Comparision of Yogic Breathing Exercise "Pranayama" and Pursed Lip Breathing (Plb) in Management of Chronic Obstructive Pulmonary Disease (COPD)

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ABSTRACT

BACKGROUND
With increased awareness and interest in health and natural remedies yogic techniques including "Pranayama" now gaining importance and becoming increasingly acceptable to scientific community. The present study was intended to establish the efficacy of Pranayama that is Alternate Nostril Breathing (ANB) on some selected autonomic function parameters *i.e.* pulse rate, respiratory rate, blood pressure and Peak Flow in patients with Chronic Obstructive Pulmonary Disease (COPD), along with Pursed Lip Breathing.

METHOD
Quashi experimental study design was used in this study. Data were collected. Male COPD patients (n = 41) from Pad DY Patil Medical College & Hospital were randomly assigned to either group A (n = 20) or group B (n = 21). Both the groups were asked to perform PURSED LIP BREATHING (PLB) in common and group B were asked to perform ANB (nadi - shodhan) for 10 minutes twice a day for consecutive 2 weeks. Outcome measure that is radial pulsed rate, respiratory rate, blood pressure, peak flow (PEFR) was taken before and after the study.

RESULT
In PLB group respiratory rate there was significant improve ($p < 0.0005$), whereas in pulse rate, blood pressure, no significant change occur, ($p > 0.05$). In PEFR, there was ext. significant improvement were found ($p < 0.0005$). In Experimental group respiratory rate, pulse rate, PEFR, significant improvement occurs ($p < 0.0005$). Whereas in Systolic blood pressure. Considerable significant improvement was seen ($p < 0.05$). The comparison of Diastolic blood pressure. shows no significant change ($p > 0.05$) Inter group comparison shows that Systolic BP & PEFR difference were extremely ($p < 0.0005$) and highly significant ($p < 0.005$) respectively. Whereas RR difference is considerable significant ($p = 0.05$).

CONCLUSION
Alternate Nostril Breathing improves autonomic dysfunction in COPD patients. Also there is improvement in respiratory function. Pranayama *i.e.* and can be an adjunct to Pursed Lip Breathing in Physiotherapy management of COPD.

KEYWORDS
Chronic Obstructive Pulmonary Disease (COPD), Pursed lip breathing, Alternate Nostril Breathing (ANB), Pranayama

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INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is an ill - defined term that is widely used to describe people who have a mix of chronic bronchitis and emphysema. The disease is progressive and characterized by acute exacerbation.[1,2] According to WHO, COPD is the third greatest cause of death worldwide. WHO estimates, 600 million people suffer from COPD all over the world. It is presently 3rd among the leading cause of death and claims 3.23 million lives in 2019. The global burden of disease study for India reported the prevalence of COPD increased from 3.3 % (28.1 million cases) in 1990 to 4.4 % (55.3 million cases) in 2016.[3] Complementary And Alternative Medicine (CAM) and therapies such as acupuncture, homoeopathy, yoga, Pranayama, reiki, herbal, and nutritional therapy are attracting an increasing number of patients with obstructive lung disease. Yoga practices, such as Pranayama, are gaining relevance and becoming more acceptable to the scientific community as people become more aware of health and natural therapies.[4] Many ailments, according to ancient yogis, are caused by a disruption in the nasal cycle, which occurs when a person breathes too long through one nostril. They devised the alternate nostril breathing technique to prevent and treat this illness. The yogis have known for a long time that prolonged breathing through the left nostril (over a period of years) will produce asthma.[5] Pranayama is a Sanskrit word. The word "prana" stands for respiration, breathe, life, vitality, wind, energy and strength. The word "ayam" means length, expansion, pause or control. Hence literal translation is "control of breathing". Autonomic activity has been demonstrated to be altered by pranayama breathing. Decrease in basal sympathetic tone has been noticed by training Pranayama. Scientists have reported that Nadishodhan Pranayama increases parasympathetic activity. Slow deep breathing itself has a calming effect on the mind and helps the individual to de - stress. This relaxing effect could have a significant physiological impact on the lungs and cardiovascular system. The gradual repetition of brief kumbhak pranayamic breathing boosts oxygen consumption and metabolic rate. Slow breathing exercise lowers the chemo reflex response to hypoxia and hypercapnia while raising baroreflex sensitivity.[6] Pursed Lip Breathing (PLB) involves breathing through a narrowed airway (the lip makes a small channel for breathing to pass through). PLB is an excellent technique to lower the breathing rate, dyspnea and arterial Pressure of Carbon Dioxide (PCO_2) and improves tidal volume and O_2 saturation in resting conditions. PLB works to improve expiration by requiring active and prolonged expiration by preventing airway collapse.[7] There are fewer studies performed to establish the effect of pranayama on autonomic function in chronic severe airway obstruction, which includes chronic bronchitis, Emphysemas and Chronic asthma. The present study is designed to establish the efficacy of Pranayama on some selected autonomic function parameters, *i.e.* pulse rate, respiratory rate, blood pressure & PEFR in patients with COPD, along with Pursed Lip Breathing. The Aim of study was to compare the effectiveness of yogic breathing exercise "Pranayama" in the management of Chronic Obstructive Pulmonary Disease (COPD) along with Pursed Lip BreathinG (PLB). The Primary objective was to evaluate the Autonomic parameter *i.e.* pulse rate, respiratory rate, blood pressure, changes after Pranayama and \ or PLB, to measure the effectiveness of Pranayama in altering the Peak flow, and to compare the effectiveness of ancient yogic breathing exercise technique and or PLB as a therapeutic intervention in COPD.[8-11]

MATERIALS AND METHODS

Quashi experimental study design was used in the present study. Data were collected from Pad DY Patil Medical College & Hospital. Purposive sampling method was used to select the subject. Male patient who ware clinically diagnosed as COPD were randomly allocated to either group A or group B. The present study consists of two groups (Double arm experiential study) of COPD patients. First group consist of 20 patient whereas second group having 21 COPD patients. Total of 41 patients were participated in the study. Sample size was calculated on the basis of following formula:

$$N = (\sigma 1^2 + \sigma 2^2) [Z 1 - \alpha / 2 + Z 1 - \beta]^2 / (M_1 - M_2)^2$$

Therapist and the patients were not blinded. Ethical committee approval was taken before the collection of data.

Sampling Criteria

Inclusion Criteria: Male patient who ware clinically diagnosed as COPD (which includes chronic air flow limitation *i.e.* chronic bronchitis, emphysema and chronic asthma) were selected in the study. To avoid biases also COPD is mainly found with male patient in our region so only male patients were included in the study. No attempts were made to distinguish the chronic bronchitis from emphysema.

Exclusion Criteria

- Patients who suffering from cold or blocked nasal passage.
- Patient with hypertension (stage ш)
- Patient who was in stage 4 of functional classification of fatigue, palpitation, dyspnea or anginal pain.
- Patient with prior history of Myocardial Infraction (MI)
- Patient who was having greatest breathlessness on VAS (Visual Analog Scale) for breathlessness.
- Any major operative condition for respiratory or cardiac condition (Figure 1).

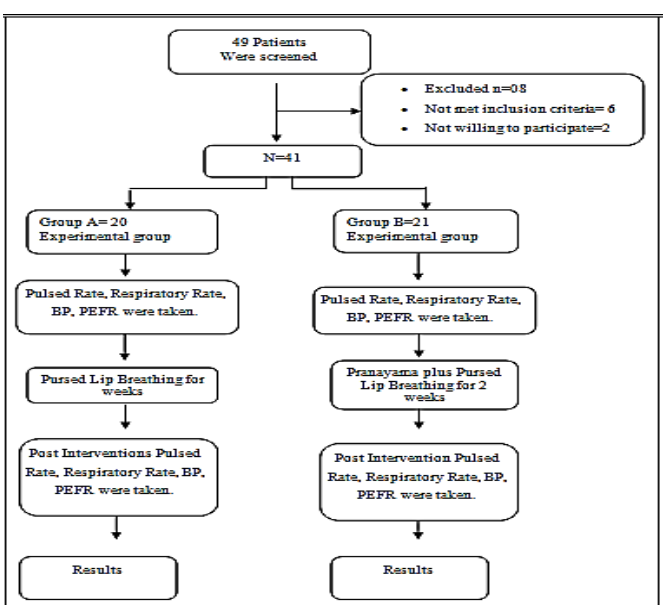

Figure 1. Flow Diagram Depicting the Procedural Sequence of the Study.

Outcome Measure

Outcomes used in the study are radial pulsed rate (per \ min), respiratory rate (breath per \ min), systolic BP (mm. Hg), diastolic BP, and peak expiratory flow rate (lit \ min) by mini - wright expiratory flow meter (brand name: MINI - BELL peak flow meter).

Procedure

Forty one patients with clinically diagnosed COPD volunteered for this study. All patients were male with mean and SD age of 58.5 ± $10^{.8}$4 yr, mean and SD for BMI in group A was 27.1 ± 5 and for group B it was 25.18 ± 4.32. All patients were randomly taken from, nearby health care institution. The patients had to be in a stable phase of their condition, and No attempt were made to distinguish the Chronic Bronchitis from Emphysema. The study was carefully explained to the patient. Each patient had signed consent to serve as a subject in the study. Each patient then thoroughly evaluated and their documentation was done. So far as possible they were requested, not to change their medication during the study period, and they did not change their smoking habits. All Patients with Chronic Obstructive Pulmonary Disease (n = 41) were randomly assigned to either group A (n = 20) or group B (n = 21). Both the groups were asked to perform Pursed Lip Breathing in common and group B (experimental group) were asked to perform Pranayama (nadi - shodhan) for 10 minutes twice a day for consecutive 2 weeks (14 days). Before starting practice in PLB \ Pranayama group, Respiratory Rate (RR), Pulse rate, Blood Pressure and PEFR were recorded in Sitting Position. Patient outcome were measured mostly in the morning.

Autonomic Function was Assessed Objectively by Measurement of the following:

• Respiratory rate

• Pulse rate: The peripheral pulse rate can be measured by palpation of pulse at anatomical sites such as the radial artery or carotid artery

• Pulse rate: The peripheral pulse rate can be measured by palpation of pulse at anatomical sites such as the radial artery or carotid artery. The normal PR for adult is 60 – 100 beats per min. and is regular in rhythm.

• Blood pressure force exerted during contraction of the left ventricle. Diastolic BP is the force occurring when the heart is relaxed BP is most commonly measured by auscultatory method, which uses a blood pressure cuff.

The Peak Expiratory Flow Rate is the maximum flow that occurs at any time during the Forced Vital Capacity It provides a simple, quantitative and reproducible measure of the existence and severity of airflow obstruction. PEF was done on a hand held, portable PEF in lit per minute. Normal peak flow averages 9 – 10 lit Since PEF can be measured with a brief, force full expiratory maneuver, it provides a rapid assessment of air flow limitation and can be helpful in monitoring the progress of obstruction and response to treatment. Forced expiration only has to be sustained for approximately one second. The needle must always be reset to zero before PEFR is measured. The patient had to Place the mouth piece in your mouth and close your lips around it and blow out as hard and fast after taking deep breath. Write the highest of the three readings. PLB & Nadi - shodhan Pranayama (alternate nostril breathing) technique was demonstrated & explained to the patient. Patients were asked to do these breathing manures at home. All patients, in both the groups were seen at regular 3 to 4 days interval in OPD, wards or home visit basis and assessed for their changes in chest symptoms or any difficulty regarding the breathing exercise manures. After two weeks of practice, all patients were reassessed and their Pulse rate, Respiratory rate, BP, & PEFR were recorded.

Pursed Lip Breathing (Common for Both the Group)

Pursed Lip Breathing (or "PLB") is a very popular and excellent "Rescue" technique for the acute dyspnea resulting from COPD, Emphysema and Asthma. It was performed in sitting position. Patient was asked to perform expiration with pursed lip while expiration prolongs then the inspiration.

Nadi - Shodhan Pranayama (Alternate Nostril Breathing)

The name Alternate Nostril Breathing is due to the fact that we alternately breaths through both nostrils. According to Yoga literature that left nostril is called as "ida Nadi" which represents mental energy and mind, and right nostril is Pingala Nadi, which represents physical energy and body. If Ida and Pingala are out of harmony, the body and mind will be as well. The goal of Alternate Nostril Breathing is to achieve harmony between the body and mind by balancing these two forces, mental and physical energy.

Instructions to the Patient Were

• Open the right hand and bend index and middle finger against the palm, the thumb was used for closing the right nostril while the fourth and fifth finger were used for the left nostril.

• Start the exercise in the sukhasana posture or any other comfortable posture with relax attitude.

• With the right thumb, close the right nostril and inhale through the left nostril. To be done for the count of four seconds.

• Immediately close the left nostril right ring & little finger, and at the same time remove your thumb from the right nostril, and exhale through this nostril. Do this to the count of eight second this completes the half round.

• Inhale through the right nostril to the count of 4 second. Close the right nostril and exhale through the left nostril to the count of 8 second. This completes the one full round.

Patient has to do this cycle for at least 10 minutes in the morning and 10 min in the evening for consecutive 2 weeks (14 days) (Figure 2).

Figure 2. Alternate Nostril Breathing Technique in Pranayama.

RESULTS

All the values obtained from, pre and post measurements of

both the groups. Mean and standard deviation (± SD) of all the observations were calculated. Comparison were done between pre and post values of respective groups, by applying Students 't' - test (paired). Comparison was done between A and B group by applying Student - test (unpaired).

Statistical significance was assigned at P < 0.05. Data analysis was done on Microsoft Excel 2010 (KB 3191855) 32 - Bit Edition. In this study total of 41 male COPD patients were recruited. They were randomly assigned to group A (n = 20, mean age 60.3 ± 10.94) and group B (n = 21, mean age 58.8 ± 10.45). Data analysis of group A and B are given in Table 1 and Table 2. Comparative statistical analysis between group A and B (by mean difference) are shown in Table 3.

variable	pre (mean ± sd)	sem	post (mean ± sd)	sem	t - value	p - value
RESP RATE	29.7 ± 4.83	1.08	26.25 ± 4.23	1	6.1	< 0.0005*
PULSE RATE	98.1±17.59	3.94	94.7 ± 16.36	4	1.5	NS
SBP	130.35 ±0.33	2.31	129.3 ± 9.49	2	1.5	NS
DBP	84.8 ± 8.18	1.83	84.4 ± 7.41	2	1.4	NS
PEFR	206.5±89.25	20	225±82.76	19	4.2	< 0.0005*

Table 1. Comparison of Pre and Post Breathing Exercise Parameters (Group - A).

In this study total of 41 male COPD patients were recruited. They were randomly assigned to group A (n= 20, mean age

60.3 ± 10.94) and group B (n = 21, mean age 58.8 ± 10.45). At the end of study, statistical analyses of both the groups were done, the results are following:-

Group - A: Control Group or Pursed Lip Breathing Group

In respiratory rate (Figure 1) there was ext. significant improvement occurs (t - value 6.065; p < 0.0005), whereas in pulse rate (Figure 2), SBP (Figure 3) and DBP. (Figure 4), no significant change occur, (t - value 1.514; p > 0.05), (t - value 1.530; p > 0.05), (t - value 1.370; p > 0.05) respectively. In pefr (Figure 5), there was ext. Significant improvement occurs (t - value 4.163; p < 0.0005).

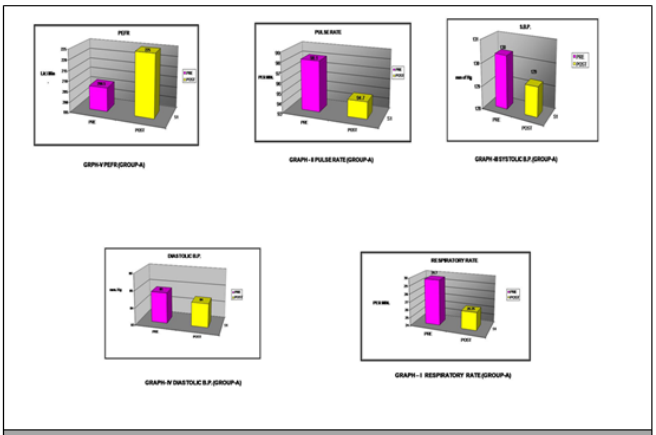

Figure 3. Showing the Graphical Presentation for Comparison of Pre & Post Breathing Exercise Parameters *i.e.* RR, PR, SBP, DBP & PEFR (group - A).

Group - B: Experimental Group or Plb with Alternate Nostril Breathing Group

In Respiratory Rate, Pulse Rate, PEFR, Ext. significant improvement occurs (t - value 4.238; p < 0.0005), (t - value 4.568; p < 0.0005) (t - value 8.395; p < 0.0005) respectively. Whereas in SBP. Considerable significant improvement occur (t - value 2.018 p < 0.05). The comparison of DBP (Graph - IX) shows no significant change. (t - value 1.874; p > 0.05)

variable	pre mean ± sd	sem	post mean ± sd	sem	t - value	p - value
Resp. rate	26.33 ± 5.10	1.1	22.33 ± 3.14	0.7	4.24	< 0.0005*
Pulse rate	91 ± 14.18	3.1	82.14 ± 10.01	2.2	4.57	< 0.0005**
SBP	133.85 ± 13.08	2.9	130.71 ± 10.85	2.4	2.02	< 0.05*
DBP	86.19 ± 7.95	1.7	84.76 ± 7.69	1.7	1.63	NS***
PEFR	257.85 ± 94.74	20	294.28 ± 98.87	22	8.4	<0.0005**

Legend: SBP = Systolic Blood Pressure (mmhg); DBP = Diastolic Blood Pressure (mmhg); PEFR = Peak Expiratory Flow Rate (l / sec); NS = Not Significant, p > 0.05. Considerable significant improvement occurs in SBP. After 2 weeks of ANB with PLB, ext. significant improvement occurs in RR, PR and PEFR, after 2 weeks of ANB with PLB, No significant change in DBP.

Table 2. Comparison of Pre and Post Breathing Exercise Parameters (Group - B).

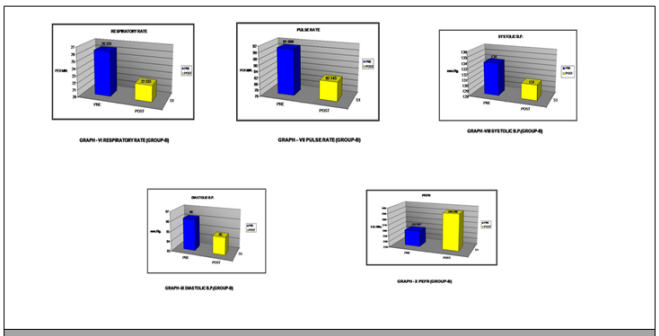

Figure 4. Showing the Graphical Presentation for Comparison of Pre and Post Breathing Exercise Parameters *i.e.* RR, PR, SBP, DBP and PEFR (Group - B).

Comparison between Group A and B

Comparison between group A and B were done by student unpaired 't' test. Difference between pre and post values of each parameter were taken from each group & mean difference were calculated. To found out the t - value. Mean difference, t - value, and p - values are shown in table 3.

	Grp - a (Mean diff.)	Grp - b (Mean diff.)	t - value	p – value and significancy	
RR	3.5	4	1.6	P = 0.05	CON.S
PR	3.4	8.9	0.7	P > 0.05	NS
SBP	1.1	3.1	3.7	P < 0.0005	EXT.S
DBP	0.6	1.8	1.5	P > 0.05	NS
PEFR	19	36	2.8	P < 0.005	V.HIGLY S

Table 3. Comparison of Mean Difference between Group - A (Plb) and Group - B (Anb and Plb).

Inter group comparison in present study suggest that SBP and PEFR difference were extremely (t - value 3.687; p < 0.0005) and highly significant (t - value 2.795; p < 0.005) respectively. Whereas RR difference is considerable significant (t - value 1.648; p = 0.05). There is no significant difference found in PR and DBP (t - value 0.709; p > 0.05), (t - value 1.546; p > 0.05) respectively (Figure 5).

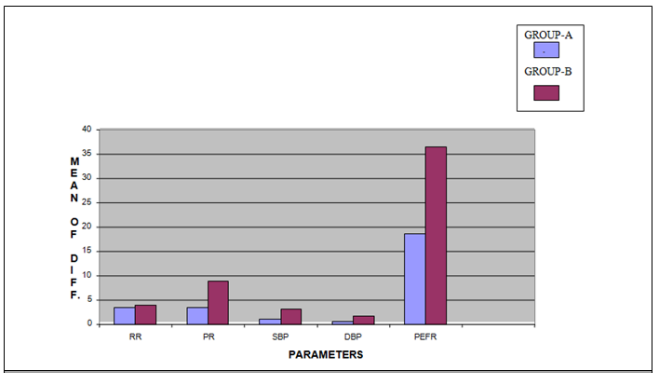

Figure 5. Mean Difference Comparison between Group A and B.

DISCUSSION

The main aim of the study was to compare the effectiveness of yogic breathing exercise Pranayama *i.e.* Nadhi Shodhan in the management of Chronic Obstructive Pulmonary Disease (COPD) along with Pursed Lip Breathing (PLB). The study showed, there was significant improvement in respiratory rate in PLB group (t - value 6.065; p < 0.0005), whereas in pulse rate, SBP and DBP, no significant change occur, (t - value 1.514; p > 0.05), (t - value 1.530; p > 0.05), (t - value 1.370; p > 0.05) respectively. In PEFR, there was ext... Significant improvement was found (t - value 4.163; p < 0.0005). In Experimental group respiratory rate, pulse rate, PEFR, significant improvement occurs (t - value 4.238; p < 0.0005), (t - value 4.568; p < 0.0005) (t - value 8.395; p < 0.0005) respectively. Whereas in SBP. Considerable significant improvement occurs (t - value 2.018; p < 0.05). The comparison of D.B.P. shows no significant change.(t - value 1.874; p > 0.05) Thus it was noted that, if Physiotherapy Breathing technique *i.e.* PLB is performed along with Nadi - shodhan Pranayama or ANB then improvement in terms of Autonomic parameters and Spirometric parameter *i.e.* PEFR is more than PLB performed alone in COPD patients. Inter group comparison in present study suggest that SBP & PEFR difference were extremely (t - value 3.687; p < 0.0005) and highly significant (t - value 2.795; p < 0.005) respectively. Whereas RR difference is considerable significant (t - value 1.648; p = 0.05). There is no significant difference found in PR and DBP (t - value 0.709; p > 0.05), (t - value 1.546; p > 0.05) respectively Improvement in respiratory rate by PLB may be because, PLB causes reduction in end - expiratory volume of Chest Wall (CW) and increase in end - inspiratory volume of CW. The decrease in end - expiratory vol of CW, mostly due to decrease in end - expiratory vol of the abdomen, related to increase in expiratory time and total time of respiratory cycle, which interns causes reduction in breath frequency. The effect of PLB on breathlessness relies on its deflationary effect on CW.[11] According to Jadranka spahija rest and during exercise; PLB encourages a slower and deeper breathing pattern. The effect of PLB on dyspnea is connected to the combined changes in total volume and end - expiratory lung volume that it promotes. Also their impact on the available capacity of the respiratory muscles to meet the demands placed on them in terms of pressure generation. This explanation is also supported by other studies.[12] another study showed, the preponderance of literature points to beneficial effects of yogic breathing techniques in both physiological and clinical setups. Advantageous effects of yogic breathing on the neurocognitive, psychophysiological, respiratory, biochemical and metabolic functions in healthy

individuals were obtained.[13] The above studies could be the explanation to support the present study, in which PEFR improved significantly after 2 weeks of PLB, because PEF measures the force and speed that air is blown out of the lung also PEF depends on patient efforts.[14] PLB causes, change in the pattern of chest wall muscle recruitment and improved ventilation in COPD. PLB lead to increase rib cage and accessory muscle recruitment during inspiration and expiration, increased abdominal muscle recruitment during expiration, decrease duty cycle of the inspiratory muscle and RR. Also improved SaO_2, indicates a mechanism of improving ventilation with PLB while protecting the diaphragm from fatigue in COPD. Alteration in the pattern of respiratory muscle recruitment with PLB may be associated with amelioration of dyspnea.[15] Bia CX observed that PLB lowers the RR and Tidal Volume. Additionally, in COPD patients with respiratory insufficiency, the arterial pressure of CO_2 ($PaCO_2$) decreased over time while the arterial pressure of O_2 (PaO_2) increased noticeably. There were no significant changes in PR, SBP & DBP after 2 weeks of PLB which may signify that there is no effect of PLB on autonomic parameters. A significant decline in RR is observed after two weeks of ANB with PLB. The decline in RR is may be due to yogic breathing induces modification of the ventilator pattern with a significant lengthening of expiratory duration and modest improvement in TV. Thus increased respiratory sensation & perhaps through its persistent conditioning of breathing pattern. [16] MK. Tendon observed that The breathing pattern of the patient with Chronic Sever Airway Obstruction changed to a slower and deeper pattern after yoga instruction, allowing them to endure higher workloads and controlling an incident of severe shortness of breath without needing medical assistance.[17] In another study there is significant improvement in visual analog score in study group, indicated that the Pranayama exercise improved the respiratory distress and quality of life. These findings are also supported by other studies of Josh. Reduction in Heart Rate or PR was also observed in the present study. In COPD patients there is distinctly different heart rate dynamics compared to normal subjects. The heart rate variability might be independent measure of the autonomic dysfunction in COPD.[18,19] Cardiac autonomic dysfunction is characterized by a "imbalance" in the heart's activity between the sympathetic and parasympathetic neural systems. In various chronic illnesses, including COPD, impaired autonomic function is linked to an increased risk of cardiovascular death. Heart Rate variability studies also demonstrated a cardiac autonomic dysfunction in COPD patients recommended that cardiac sympathetic nervous system is impaired in patients with COPD as a result of generalized sympathetic over activity. Above studies suggest that, there is autonomic dysfunction in patient with COPD, that can cause increase basal HR. Cardiac autonomic dysfunction is a condition in which the sympathetic and parasympathetic nervous systems activity in the heart is out of balance. In several chronic diseases, including COPD, impaired autonomic function is linked to an increased risk of cardiovascular death. There was improvement in parasympathetic activity which was observed following slow type breathing exercise, perhaps due to increase oxygenation of tissue.[20] The present study observation are corroborate with the observation of that Pranayama breathing decreases baseline HR and BP by improving vagal tone and by decreasing sympathetic discharge. However other studies suggested that Pranayama breathing practiced exclusively from right (right nostril breathing) increased sympathetic activity.[21,22] It was also shown that breathing through the left nostril reduced sympathetic outflow. Slow breathing exercise *i.e.* ANB, which was used in this study shows, increase parasympathetic activity. This suggests that either left nostril slow breathing or ANB enhances parasympathetic activity. A significant decline of SBP was observed in present study. SBP is determined by venous return, sympathetic and parasympathetic drive. Pulmonary inflation produces wide spread vasodilatation in the skeletal muscle vasculature due to withdrawal of sympathetic tone, this would lead to less venous return.[23] According to Subbalakshmi et al. a practitioner of Pranayama not only tries to keep his or her awareness on act of breathing, leading to concentration. These acts of concentration remove attention from worldly fears and anguish. This stress Free State of mind evokes, calm response. Parasympathetic nerve activity takes precedence over sympathetic nerve activity in this relaxed condition.[24] In a recent study it was demonstrates that both slow and fast types of pranayama practice are beneficial in reducing Perceived Stress Scale (PSS) in the healthy subjects but beneficial effect on cardiovascular parameters occurred only after practicing slow breathing type pranayama. As a result, the considerable reduction in basal HR and SBP observed in Pranayama practitioners could be attributed to improved parasympathetic regulation of the heart. According to Chacko N study, slow breathing reduces the BP and enhances baroreflex sensitivity in hypertensive patient. Another study suggests that rosary prayer or yoga mantras, which involve at 6 breaths \ min. (prolonged expiration), induce positive psychological effects. These mantras can synchronies and reinforce inherent cardiovascular rhythms and modify the beroreflex sensitivity. As earlier stated that in COPD patients, nervous system abnormalities and generalized sympathetic over activity are common. So, the current study finding of decrease in SBP can be linked to the parasympathetic system activity, which overrides the sympathetic nerve activity by doing ANB. Diastolic BP mainly varies with the degree of peripheral resistance and heart rate. The non - significant change in DBP observed in the study, suggest that Nadi - shodhan Pranayama might have no effect on peripheral vascular resistance or it has a few roles but masked by a slow heart rate. A significant improvement in Peak flow was observed in the present study. This Increase in PEFR can be explained by following changes in the respiratory dynamics that are first Cleansing of airways secretions. Second, Yogic breathing exercise strain practitioners to use the diaphragmatic and abdominal muscles more efficiently, thereby emptying and filling the respiratory apparatus more efficiently and completely. Third the relaxing effect of Pranayama inhibiting the constrictor tone to bronchial smooth muscles. Peak flow stands for effort - dependent flow, which is mostly determined by lung volume. In the Nadi - shodhan Pranayama, the lung areas that aren't used up in typical shallow breathing are employed. As a result, the elevated PEFR could be due to a small airway opening in the lungs. Increase in PEFR, is in confirmatory with and contrary to other studies. Inter group comparison in present study suggest that SBP & PEFR difference were extremely and highly significant respectively. Whereas RR difference was considered to be significant. There was no significant difference found in PR and DBP. Thus by ANB with PLB, the Peak flow, SBP and RR improves more than PLB alone. With these results, it can be suggested that, in Physiotherapy management of COPD patient ANB or Nadi - shodhan Pranayama can be included along with PLB. Pranayama breathing techniques, including Yoga, are the most promising alternative forms of supplemental alternative medicine for obstructive disorders, according to the recent published data. Reduced psychological over activity,

emotional instability, vagal efferent discharge, and sputum evacuation are among the factors responsible for the improvement. Slow breathing with or without humidified air has brochoprotective & bronchorelaxing effect, augment the autonomic control and a positive endogenous corticosteroid release. Pranayama is the process of controlling the movement of the breath during inhalation and exhalation. Yoga treatment, *i.e.* Pranayama can be help with internal awareness, autonomic imbalance, breathing regulation, immune system improvement, and improves physiological response.[25-32]

CONCLUSION

In summary, Alternate Nostril Breathing or Nadi - shodhan Pranayama improves autonomic dysfunction in COPD patients. Also there is improvement in respiratory function. Pranayama is easy to perform by individual without any help. It is safe and effective, if carried out in the right manner and on a regular basis. Thus it can be concluded that Pranayama, *i.e.*, ANB, can be an adjunct to Pursed Lip Breathing in Physiotherapy management of COPD.

CONFLICT OF INTEREST

There was no potential for a conflict of interest. This study received no specific support from public, private, or non-profit funding bodies.

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