

## Significance of *Nadi Sodhan* and *Kapalbhati* on forced ventilation capacity (FVC), maximum voluntary ventilation (MVV) and picks expiratory flow rate (PEFR)

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Contemporary researches done in the area of Yogic management provoked the researcher to attempt an individual project to judge the intervention of Yoga and find the effect of Yogic practices on selected lung functions of college going students. To observe the effect of Yogic practices (*Nadi Shodhan* and *Kapalbhati*) on FVC, MVV, and PEFR, the subjects were assigned by random sampling for a pre – post study (N=50). The subjects assigned for the study were exposed to yogic practices daily for 30 minutes for 60 days. Data collection was done individually in group and best attempts were made to avoid external distractions. A significant change was observed in FVC, MVV, and PEFR level in the subjects. Results show that FVC t=5.4, p<0.05, for MVV t=6.4, p<0.05 and for PEFR t=8.4, p<0.05. The study adds: Yogic interventions proving itself as an effective tool as CAM to improve the respiratory functions.

**Keywords:** *Kapalbhati*, *Nadi Shodhan*, FVC, MVV, PEFR

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Respiration is the process through which each and every cell of the body receives the supply of oxygen and at the same time gets rid of the product of oxidation. When there is insufficient oxygen in the blood cells it loses its bright red color becoming bluish, and the person immediately get sick. Good respiration is one of the greatest resources for vitality, creativity and wealth, while poor respiration in contrast significantly drains the aforementioned. Hence, it is necessary for the students of higher education to induce a complete health prevention technique, through which they can prevent themselves from common respiratory disorders.

Yogic practice particularly *Pranayama* like *Nadi Shodhan* and other breathing techniques like *Kapalbhati* aim to improve the pranic (vital) energy in the body. Immunity is the only factor through which one can prevent himself from any common disorders. Yogic – breathing – exercises not only improve the lung functions only, it also improves the vitality of the practitioner. For a healthy functioning of all the tissues and organs as well as for a healthy mind functioning Indian *Yogis* have provided few wonderful techniques of Yoga. *Nadi shodhan* and *Kapalbhati* are among them.

*Nadi Sodhan* and *Kapalbhati* have a great place in *Hatha Yoga Pradipika* and it has been explained as follows:

*Malākalāsu nādīṣu mūruto naiva madhyagaḥ |*  
*Katham syādunmanībhāvaḥ kāryasiddhiḥ katham*  
*bhavet ||*  
*Śuddhameti yadā sarvaṃ nāḍīcakraṃ malākulam |*  
*Tadaiva jāyate yogī prānasamgrahane kṣamaḥ ||*  
*Hatha Yoga Pradipika (2/4,5)*

Meaning : the vital air does not pass in the middle channel because the *Nadis* are full of impurities. So how can the state of *unmani* arise and how can perfection or *Siddhi* come about ? When all the *Nadis* and *Chakras* which are full of impurities are purified, then the *Yogi* is able to retain *prana*<sup>1</sup>.

*Bhastrāvallohakārasya recapūrau sasambhramau |*  
*Kapālabhātīrvikhyūtā kaphadoṣaviśoṣanī ||*  
*Ṣatkarmanirgatasthauyakaphadoṣamalādīkaḥ |*  
*Prānāyāmaṃ tataḥ kuryādanāyāsena siddhyati ||*  
*Prānāyāmaireva sarve praśuṣyanti malā īti |*  
*Ācāryānām tu keṣāmcidanyatkarma na sammatam ||*  
- *Hatha Yoga Pradipika (2/35, 36 & 37)*

Meaning: perform exhalation and inhalation rapidly like the bellows (of the blacksmith). This is called *Kapalbhati* and it destroys all mucous disorders. By the *Shatkarma* (six cleansing processes of *Hatha Yoga*) one become free from excess of the *Doshas*. Then *Pranayama* is practiced and success is achieved without strain. According to some of the masters of *Hatha Yoga*, *Pranayama* alone removes impurities and therefore they hold *Pranayama* in esteem and not the other techniques<sup>2</sup>.

Various researches have been done in the related area. Effect of Yogic practices improves the flexibility and respiratory measure of vital capacity and breath holding time<sup>3</sup>. One of the studies found no significant difference between inspiratory volume and *Kumbhaka* period/duration of *Pranayama*<sup>4</sup>. Another study found that slight increase in peak flow rate due to practice of *Anulom-Vilom Pranayama*<sup>5</sup>.

Yogic practices produce consistent physiological changes and have sound scientific basis. The researcher found a cardio respiratory change during *Savitri Pranayama* and *Shavasana*<sup>6</sup>. One of the studies concludes that the effect of one attempt and five attempt of *Kapalbhati* on plasma fibrinogen level in normal subjects was significantly increased after single and five consecutive attempts of *Kapalbhati* of one minute duration each in normal subjects<sup>7</sup>. In another study the effect of ten minutes *Kapalbhati* on some physiological functions has been observed and it has been found that the heart rate and eye movements increase and the finger pulse volume decreases significantly as well as the respiration rate decreased immediately after *Kapalbhati*<sup>8</sup>. Researchers find in another study a better Oxygen consumption in the subjects during *pranayamaic* type of very slow-rate breathing<sup>9</sup>.

Effect of short term Yoga training program on peak expiratory flow rate is significant<sup>10</sup>. Practice of Yoga, including *Nadi Shodhan* having a positive impact in the treatment of a case of coxalgia<sup>11</sup>.

The above studies show that researchers are keen to know the effect of *Pranayama* and *Yoga Nidra* in various directions; thus it is the right time to go deep into the search of the impact of Yogic package, having the following aims and objectives: to assess the effect of *Kapalbhati* and *Nadi Shodhan* on FVC, MVV and PEFR level of the subjects.

## Methodology

Fifty students with age 18 - 25 yrs, from Govt M B P G College Haldwani Nainital of M A classes were selected for this pre – post research study. To observe the effect of Yogic practices (*Nadi Shodhan* and *Kapalbhati*) on FVC, MVV, and PEFR, the subjects were assigned by random sampling (N=50). The subjects assigned for the study were exposed to yogic practices daily for 30 minutes for 60 days.

Practice of *Kapalabhati* is undertaken through a simple method, as: Sit in any comfortable meditative *Asana*, with the head and spine straight and the hands resting on the knees. Inhale deeply through both nostril expanding the abdomen, and exhale forcefully with contraction of the abdominal muscles. The next inhalation takes place by passively allowing the abdominal muscles to expand. Inhalation should be a spontaneous. Twenty strokes of *Kapalbhati* followed by a deep breathing and another twenty strokes followed by a deep breathing technique was performed for 15 minutes regularly.

In practice of *Nadi Shodhan Pranayama*, the first step suggested in a book “*Asana Pranayama Mudra Bandha*” has been adopted<sup>12</sup>. Sit in any comfortable meditative posture, keep the hand and spine upright. Relax the whole body and close the eyes. Left hand on knee in *Chin Mudra*. Close the right nostril with the thumb. Inhale and exhale through the left nostril 5 times. The rate of inhalation / exhalation should be normal. After 5 breathe release the pressure of thumb on the right nostril and press the left nostril with the ring finger blocking the flow of air. Inhale and exhale through the right nostril 5 times keeping the respiration rate normal. Practice for 15 minutes.

Data collection was done individually in group and best attempts were made to avoid external distractions. After a 30 minutes regular practice of this above mentioned Yogic intervention for 60 days duration, the pre - post collected data over all three parameters were analyzed through proper statistical methods, which have been radiated below:

## Results

**Hypothesis (1):** The practice of *Nadi Shodhan* and *Kapalbhati* will positively increase forced vital capacity of the subjects.

Table 1 shows Pre - Post mean and standard deviation of the subject for F V C. level. It is observed that there is a positive change in the F V C level where  $t = 5.4 < 0.05$  at the 49 degree of freedom. Hypothesis (1) has been proved.

**Hypothesis (2):** The practice of *Nadi Shodhan* & *Kapalbhati* will positively increase maximum voluntary ventilation of the subjects.

Table 2 shows Pre - Post mean and standard deviation of the subject for M V V level. It is observed that there is a positive change in the M V V level where  $t = 6.4 < 0.05$  at the 49 degree of freedom. Hypothesis (2) has been proved.

**Hypothesis (3):** The practice of *Nadi Shodhan* & *Kapalbhati* will positively increase peak expiratory flow rate of the subjects.

Table 3 shows Pre - Post mean and standard deviation of the subject for P E F R level. It is observed that there is a positive change in the P E F R level where  $t = 8.4 < 0.05$  at the 49 degree of freedom. Hypothesis (3) has been proved.

### Discussion and conclusion

The results revealed that the practice of *Kapalbhati* and *Nadi Shodhan* improved forced ventilation capacity (F V C), maximum voluntary ventilation (M V V) and picks expiratory flow rate (P E F R) significantly. The practice of *Pranayama* improves the lung capacity<sup>13</sup>.

An observation during study reflects that the practice of Yoga influence the Pulmonary function<sup>14</sup>. During another study researcher observed an influence of breathing exercise on pulmonary function tests<sup>15</sup>. The effect of short term *Pranayama* practice on breathing and ventilation function of lungs was significantly changed<sup>16</sup>.

During this study it has been observed that the functioning of lungs improves as the forced vital capacity and maximum voluntary ventilation and picks expiratory flow rate improves significantly.

Table 1—Forced Ventilation Capacity (F V C)

Mean	sd	“t” value	dof
Pre	89.25	2.4	
Post	98.77	3.8	49

Table 2—Maximum Voluntary Ventilation (M V V)

Mean	sd	“t” value	dof
Pre	90.25	2.8	
Post	70.25	1.6	49

Table 3—Peak Expiratory Flow Rate (P E F R)

Mean	sd	“t” value	dof
Pre	68.05	6.4	
Post	78.02	4.2	49

As the nervous system normally adjusts the rate of alveolar ventilation almost exactly to the demands of the body so that the oxygen pressure and carbon dioxide pressure in the arterial blood can be regulated. Practice of *Nadi Shodhan* not only works on respiratory tracts it regulates the sympathetic and parasympathetic nervous system also. Through the regulation of nervous system it improves the function of respiratory system also.

Yogic breathing exercises like *Kapalbhati* and *Nadi Shodhan* in combination not only regulates the breathing pattern, it also improves the lungs functioning as well. With the forceful pumping of lungs the pulmonary ventilation improves. The proper oxygen supply improves the metabolic rate. Hence, proper absorption and assimilation of the food improves the vitality as well the immunity of the body.

The above results and discussion can be concluded that the *Kapalbhati* and *Nadi Shodhan* can play greater preventive role as well as curative role for common respiratory problems today as forced ventilation capacity (F V C) and Maximum voluntary ventilation (M V V) improves through a regular practice of this Yogic Package.

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