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A study on the effect of Pranayama in improving quality of life among Chronic Obstructive Pulmonary Disease patients

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Abstract

Problem:*Provision of treatment for chronic obstructive pulmonary disease (COPD) may be useful for some extend to improve the lung functions. A special focus on rehabilitation along with medical treatments and special interventions may help to recover the patients. Pranayama (a controlled breathing), a specific set of respiratory exercise that improves the resting respiratory rate, breath holding time, maximum inspiratory and expiratory pressures, maximum voluntary ventilation and vital capacity.* ***Methodology:****The main objective of this study is to analyze the effect of pranayama in the improvement of the quality of life among COPD patients who are medically stable. Thirty patients who are eligible to include were trained for practicing pranayama for twice a day for 30 minutes with regular medications.St. George's Respiratory Questionnaire was given to all recruiters before and after six weeks of supervised pranayama practice along with their usual medication.The data were analyzed in three domains including symptoms, activity and impact.* ***Findings:****The symptom ranges (troubling in the chest) were observed from 71.6 and 29.5% (before pranayama) and reduced to 36 and 5% (after pranayama) respectively. The activities affected by the breathing from 91.8 to 14.9% and were improved after pranayama from 61.5 to 7.6% respectively. The impact showed better improvements where the ranges from 85.7 to 8.6% showed initially and further reduced after pranayama from 63.8 to 3.9% respectively.* ***Conclusion:****The present investigation showed that practicing pranayama has been very much useful in the management of moderate to severe COPD. Significant improvements have been observed in all the three domains and therefore this may bea useful adjunct treatment and can be a very useful rehabilitation for COPD patients.*

Keywords:1 *COPD,2 pranayama,3 SGRQ-C,4 quality of life*

Introduction

Even though, the chronic obstructive pulmonary disease (COPD) is preventable and treatable, it has been found in larger numbers and considered as the major emerging health issues in developing countries like India [1,2]. COPD is now graduated as 12th largest burden of disease and is likely to be the 5th within the next 5 years [3].The pulmonary involvement is closely associated with an abnormal inflammatory response of the lung to noxious particles or gases and is pigeonholed by airflow constraint that is not fully revocable but is habitually progressive [4].

The improvement in the muscle functions and exercise capacity in COPD patients, rehabilitation of lungs is considered as evidence-based intervention strategy; adequacy of physical activity isincluded. Endorsements in the physical activity have been evolved for at least a moderate intensity for 30 minutes[1],where the patients remain insufficiently active [5] the description of the yoga and its practices fall into five major principles including relaxation, exercise (asanas), pranayama (breathing control), nourishing diet and positive thinking and meditation. Among them, pranayama can improvethe capacity of the lungsand also help to strengthen the internal organs, improve mental control and deepen the ability to relax. This may be very much useful since it is simple, inexpensive, and widely available.

Pulmonary rehabilitation is defined as the comprehensive intervention including exercise training, education and behavior modification that are designed for improving the physical and psychological observation of COPD patients [6,7]. The signal of increasing the efficacy of several kinds of exercise training as a part of pulmonary rehabilitation is aimed at reducing dyspnea, fatigue and improving health-related quality of life and exercise capacity in COPD patients[8].An adjunct to physical therapy treatment in industrial rehabilitation programs and proven to enhance mind-body coordination has been determined using pranayama [7,9]. Some studies highlighted that the breathing practices improved lung capacity, increased diffusion capacity, decreased dyspnea-related distress and improved health-related quality of life [10-13].

An extensive study demonstrated the usefulness of asanas, pranayama, relaxation techniques, meditation, chanting for various disorders including anxiety and depression, asthma, autism spectrum disorder,cancer, coronary artery bypass graft, diabetes mellitus, hypertension, low back pain, osteoarthritis of knee and schizophrenia[14-25]. Few studies are available in the importance of yoga systems in the management of COPD patients [10-13]. Thus, we planned to do this study forunderstanding the role of pranayama among COPD patients and its management. We hypothesized that pranayama would improve the quality of the life of COPD patients in order to manage their disease state to normal.

Materials and Methods

Study participants

The COPD patients who are attending the OPD of Respiratory Medicine, Department of Trichy SRM Medical College Hospital and Research Centre were recruited as study participants. The study sample consisted of 30 COPD patients in the age range 29 to 54 years.

Inclusion criteria

Clinically confirmed COPD patients, aged 20 to 55 years of both genders, with mild to very severe stable physician-confirmed COPD satisfying Global Initiative for Obstructive Lung Disease (GOLD) criteria, those with forced expiratory volume 1 (FEV1)/forced vital capacity ratio <0.7 and post-bronchodilator FEV1 <80% predicted, clinically stable for at least 3 months prior to enrollment, able to walk without aid, willing to complete all study assessments and provide informed consent were included in the study.

Exclusion criteria

Patients with recently diagnosed COPD, epilepsy, unstable angina, respiratory tract infection within 1 month of the start of the study, myocardial infarction, angioplasty, heart surgery in the previous 6 months, basal blood pressure > 180/100 mmHg, resting PR > 120 bpm, body mass index (BMI) >35 kg/m^2, injury-free, no history of hospitalization, previous participation in yoga rehabilitation programs, mentally retarded and related neuromuscular disorders were excluded.

Ethical clearance and informed consent

The study protocol was approved and certified by Institutional Ethical Committee (Ref: No. 14/ TSRMMCH&RC/ ME-1/ 2020-IEC No. 021 dated 31.01.2020). All procedures were performed according to the Declaration of Helsinki research ethics. Each participant received detailed information about the study and provided written informed consent before the work commenced.

Intervention

In this study, combination of asanas, loosening exercises, breathing exercises, *pranayama* were included. This aims to give a holistic treatment correcting imbalances at physical, mental and emotional. For intervening the COPD patients, the following relaxation procedures were followed initially

1. Deeply relax various different muscle groups
2. Slow the breath through breathing practices
3. Strengthen respiratory muscles
4. Calm the mind
5. Balancing the emotions
6. Develop internal awareness and bliss in action.

All the usual demographic parameters were collected and recorded in the proforma. The St. George's Respiratory Questionnaire was given to all 30 COPD patients before and after six weeks of supervised pranayama practice along with their usual medication. The details of the pranayama practices given to the patients are defined in table 1.

St. George's Respiratory Questionnaire (SGRQ)

This questionnaire is a disease-specific instrument designed to measure impact on overall health, daily life, and perceived well-being in patients with obstructive airway disease. It is categorized with three components:

Domain 1: Symptoms component (frequency & severity) with a 1, 3 or 12-month recall (best performance with 3- and 12-month recall) with several scales; including frequency of cough, sputum production, wheeze, breathlessness, and the duration and frequency of breathlessness or wheeze.

Domain 2: Activities that cause or are limited by breathlessness – dichotomous (true or false)

Domain 3: Impact components (social functioning, psychological disturbances resulting from airways disease); it covers such factors as employment, being in control of health, panic, stigmatization, the needfor medication and its side effects, expectations for health and disturbances in daily life.

Scores ranging from 0 to 100 are calculated foreach component, as well as a total score which summarizes the responses to all items. A zero score indicates no impairment of qualityof life. The questionnaire takes approximately 10 minutes to complete andto date has been shown to be reproducible, valid and responsive inboth COPD and asthmatic populations (Jones et al., 1992; Jones, 1994).

The arithmetic adjustment was done to make them directly comparable to those obtained with the SGRQ. The adjustments are:

Symptoms: SGRQ score = (SGRQ-C x 0.99) + 0.94 units

Activity: SGRQ score = (SGRQ-C x 0.87) +7.01 units

Impacts: SGRQ score = (SGRQ-C x 0.88) +2.18 units

Results

The inclusion of age groups of COPD patients in this study ranged from 25 to 55 years and total of 14 males and 16 females. The mean range of such measures of the disease activity for the study population is summarized in Table 2.There was a large range of scores suggesting that the population covered a wide spectrum of disease activity.

The scores recorded among the symptoms, activity and impact suggesting that the population covered a wide spectrum of disease activity. The age of the patients was not correlated and gender of the patients was not affecting the SGRQ scores. There were no differences in SGRQ scores between the patients who had previous symptoms and other coexisting diseases and its related clinical complications.

The mean SGRQ scores of different domains were analyzed. Among the symptoms, 278.27 and 131.68 were observed before and after pranayama interventions among the patients with COPD medications. The symptom ranges were observed from 71.6 and 29.5% (before pranayama) and reduced to 36 and 5% (after pranayama) respectively. The percentage determination of symptom score before and after pranayama was depicted in Table 3.

Means (95% confidence intervals) for SGRQ scores in subjects included in this study showed the elevation of COPD conditions. The aggregative scores of symptoms, activity and impact of analyzing the effect of pranayama were analyzed and the same was depicted in table 4.

The intraclass correlation (rI) for the short-term repeatability of the SGRQ component and total scores measured in a subgroup of 30 patients, six weeks apart were as follows: ymptoms (rI=0.94); Activity (rI=0.92) and Impacts (rI=0.89). The coefficients for the SGRQ components were 0.92 for the symptoms component, 0.87 for the activity component and 0.90 for the impacts component.

The severity of the COPD among patients included in this study showed maximum among mild stages (46.7%) followed by moderate cases (9%) (Table 5). This study also highlighted the observation of pulmonary function test (PFT) with predicted responses, symptoms, need of hospitalization and types of interventions requires for the patients.

Discussion

Chronic obstructive pulmonary disease (COPD) is a multifaceted disorder which is reversible and progressive with pulmonary and other systemic components that impairthe quality of life. Appropriate and consistent medical management for need based periods is provided; also occurrence of significant side effects and disease worsens happen [2,6]. The disease progression can be delayed with preventive measures; however, further intervention with rehabilitation is recommended by various studies [31-33].

Process of validating any questionnaire designed to measureimpaired health is multifactorial. The evidence for the validity ofsuch questionnaires is done using large number of test participantsinrelation with theeligibility and inclusion criteria of the questionnaire and relevant measuresof disease activity and its effects on the health and well-being[34]. In this study, we addressed the correlation of SGRQ with a COPD severity including symptoms, activity and its impact to patients. The correlation patterns with the components of the SGRQ suggested that these components were addressing relatively specific areas of impaired health among the study groups.

Non-pharmacologic treatments included aerobic exercise, strength training, stress-reduction techniques and cognitive-behavioral approaches have been already being commonly used in COPD but most of them are not much effective respiratory management[33,35,36]. In addition, the wide spread practicing of breathing techniques may be effective as an adjunct treatment for COPD [37]. Among them, Pranayama has been practiced widely in India with encouraging results in people with COPD as adjunct treatment and rehabilitation measure[2].Pranayama is easy to perform and no financial role; the time fixed for doing pranayama also very less 15 to 20 minutes.

The symptoms score of SGRQ was significantly related to disease symptoms that are closely associated with COPD but had lower associations that found between the SGRQ symptoms component and other scores (Table 2) are more or less found similar to the reference where patients with chronic airflowlimitations were included[38]. The SGRQ activity score was most strongly associated with pranayama and was also moderately correlated with. The associations between SGRQ and spirometry were relatively weak in thisstudy, but similarly weak correlations have been observed betweenspirometry measures and other disease-specific SGRQmeasures in asthma and COPD [39,40].

This study also revealed the importance of SGRQ score in participants with COPD for determining the effects of pranayama. Obvious improvements in the symptom score were observed after 6 weeks among the COPD patients compared with those who are not performing pranayama. The activity and impact levels for the pranayama improve the generalcondition of individuals with COPD, relieving theirsymptoms and making them feel better.

After 6 weeks of pranayama, the pulmonary function test (PFT)was found significantly improved and in this study it could be observed because of reduction of sympathetic reactivity while performing pranayama. The ultimate use of this pranayama is to improve the broncho-dilatation by correcting the abnormal breathing patterns and reducing the muscle tone of inspiratory and expiratory muscles. By improving the breathing patterns, respiratory bronchioles may be widened and perfusion of a large number of alveoli can be carried out efficiently. Hence, it can be said that pranayama breathing may prevent serious cardio-respiratory complications by emphasizing optimal physical and mental conditioning.

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Table 1: Pranayama practices

Name of the practice	Duration	Methods	Benefits	Reference
Pranayama	10 minutes	After settle down in the posture, the movements of inhalation and exhalation are regulated by long breathing	Improves balance of body mind complex, emotional stability, improves lung functions	[26,27]
Kapalabhati	6 minutes	A series of fast successive bursts of exhalations followed by automatic passive inhalations	Strengthens diaphragm, cleanses lungs and entire respiratory tract	[28]
Anuloma-Viloma	15 minutes	Holding one nostril closed with inhaling then holding other to	Stress reduction, improved breathing and circulation	[29]

pranayama		exhale; then reversed and repeat		
Bhastrika Pranayama	5 minutes	Inhale through both nostrils maximum for 4 seconds and then exhale for 6 seconds	activating pulmonary stretch receptors and decreasing the diastolic blood pressure	[30]
Sasangasana	6 minutes	Hold onto the heels with the hands and pull the forehead in towards the knees with the top of the head on the floor	Spine and stretches the back, arms, and shoulders while stimulating the immune and endocrine systems	[31]
Bhramari Pranayama	6 minutes	Quick inhalation and slow exhalation with humming sound	Relieves stress and cerebral tension, harmonize the mind, deals problems of a sore throat.	[32]

Table 2: Gender and Age group of the subjects included

Age groups (in years)	Gender verses diseases state		Total (n=30)	Mean
	Males (n=14)	Females (n=16)		
25 to 30	-	1 (6.25)	1 (3.3)	43.6±1.3
31 to 35	-	1 (6.25)	1 (3.3)	
36 to 40	3 (21.4)	4 (25)	7 (23.3)	
41 to 45	2 (14.3)	6 (37.5)	8 (26.7)	
46 to 50	7 (50)	4 (25)	11 (36.7)	
51 to 55	2 (14.3)	-	2 (6.7)	

[Figure in parenthesis denoted percentages]

Table 3: SGRQ score variations among patients (n=30) without adjustments

Before pranayama				After pranayama			
Score range	Symptoms	Activity	Impact	Score range	Symptoms	Activity	Impact
20 to 30	3 (10)	6 (20)	8 (26.7)	5 to 10	6 (20)	4 (13.3)	11 (36.7)
31 to 40	5 (16.7)	3 (10)	4 (13.3)	11 to 20	11 (36.7)	5 (16.7)	5 (16.7)
41 to 50	8 (26.7)	5 (16.7)	8 (26.7)	21 to 30	4 (13.3)	11 (36.7)	1 (3.3)
51 to 60	8 (26.7)	6 (20)	6 (20)	31 to 40	4 (13.3)	4 (13.3)	8 (26.7)
61 and ↑	6 (20)	10 (33.3)	4 (13.3)	41 and ↑	5 (16.7)	6 (20)	5 (16.7)

[Figure in parenthesis denoted percentages]

Table 4: SGRQ scores in COPD patients

N	Age in years	Symptoms score	Activity score	Impact score
30	43 (25 to 55)			
Before Pranayama		49.6 (28.5 to 68.9)	52.0 (19.9 to 86.9)	40.8 (9.7 to 77.6)
After Pranayama		23.9 (5.9 to 53.9)	32.2 (13.6 to 81.4)	22.5 (4.0 to 58.3)

[Figure in parenthesis denoted the range of scores]

Table 5: COPD patient groups

Types	Descriptions	No. of cases (%)
Mild	Short breath, slight incline while walking, cough for several days a week; PFT is usually 80%	14 (46.7)
Moderate	Breathlessness, cough with sputum; chest tightness and wheezing; PFT us 50 to 79%	9 (30)
Severe	Flares and exacerbations are worse, increased fatigue; PFT is 30 to 49%	4 (13.3)
Very severe	Breathless all times, trouble breathing, frequent exacerbations and hospitalization needed; PFT below 30%	3 (10)