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A CASE-CONTROL RESEARCH TO ASSESS THE EFFECTIVENESS OF PHYSICAL ACTIVITIES BETWEEN EXPERIMENTAL & CONTROL GROUPS ABOUT PULMONARY FUNCTIONS

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Abstract:

Objective: *Our aim of this research was to compare and assess the variations in the pulmonary functions before physical exertion and after physical exertion in the healthy young adults.*

Methods: *We conducted this case-control research at Mayo Hospital, Lahore from January to June 2017 on a total of 292 students who were in the age bracket of eighteen to twenty-four years. We measured the baseline values of the (FVC) forced vital capacity and (FEV – I) forced expiratory volume and proportions through digital spirometer. Research sample had a subdivision to assess the functioning of lungs of Group – I and II respectively including 192 and 100 volunteers taken as cases and controls. Group I and II observed regular thirty minutes aerobic exercise and no physical exertion routine respectively. Exercise pattern of Group – I included five days daily exercise in a week which continued for eight consecutive weeks. Final outcomes analysis completed through social statistical software (SPSS).*

Result: *After completion of eight weeks an increase was evident in FEV – I from (2.49 ± 0.82) litres to (2.59 ± 0.79) litres; whereas, a decline in the FVC volume from (2.80 ± 0.92) litres to (2.7 ± 0.87) litres. The FEV – I to FVC ratio was (89.52 ± 12.66) : (95.56 ± 13.42) in the participants of Group – I.*

Conclusion: *No doubt, physical actively positively improved the pulmonary functions as reported in Group – I participants who underwent aerobic exercise pattern five days a week for a period of eight weeks.*

Keywords: *Forced Vital Capacity (FVC), Forced Expiratory Volume (FEV – I), Pulmonary, Lungs, Liters and Aerobics.*

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INTRODUCTION:

Physical capabilities are best tested through exercise and physical fitness activities. It is a form of physiological response of an individual on the basis of well-being and better health conditions. Various abilities such as tolerating ability, carrying on in difficult situations and withstand stress develop through physical activities; whereas, an unfit person is not capable to withstand difficult situations and tolerate even minute things. The medical practice uses lung function as an important morbidity and mortality indicator. A research on buffalo concludes that pulmonary function can predict the overall rate of survivals in both the genders [1]. The test of a pulmonary function includes (FEV – I) which is actually an exhaled amount of air per second; whereas, FVC is maximum air amount exhalable in one breath. Both FEV-I and FVC are measurable through spirometer [2]. The ratio of FEV-I and FVC is a percentage of exhaled FVC during the first second that is also measurable [2].

Body functions experience marked variations because of the stressful condition during physical activity and it also improves overall individual's awareness and decreased the factor breathlessness. Numerous crucial aerobic conditions are controllable through skeletal muscles which also includes ventilation of the lungs. The best available description is regular and forceful deflation and inhalation of lungs for longer timespan which increases the strength of the respiratory muscles [3]. Training may also affect the increase in the inspiratory muscles maximal shortening, it also improves the parameters of lung functioning [4]. In the specific concern of the exercise on the lungs; it has positive effects on the overall well-being of the human body which also develops exercise physiology [5]. However, there are also numerous reports about its non-significant associations [6].

In the light of two opposite research studies, we aimed to investigate the physical activity role in the lung function modification. Therefore, our aim of this research was to compare and assess the variations in the pulmonary functions before physical exertion and after physical exertion in the healthy young adults.

SUBJECTS AND METHODS:

We conducted this case-control research at Mayo Hospital, Lahore from January to June 2017 on a total of 292 students who were in the age bracket of eighteen to twenty-four years. We measured the baseline values of the (FVC) forced vital capacity and (FEV – I) forced expiratory volume and proportions through digital spirometer. Research sample had a subdivision to assess the functioning of lungs of Group – I and II respectively including 192 and 100 volunteers taken as cases and controls. Group I and II observed regular thirty minutes aerobic exercise and no physical exertion routine respectively. Cycle ergometry supervised the physical activity performed on a cycle ergometer. Paddling rate was in between sixty to eighty revolutions/minute. Exercise pattern of Group – I included five days daily exercise in a week which continued for eight consecutive weeks. We documented daily activity routine after taking informed consent of the research participants which subsequently followed student's physical examination. We did not include any student with previous medical history, exercise-induced asthma, asthma, chronic cough, smoking, the repeated incidence of respiratory tract infection, spinal or chest deformity, COPD and obesity. Research used standardized measuring protocols as the students seated in a comfortable manner with a tight fit between tube and lips. We also encouraged the students to breathe out forcefully and as long as it is possible in order to evaluate on spirometer. An experienced technician observed the best trial run among three trial runs and calculated the ratio through spirometer. Trained technical staff supervised pulmonary function after every session of exercise [9].

Eighteen students left the research because of various reasons such as FEV – I fall in six students, exercise-induced asthma in ten students and own accord by two students. No specific exercise pattern reported in Group – II; whereas, Group – I continued with regular exercise pattern [8]. The researcher also compared the proportions of FVC and FEV – I in order to compare the student's pulmonary functions. Final outcomes analysis completed through social statistical software (SPSS) P-Value (< 0.05).

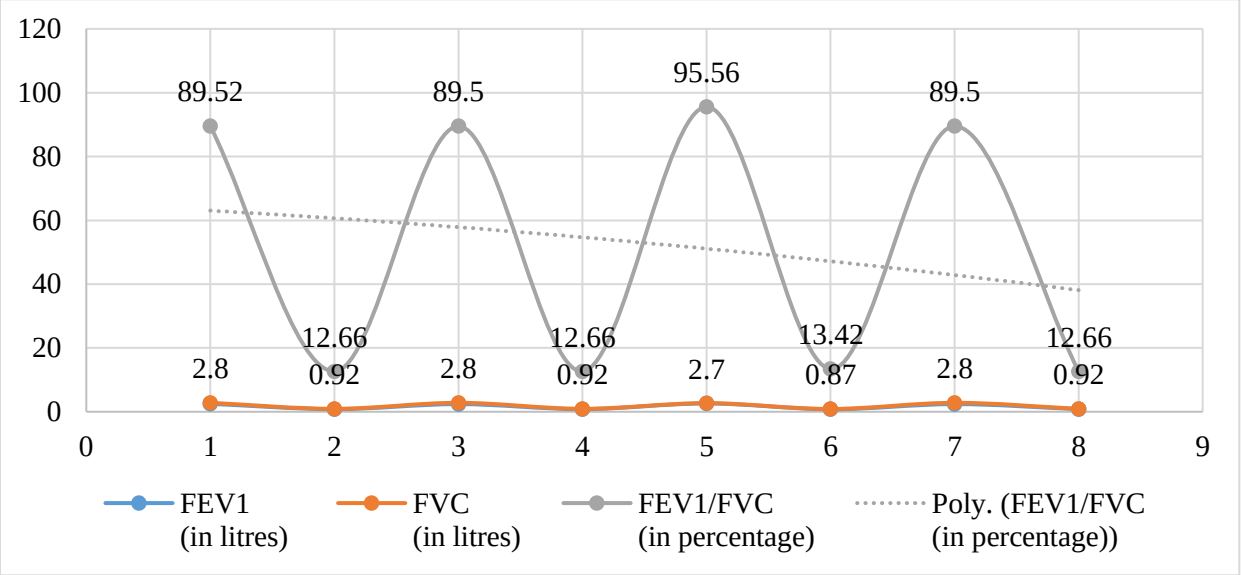
RESULTS:

After completion of eight weeks an increase was evident in FEV – I from (2.49 ± 0.82) litres to (2.59 ± 0.79) litres; whereas, a decline in the FVC volume from (2.80 ± 0.92) litres to (2.7 ± 0.87) litres. The FEV – I to FVC ratio was (89.52 ± 12.66) : (95.56 ± 13.42) in the participants of Group – I. Research sample was 292 medical students with mean age factor of (19 ± 2) years. Group – I had a total of 192 participants with 103 females (53.64%) and 89 males (46.35%); whereas, in Group – II there were a total of one hundred students with 46 males (46%) and 54 females (54%). The first set of baseline values included FVC, FEV – I and FEV-I / FVC; whereas, in second set research made an analysis of the after-

exercise values of Group – I to Group – II. No variation reported in the baseline values of the pulmonary functions in control group; whereas, raised FEV-I, reduced FVC and FEV-I / FVC proportion had also an increase as reflected in the tabular data.

Table: Comparison of lung function tests in study and control groups (with and without exercise)

Details	Initial Values				Final Values				P-Values
	Experimental Group		Control Group		Experimental Group		Control Group		
	Mean	±SD	Mean	±SD	Mean	±SD	Mean	±SD	
FEV – I (in liters)	2.49	0.82	2.4	0.82	2.59	0.79	2.4	0.82	< 0.0001
FVC (in liters)	2.8	0.92	2.8	0.92	2.7	0.87	2.8	0.92	
FEV – I / FVC (in percentage)	89.52	12.66	89.5	12.66	95.56	13.42	89.5	12.66	



DISCUSSION:

There is a vital role of physical activities in the healthy existence of the human body and its biological and physiological functioning through natural nurturing [10]. There are various positive effects of regular moderate physical activity on overall human systems which primarily include respiratory and cardiovascular systems of a human body. Respiration is dependent on various factors which include respiratory muscles, nervous system and dimensions of the lung. Lung function measurement is possible through different ways; whereas, FEV-I is among effective method of pulmonary variation detection especially in obese cases [3]. FVC is maximum air volume exhaled with a maximum deep inspiration effort which predicts the chest wall and lungs compliance. There is an approximation of FEV-I / FVC ratio as (75% – 80%) [12]. The overall eight-week physical activity improvement is similar to the significant FVC and FEV-I augmentation observed at the end of physical activities in the healthy welders (male) [13]. These outcomes are also comparable with another previously conducted research that proved pulmonary improvement after ventilatory exercises [14].

Previous studies also report a correlation between FVC, FEV-I and physical exertion in general public. Physically active men had higher FVC and FEV-I in

comparison to the men living in a sedentary lifestyle [15]. Another author reported no association in physical activity and pulmonary functions [16]. Our outcomes are also comparable with the significant FEV-I improvement with a mean change of seventeen percent in the workers of various industries [17]. In the concern of airways, its reduction associates with the activity-induced bronchodilation with an improved pulmonary ventilation and reduced resistance of the airway. It is a fact that neural output initiates the pattern and volume of ventilation in the brainstem. Proprioceptive and Chemo receptors influence the output of muscles joints and tendons. Diaphragmatic and intercostal muscles receive the impulses through nerves. Reparation depth and rate increases with muscular exercise which improves FVC, diffusion rate and oxygen consumption [18]. After exercise, the improved FVC has an association with increased respiratory muscles strength, air reduction in the trapping of air, lung compliance improvement, decreased resistance of airway, decreased concentration f blood lactate and an improved compliance of the lungs with numerous other related factors after the act of physical activity [19, 20].

Physical exertion reduces weight and increased the strength of the muscles; it improves the capacity of the respiration, the resistance of the airway, improved breathing and tolerance [21]. Research also points out an improved endurance, muscle strength, positive pressure bearing and improved ventilation efficiency. Our research reports a slight decrease in the value of FVC which may have an association with age, weight and height of the students. Outcomes also have a direct link with the consistency and effort of the physically active student. Therefore, an effective FVC level is possible with a difficulty when compared with FEV-I production [22].

The decrease in FVC and FEV-I characterizes the restrictive lung disease with a normal proportion in the range of (85% – 100%). Therefore, an isolated FVC fall cannot speak for the restrictive lung disease. There is an association of total capacity of the lung with restrictive disease diagnostic. Normal FVC and FEV-I ratio in case of decreased FVC help to detect restrictive abnormality presence [23].

CONCLUSION:

Lung function positively improved in the regular exercise patterns with an improved function of the lungs especially in terms of FVC and FEV-I proportions. A periodical FEV-I measurement improves the overall general lifestyle awareness and in the acquisition of healthy and active habit development. No doubt, physical actively positively improved the pulmonary functions as reported in Group – I participants who underwent aerobic exercise pattern five days a week for a period of eight weeks.

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