Effects of calisthenics on exercise capacity, symptoms and quality of life in COPD

Ganapathy Sankar U, Monisha R*
SRM College of Occupational Therapy, SRM Institute of Science and technology, SRM Nagar, Kattankulathur - 603203, Kanchipuram, Chennai, Tamil Nadu, India

ABSTRACT

Chronic Obstructive Pulmonary Disease (COPD) is the leading cause of death and disability in India. The study aims to evaluate the effects of CSC-COPD Sitting Calisthenics on exercise capacity, symptoms and quality of life. Twenty-five patients with COPD admitted in SRM Medical college hospital, and research centre (Department of respiratory medicine) were included in the study. After calculating the samples of 25 with excluding one dropout patient, randomly assigned 12 patients in each group, group A (n = 12), group B (n = 12) and the patients in two groups received five sessions of intervention (CSC and CET) in the hospital stay. The results indicate that there is a significant improvement in exercise capacity in calisthenics group on day 5 (P < 0.001). There was no significant difference found for modified Borg’s scale on day 5 in calisthenics group. QOL showed a statistically significant difference in Group A, and the current study concludes that calisthenics is effective in improving exercise capacity and QOL in patients diagnosed with COPD.

INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is the leading cause of death and disability in India. This sizeable growing health problem needs early identification and effective intervention. According to the WHO, 65 million people were affected and living with symptoms of chronic obstructive pulmonary disease (COPD). According to the research expertise committee, 30 million people from India were affected because of COPD. Patients were diagnosed with COPD, which includes chronic bronchitis and emphysema (Vestbo et al., 2013). Man and females were affected equally and suffer from the symptoms of COPD, and The prevalence of COPD is identified to a greater extent among the age of 40–50 years. Symptoms develop and progress rapidly as patients with COPD ages. Among the Indian population, the prevalence of smoking and chewing tobacco were high, and there also exists a greater risk of air pollution, occupational dust exposure. Adolescents were reported to have frequent lower respiratory tract infection (Martinezch et al., 2014). Passive smoking occupies the highest incidence among females and children also proved to cause of COPD. Cough, expectoration, respiratory Muscle fatigue, and dyspnea were notable symptoms of COPD. Initially, the symptoms were concerned with pulmonary manifestations. Later COPD patients experience extra-pulmonary features which include skeletal muscle dysfunction and atrophy (Woodruff et al., 2016).

The regular daily activity which is easily done by others was troublesome for those affected with COPD and when the disease progresses to stage II, even the simple sit to stand activity become challenging to perform. These patients prefer bed rest,
and they were bedridden due to inactivity. There is a frequent reported worsening of symptoms that range from 2 days to 6 weeks which facilitates hospitalisation for the patient with COPD (Tan et al., 2014).

Hospitalisation facilitates oxygen therapy, which further reduces the work of respiratory muscles. Thus the patients experience deterioration in the capacity to perform activities of daily living and exercise capacity. Researchers have concluded that exercise tolerance is lower in this patient population. This skeletal muscle dysfunction, along with respiratory muscle fatigue, affects their quality of life (QOL) (Reganea et al., 2015). The CSC (COPD sitting calisthenics) is a therapeutic intervention which contains sequences of low-intensity calisthenics that includes stretches strength training, aerobics exercise. The calisthenics is facilitated to reduce the sensation of dyspnea and increase the submaximal exercise capacity; it’s associated with enhanced quality of life among patients with COPD (Jones et al., 2009).

In the baseline assessment of any COPD patients, it is mandatory to assess the skeletal muscles for dysfunction and atrophy. Hence, the assessment includes quantification of obstruction in airflow, dyspnoea, exercise tolerance and quality of life. Pulmonary function test can be used to quantify the airflow obstruction and the patients with COPD can be categorised as mild, moderate, severe, and very severe categories based on the GOLD classification. However, every COPD patient’s despite regular medications will be affected because of acute exacerbation, which makes them hospitalised (Couper et al., 2014).

During Hospital stay, conventional therapy programs were initiated to reduce the symptoms and enhance exercise capacity. Pulmonary rehabilitation program occupies the first line preferences by the majority of the therapist. But the PR program is not accepted by the patients during hospitalisation. They fear of PR program, thus rehabilitation goals were not attained (Hankinson et al., 1999). These rehabilitation goals can be achieved only by exercises that don’t elicit respiratory discomfort, and it should facilitate easy and different forms of exercises. Research evidence suggested another standardised form of therapy, which includes calisthenics, and yoga. Previous researchers have highlighted the effects of conventional Chest physiotherapy. Despite many studies done on COPD, there are only a few studies done on sitting-calisthenics (Ferris, 1978). There is a lack of high-level evidence. The present study was done to examine the effects of calisthenics on exercise tolerance, symptoms and QOL in COPD patients.

**METHODOLOGY**

The study design was experimental and assessor-blinded. The assessor was blinded from allocating the patients to the treatment group. The primary researcher did this allocation procedure; he had assigned the patients into the study. The CSC was administered by a primary researcher and gathered the pre- and post-intervention assessment data. Before the commencement of the study, the protocol has been presented in the College of occupational therapy, and after getting approval to precede the study, information sheet which contains the details of the study and its merits have been explained to every patient and written informed consent was obtained from every participant of the study. Twenty-five patients with COPD admitted in SRM Medical college hospital, and research centre (Department of respiratory medicine) were included in the study (Figure 1). The sample size was calculated using patient record entry book from previous years. After calculating the samples of 25 with excluding one drop out patient, randomly assigned 12 patients in each group, group A \((n = 12)\), group B \((n = 12)\) and the patients in two groups received five sessions of intervention in the hospital stay. Both genders were selected in the study and age group of 40-80 with GOLD stage II were selected, and patients with long term oxygen therapy and with any other comorbidity factors were excluded.

Participants were assessed at the baseline for exercise capacity, dyspnea, fatigue symptoms and QOL respectively. Modified Borg’s scale consists of scoring, which starts with 0 and ends with 10, where 0 indicates nil breathing difficulty and 10 denotes maximum breathing difficulty. The patient was asked to rate the scale, which is marked with 0 to 10 according to the severity of breathing difficulty him/her experiences. This scale was found to be a valid and reliable assessment tool. QOL was examined in the current study using SGRQ-C. Fourteen questions were present in the questionnaire, and patients have to rate and answer all the questions honestly. Scoring ranges from 0 to 100. If lesser the score, better the QOL. A total of three-component scores on symptoms, activity, and impacts were analysed. The exercise capacity was examined using the 6-min walk test for distance. This is a tool to analyse the ability to maintain submaximal aerobic exercise for an extended time. All the patients in group A received calisthenics (Table 1) and group B received conven-
Table 1: Exercise intervention for two groups

<table>
<thead>
<tr>
<th>Group A: CSC</th>
<th>Group B: CET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muscle stretching</td>
<td>Relaxation positions</td>
</tr>
<tr>
<td>Trunk lateral</td>
<td>Chest expansion exercises</td>
</tr>
<tr>
<td>Shoulder girdle</td>
<td>PNF- respiratory muscles</td>
</tr>
<tr>
<td>Neck and back</td>
<td></td>
</tr>
<tr>
<td>Strength training</td>
<td>ACBT</td>
</tr>
<tr>
<td>For quadriceps &amp; antigravity muscles</td>
<td></td>
</tr>
<tr>
<td>Aerobic exercise</td>
<td>Breathing exercises and breathing control</td>
</tr>
<tr>
<td>Dorsal-ventral step</td>
<td></td>
</tr>
<tr>
<td>Lateral step</td>
<td></td>
</tr>
<tr>
<td>Chair walking</td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Mean difference between Group A and Group B

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Group A</th>
<th>Mean</th>
<th>Group B</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 Minutes Walk Test Distance</td>
<td>291.82</td>
<td>398.18</td>
<td>290.56</td>
<td>320.90</td>
</tr>
<tr>
<td>Borg’s scale</td>
<td>4.20</td>
<td>3.90</td>
<td>4.22</td>
<td>3.50</td>
</tr>
<tr>
<td>St. George’s Respiratory Questionnaire</td>
<td>45.99</td>
<td>25.76</td>
<td>41.64</td>
<td>36.09</td>
</tr>
</tbody>
</table>

Figure 1: Modified CONSORT flow diagram
tional exercise regimen for a while of 30–45 min for five sessions consecutively. Every patient is treated for an equal number of days.

Statistical analysis was done using SSPS software version 21. Comparison of changes obtained before the intervention and post-intervention changes on day 1, day 3, and day 5, 7, 9 was analysed using the t-test for all the outcome measures.

RESULTS AND DISCUSSION

The results indicate that there is a significant improvement in exercise capacity in callisthenics group on day 5 ($P < 0.001$). There was no significant difference found for modified Borg’s scale on day 5 in callisthenics group. QOL showed a statistically significant difference in Group A. When day one and day five post-intervention callisthenics group was better than CET ($P = 0.023$).

According to ACSM guidelines, COPD patients should engage in a regular exercise programme which consists of walking, strength training and participating in pulmonary rehabilitation will enhance the QOL. COPD patients experience physical inactivity. Thus, instead of engaging in pulmonary rehabilitation which is not every COPD patients were aware and affordable off. Thus there is a need for conventional easy methods and exercise intervention, which should enhance the QOL and also reduce the symptoms associated with pulmonary and extra-pulmonary manifestations of COPD (Bestall et al., 1999; Jones et al., 1991).

Callisthenics is easy to perform among the COPD population. To enhance activities of daily living skill, the exercise regimen should focus on walking and strength training. With regularly scheduled sessions of strength training will provide a productive lifestyle. In the current study, it was concluded that more females in Indian context suffered from COPD when compared with males. This predominance was observed and documented in many epidemiological investigations in India. In the Indian scenario, the prevalence estimate is high was attributed to risk factors like passive smoking and indoor air pollution. The current study focused on the age group of 40-80 years from rural locations, and previous researchers were also concluded with similar findings among the age group. It has been documented in previous studies that hospital stay is not reduced when engaged with any pulmonary rehabilitation programme. This concluded that there exists no relationship between the exercise program and the length of hospital stay. This study was not done focusing on the calisthenics over reduction on the length of stay in hospitals or admissions to the hospitals. In future, researchers can focus on identifying the factors and treatment strategies that reduce the hospital admissions (Breeman et al., 2015; Buysse et al., 2008).

COPD Sitting Calisthenics includes stretching, strengthening, and aerobic exercises. However, chair callisthenics is a low-intensity dynamic exercise that enhances endurance, dyspnea, and QOL. The mechanics of reduction in dyspnoea behind COPD sitting callisthenics lies in thoracic mobility. It was documented in previous works of literature that thoracic mobility is enhanced with the practice of COPD sitting callisthenics when combined with a breathing exercise programme. The desensitisation of dyspnea was the immediate effect reported in patients with regular practice of calisthenics. Proprioceptive receptor located in the rib cage is activated, and that reduces the central nervous demand for Oxygen. However, in the present study, where calisthenics has reduced dyspnea and fatigue (Table 2), thereby improving the QOL in COPD patients (Andersson et al., 2015; Myers et al., 2001).

Katiyar and Bihariconducted a research trial among COPD population. They concluded that there exist a drastic improvement in QOL, lung function parameters, and reduced symptoms, and a patient turned out active by regular practice of breathing retraining. Yet, another researcher had concluded that lower limb muscle training and engaging patients with COPD in physical activity would enhance their quality of life. However, the present study did not relate the length of hospital stay and the influence of COPD Sitting calisthenics over it. However, exercise capacity, symptom and QOL is enhanced with the short duration of treatment, i.e., five sessions.

CONCLUSION

The findings of the present study indicated that low-intensity chair callisthenics is effective in improving exercise capacity and QOL in patients diagnosed with COPD.

Conflict of Interest

The authors declare that they have no conflict of interest for this study.

Funding Support

The authors declare that they have no funding support for this study.

REFERENCES


