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Original Research Paper

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CORRELATION OF PHYSICAL ACTIVITY AND PULMONARY FUNCTION TEST IN FIRST YEAR MEDICAL STUDENTS IN A TERTIARY CARE CENTRE.

Dr. Anuradha Upadhyay*	Senior Demonstrator, Department of Physiology, S. K. Govt. Medical College, Sikar, Rajasthan, India. *Corresponding Author.
Dr. Kavita Yadav	Associate professor, Department of Physiology, S. K. Govt. Medical College, Sikar, Rajasthan, India.
Dr. Rajesh Kumar Sharma	Assistant Professor, Department of Orthopaedics, J.L.N. Medical College, Ajmer, Rajasthan, India.

ABSTRACT

BACKGROUND: Measurements of the ventilatory adaptations to physical activity provide useful information about the functional conserve capacity of the lungs in study participants with respiratory diseases.

AIM: The present study aimed to study the correlation of physical activity and pulmonary function test in first year MBBS medical students

MATERIALS AND METHODS: A cross-sectional study conducted in a medical college. A total of 80 participated students comprising of 40 males and 40 females in the age group of 18-21 years were divided into four groups based on their body mass index as underweight, normal, overweight and obese group. Respiratory parameters (VC, FVC, FEV1, FEV1% and PEF) measured before and after acute physical activity in the bicycle ergometer.

RESULTS: No significant changes found in all the four groups before and after physical activity in males. The values of FVC & VC after exercise reduced than the baseline values in overweight and obese females ($p < 0.01$).

CONCLUSION: Acute exercise not significantly affect the respiratory parameters. The body fat distribution of the participated significantly affect the ventilatory response to acute physical activity in otherwise healthy individuals.

KEYWORDS : Physical Activity, Pulmonary Function Tests, Body Mass Index

INTRODUCTION

Physical activity and fitness are important for lung health [1], Exercise is an important part of keeping persons healthy. Physical activity is known to improve physical fitness and to reduce morbidity and mortality from numerous chronic conditions [2]. It represents a state of physical exertion of the body and it is associated with extensive alterations in the circulatory and respiratory systems. Exercise testing is a non-invasive tool to evaluate the cardiopulmonary response to stress under carefully controlled conditions.

The ventilatory capacity of a healthy individual often exceeds the demands even during strenuous exercises [3]. In the excessive conserve, the ventilatory response to exercise constrained in obese individuals with normal lungs [4].

Pulmonary function testing is a major step forward in assessing the functional status of the lungs [5]. After exercise, measurement of pulmonary functions provide the useful information of the functional conserve capacity of lungs both in healthy persons and in patients with respiratory diseases. Exercise is used as a challenge test to make a diagnosis of exercise induced bronchoconstriction in asthmatic patients with a history of breathlessness during or after exertion [6]. Some studies explored the effect of acute exercise on pulmonary function tests in normal individuals. Acknowledge of the lung volume response to exercise is important for understanding respiratory mechanics and also carry a clinical significance. Physical activity does not conduct the improved fitness may be less likely to have an impact on lung function.

Several studies on the effects of physical activity on respiratory function are cross sectional on populations such as athletes or patients with chronic obstructive pulmonary disease [7], Physical activity rehabilitation used in the patients with cardio-vascular and respiratory diseases. The relation between physical activity and cardiovascular and respiratory functions provide the how physical activity improves patient's quality of life and evaluate effects of rehabilitation.

There is limited studies on associations between physical fitness and lung function. Thus, the present study aimed to assess the influence of exercise on pulmonary function tests in young healthy individual.

MATERIALS AND METHODS:

This study was conducted in the department of Physiology, Dr. S.N. Medical College, Jodhpur, (Rajasthan), during the years 2017 to 2019. A total of 80 students comprising of 40 males and 40 females in the age group of 18-21 years were recruited for this cross sectional study according to inclusion criteria. Informed consent was obtained from all the study participants after clearly stating the purpose of study to them.

Inclusion Criteria:

- Age between 18 -21 years.
- Willingness to participate in the study.

Exclusion criteria:

- Smokers
- Students with recent respiratory tract infections
- History of allergy, bronchial asthma
- Physically and mentally unfit subjects.
- Hypertensive, and diabetic.
- Uncooperative.
- Students who were absent.

Procedure of Measurement:

Body Mass Index (BMI) calculated by the ratio of weight and square of Height in meters, using Quetelet Index.

[Wt (kg) / Ht (m^2)]

The study participants divided into four subgroups based on their body mass index (BMI) in both the genders as:

Group 1–BMI < 18.5 (Underweight)

Group 2–BMI-18.5-24.9 (Normal)
Group 3–BMI-25.0-29.9 (Overweight)
Group 4–BMI ≥ 30 (Obese)

Pulmonary function tests were measured using a computerised spirometer. Before the procedure Subjects were not to have heavy meals because a full stomach may prevent lungs from full expansion and were asked to wear loose clothing to prevent any restriction of movements.

The procedure demonstrated to the subjects and asked to make three acceptable manoeuvres and the best of the three values selected for reporting. The following variables were measured–Vital capacity (VC), Forced vital capacity (FVC), Forced Expiratory volume in 1st second (FEV1), FEV1/FVC ratio (FEV1%) and Peak expiratory flow (PEF) at rest and the basal readings were noted. subject was allowed to do exercise after basal recordings. Harvard's step test for 6 minutes. The values of the forced expiratory spirograms and PEFR recorded immediately after exercise. Three readings were taken each time and the average was calculated. Mean and standard deviation were calculated.

STATISTICAL ANALYSIS:

Statistical analysis was undertaken using SPSS v10.0 and MS Excel 2013.

RESULTS:

The study participants consisted of 40 Male and 40 Female, first year M.B.B.S. students of age group 18-21 years. The baseline characteristic of the study participants before exercise (Table 1). FEV1% significantly higher in males compared to the females ($p < 0.001$). (Table 2) shows the respiratory parameters before and after acute physical activity within the groups in males. The comparison of the values between VC, FEV1, FVC and PEF significantly lower in groups 1(underweight), 3 (overweight) and 4 (obese) compared to group 2 (normal) ($p< 0.001$). No significant changes were observed in the respiratory parameters after physical activity in all the four groups.

Table 3 shows in the female groups the respiratory parameters before and after acute exercise. The comparison of the values between VC, FEV1, FVC and PEF significantly lower in groups 1(underweight), 3 (overweight) and 4 (obese) compared to group 2 (normal) ($p< 0.001$).

Table 1: Baseline Characteristics Of The Study Participants

Gender	N	BMI	VC	FEV1	FVC	FEV_1%	PEF
Male	40	21.44 ± 2.50	3.12 ± 0.78	3.20 ± 0.50	3.30 ± 0.70	97.50 ± 3.40	6.51 ± 1.62
Female	40	24.00 ± 2.15	3.00 ± 0.60	2.98 ± 0.55	3.04 ± 0.69	96.20 ± 3.48	6.30 ± 1.50

Table – 2 Comparison Of Respiratory Parameters Before And After Physical Activity Within Groups In Males

Parameters	Physical Activity	Group 1 Underweight BMI <18.5 kg/m²	Group 2 Normal BMI 18.5-24.9 kg/m²	Group 3 Overweight BMI 25-29.9 kg/m²	Group 4 Obese BMI >30 kg/m²
VC	Before	2.31± 0.26	4.02 ±0.39	2.98± 0.42	2.01± 0.06
	After	2.31± 0.30	4.10± 0.42	2.98± 0.42	1.78± 0.08
FEV1	Before	2.40± 0.35	3.50± 0.40	2.78± 0.40	2.04± 0.07
	After	2.43± 0.45	3.54 ±0.37	2.76± 0.40	1.97± 0.15
FVC	Before	2.43± 0.30	3.98± 0.38	2.98± 0.42	3.20 ± 0.06
	After	2.50± 0.47	4.05± 0.39	3.00± 0.42	3.06± 0.11
FEV_1%	Before	97.60 ±2.76	97.45± 2.60	94.74± 3.88	1.99 ±0.04
	After	94.60 ±3.28	96.65 ±1.60	96.82± 3.00	1.70± 0.10
PEF	Before	4.41± 0.35	6.27± 1.03	5.16± 1.20	98.64±2.28
	After	4.50 ±0.40	6.32 ±0.98	4.23± 1.30	94.00± 1.00

Table – 3 Comparison of respiratory parameters before and after physical activity within groups in females

Parameters	Physical Activity	Underweight BMI <18.5 kg/m²	Normal BMI 18.5-24.9 kg/m²	Overweight BMI 25-29.9 kg/m²	Obese BMI >30 kg/m²
VC	Before	2.11±0.11	3.35± 0.30	2.80± 0.32	1.98± 0.52
	After	2.14± 0.08	3.40± 0.34	2.78± 0.38	1.60 ± 0.45
FEV1	Before	2.08± 0.16	3.24± 0.32	2.79± 0.32	1.80± 0.11
	After	2.08± 0.09	3.28 0.30	2.70 ± 0.34	1.68 ± 0.19
FVC	Before	2.15 ± 0.20	3± 0.25	2.21± 0.47	1.67± 0.70
	After	2.17 ± 0.18	3.02± 0.23	2.10± 0.50	1.60± 0.20
FEV_1 %	Before	97.15 ± 3	95.60± 3.40	96.50± 4.20	97.20 ± 2.28
	After	95.66 ± 2.60	96.90± 2.50	98± 2.50	97.20 ± 2
PEF	Before	4.15± 0.85	5.50± 1	4.80 ± 0.82	3.25± 1.20
	After	4.25 ±1.10	5.60 ± 0.88	4.57± 0.70	3.10± 1.60

DISCUSSION

The present cross sectional study aimed to study the correlation of physical activity and pulmonary function tests in first year MBBS medical students. In our study the baseline values of the respiratory parameters between the genders showed a statistical significant difference, with males showing the higher values than females. When the person starts to the exercise, a increase in ventilation starts immediately on initiation of the exercise, before any blood chemicals change. A comparison of the respiratory parameters before exercise between the various groups of males and females, discuss a statistically significant effect of body mass index on the pulmonary function.

In the present study, study participants with normal body mass index had a significantly higher values compared to the underweight, overweight and the obese participants and no change in FEV1 %. Similar results were found by Saxena et al. [9]. The results specify a restrictive mode of impairment in overweight and obese subjects, and the increased body fat percentage mechanical restraint to the movement of abdomen and thorax and increased airway resistance in overweight and obese individuals. The lower values of respiratory parameters contributed by low respiratory muscle strength in the underweight individuals Muralidhara DV [11]. Respiration is stimulated by neurogenic mechanisms during exercise, this stimulation causes direct stimulation of the respiratory center by the same nervous signals that are transmitted from the brain to the muscles to cause the exercise. Similar findings of Ikram MH, found that release of catechol amines during exercise, cause significant rise in FEV1 after exercise in both the genders [12]. The

cardiopulmonary changes with exercise in adolescents an increase in FEV1 and without changes in FVC found by Lakshmi PVV. It also reported that mild and moderate exercise do not produce a significant alteration in the pulmonary function tests. Sagher F observed the bronchoconstrictor effect of exercise fall in PEF, in healthy Libyan children. The bronchospasm in healthy children was attributed to the low temperature and dry stimulus to the airways during exercise [13]. In higher body mass index females, a significant reduction was observed in FVC and VC after acute exercise. Faria AG et al studied the effect of exercise test on pulmonary function of obese adolescents and reported that body fat distribution influences the resting values more than the changes after exercise [14]. A person with higher body mass index lung volumes decreases and to increase respiratory resistance, contributing to exercise induced reduction in FVC in these subjects found by Navarro B et al [15] and Kaplan et al [16]. This reduction significantly only in the females by the fact they have lesser respiratory muscle strength and therefore prone for a greater reduction of lung volumes and flow rates.

CONCLUSION:

The results of the present study indicate that pulmonary function tests are not altered with acute exercise in normal individuals, however exercise induced changes may be significantly influenced by higher body mass index and respiratory muscle strength. This shows that excessive ventilatory reserve in an individual with normal lungs could be compromised due to many factors like obesity. Although the beneficial effects of continuous physical training has proven effects, more research has to be done to explore the beneficial effects of acute exercise and its effectiveness as a screening tool in assessing the functional capacity of the lungs.

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REFERENCES

1. Carson KV, Chandratilleke MG, Picot J etal. Physical training for asthma. Cochrane Database Syst Rev 2013: 9: CD001116. PubMedGoogle Scholar
2. U.S. Department of Health and Human Services. Physical activity and health: a report of the Surgeon General. Atlanta, GA: Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, 1996. Google Scholar
3. Aaron EA, Seow KC, Johnson BD, Dempsey JA. Oxygen cost of exercise hyperpnea: implications for performance. J Appl physiol. 1992; 72(5):1818-25.
4. Ofir D, Laveneziana P, Webb KA, Donnell DE. Ventilatory and perceptual responses to cycle exercise in obese women. J Appl Physiol.2007; 102: 2217-2226.
5. Ganong WF. Respiratory adjustments in health and disease. In: Ganong WF (Ed.), Review of medical physiology, 22nd ed., United states of America:McGrawHill, 2005: 681.
6. Custovic A, Arifhodzic M, Robinson A, Woodcock A. Exercise testing revisited. The response to exercise in normal and atopic children. Chest. 1994; 105(4):1127-32.
7. Burchfiel CM, Enright PL, Sharp DS, et al. Factors associated with variations in pulmonary function among elderly Japanese-American men. Chest 1997;112:87–97.
8. Saxena Y, Saxena V, Divedi J, Sharma RK. Evaluation of dynamic function tests in normal obese individuals. Indian J Physiol Pharmacol. 2008; 52(4): 375-382.
9. Muralidhara DV, Ramesh bhatt M. Some aspects of pulmonary functions in the underweight and overweight human subjects. TJPS. 2007; 20: 3-7.
10. Ikram MH. Evaluation of pre and post exercise pulmonary function tests in medical students. Professional Med J. 1998; 5 (1):77.
11. Sagher F, Hweta A. Bronchoconstrictor effect of exercise in healthy Libyan chidren in Tripoli. Eastern Mediterranean Health journal .1999; 5 (2):350-53.
12. Faria AG, Ribeiro MA, Marson FA, Schivinski CI, Severino SD, Ribeiro JD, et al. Effect of exercise test on pulmonary function of obese adolescents. J Pediatr (Rio J). 2014;90: 242-9.
13. Navarro B, Rivero M, Eslava A, Reyna G, Monge J. Exercise induced bronchospasm in asthmatic and non-asthmatic obese children. Allergol Immunopathol (Madr). 2000;28(1):1-4.
14. Kaplan TA, Montana E. Exercise-induced bronchospasm in nonasthmatic obese children. Clinical pediatrics. 1993, 32(4):220-5.