15 | 75.00       | 64.00| 0.10| 0.31| >0.05|
| Swetakapha           | 12 | 64.29       | 73.91| 0.63| 2.60| >0.05|
| Mandagni             | 16 | 57.14       | 73.33| 0.14| 1.28| >0.05|
| Aruchi               | 23 | 58.62       | 66.67| 0.36| 1.85| >0.05|
| Vamana               | 14 | 100.00      | 100.00| 0.14| 1.15| >0.05|
| Peenas               | 25 | 78.57       | 92.31| 0.14| 0.99| >0.05|
| Agnibala             | 38 | 45.03       | 39.01| 1.10| 2.67| <0.05|
| Dehabala             | 38 | 50.00       | 46.51| 0.40| 1.71| >0.05|
| Sharira              | 38 | 6.48        | 6.42 | 0.10| 0.52| >0.05|
| Upachay/Ni           | 38 | 35.57       | 28.57| 0.85| 2.94| >0.05|

Table 8: Comparative effect on laboratory parameters in Group A and B

| Features             | df | % of change | Mean difference | t   | P   |
|----------------------|----|-------------|-----------------|-----|-----|
| Total WBC            | 38 | 02.67       | 13.22           | 885.00 | 1.726 | >0.05|
| Neutrophil (%)       | 38 | 05.39       | 11.51           | 02.95 | 0.80  | >0.05|
| ESR (mm/1st h)       | 38 | 32.42       | 35.84           | 00.90 | 0.18  | >0.05|
| AEC                  | 38 | 03.21       | 02.56           | 07.00 | 0.06  | >0.05|
| ALC                  | 38 | 05.27       | 02.21           | 246.05 | 0.90  | >0.05|
| IgG (mg/dL)          | 38 | 06.66       | 02.09           | 48.65 | 0.83  | >0.05|
| IgE (IL/mL)          | 38 | 37.85       | 03.45           | 156.51 | 1.43  | >0.05|
| Total protein (g/dL) | 38 | 03.35       | 01.67           | 00.13 | 0.85  | >0.05|
| Globulin (g/dL)      | 38 | 08.10       | 07.25           | 00.05 | 0.38  | >0.05|
| Albumin (g/dL)       | 38 | 00.37       | 02.38           | 00.08 | 1.16  | >0.05|

Overall effect of therapy and follow-up findings

There was 54% of relief in the overall condition of recurrent Kasa/RRTI found in Group A and it was 52% in Group B. By considering the above data, it can be inferred that the trial drug is marginally more effective in treating the condition of Kasa/RRTI, even though the superiority was statistically insignificant. When the individualized overall effect of therapy was considered, both the formulations showed similar response with a majority of the patients reaching up to the moderate improvement zone followed by those in mild improvement zone. Both the trial and control drugs were almost equally effective in preventing the recurrence of the disease Kasa.

In the present disease condition, till date, there is no definite known cure.[15] So any sort of improvement in the overall condition is fairly acceptable. The improvement to an extent of around 50% in present study is highly promising and can be studied further.

Probable mode of drug action

The trial drug Kasahara Dashemani Vati consists of 10 herbs with multi-dimensional properties. The drugs which directly act on the disease Kasa (Kantakari, Pippali, Shringi, Sweta Punarnava/Vrishchira) act by Kapha Vatahara property. The Teekshna drugs such as Kantakari, Pippali, Shringi act locally at the site of Kantha and cause Vilayana of obstructed Kapha. Thus, immediately after removal of Srotovarodha caused by Kapha, the Vatahara drugs such as Haritaki cause Vatansulomana and pacify Vimargaga kupita Vata caused due to Avarana. The drugs with Vatapittahara (Duralabha, Draksha) and Kaphapittahara (Bhumyamalaki) properties come into action when there is association of Pitta. The drugs such as Haritaki, Shringi etc., with Kashaya Rasa have local Kaphahara action on the mucosa. This process explains the symptomatic relief from Kasa. In the later phase, the drugs like Pippali, Haritaki, Sweta Punarnava, and Kantakari do action of Pachana followed by Deepana and Anulomana. This process sets right the
digestion, assimilation, and metabolism. Further the drugs such as Amalaki, Panarnava, Haritaki, Draksha, and Pippali nourish the body with their Rasayana effect. These drugs improve Dhatusara and Ojas and thus increase the Vyadhikshamatva.

In modern perspective, the antitussive action of both the drugs is purely through interfering with peripheral mechanisms of the cough reflex. The pungent principles present in both drugs is purely through interfering with peripheral mechanisms of the cough reflex.[16] Probably by blocking the vagal sensory afferents by counter-irritant and local anesthetic mechanism.[17,18] Piperine, one of the principle components present in both the formulations has recorded its role in modulating the membrane permeability[19] which may permit potassium ion influx and have a role on the ion gated mechanism of the mucosal C-type vagal receptors and may up-regulate the cough threshold.[20] When administered along with honey, additional demulcent and mucokinetic actions further enhance the antitussive action. Yamalaki (Bhumyamalaki), Kantakari, Shringi, and Madhu have systemic antiviral and antimicrobial[21] actions which help in controlling the systemic infection of different origins.[20] Pippali, Haritaki, Panarnava, Amalaki and Madhu have immunomodulatory activity[22] which helps in eliminating the infection or regulating the allergic responses.[21] On long-term usage, these also potentiate immune system as a whole and prevent recurrence or decrease the magnitude manifestation of infections and allergic phenomenon. The probable action of the drug against allergic response may be by causing an immunological shift from IgE type humoral response toward an IgG or Ig-M type response against invading antigen. The clinical study also supported the action of Kasahara Dashemani group of drugs on the humoral mechanism of immunity.

The control drug Indukanta Vati has ingredients which can be divided in to three sets. The first one is Dashamoola which is a well-known Vatahara, Shothahara, and Rasayana; whereas the other group contains Panchakola which is Ushna, Teekshna, and Vatakaphahara. The third group contains other drugs namely Puteeka, Devadaru, and Yavakhsha each having different pharmaco-therapeutic actions. The drug is administered with Madhu as an adjuvant. The antitussive action of the drug is similar to that of Kasahara Dashemani Vati. Here, Madhu and Dashamoola which have additional Shothahara property act locally to alleviate the Shotha in Kantha. Panchakola exhibits its Pachana and Dipana properties and remove Ama; it also causes Sroto Shodhana and clears up all the bodily channels. The restoration of Agni improves digestion, assimilation and metabolism. As Dhatu Freenana is optimized, there will be unobstructed production of subsequent Dhatu. Ultimately, the essence of all Dhatu “Ojas” will be nourished and thus improve Sharira Bala and Vyadhikshamatva.

In modern perspective, the mode of action can be explained as follows. The drugs such as Devadaru, Yavakhsha, and Madhu have mucolytic, expectorant, and demulcent properties; the constituent drugs of Panchakola act as pharyngeal counter irritants and block the receptors of cough reflex and through collective mechanism, they act as immediate cough relievers. The drugs of Dashamoola (Bhiva, Agrinmantha, Gambhiri, Shyonaka, Gokshura, Prishniparni), Puteeka, and Devadaru possess anti-inflammatory action and these help in reducing the inflammation of the respiratory tract.[23] Majority of the drugs (Devadaru, Puteeka, Agrinmantha, Patala, Kantakari) of this formulation have antiviral, antibacterial, or antimicrobial actions which help in eliminating systemic infection. On long-term intake, because of efficient digestion and assimilation, the body gets adequate nutrition. As the body metabolism is normalized by the action of Panchakola, there is less production of free radicals.[25]

**Conclusion**

Kasahara Dashemani Vati was more effective in Vata Pradhana and Pitta Pradhana Kasa, showed better action on RRTI with primarily allergic etiology and was marginally better than Indukanta Vati in improving Vyadhikshamatva/Bala, even though both have a significant effect. Whereas Indukanta Vati was better in Kapha Pradhana Kasa and on RRTI with primarily infective etiology. When considering specific immune modulation on humoral immunity, Kasahara Dashemani is the better drug of choice when compared to Indukanta Vati.

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