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Effects of Breathing Exercises on Lung Volumes and Capacities Among Smokers

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ABSTRACT

Objective: To determine the effect of deep breathing exercises on lung volumes and capacities among smokers. **Methodology:** The participants were divided into a control group and an experimental group. The control group was not given any treatment, while the experimental group performed deep breathing exercise techniques. The experimental group performed exercises for six weeks. After six weeks lung function tests were performed to evaluate the effects. Data were compared at baseline and after the intervention. To check within the group's changes paired sample t-test was used. To check between groups changes independent sample t-test was used for normally distributed data. **Results:** In the experimental group, significant changes ($p \leq 0.05$) were observed after the intervention. While comparing groups, significant differences ($p \leq 0.05$) were observed in some variables between experimental and control groups.**Conclusion:** It was concluded that deep breathing exercises are useful among smokers. As deep breathing helps in improving lung volumes and capacities.

Introduction

Smoking is lethal to health, it encompasses harmful substances that are the foundation of different life-threatening diseases like asthma, COPD, bronchitis and cardiovascular diseases, etc. (1). World Health Organization (WHO) expects that figure of smokers who will be expired due to smoking will go beyond the number of people dying from a traffic accident, AIDS, murder, and suicide by 2020. (2) Smoking cigarettes gradually damage pulmonary functions. As a result, chronic obstructive pulmonary disorders are found around about 15–20% of smokers, chronic bronchitis signs in 50%, and only 30% are healthy smokers. (3) A large number of studies have been documented the tobacco smoking epidemiology and its damaging properties on human health. It is assessed that one in ten deaths globally is happening due to tobacco smoking (4) At the present, about partial of the world's male smokers live in 3 countries of Asia: India, China, and Indonesia. (5) The world's major tobacco consumer in Asia and is also the major tobacco maker. (6)

During normal breathing, oxygen is delivered to the body through blood circulation. But carbon monoxide is delivered to the body instead of oxygen in smokers, resulting in respirational issues like breathlessness and coughing in an acute stage. (7) Spirometry is the most common method to test the lung function. The most common values which can be measured through spirometry are forced vital capacity in one second (FEV1) and forced expiratory volume. There are deep breathing exercises which help to improve oxygen saturation and lung function by increasing inhalation and exhalation. Respiratory volumes are the amount of air inhaled, exhaled, and stored within the lungs at any given time.

Although literature was available on the effectiveness of deep breathing exercises in respirational conditions like bronchitis, asthma, COPD, etc. but limited literature was found in healthy smokers about effects on lung functions. This study has been done to investigate the effect of breathing exercises on lung function among smokers. In my study, I have checked the effects of breathing exercises such as deep breathing exercises (pursed-lip breathing exercises, balloon blowing, and diaphragmatic breathing exercises) on lung volumes and capacities among healthy smokers.

Methodology

This was a randomized controlled trial (RCT) which was conducted in the health care clinic Muzaffarabad. In this study, sixty healthy smokers from the last 12 years between the ages of 20-50 year, were selected randomly from the general population in Muzaffarabad. The participants were divided into a control group and an experimental group. The control group was not given any treatment, while the experimental group performed deep breathing exercise techniques. The experimental group performed exercises for six weeks. After six weeks lung function tests were performed to evaluate the effects.

Statistical Analysis:

For analysis of data, SPSS version 21 was used. Data were compared at baseline and after the intervention. To check within the group's changes paired sample t-test was used. To check between groups changes independent sample t-test was used for normally distributed data.

Results

1. Demographics of Data

Table 1. Mean and Standard Division

	Groups	**Mean±SD**	**P-value**
Age	Control	1.433±0.504	0.324
	Experimental	1.366±0.49	
Height (feet)	Control	2.000±0.000	---
	Experimental	2.000±0.000	
Cigarette Per day	Control	1.200±0.406	.000
	Experimental	1.466±0.507	
Weight (kg)	Control	2.000±0.000	0.043
	Experimental	1.967±0.182	
History of Smoking (year)	Control	1.700±0.466	0.254

	Groups	Mean±SD	P-value
	Experimental	1.766±0.430	
Blood Pressure (mmhg)	Control	1.666±0.479	0.598
	Experimental	1.633±0.490	
Respiratory Rate (Per Minutes)		1.733±0.449	.0001
	Experimental	1.900±0.305	

Table 2. Lung Function Test Pre and Post Within Group Comparison

Item		Group 1 (Control)		Group 2 (Experimental)	
		Mean± SD/ Median (IQR)	p-value	Mean± SD/ Median (IQR)	p-value
Chest Diameter (Inch)	Week 0	37.96±2.61	0.00	38.100±2.60	0.00
	Week 6	37.96±2.61		38.16±2.05	
Vital Capacity (ml)	Week 0	2.998±0.691	0.000	2.862±0.59	0.257
	Week 6	3.033±0.748		2.940±0.72	
Forced Vital Capacity (ltr)	Week 0	2.955±0.75	0.000	2.755+0.788	0.000
	Week 6	3.043±0.674		3.316±0.926	
Force Expiratory Capacity	Week 0	2.111±0.817	0.000	1.823±0.716	0.744
	Week 6	2.211±0.701		2.315±0.455	
Force Expiratory Volume Reserve	Week 0	0.628±0.213	0.000	0.570±0.209	0.000
	Week 6	0.669±0.151		0.718±0.165	
Peak Expiratory Flow Rate	Week 0	3.029±2.004	0.000	2.308±1.206	0.000
	Week 6	3.069±1.410		2.904±0.887	
Oxygen Saturation %	Week 0	97.46±1.696	0.000	95.900±2.294	0.000
	Week 6	97.66±1.124		96.700±1.622	
FEV1 % Pred	Week 0	65.83±18.80	0.000	56.2667±20.88	0.000
	Week 6	65.83±15.13		68.633±13.99	
	Post	93(5)		92(3)	

Table 3. Post Treatment Lung Function Test Between Groups Comparison

Item	Group	0 Week		After 6th Week	
		Mean± SD/ Median(IQR)	p-value	Mean± SD/ Median(IQR)	p-value
Chest Diameter (inch)	Control	37.966±2.61	0.95	37.96±2.61	0.92
	Experimental	2.8627+0.763		2.9403+0.729	
Vital Capacity(ml)	Control	3.1350+0.763	.352	3.125±0.7672	.651
	Experimental	2.862±0.592		2.9403±0.729	
Force Vital Capacity	Control	2.955±0.756	.75	3.043±0.674	0.00
	Experimental	2.755±0.788		3.167±0.926	
Force Expiratory Volume(ml)	Control	2.111±0.817	.52	2.211±0.701	0.04
	Experimental	1.8233±0.716		2.315±0.455	
Force Expiratory Volume reserve(ml)	Control	0.628±0.213	.56	0.669±.1512	0.78
	Experimental	0.570±0.209		0.718±0.165	
Pea Expiratory Flow Rate	Control	3.0290±2.00	.17	3.069±1.4109	0.14
	Experimental	2.3080±1.206		2.9040±0.887	
Oxygen Saturation (%)	Control	97.46±1.696	.08	97.66±1.124	0.05
	Experimental	95.90±2.294		96.70±1.62	
*FEV1 % Pred	Control	65.83±18.80	.50	65.833±15.134	0.53
	Experimental	56.266±20.88		86.63±13.99	

**Independent Sample T-test*

Discussion

The study was conducted to determine the effectiveness of deep breathing exercises on lung volumes and capacities among smokers. The study hypothesis was accepted to some extend that deep breathing exercises significantly improve lung functions in healthy smokers. As the study showed improvement in some parameters and others remain the same. Significant improvement was seen in vital capacity, forced expiratory volume, and oxygen saturation while other parameters were not significantly improved.

A study was conducted in 2016 that supports the current study that deep breathing exercises are operational for intercostal muscles which help to improve breathing, lung capacities and volume, oxygen saturation, and ultimately the quality of life. As breathing exercises learned easily so a person can perform these exercises any time and at any place. (08)

A study was conducted in 2015 to investigate the effectiveness of diaphragmatic breathing exercises on lung function in young male smokers. The results of the study shown significant progresses in pulmonary function with diaphragmatic breathing techniques. (09)

A study was conducted in 2017 that shows that deep breathing exercises are very effective in reducing stress and improve mood (10), Researches shows that deep breathing exercises are very effective in obstructive lung diseases as above mentioned researches indicates. In another study that was conducted in 2016 Blowing balloon workout is an operative way of improving lung functions and relieving stress in medical students. All the parameters of the pulmonary function test i.e. tidal volume TV, VC, FVC, FEV1, and FEV1/FVC were considerably upgraded after carrying out the blowing balloons exercise. (11), Above mentioned studies support the current study that deep breathing exercises were beneficial in improving lung functions. These exercises are also useful in improving the partial pressure of oxygen.

A previous study that was done in 2018 shows that deep breathing exercises work as anti-smoking and deliver essential evidence for exercises and provide valuable directions for the development of interventions that help in smoking cessation. (12) There is a lack of awareness among peoples regarding exercises and their useful effects so they did not follow the exercise plan properly, so there is a need to give awareness.

Conclusion

It was concluded from the results of the present study that deep breathing exercises are useful among smokers for improving lung functions.

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