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ORIGINAL ARTICLE

Effects of Pursed Lip Breathing with Arm Ergometry after Chin Support Position in Copd Patients

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ABSTRACT.

Background: COPD is the 4th leading cause of mortality around the globe and is expected to be the 3rdleading cause of mortality by 2020. It is a life limiting condition with symptoms of distress such as dyspnea, fatigue, pain and depression as it reaches the terminal stage. The condition decreases the pulmonary function values and QoL. Aerobic training and breathing maneuvers are essential components of pulmonary rehab improving pulmonary function values and QoL.

Objective: To find out the effects of pursed lip breathing with arm ergometry after chin support position on respiratory parameters, spirometry tests and quality of life in patients of COPD..

Methods: It was a Randomized control Trial conducted on mild to moderate stage COPD patients. Purposive sampling was used to gain the study sample and then allocated randomly into two groups by coin toss method. The sample size calculated was 74 with 37 subjects in control group and 37 subjects in interventional group. It was conducted at Rehman Medical Institute Peshawar. Spirometer Testing (FEV1,FVC,PEF), HR,SPO2, RR, BORG dyspnea scale and CAT questionnaire were used as outcome measures to measure breathlessness and QoL respectively.

Results: Mann-Whitney U test was used between the two groups to measure the effect of the two interventions. There was significant difference between group results (p-value<0.05) were found post-intervention for HR, FEV1, FVC, PEF, BORG score and CAT score. Freidmann test was used for within group analysis and reported significant results (p-value >0.05) for RR, oxygen saturation along with significant BORG and CAT results.

Conclusion: It was concluded that there were significant effects of pursed lip breathing with arm ergometry after chin support position on respiratory parameters, spirometry tests and QoL in patients with COPD.

Keywords: Chin Support Position, Arm Ergometry, Oxygen Saturation.

INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is defined as the typically progressive limitation of airflow associated with unusual inflammatory response of the airways and dysfunction of the skeletal muscles.(1-3) It is clinically a diverse condition affecting status of function, QoL, and reaction to treatment, especially pulmonary rehabilitation.(4)

Pursed Lip Breathing (PLB) was observed in COPD subjects as a method initiated by them in order to relieve dyspnea, and it was first recommended by Saege in 1910 as a breathing maneuver. It is a pulmonary rehabilitation approach employed to relieve patient of dyspnea. It involves active expiration against resistance. Resistance may be provided at level of lips or tongue and a whistling is produced during expiration. (7)

Positioning and breathing maneuvers are frequently used physical therapy therapeutic interventions despite of inadequate evidence advocating the two. Positioning of the body is among the breathing exercises in order to improve the functioning of the respiratory muscles and alleviating dyspnea. Hence the COPD patients often adopt the tripod positioning, that is, forward leaning of trunk and supported arms, at the time of dyspnea. This positioning creates the length-tension relationship of diaphragm and lessens the sternocleidomastoid and scalene muscle activity thus improving the thoraco-abdominal movement and alleviating breathlessness. The arm support engages pectoralis major and pectoralis minor muscles for improving elevation of ribs.(1)Postures which involve forward trunk leaning with arm support are often believed improve lung function.(9, 10)

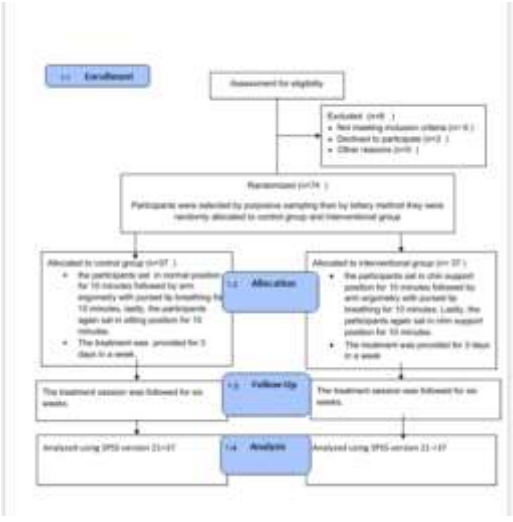
Significance of the Study: Among the previous studies, none has seen the integrated effect of chin support positioning with pursed lip breathing maneuver and arm ergometry in COPD patients on their QoL, level of dyspnea and pulmonary function.

The only study on the effects of chin support position was conducted in 2012 in Gangnum, South Korea which effect mechanically on breathing and dyspnea. (11) Other literature shows the positive endurance effects on lungs by imposing PLB on mechanics of respiration and dyspnea at rest and during exercise in COPD. (12) This study attempts to integrate the work these two studies, that is, effects of pursed lip breathing with arm ergometry after chin support position in patients with COPD.

METHOD

The study design was randomized control trial. Purposive sampling method was used to gain the sample for the study and then it was randomly allocated into two groups by coin toss method. It was conducted from July 2019 to January 2020 at Rehman Medical Institute Peshawar .The sample size was calculated to be 74 via epitool and 37 subjects were allotted to control group and 37 subjects in interventional group.

Inclusion & Exclusion Criteria: Inclusion criteria: Patients above 40 years of age with GOLD criteria's mild to moderate stage COPD patients were included in the study.



Exclusion Criteria: Patients with severe stage of COPD according to GOLD criteria or pulmonary diseases other than COPD were excluded. COPD patient with third degree heart block, congestive heart failure, angina pectoris, and neuromuscular and orthopedic conditions (cervical involvement aggravating symptoms) or radiculopathy were also excluded from the study.

Data collection procedure: Subjects who fulfilled the inclusion criteria were randomly allocated to control and interventional group by coin toss method. Demographics of each subject were noted. Spirometry tests were calculated through digital spirometer before the provision of training, CAT and BORG score were also calculated before training for both the groups. Those in the intervention group first adopted the chin support position for a period of 10 minutes. Later, performed arm ergometry with PLB for a period of 10 minutes. Those allocated to control group adopted the normal sitting position for 10 minutes then later performed arm ergometry with PLB. After the training, spirometry values, CAT and BORG scores were calculated again.

Statistical Analysis: After checking the Normality Test non-parametric tests were analyzed by SPSS version 21 as P value <0.05.(Table 1) Non parametric tests were used for between group and within group analysis. Mann-Whitney test was applied for obtaining the between group analysis whereas Wilcoxin test was used for obtaining the within group analysis.

According to p-value obtained through Kolmogrov test, the calculated p-value was <0.05, hence the optimal test was the Mann Whitney non-parametric test to relate the pre-training and post-training values of all study variables between both the groups.

RESULTS

Since the study was an RCT, the subjects were randomly allocated into 2 groups, that are, Group 1 (interventional group) and Group 2 (control group). 70 subjects participated in the study among which 35 subjects were in Group 1 (50%) and 35 subjects were in Group 2 (50%). The age in group 1 was (63.17+9.89) years and in group 2 was (66.25+ 10.53) years. In group 1, 17 females (48.6%) and 18 males (51.4%) were included whereas in group 2, 20 females (57.1%) and 15 males (42.9%) were involved.

Between group analysis: Mann-Whitney U test was applied between the two groups to measure the effectiveness of the two interventions. Group 1 and group 2 showed pre-training median (IQR) for FEV1 (0.93+0.45) and (0.76+0.37) respectively with p-value 0.106 whereas post training FEV1 median (IQR) for group 1 and group 2 was (1.09+0.48) and (0.72+ 0.35) respectively with p-value 0.000 . Group 1 and group 2 showed pre-training median (IQR) for FVC (1.27+0.94) and (0.90+0.47) respectively with p-value 0.111 whereas post training FVC median (IQR) for group 1 and group 2 was (1.51+0.91) and (0.89+0.48) respectively and p-value 0.000 .Group 1 and group 2 showed pre-training median (IQR) for PEF(2.44+1.56) and (1.68+1.07) respectively with p-value 0.010 whereas post training PEF median (IQR) for group 1 and group 2 was (2.52+1.70) and (1.67+0.99) with p-value 0.022 respectively. Group 1 and group 2 showed pre-training median (IQR) for FEV1/FVC (0.83+0.21) and (0.86+0.26) respectively and p-value 0.129 whereas post training FEV1/FVC median (IQR) for group 1 and group 2 was (0.87+0.46) and (0.92+0.34) respectively and p-value 0.164 (Table 1).

Group 1 and group 2 showed pre-training median (IQR) for HR 99(17) and 99(21) respectively with p-value 0.782 whereas post training HR median (IQR) for group 1 and group 2 was 87(17) and 95(14) respectively with p-value 0.002. Group 1 and group 2 showed pre-training median (IQR) for RR 25(6) and 24(6) respectively with p-value 0.754 whereas post training RR median (IQR) for group 1 and group 2 was 18(4) and 18(2) respectively with p-value 0.891. Group 1 and group 2 showed pre-training median (IQR) for Spo2 91(4) and 89(4) respectively with p-value 0.086 whereas post training SpO2 median (IQR) for group 1 and group 2 was 93(3) and 92(4) respectively with p-value 0.754(Table 2).

Group 1 and group 2 showed pre-training median (IQR) for BORG score 3(0) and 3(0) respectively with p-value 0.37 whereas post training BORG score median (IQR) for group 1 and group 2 was 2(1) and 2(1) respectively with p-value 0.05 (Table 3)

Group 1 and group 2 showed pre-training median (IQR) for CAT score 3(0) and 3(0) respectively with p-value 0.437 whereas post training CAT score median (IQR) for group 1 and group 2 was 24(7) and 21(9) respectively with p-value 0.050 (Table 3)

Table 1: Mann-Whitney Test Applied For Between Group Analysis Of Heart Rate/Min, Respiratory Rate/Min, Oxygen Saturation In Percentage.

Variable		Interventional Group n=35 Median(IQR)	Mean Rank	Control Group n=35 Median(IQR)	Mean Rank	Z Value	P Value
Forced expiratory volume in 1 second (litre/second)	Pre Training	0.90(-0.76)	39.43	0.61(0.39)	31.57	-1.616	0.106
	Post Training	0.69(0.88)	43.44	0.66(0.34)	27.56	-3.267	0.001***
Forced Vital capacity (litres)	Pre Training	1.04(0.91)	39.37	0.68(0.77)	31.63	-1.592	0.111
	Post Training	1.46(0.89)	44.63	0.69(0.56)	26.37	-3.754	0.000***
Peak Expiratory Flow	Pre Training	1.77(1.32)	41.76	1.27(1.37)	29.24	-2.573	0.010
	Post Training	1.96(11.74)	41.06	1.58(0.86)	29.94	-2.285	0.022*

Table 2: Mann-Whitney Test for Between Group Analysis of FEV1, FVC, PEF, FEV1/FVC Ratio

Variable		Interventional group n=35 Median(IQR)	Mean Rank	Control Group n=35 Median(IQR)	Mean Rank	Z Value	P Value
Heart Rate /Min	Pre Training	99(17)	34.83	99(21)	36.17	-0.277	0.782
	Post Training	87(17)	27.97	95(14)	43.03	-3.099	0.002**
Respiratory Rate / Min	Pre Training	25(6)	36.26	24(6)	34.74	-0.313	0.754
	Post Training	18(4)	35.83	18(2)	35.17	-0.137	0.891
Oxygen Saturation in Percentage	Pre Training	91(4)	39.63	89(4)	31.37	-1.718	0.086
	Post Training	93(3)	39.71	92(4)	31.29	-1.747	0.081
Forced expiratory volume in one second to forced vital capacity ratio	Pre Training	0.90(-0.76)	31.96	1.00(0.2)	39.04	-1.518	0.129
	Post Training	0.93(0.3)	32.23	1.00(0.16)	38.77	-1.390	0.164

Table 3: Mann-Whitney test applied for between groups analysis of BORG Score and CAT Score

Variable		Interventional group n=35 Median(IQR)	Mean Rank	Control Group n=35 Median(IQR)	Mean Rank	Z Value	P Value
Borg scale	Pre Training	3.00(0)	32.06	3(0)	38.94	-2.089	0.037
	Post Training	2.00(1)	28.97	2(1)	42.03	-3.009	0.003**
CAT score	Pre Training	24(5)	33.63	24(7)	37.37	-0.776	0.437
	Post Training	16(5)	30.76	21(9)	40.24	-1.962	0.050*

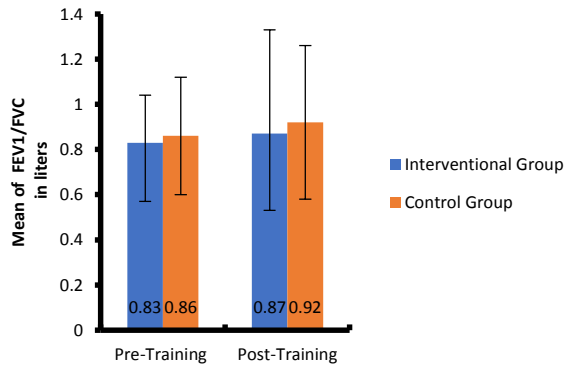


Figure 1: Comparison of Means and SD of FEV1/FVC in Liters between Pre-Training and Post-Training of Both Groups

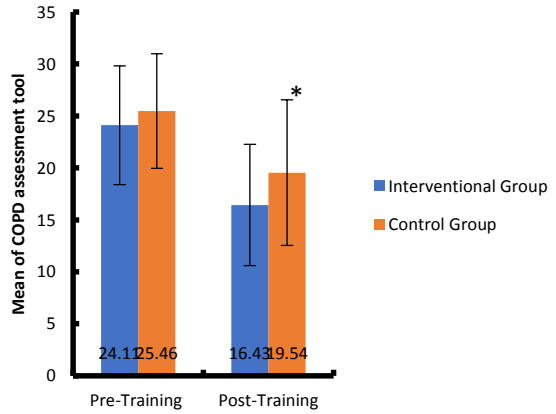


Figure 2: Comparison of Means and SD of Total Score of COPD Assessment Tool in Liters between Pre-Training and Post-Training of Both Groups

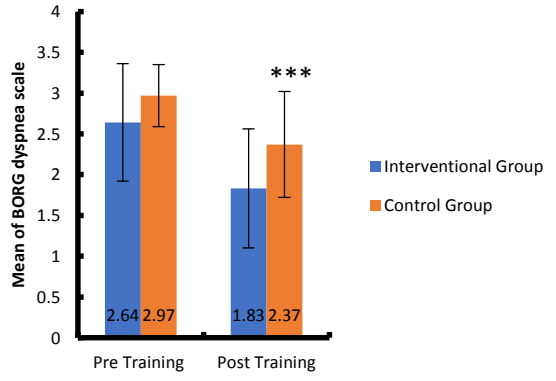


Figure 3: Comparison of Means and SD of BORG Score between Pre-Training and Post-Training of Both Groups

DISCUSSION

According to the fraction of literature available related to our study, it is suggested that none of the studies have been conducted on the combined effects of PLB with arm ergometry and chin support position.

In our study, HR improved significantly (p-value =0.002) after post-training in both the groups. SpO2 and RR showed post-training significant improvements clinically but not statistically in interventional group. Significant improvements in FEV1 (p-value=0.001), FVC (p-value=0.000) and PEF (p-value=0.022) were found. Moreover, significant results for BORG score (p-value=0.003) and CAT score (p-value=0.050) in both the groups.

Significant results were found for decrease in HR secondary to PLB in the previous studies which is consistent with our findings.(13) Calik et al found significant results for decrease in heart rate of COPD patients after arm ergometry.(14) PLB combined with forward leaning position showed significant improvements in HR and RR (P<0.05) similar to our study. (15)

According to a study conducted by Ki Song Kim, PLB induced a advantageous breathing pattern and allevad respiratory rate significantly. Furthermore PLB when combined with With Arm Support or With Arm Head Support can be suggested for decreased diaphragmatic respiratory work in COPD patients. (16)This is consistent with our study since our intervention induced significant effects by reducing respiratory rate and relieving dyspnea. However another study showed no significant differences between NP WAS and WAHS positions for RR.(17) Significant effect of PLB (F=90.02, p<0.01) was found in the previous study but no significant effect of

position (F=0.84, p=0.45).(16) PLB was a novel finding in teaching COPD patients in managing their breathlessness.(18)

Oxygen saturation: Previous study incorporating PLB in COPD patients reported increase in oxygen saturation.(18) similarly a study by Sakhaei et al indicated significant improvements in cardiac and respiratory parameters which included increased SpO2 secondary to PLB. (13) Orthopnea position was shown to have positive effect on oxygen saturation in patients with dyspnea.(19) All these studies reported improved oxygen saturation which is consistent with our study results.

Reduction in RR and dyspnea was found in the study by Roberts et al.(18) Calik et al also reported decrease in dyspnea secondary to arm strength training by arm ergometry.(14)Forward lean position combined with PLB induced significant results on dyspnea which is similar to our results.(15)

Significant changes were found in CAT score after PLB with p-value 0.000 in previous study which is consistent with significant results of CAT score in our study.(20) Significant results for CAT score were reported secondary to pulmonary rehab in COPD patients (p < 0.001) which is consistent with our results for CAT score.(21) In a previous study, the frequency distributions of CAT items were reported to be shifted from higher scores to lower scores secondary to pulmonary rehab. (22)

PFTs: Significant statistics were found for FEV1 PEF and FEV1/FVC in the study conducted by Ki Song Kim however FVC was not found to be significant though our study showed significant results for FVC.(17) In our study no significance could be found for PEF and FEV1/FVC but significant results for FEV1. Moreover a study by Shelby Carlson reported no significant results in

pulmonary function values by the adoption of WAS support positions.(23) FEV1, PEF and FVC values were reported to be higher in more erect postures in both healthy individuals and individuals with cardiac , pulmonary , neuromuscular conditions or obesity.(24)

CONCLUSION

It was concluded that there were significant effects of pursed lip breathing with arm ergometry after chin support position on respiratory parameters, spirometry tests and QoL of patients with COPD.

Limitation of study: The study could be conducted for a longer follow up period.

Recommendations: We recommend more variables to be investigated in the future studies and to conduct the study for a longer follow up period.

Disclaimer: None.

Conflict of interest: None.

Source of funding: None.

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