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Original Article

Comparison of PEFR (Peak expiratory flow rate) before & after exercise in normal weight group & overweight –obese group of young adult females

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Abstract

Background: Obesity is the disease of modern era. How it affects pulmonary functions & its role in pathogenesis in many respiratory diseases is still under research. Moreover, effect of physiological stress like exercise in overweight & obese people on pulmonary functions is still under study.

Aim: So aim of this study is to find whether obesity causes exercise induced respiratory hyper-responsiveness in terms of PEFR in non-asthmatic young adults.

Materials and Methods: Total 42 healthy female volunteers of 18-20 years of age were classified in to normal weight group and overweight –obese according to their BMI and percentage body fat. PEFR was recorded using Wright's peak flow meter before and after five minutes of a free running for eight minutes.

Results: In the present study it was found that there was no significant difference in PEFR after acute exercise in normal weight and overweight –obese group. The mean PEFR before and after exercise in overweight –obese group were 411.25(±61.66) L/min and 419.58(±64.77) L/min respectively. The mean PEFR before and after exercise in normal weight group were 387.78(±50.59) L/min and 381.67 (±52.72) L/min respectively.

Conclusion: In conclusion our study shows no airway hyper-responsiveness after exercise in both normal weight & overweight-obese groups. So it can be taken as an advantage to promote them especially overweight and obese to perform repeated short duration exercise for weight reduction and physical fitness.

Key words- obesity, peak expiratory flow rate, exercise, respiratory hyper-responsiveness, young adults

Introduction

Obesity is the disease of modern era. This is one of the illness with multisystem involvement. It is associated with chronic diseases like chronic heart diseases & diabetes mellitus. But how it affects pulmonary functions & role of it in pathogenesis in many respiratory diseases is still under research. Moreover, effect of physiological stress like exercise in overweight & obese people on pulmonary functions is still under study.

It is postulated that obesity induces generalized inflammation & one of its effects may be seen as respiratory tract hyper responsiveness to exercise in non-asthmatics. It is characterized by spilling over series of mediators into the blood, known as adipokines which produce inflammatory activators at site distant to adipose tissue. Adipokines include interleukin-6, tumor necrosis factor-α, eotaxin, vascular endothelial growth factor that have been associated

with asthma & may have role in common state of inflammation. These mediators may involve in airway narrowing leading to decrease in Peak Expiratory Flow Rate (PEFR)[1]. This airway, hyper-responsiveness can be better demonstrated by checking PEFR after exercise [2]. Few studies have been conducted in children to check the same, but in young adults it is yet not well studied.

So we decided to conduct this study with the aim to find whether obesity causes exercise induced respiratory hyperresponsiveness in non-asthmatic young adults. Respiratory hyperresponsiveness can be measured by PEFR with the help of Peak flow meter which is inexpensive, practical way to measure the lung function[3]

Aims/Objectives-

To compare PEFR before & after exercise in normal weight group & overweight –obese group of young adults females.

Material & Methods-

Ethics committee permission was obtained. Study population included 24 overweight –obese & 18 normal weight female volunteers aged 18-20 years. They were classified as normal weight, overweight-obese accordingly International cutoff point of body mass Index (BMI) & according to percentage body fat (% body fat) (American council of exercise). The subjects with history of cardio-respiratory diseases, major surgery/illness and undergoing any physical training programme or yoga were excluded.

Proper informed consent of volunteer was obtained before procedure. History taking, general & systemic examination was done to exclude any cardio-respiratory disease. Weight was measured by standard weighing scale and height by stadiometer. Body mass index was calculated by Quetelet's Index. Percentage body fat was recorded by using Tanica's Inner scan V (segmental body composition monitor).

Peak expiratory flow rate measurements were obtained using Wright's peak flow meter. The subjects were trained to use the device Wright's peak flow meter correctly. Three readings were recorded from each subject. The highest of three maximal expiratory readings was considered as final reading for analysis. The second measurements (after exercise readings) were recorded five minutes after a free running for eight minutes. Mean PEFR at baseline was calculated for obese & non-obese group.

Statistical analysis was done by using software SPSS statistics-21. The unpaired t-test was used to compare PEFR in overweight-obese & normal weight. The paired-t test was used to compare PEFR before and after exercise in each group.

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Results –

Table no. 1 Descriptive data of participants

GROUPS	N	Weight (kg) Mean ± SD	Percentage body fat Mean ± SD	BMI Mean ± SD
Normal weight	18	54.21±5.65	29.17±3.86	21.22 ±2.08
Overweight-obese	24	72.06±9.52	41.50±4.38	29.37±3.63

Table no. 2 Comparison of PEFR in normal weight participants before & after exercise

Normal Weight	Before exercise Mean± SD	After exercise Mean± SD	P -VALUE
PEFR (L/min)	387.78(±50.59)	381.67 (±52.72)	0.444

Table no. 3 Comparison of PEFR in Overweight-obese participants before & after exercise

Overweight-obese	Before exercise Mean ±SD	After exercise Mean ±SD	P -VALUE
PEFR (L/min)	411.25(±61.66)	419.58(±64.77)	0.120

Table no. 4 Comparison of PEFR before exercise in normal weight & overweight-obese group

Before exercise	Normal weight Mean ±SD	Overweight Mean ±SD	P -VALUE
PEFR (L/min)	387.77±50.59	411.25±61.66	0.196

Table no.5: Comparison of PEFR after exercise in normal weight & overweight-obese group

After exercise	Normal weight Mean ±SD	Overweight Mean± SD	P -VALUE
PEFR (L/min)	381.66 (±52.72)	419.58(±64.77)	0.043*

*p value significant at ≤ 0.05

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Discussion-

Table no.1 shows normal distribution in female participants in both the groups.

As per Table No. 2 there is no significant difference in PEFR, before & after exercise in normal weight group. Contrary to above findings a study conducted by Febrina Z. Siregar et al [(4)] found significant decrease in PEFR in normal weight group before & after exercise.When compared with result of our study, the difference may be because of study population which consists of pediatric age group in their study. In another study, conducted by Aditya Ghosh[(5)] there was significant increase in PEFR after exercise in all groups in normal weight, underweight & overweight. They have not discussed possible causes.A study conducted in young adults by swati Chauhan et al[(6)] there was reduction in PEFR after exercise in all 3 weight groupsbut was significantly decreased in normal weight group.

As per table no. 3 there is no significant difference in PEFR before & after exercise in overweight-obese group. In a Study was conducted by Febrina Z. Siregar et al[(4)] they found significant decrease in PEFR in obese children than normal weight children after exercise..According to them increased body mass load on lungs and chest causesrespiratory failure by either insurmountable load to the respiratory muscles or significant ventilation perfusion inequalities. In a study by B. E. del Río-Navarro[(7)] et all on healthy obese children they found decrease in FEV1 after exercise challenge and they attributed it to bronchial hyperreactivity to exercise. According to Aditya Ghosh[(5)] there was significant increase in PEFR in healthy young adults after exercise in all BMI group (≤ 18.5 to ≥ 30) . In another study conducted by Sheetal Bhavsar et al PEFR in females increased after exercise. Both above study concluded that exercise has beneficial effect on airway function. Another study conducted by R P Schnall & L I.Landou[(8)] showed that repeated sprint is protective in exercise induced asthma by inducing bronchodilatation. In this study they tried to take advantage of two phase response of respiratory system to exercise i.e. initial bronchodilatation followed by bronchoconstriction. They postulated that exercise induced bronchodilatation may be manifestation of increased sympathetic adrenal drive. Three possible mechanism by which increased sympathetic activity may modify the response of an asthmatic to exercise explained by R P.Schnall & L I .Landau[(8)].

a) By acting on bronchial smooth muscle B2 receptors & increased intracellular level of Cyclic-AMP
b) By elevating plasma titre of catecholamine that may stabilize mass cell membrane & inhibit release of bronchoconstricting mediator
c) Catecholamine also inhibits the cholinergic discharges which produce bronchoconstriction.

So they concluded that asthmatic can cope better with repeated short duration activities & that warm up period may be beneficial in allaying the effects of more prolong periods of exercise.

As per table no. 4 , There is no significant difference in PEFR before exercise in two groups. In a study by Laxmikant Borse[(9)] et al, PEFR in overweight group was significantly less than normal weight group at rest. In another study Kanavi Roopa shekharappa et al[(10)] found significant decrease in PEFR in obese subjects as compared to non-obese subjects . In a study conducted by J. P. Shenoy et al[(11)] ,mean value of PEFR didn't show any significant difference in normal, overweight & obese groups.

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As per table no. 5-There is significant difference PEFR after exercise when compared in normal & overweight group. This might be due to decrease in PEFR (not significant) in normal weight group and increase in PEFR (not significant) in overweight-obese group. The cause of this contradictory finding needs further evaluation. Febrina Z. Siregar et al[4] concluded that PEFR before & after exercise was significantly lower in obese subjects as compared to normal weight. Francoise Zerah and his colleagues [12] studied the effects of obesity on respiratory resistance on healthy subjects exhibiting various degrees of obesity with BMI ≥ 30 and found that there was a change in most lung volumes as the BMI increased.Air flow limitation in morbidly obese, nonsmoking men was studied by Rubinstein et al[13] in obese men and women. They found a significant difference in pulmonary function between the obese and non-obese persons. It may be because of morbid obesity.

Limitations of study – This study was conducted in small group of population. For better clarity it should be conducted in larger population, with obese and overweight group as two separate groups and it should include other respiratory parameters in pulmonary function test.

Conclusion-

In conclusion our study shows no airway hyper-responsiveness after exercise in both normal weight & overweight-obese groups. So it can be taken as an advantage to promote them especially overweight and obese to perform repeated short duration exercise for weight reduction and physical fitness.

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