

## Original Article

### Efficacy of naturopathy and yoga in bronchial asthma

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## Abstract

The aim of the study was to test the efficacy of a one month in-patient naturopathy and yoga programme for patients with asthma. Retrospective data of 159 bronchial asthma patients, undergoing the naturopathy and yoga programme, was analyzed for Forced Vital Capacity, Forced Expiratory Volume at the end of 1 second, Maximum Voluntary Ventilation and Peak Expiratory Flow Rate on admission, 11th day, on discharge and once in three months for three years. The paired sample t test results showed significant increase in the Forced Vital Capacity and Forced Expiratory Volume from the date of admission up to 6th month ( $P<0.0035$ ) post Bonferroni correction. Maximum Voluntary Ventilation significantly increased from admission till the date of discharge ( $P<0.0035$ ) and Peak Expiratory Flow Rate significantly increased from admission till the 36th month of follow-up ( $P<0.0035$ ), post Bonferroni correction. This validated the beneficial effect of combining naturopathy and yoga for the management of bronchial asthma.

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## Introduction

Research has shown that different types of alternative and complementary treatments like acupuncture, yoga, tai chi, chuan and hypnosis have been used by asthma patients in alleviating their symptoms (1).

A meta-analytical review of seven databases including three RCTs and one NRCT suggested that yoga lead to significant greater reduction in airway hyper-response, PC20 (needed to provoke a 20% reduction in forced expiratory volume in the first-second weekly number of asthma attacks), and the need for drug treatment (2). Other reviews have also reported that yoga leads to a significant greater reduction in airway hyper-response, weekly number of asthma attacks and drug treatment (3-7).

In the last decade, there have been only 12 experimental studies in the field of yoga and asthma (8-17). As yoga is a long-term treatment - with its efficacy most pronounced after 4-8 weeks, it is very

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(Received on September 5, 2012)

essential to have extended follow-up studies to test the efficacy of yoga for treatment of asthma. In the last few decades, only one long-term follow-up study (3-54 months follow-up) has been conducted to assess the effect of a 2 week integrated yoga therapy programme on patients suffering from asthma (18). This study showed that there was a significant improvement in the yoga group in the weekly number of attacks of asthma, scores for drug treatment, and peak flow rate (18).

Along with the mind-body therapy of yoga that integrates physical postures, breathing exercises, and meditation, the researchers of the current study believe that the intake of naturopathic medicine [natural substances to treat the patient (19)] can create a lasting effect in the patient's mental, emotional, and physical states. Till date only one self controlled matched study has looked at the efficacy of a 21 day naturopathy and yoga intervention in bronchial asthma and has shown significant improvement in PEFR, VC, FVC, FEV<sub>1</sub>, FEV/FEC%, MVV, ESR and absolute Eosinophil count (11). We have thus attempted to analyze retrospective data of a study which was designed to test the efficacy of a combined treatment of naturopathy and yoga treatment in patients with asthma, using a longitudinal follow-up design (36 month follow-up design).

## Methods

The current study was a retrospective study and hence all cases available of bronchial asthma in the INYS Medical Research Society – Jindal Nature Cure database and meeting the eligibility criteria were selected [n=159 patients (74 males and 85 females)]. The average age of these patients ranged from 18 to 70 years [mean age (SD): 39.8 (13.0) years] and their average education was tenth standard. The average (SD) duration of untreated illness (asthma) was 10(8.01) months. 71% of patients had a family history of asthma.

In the original study, diagnosis of asthma was arrived at based on the: (1) detailed medical history, (2) physical examination including auscultation, (3) spirometry measures (to demonstrate obstruction and

assess reversibility after inhalation of short acting bronchodilators) (4) reversibility (determined by an increase in FEV<sub>1</sub> of  $\geq 12$  percent from baseline). These patients were not controlled satisfactorily by conventional medicines prior to their enrollment into the study. Patients with other major health problems (medical/neurological/psychiatric) were excluded from the study. Before enrolling in the study all the patients were using conventional medicines as prescribed by their physician. As these patients were treated by different physicians who were not a part of the current study, the researchers had no control on the method of treatment used prior to their enrollment in the study. Hence at the start of study each patient was examined by the investigator/naturopath physician. Based on the patient's disease condition the investigator prescribed the minimum pharmacological intervention/medication dosage to help control the symptoms.

The combined intervention of Naturopathy and Yoga was provided as a residential treatment for a period of one month at Jindal Nature Cure Hospital. The Yoga session included physical activity, relaxation, regulated breathing and philosophical aspects of yoga. The Integrated yoga module was selected from the integrated set of yoga practices used in earlier studies on yoga for positive health (18). The yoga sessions were conducted three times in a day. Morning sessions of asanas were conducted for about one hour. It consisted of 'suryanamaskar' of 4 rounds and other asanas such as Ardha cakrasana, Pādahastāsana, Vajrāsana, Supta vajrāsana, Ardha matsendrasana, Paschimottasana, Ustrasana, Naukasana, Shashanasana, Halāsana or Mayūrāsana, Dhanurāsana, Sarvāṅgāsana, Matyāsana, Ardha sirsasana or sirsasana, Vipareetakarani (one round of each asana). Beside this 'yogic kriyas' such as Jalaneti, Gargling, Ghee drop in nose, Vamana dhuti (once in three days), Rubber neti, Trataka, Kapālabhāti, Laughing Exercises – were practiced for half an hour. The afternoon session consisted of half an hour of yoga asanas (as listed above) which included one round of each asana. The evening session consisted of half an hour of 'yoga nidra'. All sessions were done under supervision – in the presence of a qualified yoga instructor, specially trained for the study protocol.

Naturopathy therapies were selected as per the standard practice/treatment prescribed for patients with asthma. The treatment included various combinations of naturopathic treatments such as diet, mud pack, enema, steam bath, steam inhalation, hot-hip bath, contrast foot bath, oxygen bath, hot-foot arm bath, drainage massage, oil massage, neutral immersion bath, vibro-drainage massage, hot check pack, sauna, half bath, neutral spinal bath and asthma bath.

Both men and women were provided the same intervention programme. Menopausal patients were not excluded from the study. If a woman patient was observed to be menstruating during the study period, she was barred from practicing therapies which were considered contraindicated during the period (like abdominal packs and hydrotherapy treatments involving abdomen and pelvis and yogic exercises contraindicated during menstruation). The remaining therapies were continued with these women participants.

The subjects were assessed at baseline, 11<sup>th</sup> day and after 21 days (post naturopathy-yoga intervention). The subjects were followed up once in every three months for three years. During each follow-up visit, the patients were examined by a physician and based on the patient's condition the anti asthmatic drugs were first documented and then either reduced or stopped. In case of aggravation of symptoms after stopping/reduction of pharmacological medications inhaled bronchodilators were used as rescue medications to manage acute bronchospasm; and/or naturopathy therapies (like hot chest pack, hot foot immersion) were provided for symptomatic relief. In an eventuality of these therapies failing to relieve the symptoms, there was a provision in protocol to provide symptomatic relief medication (a  $\beta$  agonist) based on the assessment of a general physician.

The outcome variables assessed were Forced Vital Capacity (FVC), Forced Expiratory Volume (FEV1), Maximum Voluntary Ventilation (MVV) and Peak Expiratory Flow Rate. FVC was the total volume of air breathed out by the person after a full inspiration (inhalation) into a spirometer. FEV1 was the volume

of air expired into a spirometer in the first second (FEV1). MVV was measured based on how quickly one can exhale (MVV) and PEFR was measured as the greatest amount of air one can breathe in and out during one minute. FVC, MVV were assessed using a 'spirometry', whereas PEFR was assessed using 'Peak flow meter'.

The above primary study data was retrospectively analyzed in the year 2008-2011, from the medical record files of the Jindal Nature Cure Hospital using the Statistical Software of Social Sciences (SPSS) version 10. The baseline data of the patients was assessed using Kolmogorov-Smirnov test for normality. As the data normally distributed ( $P > 0.200$ ) and the study design did not have a control group, paired t test was used to analyze the pre/post data. Due to multiple comparisons with baseline, Bonferroni correction was also conducted using the formula  $0.05/n$  (where  $n=14$ , as there were 14 pair wise comparisons only with baseline). Though Bonferroni correction is usually used with ANOVA, statistical experts have opined that in case of multiple baseline comparisons with t test, this method could be used to increase the power of the test used and to determine the significant results (20). The Holm-Bonferroni method, a uniformly more powerful test procedure (i.e. more powerful regardless of the values of the unobservable parameters) was also considered as an effective alternative power test. However, as current methods for obtaining confidence intervals for the Holm-Bonferroni method do not guarantee confidence intervals that are contained within those obtained using the Bonferroni correction (21), the authors of this paper have analyzed the data using only Bonferroni correction.

## Results

Records detailed that as all the patients were under direct observation and care of investigator there was very good compliance to the interventions during their stay in the hospital. Though the patients were advised to continue the interventions at home post discharge, their compliance to these treatments during the 3 years of study period was checked but not documented. Out of the 159 recruited patients,

medical records showed that only 134 underwent the intervention and assessments and only 34 patients (FVC, FEV1, MVV; 78.6% attrition) -78 patients (PEFR; 50.9% attrition) completed the 36 month follow-up visit.

Table I shows the mean (SD) values for Forced Vital Capacity (FVC), Forced Expiratory Volume (FEV1), Maximum Voluntary Ventilation (MVV) and Peak Expiratory Flow Rate Morning (PEFR) and Table II shows the differential mean and SD values along

with the t test values and significance computed using the paired sample t test. There was a significant increase in FVC, FEV1 mean values from admission to 6<sup>th</sup> month ( $P < 0.0035$ , Table II) post Bonferroni correction. There was also significant increase in the MVV mean values; however only from admission till the date of discharge ( $P < 0.0035$ , Table II). Significant increase in the PEFR mean values was observed from admission till the 36<sup>th</sup> month of follow-up ( $P < 0.0035$ , Table II) except for the 9th month, post Bonferroni correction.

TABLE I: Mean (SD) of Forced Vital Capacity (FVC), Forced Expiratory Volume at 1 second (FEV1), Maximum Voluntary Ventilation (MVV) and Peak Expiratory Flow Rate (PEFR) over the 36 month study period.

| Time | FVC (Liters) |             | FEV1 (Liters) |             | MVV (Liters/Min) |               | PERF (Liters/Min) |                 |
|------|--------------|-------------|---------------|-------------|------------------|---------------|-------------------|-----------------|
|      | n            | Mean±SD     | n             | Mean±SD     | n                | Mean±SD       | n                 | Mean±SD         |
| OA   | 133          | 2.00 (0.77) | 133           | 1.54 (0.64) | 133              | 53.58 (25.59) | 25                | 228.00 (101.78) |
| 11D  | 134          | 2.15 (0.83) | 134           | 1.67 (0.68) | 134              | 57.34 (27.53) | 29                | 324.14 (150.06) |
| OD   | 129          | 2.15 (0.86) | 130           | 1.67 (0.71) | 130              | 58.74 (29.67) | 33                | 339.09 (131.21) |
| 3M   | 55           | 2.34 (0.74) | 55            | 1.78 (0.61) | 55               | 65.17 (31.03) | 117               | 340.85 (119.16) |
| 6M   | 67           | 2.23 (0.77) | 67            | 1.68 (0.60) | 67               | 60.60 (26.54) | 106               | 335.94 (111.81) |
| 9M   | 53           | 2.10 (0.83) | 53            | 1.55 (0.63) | 52               | 55.60 (24.95) | 100               | 322.36 (123.53) |
| 12M  | 49           | 2.11 (0.64) | 51            | 1.66 (0.58) | 51               | 59.67 (25.60) | 96                | 326.15 (120.82) |
| 15M  | 43           | 2.22 (0.79) | 42            | 1.70 (0.63) | 42               | 58.07 (26.53) | 96                | 330.88 (123.66) |
| 18M  | 49           | 2.05 (0.77) | 50            | 1.57 (0.64) | 50               | 54.07 (24.69) | 90                | 322.33 (120.81) |
| 21M  | 48           | 2.06 (0.82) | 47            | 1.57 (0.63) | 46               | 56.51 (25.36) | 90                | 324.33 (118.15) |
| 24M  | 44           | 1.94 (0.78) | 45            | 1.53 (0.63) | 45               | 54.33 (26.20) | 85                | 327.29 (120.55) |
| 27M  | 40           | 2.03 (0.68) | 40            | 1.62 (0.53) | 40               | 56.92 (23.75) | 82                | 335.98 (112.99) |
| 30M  | 42           | 2.06 (0.76) | 42            | 1.63 (0.65) | 42               | 53.49 (27.04) | 80                | 337.50 (111.04) |
| 33M  | 47           | 2.02 (0.75) | 47            | 1.57 (0.62) | 46               | 53.36 (24.96) | 72                | 333.17 (117.25) |
| 36M  | 34           | 1.76 (0.71) | 34            | 1.39 (0.60) | 34               | 51.97 (26.06) | 78                | 325.13 (117.06) |

\*OA: On admission; OD: On discharge; 11D: On 11<sup>th</sup> day; 3M/6M...: On 3 month/6 month...

TABLE II: Paired Samples t Test for Forced Vital Capacity (FVC), Forced Expiratory Volume at 1 second (FEV1), Maximum Voluntary Ventilation (MVV) and Peak Expiratory Flow Rate (PEFR) over the 36 month study period.

| Time   | FVC (Liters) |              |       |      | FEV1 (Liters) |              |        |      | MVV (Liters/Min) |               |       |      | PERF (Liters/Min) |                 |       |      |
|--------|--------------|--------------|-------|------|---------------|--------------|--------|------|------------------|---------------|-------|------|-------------------|-----------------|-------|------|
|        | n            | Mean (SD)    | t     | Sig. | n             | Mean (SD)    | t      | Sig. | n                | Mean (SD)     | t     | Sig. | n                 | Mean (SD)       | t     | Sig. |
| OA-11D | 129          | -0.17 (0.39) | -5.06 | .00* | 129           | -0.14 (0.31) | -5.15  | .00* | 129              | -4.44 (12.83) | -3.93 | .00* | 20                | -84.50 (90.29)  | -4.19 | .00* |
| OA-OD  | 124          | -0.19 (0.51) | -4.08 | .00* | 125           | -0.16 (0.44) | -3.95  | .00* | 124              | -6.82 (16.24) | -4.68 | .00* | 23                | -87.39 (84.22)  | -4.98 | .00* |
| OA-3M  | 51           | -0.22 (0.49) | -3.23 | .00* | 51            | -0.16 (0.36) | -5.15  | .00* | 52               | -4.16 (17.60) | -1.70 | .09  | 21                | -88.57 (86.04)  | -4.72 | .00* |
| OA-6M  | 53           | -0.20 (0.42) | -3.36 | .00* | 53            | -0.17 (0.35) | -3.61  | .00* | 53               | -4.51 (17.56) | -1.87 | .07  | 17                | -92.94 (100.48) | -3.81 | .00* |
| OA-9M  | 44           | -0.10 (0.44) | -1.47 | 0.15 | 44            | -0.08 (0.43) | -1.27  | 0.21 | 43               | -0.22 (16.39) | -0.09 | .93  | 16                | -73.13 (103.26) | -2.83 | .01  |
| OA-12M | 38           | -0.17 (0.38) | -2.73 | 0.01 | 39            | -0.12 (0.31) | -2.44  | 0.02 | 40               | -2.81 (15.75) | -1.13 | .27  | 22                | -84.09 (87.98)  | -4.48 | .00* |
| OA-15M | 35           | -0.18 (0.35) | -2.95 | 0.01 | 35            | -0.18 (0.34) | -3.08  | .004 | 36               | -4.04 (16.47) | -1.47 | .15  | 17                | -88.82 (89.50)  | -4.09 | .00* |
| OA-18M | 38           | -0.07 (0.46) | -0.99 | 0.33 | 38            | -0.07 (0.44) | -1.00  | 0.32 | 39               | -1.81 (22.52) | 0.50  | .62  | 19                | -78.95 (88.88)  | -3.87 | .00* |
| OA-21M | 41           | -0.13 (0.45) | -1.84 | 0.07 | 41            | -0.12 (0.38) | -1.96  | 0.06 | 40               | -2.18 (17.79) | -0.78 | .44  | 19                | -76.84 (92.80)  | -3.61 | .00* |
| OA-24M | 37           | 0.03 (0.36)  | 0.53  | 0.60 | 37            | -0.05 (0.39) | -0.82  | 0.42 | 38               | -1.84 (17.90) | -0.63 | .53  | 16                | -76.88 (84.99)  | -3.62 | .00* |
| OA-27M | 36           | -0.11 (0.39) | -1.68 | 0.10 | 36            | -0.11 (0.35) | -1.80  | 0.08 | 36               | -0.37 (14.87) | -0.15 | .88  | 15                | -98.00 (76.74)  | -4.95 | .00* |
| OA-30M | 38           | -0.05 (0.42) | -0.78 | 0.44 | 38            | -0.07 (0.33) | -1.27  | 0.21 | 39               | 4.37 (16.34)  | 1.67  | .10  | 15                | -94.67 (95.38)  | -3.84 | .00* |
| OA-33M | 42           | 0.01 (0.51)  | 0.06  | 0.95 | 42            | -0.05 (0.41) | -0.735 | 0.47 | 41               | -0.52 (18.11) | -0.18 | .86  | 14                | -104.29 (70.13) | -5.56 | .00* |
| OA-36M | 32           | 0.19 (0.45)  | 2.33  | 0.03 | 32            | 0.11 (0.35)  | 1.72   | 1.0  | 32               | 2.69 (11.92)  | 1.28  | .21  | 16                | -100.63 (86.45) | -4.66 | .00* |

\*Bonferroni Correction  $p < 0.0035$ ,  $\alpha = 0.05$

\*OA: On admission; OD: On discharge; 11D: On 11<sup>th</sup> day; 3M/6M...: On 3 month/ 6 month...

To understand the gender differences, independent sample t test analysis was conducted. The results depicted that FVC, FEV<sub>1</sub>, MVV and PEFR were significantly lower in men as compared to females at the time of discharge ( $P < 0.05$ , Table III). However the same variables were significantly higher in males as compared to females at the last follow-up (36<sup>th</sup> month;  $P < 0.05$ , Table IV).

TABLE III: Gender differences in efficacy of yoga and naturopathy across variables on discharge.

| Variables |        | Mean±Std. deviation | 95% confidence interval of the difference lower | Sig. (2-tailed) |
|-----------|--------|---------------------|-------------------------------------------------|-----------------|
| BMIOD     | Male   | 21.1±4.5            | -4.674                                          | .000*           |
|           | Female | 24.1±5.7            |                                                 |                 |
| FVC_OD    | Male   | 2.5±1.1             | .2802                                           | .000*           |
|           | Female | 1.9±0.5             |                                                 |                 |
| FEV1_OD   | Male   | 1.8±0.9             | 5.950E-02                                       | .015**          |
|           | Female | 1.5±0.5             |                                                 |                 |
| FE1FVCOD  | Male   | 71.4±14.6           | -12.152                                         | .002*           |
|           | Female | 78.9±12.4           |                                                 |                 |
| MVV_OD    | Male   | 68.0±38.3           | 6.772                                           | .001*           |
|           | Female | 51.3±17.1           |                                                 |                 |
| PEFRM_OD  | Male   | 396.7±143.6         | 18.73                                           | .019**          |
|           | Female | 291.1±100.3         |                                                 |                 |
| ESR_OD    | Male   | 7.3±8.5             | -10.71                                          | .010**          |
|           | Female | 13.4±18.3           |                                                 |                 |

\* $P < 0.01$ ; \*\* $P < 0.05$ .

TABLE IV: Gender differences in efficacy of yoga and naturopathy across variables on 36<sup>th</sup> month follow-up.

| Variables |        | Mean±Std. Deviation | 95% confidence interval of the difference lower | Sig. (2-tailed) |
|-----------|--------|---------------------|-------------------------------------------------|-----------------|
| BMI_36M   | Male   | 21.9±3.8            | -5.67                                           | .001*           |
|           | Female | 25.5±5.2            |                                                 |                 |
| FVC_36M   | Male   | 2.0±0.9             | 9.822E-02                                       | .019**          |
|           | Female | 1.5±0.4             |                                                 |                 |
| MVV_36M   | Male   | 61.5±32.3           | 1.873                                           | .031**          |
|           | Female | 42.5±12.9           |                                                 |                 |
| PEFRM_36M | Male   | 367.2±126.2         | 37.11                                           | .001*           |
|           | Female | 280.8±88.3          |                                                 |                 |

\* $P < 0.01$ ; \*\* $P < 0.05$ .

## Discussion

The above results depict that the combined yoga and naturopathy intervention has a significant effect

on FVC, FEV<sub>1</sub>, MVV and PEFR, as long as the intervention is practiced regularly by the patients. A look at Table I shows that all the outcome variables have significant results from admission till date of discharge (the time period during which the patients practiced yoga and naturopathy as in-patients) Due to the positive results during admission, it could be assumed that the patients continued to practice both the interventions at home for the next few months (positive results observed in all outcome variables till the 6th month). However, even though the patients were followed up every three months for two years post discharge, the possible lack of motivation to continue the interventions at home could be one of the reasons for lack of significance in most outcome variables post 6 months.

In case of yoga and naturopathy, it is well known that regular practice of the interventions can only bring about desired results. However this aspect is also true vice-versa, where it is often observed that positive results of an intervention are a strong indicator for continuation of the treatment. It could be reasoned that the lack of motivation to continue practice post 6 months could have resulted in stagnation in symptoms, which in turn could have acted as a disillusionment to continue with the treatment itself. This could possibly explain the large attrition or drop-out rates in the study.

In such a scenario, it would be best to discuss the results and the effectiveness of the intervention when it is practiced regularly. A number of studies have shown varied results with respect to FEV and FVC as output variables in testing the efficacy of interventions for asthma. One such study showed that there was no significant difference in pre- and post-FEV<sub>1</sub> and pre- and post-FVC and in their percentage predicted. Thus it was concluded that reversibility in FEV<sub>1</sub> levels or percentage change in FEV<sub>1</sub> are promising lab parameter to assess the efficacy of intervention in asthma patients (22). In another study PEFR and FEV<sub>1</sub> improved significantly following inhalation of bronchodilator in each of the five spacers. Similarly delta FEV<sub>1</sub> and percentage improvement were comparable in the five groups. This study corroborates the results of our study where both the Forced Expiratory Volume (FEV) and (Peak

Expiratory Flow Rate) PEFR values have seen an increase (improvement) from admission to discharge. Only one study till date has looked at the Maximal minute ventilation during exercise and pulmonary function of 78 elite winter athletes (25 males, 53 females; 25 EIB positive, 53 normal) retrospectively (23). In such a scenario, our study is the first to show the positive relation between MVV and improvement in symptoms of asthma patients through the use of yoga and naturopathy treatment.

The results of gender comparison depict that though males improved better than females at discharge, females improved better than males at the end of 36<sup>th</sup> month of the study. According to the treating team at INYS-Medical Research Society, Jindal Nature cure Institute, Bangalore, the patients were banned from using addictive substances (i.e. nicotine) during their stay at the hospital, as nicotine had an adverse reaction to the asthma symptoms. Though not documented, a number of males in the current study were addicted to nicotine and the team felt that, it was difficult to control the addictive/drug habits of the patients once they were discharged from the hospital. This could be one of the causes for the gender differences at different timelines of the study.

This study has some inherent limitations: (1) As a retrospective study, it is difficult to interpret the result based on the current cultural milieu and patient characteristics of the hospital, (2) Due to lack of control group, the result could be interpreted as an outcome of extraneous factors or time factor (patient improving over time) instead of the effectiveness of the treatment introduced, (3) As the interventions of yoga and naturopathy were provided together, it was difficult to tease out the individual effects of each of the interventions for asthma. A cross-over design could have helped in this purpose. Further, to strengthen the overall study methodology, future research could focus on conducting a prospective randomized control clinical trial based on the GINA guidelines (for diagnosis and management of bronchial asthma), with a large sample size.

In spite of the limitations explained above, the current study is a classic longitudinal study with a 36 month follow-up of patients who have undergone a combined naturopathy and yoga intervention. As all patients were on conventional care at baseline, practicing the combined naturopathy and yoga treatment, clearly demonstrated positive and significant changes in lung function even after tapering of the antiasthmatic medications. The naturopathy treatment helped create a lasting effect in the patient's mental, emotional, and physical states and yoga helped reduce the frequency of infections (by enhancing the immunity) and mental stress. In this context, the present study can have significant clinical implications as a new and modern solution for bronchial asthma patients who suffer from the other adverse effects of consuming oral pharmacological medicines. Further propagating naturopathy and yoga as a way of life (long term practice of intervention), could help not just control symptom exacerbation but also improve the overall health and immunity of the patient.

## Conclusion

The current study provides evidence that if practiced regularly, a combined intervention of naturopathy and yoga is an effective alternative treatment for bronchial asthma. A rigorous prospective randomized control clinical trial based on the GINA guidelines for diagnosis and management of bronchial asthma, with a large sample size would help further validate these results and also tease out the effects of the individual and/or combined treatments.

## Acknowledgements

The authors would like to thank Soumya S, staff of Swami Vivekananda Yoga Anusandhana Samasthana (SVYASA), Bangalore for helping in the preparation of the manuscript. The authors would also like to thank INYS-Medical Research Society, Jindal Nature Cure Institute, Bangalore for funding and conducting the project.

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