

Physical Training Improved Cardiovascular Fitness Level among Chronic Obstructive Pulmonary Disease Patients

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ABSTRAK

Pesakit Penghalang Pulmonari Kronik (PPK) dilaporkan mengalami fungsi kardiovaskular tidak stabil yang membataskan aktiviti dan menjejaskan kualiti hidup. Latihan fizikal telah dibuktikan bertindak sebagai salah satu moderator ke atas batasan aktiviti tersebut. Bagaimanapun, protokol dan durasi latihan fizikal masih belum difahami sepenuhnya. Kajian ini menyiasat kesan latihan fizikal ke atas tekanan darah, kadar dengupan jantung dan Hasil Darab Kadar Tekanan bagi pesakit PPK. Sejumlah tiga puluh pesakit PPK yang berumur antara 40 hingga 55 tahun direkrut untuk kajian berdasarkan kriteria serta dan singkir dan dibahagikan kepada kumpulan eksperimen (15 pesakit) dan kumpulan kawalan (15 pesakit). Min beza tekanan darah antara bacaan sebelum dan selepas ujian dianalisa menggunakan ujian-t. Terdapat perbezaan signifikan bagi semua parameter antara kumpulan eksperimen dan kumpulan kawalan dengan $p < 0.05$. Tekanan darah diastolic adalah kurang signifikan berbanding tekanan darah sistolik. Ini menunjukkan bahawa aktiviti fizikal yang direka khas meningkatkan tahap kecergasan kardiovaskular pesakit PPK.

Kata kunci: penyakit penghalang pulmonary kronik, bersenam, kecergasan kardiovaskular

ABSTRACT

Chronic obstructive pulmonary disease (COPD) patients are reported to have cardiovascular instability which leads to greater limitation for activities there by leads to poor quality of life. Physical training proved to be one of the moderators of these limitations. However, uncertainty prevails among the protocol and duration. The present study investigated the effect of physical training on blood pressure,

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heart rate and Rate pressure Product (RPP) among COPD patients. A total of thirty COPD patients aged between 40 to 55 years were recruited for the study based on the inclusion and exclusion criteria and were assigned in to experimental group (15 patients) and control group (15 patients). The mean difference of blood pressure, heart rate and RPP were analyzed using paired t-test. There was significant difference between the pre and post test values of all parameters between experimental and control group with $p < 0.05$. Diastolic blood pressure showed to be less significant compared to the systolic blood pressure. This showed that specifically designed physical improved the cardiovascular fitness among COPD patients.

Keywords: chronic obstructive pulmonary disease, exercise, cardiovascular fitness

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a leading growing cause of increasing in morbidity and mortality through out the world. COPD disease represents an increase in burden worldwide, and is reported to be the sixth leading cause of death in the year 1990 and the fourth in the year 2000. Alarmingly, it is expected to be the third leading cause of death by the year 2020. Majority of COPD are at risk of developing cardiovascular complications and about 30% of mortality rate were reported in COPD patients (Lopez et al. 2006). Since, these population has activity limitation because of increased work of breathing, they are prone to develop inadequate exercise intolerance, thereby reducing the cardiac fitness. Numerous rehabilitation strategies and protocols have been employed to reduce the activity limitation in order to preserve their activity or exercise. An earlier study concluded that the heavy resistance training increases muscle size and strength in elderly

COPD individuals (Kongsgaard et al. 2004). Similarly, another study found that exercise training was a core component of the pulmonary rehabilitation and it improved the exercise capacity, dyspnoea and health related quality of life (Rochester 2003). In general, it was concluded that circuit training promoted muscle strength, performance in the bicycle ergometry and six minute walk test (Kamahara et al. 2004). An earlier study observed the component of cardiovascular fitness for a period of 6 weeks duration with a predesigned exercise protocol (Borghini-Silva et al. 2009). However, these study results showed different levels of improvements in the fitness level with different protocols and duration. Considering these facts, we designed a specific exercise protocol to know the impact of cardiovascular fitness among the COPD population. Hence, the main objective of the present study was to find out the effect of physical training on blood pressure, heart rate and rate pressure product (RPP) among COPD patients.

MATERIALS AND METHODS

A total of thirty subjects were selected based on the inclusion and exclusion criteria and were divided into two groups, experimental (Group 1)-15 patients and control (Group 2)-15 patients who are aged between 40-55 years. Subjects who had COPD and free from other diseases were recruited and randomly assigned. The study was approved and informed consent was obtained from the subjects prior to study. Subjects in both group received routine physiotherapy such as nebulisation and chest physiotherapy where as experimental group additionally received specifically designed physical training for three days a week up to eight weeks. Pulse rate, blood pressure (systolic, diastolic), Rate pressure product (RPP) were recorded as an outcome measure for all the subjects in both group. Pulse rate was measured at the radial pulse and the blood pressure was measured using mercury sphygmomanometer. RPP was calculated as the product of systolic blood pressure and heart rate (Ansari et al. 2012). The mean difference of pulse rate, blood pressure and RPP between the two groups was analyzed using paired t-test.

The experimental subjects were asked to perform specific exercise and

each set consisted of 10 repetitions. The duration of each session of therapy lasted for about 30-40 minutes, respectively (warm-up and cool down for 10 min respectively; specific exercise for 20 minutes in standing position) with a rest period lasting for 10 minutes between each sets. The exercise program were as follows: Wrists bend and stretch (flexion and extension), Elbows bend and stretch (flexion and extension), Both arm stretching overhead and reaching towards the floor (flexion), one arm drawn backward and forming a shape of V, alternative foot up and down (ankle raise), one leg then bend and stretched (knee flexion and extension), one leg taken forward and sideways (hip flexion and abduction). The exercise program were altered and monitored based on Rate of perceived exertion Scale – 10 point -Borg's Scale (Lellamo et al. 2014).

RESULTS

The baseline characteristics showed there was no significant difference in the experimental and control groups before starting the physical training in pulse rate, blood pressure and RPP. The comparison of pre and post test values of pulse rate, blood pressure and RPP for the experimental and control

Table 1: Characteristics of parameters between both the groups

Group	Mean \pm SD							
	Pre SBP	Post SBP	Pre DBP	Post DBP	Pre PR	Post PR	Pre RPP	Post RPP
1	120 \pm 10.41	90.67 \pm 21.44	83.53 \pm 7.75	78.20 \pm 4.95	72.53 \pm 4.63	72.53 \pm 4.63	10270.67 \pm 1379.59	8956.80 \pm 1162.24
2	120.6 \pm 10.54	120.33 \pm 8.94	85.87 \pm 5.21	85.47 \pm 5.21	77.07 \pm 4.27	76 \pm 4.78	10113.87 \pm 1132.20	9945.87 \pm 1177.6

SBP- systolic blood pressure, DBP- diastolic blood pressure, PR- Pulse rate, RPP- rate pressure product

Table 2: Comparison of pre and post parameters among experimental group

Parameters	t value	P value
SBP	4.996	0.000
DBP	2.748	0.010
PR	2.018	0.048
RPP	0.736	0.028

SBP- systolic blood pressure, DBP- diastolic blood pressure, PR- Pulse rate, RPP- rate pressure product

groups were shown in Table 1. Results showed that there was a significant difference between the pretest and post test values of all parameters in Group 1 when compared to Group 2 with $p < 0.05$. The results of the Group 1 were tabulated (Table 2). Diastolic blood pressure showed to be less significant as compared to systolic blood pressure. This showed that specifically designed physical training improved the cardiovascular fitness in COPD patients.

DISCUSSION

The present study results proved that the physical training promoted cardiovascular parameters among COPD subjects who had predetermined protocol compared to those who had routine chest physiotherapy session alone. This present study was supported by a group of authors in which the authors concluded that the endurance training improved cardiovascular fitness in COPD individuals and also causes an improvement in quality of life (Ram et al. 2006). In contrast, a study carried out on the effects of physical training on exercise tolerance showed no significant effect (Mador et al. 2004). The reason behind contrary results could be explained by the facts that physical training alone was carried

out in the study where as the present study performed with conventional physiotherapy along with physical training protocol. In one particular study, due to interdisciplinary intervention there was reduced leptin level, in which it indirectly showed improvement in lung function with a duration of one year intervention (Leão da Silva et al. 2012). Similarly a study carried out in the year 2003, suggested that exercise training promoted exercise capacity, reduced dyspnea and health related quality of life (Gigliothi et al. 2003). In the present study, the subjects initially showed increase in blood pressure and later on, it got normalized. The possible reason could be the instruction on, how to perform exercise made the subjects nervous and finally increased the blood pressure to a little extent. The physiological reason behind the reduction in the blood pressure was not well understood, but it has been suggested that the reduction in blood pressure were due to the involvement of increased sympathetic activity which decreased baroreflex function and reduced arterial wall compliance. The nitrous oxide produced as a result of aerobic exercise would have caused relaxation of smooth muscles of the blood vessels. We humbly admit few limitations of the study. Initially in the present study most of the subjects

involved belonged to the working class. Hence, the activity they got involved also influenced the cardiovascular status. We excluded the Neurology, Cardiac and systemic disease patients. This study was conducted in subjects with in age group of 45 to 55 years which was prone for hypertension. Hence the results obtained could not be generalized to all ages. The study samples were very small and duration is also very less, in future the effect of physical training on respiratory status for COPD should be taken in account.

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