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AN INTERVENTIONAL STUDY TO ASSESS THE EFFECT OF NADISHUDHI PRANAYAMA IN PULMONARY FUNCTIONS OF OVERWEIGHT INDIVIDUALS

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ABSTRACT

Introduction: Obesity and overweight is a main global health problem plaguing almost the whole planet. Also it is an important fact to realize that, obesity and overweight are problems of the current society. Therefore, it is clear that obesity and overweight apart from genetic predisposition and psychological disorders might derive as well from the modern sedentary life-styles. In 2014, more than 1.9 billion adults worldwide at the age of 18 years and older were overweight and it contributes 39% of world wide population. Excess weight impairs respiratory function via mechanical and metabolic pathways. In *Yoga* there are several ways to modify breathing, such as changing the rate and the depth, holding the breath, breathing through the mouth, or breathing alternately through one or both nostrils. These voluntarily regulated *yoga* breathing techniques are called *Pranayama*. This study is designed to find out the effect of *Nadishudhi pranayama* in pulmonary function of overweight individual. **Method:** 30 overweight individuals were taken based on inclusion and exclusion criteria from Kadannapalli Panapuzha Panchayath around GAVC Kannur and subjected to practice 3 months of *Nadishudhi pranayama*. Spirometric values and MRC dyspnoea scale grading was done before and after intervention. Pulmonary functions were evaluated based on the information gathered from the result. **Result and discussion:** After 3 months of regular practice of *Nadishudhi pranayama* the FVC, FEV1, FEF 25%, FET 100% and the IC values were improved in the subject and MRC-dyspnoea scale grading gave reduced *pranavaha srotho dushti*. This shows improvement in the pulmonary function. The study confirmed the effectiveness of *Nadishudhi pranayama* in pulmonary function of overweight individuals.

Keywords: *Nadishudhi Pranayama*; Pulmonary function; Overweight; Spirometry

INTRODUCTION

Overweight and obesity are the serious health problems in the present scenario. The prevalence of both is rising to epidemic proportions at an alarming rate in both developed and developing countries. Overweight refers to a condition characterized by an excess of body weight compared to a set of standards. Body mass index can be used to measure both obesity and overweight in adult. BMI is a direct calculation based on height and weight and it is not gender specific. The national institute of health identifies overweight as a BMI of 25-29.9 Kg/m^2. The sedentary life style is main cause of overweight and obesity. Breathing difficulty is one of the common and important clinical features of overweight and obesity. Vital capacity is important during intense physical activity. Unfit and overweight, will not have the lung capacity to increase the volume of air inhale and exhale beyond normal breathing. Individuals with large amount of fat mass typically have weak respiratory muscles and therefore low vital capacity. Increase physical activity for overweight individuals can make breathing more difficult. *Pranayama* techniques increase the lung capacity and help burning fats. Vital capacity is the maximum volume of air that can be expelled out forcefully after a deep inspiration. *Pranayama* is a technique to control the motion of exhalation and inhalation of breath.

Study which was conducted in *Kriyasareera* department also proved the effect of *Pranayama* in reducing body weight. The present work is to improve the pulmonary functions in overweight individuals and assess the improvement using computerized spirometer.

OBJECTIVES

To determine the effects of *Nadishudhi Pranayama* in the pulmonary functions of overweight individuals

HYPOTHESIS

NULL HYPOTHESIS

There is no change in pulmonary function of overweight individuals after practicing 3 months of *Nadishudhi pranayama*.

ALTERNATE HYPOTHESIS

There is change in pulmonary function of overweight individuals after practicing 3 months of *Nadishudhi pranayama*.

METHODOLOGY

A survey was conducted in Kadannapalli Panapuzha Panchayath of GAVC Kannur with the help of specially prepared case proforma till the sample size was obtained, satisfying the inclusion and exclusion criteria. Their Spirometric values and *pranavaha Srothodushti lakshanas* were assessed. They were made to practice *Nadishudhi pranayama* either in the morning or in evening for 3months. They were advised to stick on to their normal diet. After intervention, again the Spiro metrical values and *pranavaha Srothodushti lakshanas* were assessed.

STUDY POPULATION

30 Overweight individuals aged between 18 – 50 years with BMI ranging 25 to 29.9 kg/m^2

INCLUSION CRITERIA

1. Both sex
2. Age: 18 – 50 years
3. Overweight individuals with BMI ranging from 25 – 29.9 kg/m^2

EXCLUSION CRITERIA

1. Pregnancy
2. Lactating women.
3. Severe systemic illness
4. Individuals with history of mental illness.
5. Individuals who are doing *yoga* and vigorous exercise regularly.

DISCUSSION

Table 1: EFFECT OF INTERVENTION ON SLEEP

SLEEP	N	MEAN	S.D	SEM	P -VALUE
B .T	30	0.33	0.48	0.09	
A. T	30	0.07	0.25	0.05	0.005

Out of 30 subjects participated in the study 20 subjects were having undisturbed sleep and 10 were having disturbed sleep. After intervention the 8 out of 10 who complained of disturbed sleep were relieved and reported to have sound sleep. Practice of *pranayama* induces tranquility of mind, thereby releasing anxiety and stress which is effective for undisturbed sleep. Airway obstruction also cause sleep disturbance. Practice of *pranayama* regularly clear the *sanga* in *pranavaha srothas* and thus helps in free flow of air and results in sound sleep.

Table 2: EFFECT OF INTERVENTION ON NATURE OF BOWEL

Bowel	N	MEAN	S.D	SEM	P -VALUE
B .T	30	0.67	0.96	0.18	
A. T	30	0.00	0.00	0.00	0.002

Certain subjects had formed, and constipated nature of bowel participated in the study. Out of them 66.7% were having formed and 33.3% were having constipated stool and after the practice of *pranayama* all those having constipated in nature were changed to formed nature of bowel. By practicing *Nadishudhi pranayama*, *vayu* moves up and down as *prana* and *apana* through right and left nostrils according to *Gheranda Samhitha*.

Constipated nature of bowel is due to the *rooksha guna* of *vata*, *Nadishudhi pranayama* cleanses the channels through which the free flow of *vata* taking place and it improves the quality of *vata* and decreases the *rooksha guna* by regular and disciplined practice and pacify *vata dosha*. So here the functions of *prana vayu* and *apana vayu* are corrected and *vata-nulomyata* of *apana vata* corrects the bowel nature.

Table 3: EFFECT OF INTERVENTION ON EMOTIONAL STATUS

EMOTIONS	N	MEAN	S.D	SEM	P -VALUE
B .T	30	4.17	1.09	0.19	
A. T	30	4.97	1.45	0.26	0.000

Subjects were having anxious, depressive, sentimental, reckless, irritable, aggressive types of emotions were participated in the present study. After intervention the subjects were transferred to the ones having normal kind of emotional status. *Nadishudhi pranayama* is normally done in a relaxed condition in which the subject has to concentrate either in his breathing or the centre of eyebrows while practicing the technique. *Pranayama* helps to strengthen and revitalize both the voluntary and autonomic nervous system. Also when practiced consistently, the *pranayama* has a powerful effect on the mind and emotions thus promoting calmness and relaxation. According to *Hathayoga pradeepika* when movement of *pranavayu* is there, *Chitta* moves and *pranavayu* is not moving *chitta* is also stationary[3]. Thus *pranavayu* helps in controlling *chitta.*

Table 4: EFFECT OF INTERVENTION ON MRC-dyspnoea scale

MRC dyspnoea scale	N	MEAN	S.D	SEM	P -VALUE
B .T	30	2.77	1.19	0.22	
A. T	30	1.30	0.47	0.09	0.000

Nadishudhi pranayama helps to purify the blood and respiratory system. The deeper breathing enriches the blood with oxygen. Thus large amount of oxygen goes to the brain, lungs, heart and capillaries which increase the respiratory efficiency and making respiration much smoother. In addition inflation of lung nearly to total lung capacity stimulates the stretch receptors, which relaxes smooth muscles of larynx and tracheabronchial tree, and helps in easy breathing.

Table 5: EFFECT OF INTERVENTION ON *JARANA SAKTHI*

Jarana	N	MEAN	S.D	SEM	P -VALUE
B .T	30	1.20	0.55	0.10	
A. T	30	0.53	0.51	0.09	0.000

Out of 30 subjects that participated in the study 23.3% were having *Avara Jarana sakthi,* 6.7% were having *pravara Jarana sakthi* and 70% were having *madhyama Jarana sakthi*. After intervention the subjects having *madhyama Jarana sakthi* were 53.3% and 46.7% were having *pravara Jarana sakthi.*

Table 6: EFFECT OF INTERVENTION ON *AGNI*

Agni	N	Mean	S.D	SEM	P -Value
B .T	30	0.60	0.67	0.2	
A. T	30	0.13	0.35	0.06	0.002

Out of 30 subjects participated in the study 10% were having *Mandagni,* 40 % were having *vishama Agni,* and 50 % were having *samagni*. After intervention 86.7% were having *samagni* and the rest were having *vishama Agni.*

Agni is depended on *vata dosha*, as *pachaka pitta* is kept near *samana vata*. By correcting the flow of *prana vata* by practicing *Nadishudhi pranayama*, it corrects the vitiation of *samana vata* and improves its quality. This in turn normalizes the functioning of *Agni*. When *Agni* gets corrected the *Jarana sakthi* enhanced and distribute equal nourishment to all *dhathus*. *Nadishudhi pranayama* also increases the intake of oxygen and thereby increase availability of oxygen which stimulates the enteric nervous system and digestive system, or results in improvement of metabolism which increases the demand of fuel and by that *Jarana sakthi* improved.

EFFECT OF INTERVENTION ON SPIROMETRIC VALUES

Spirometric parameters showed significant changes were FVC, FEV1, FEF 25%, FET 100% and IC, with P-value 0.000, 0.015, 0.000 and 0.000 respectively. Study showed that after 3 months of regular practice of *Nadishudhi pranayama*, the FVC, FEV1, FEF 25%, FET 100% and the IC values had improved in the subject.

Regular practice of *Nadishudhi pranayama* by prolonged inspiration, breath hold and prolonged expiration makes the lungs to inflate and deflate maximally and this result in the strengthening and improving the endurance of the respiratory muscles. This maximum inflation and deflation is an important physiological stimulus for the release of surfactants and prostaglandins into the alveolar spaces, which thereby increases lung compliance. The stretch receptors decreases the trachea-bronchial smooth muscle tonicity, which leads to decreased air flow resistance and increased airway caliber, which causes the dynamic parameters of the lung function test to improve. By practicing *Nadishudhi pranayama* the *pranavaha srotas* are cleansed and *swasana prakriya* becomes easy.

PHYSIOLOGY OF *NADISHUDHI PRANAYAMA*

Nadishudhi pranayama is a balancing *pranayama* which removes impurities of *nadi*. When the balance between the flow of the right and the left nostril is upset, the *prana* is affected by it, and it results in some sort of ailments. If one wants to restore the balance he should restore the balance between the flows of breath.

Nadishodhana maintains the homeostatic mechanism of the body, and it purifies the body. During *Nadishodhana* the respiratory channels are cleansed and process of respiration becomes easy. In *swasa chikithsa*, *svedana* therapy is administered first and after that body is anointed with oil mixed with salt. By these the solid *kapha* adhering in the channels gets liquefied and comes out into the *koshta*. Thus the channels become soft and *anulomana* of *vayu* takes place. For *virechana* purpose also *saidhava lavana* mixed with *amla rasa* is administered in *swasa rogi*. So by administering *oushadha* at the level of *koshta pranavaha srotho dushti* is corrected. So by practicing *pranayama*, *prana vata* along with *samana* and *vyana vata* can also be corrected and symptoms of *Atisthaulya* can be reduced.

The effect of *Nadishodhana pranayama* on respiratory system:

Nadishodhana pranayama does the *shodhana* of *nadis* through which the *pranic* energy flows. By this the *Pranamaya Kosa* also gets cleansed, and components of *Pranamaya Kosa*

like *Pancha prana* and *Upapranas* functions properly. *Nadis* are also representatives of *Pranamaya Kosa*, *pranavayu* moves through purified *nadis* and performs the *swasana prakriya* properly. *Nadishodhana pranayama* decrease the work of breathing, strengthens and trains the diaphragm and other respiratory and abdominal muscles, improves gas exchange and oxygenation. Other effects are reduced stress, give more relaxation, give energy and vitality and improve overall health and well-being.

In the *swasa samprapthi* the flow of *prana vata* gets obstructed by vitiated *kapha*, and it spreads in all direction and vitiates the *pranavaha srotas* also. *Pranayama* destroys the impurities of *nadis* and helps in the proper movement of *prana vata* without any obstruction. When the *prana vata* movement is in proper channel it helps in the proper functioning of digestive fire also. Thus it burns the body fat and by that the *Medovridhi*.

Nadishodhana maintains the homeostasis of the body. Hypothalamus is the homeostasis center of our body. Nucleus of the hypothalamus can be divided into *ushna* center and *seetha* center. *Ushna* center includes sympathetic activating center, heart rate and BP accelerator center, heat gain center, punishment center, feeding center, thirst center etc. *Seetha* center includes parasympathetic activating center, heat loss center, satiety center, heart rate and BP inhibiting center etc. *Ushna* center is similar to *vata pitta* in function and *sheeta* center to *kapha*. Even though *Ushna guna* decreases *vata*, all other functions of *ushna* center are related to *vata*. Balancing these two centers making the function of *Nadishudhi* and by that it regulates *pancha vata*, *pitta* and *kapha.*

Practice of *Nadishodhana* enhances voluntary regulation of the breathing to make respiration rhythmic and to calm the mind. During the practice the subject tries to keep his or her attention on the act of breathing leading to concentration which in turn de-stress the subject and improves the pulmonary functions. *Nadishudhi pranayama* is normally done in a relaxed condition in which the demand for oxygen from the body is minimal. It has three components to it namely controlled inhalation (*Puraka*), controlled exhalation (*Rechaka*) and holding of the breath (*Kumbhaka*).

CONCLUSIONS

CONCLUSIONS DRAWN FROM ANALYSIS

In this study after 3 months of regular practice of *Nadishudhi pranayama*, the FVC, FEV1, FEF 25%, FET 100% and the IC values had improved in the subject. *Pranavaha srotho dushti lakshanas* assessed using MRC- dyspnoea scale was found to be reduced in this study. Pattern of sleep was improved after the intervention i.e. disturbed sleep pattern was changed to sound sleep. Bowel natures of the subjects were changed. Constipated nature of bowel changed to formed nature after practicing *pranayama*. *Agni* and *Jarana sakthi* was improved after intervention. Those who had *vishama*, *manda Agni* was changed to *Sama Agni*. Emotional status of the subjects was satisfactory after intervention. Null hypothesis has been rejected as there is significant change in pulmonary function of overweight individuals after 3 months of *Nadishudhi pranayama.*

Limitations of the study

Limitations of the study are only 30 individuals were selected for the study. Effect of *Nadi-*

shudhi pranayama was studied only in overweight individuals. Ventilation perfusion ratio was not calculated before and after the practice of *Nadishudhi pranayama*. Measurement of oxygenation was not done before and after the practice of *Nadishudhi pranayama*. Improvement in concentration level before and after practice of *Nadishodhana* was not assessed.

Recommendation of the study

Recommendation of the study was, the intervention can be conducted on a larger sample size. Study can be conducted on separate group of obese and underweight individuals also. A comparative study can be conducted by administering oral medication in one group and *Nadishudhi pranayama* in another group. The effect of *Nadishudhi pranayama* on oxygenation of overweight individuals can be done.

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