e-ISSN: 0976-822X, p-ISSN:2861-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2023; 15(4); 327-332

Original Research Article

Effect of Sedentary Life Style on Respiratory Rates and Peak Expiratory Flow Rate among Medical Students

Kumari Abha[1], Chandrakant Prasad[2], Dinesh Kumar[3]

[1]Tutor, Department of Physiology, Government Medical College, Bettiah, Bihar, India

[2]Assistant Professor, Department of Physiology, Government Medical College, Bettiah, Bihar, India.

[3]Professor, Department of Physiology, Government Medical College, Bettiah, Bihar, India.

Received: 02-03-2023 / Revised: 22-03-2023 / Accepted: 19-04-2023
Corresponding author: Dr. Kumari Abha
Conflict of interest: Nil

Abstract

Aim: The current study was undertaken to compare Resting, peak exercise, 5 min after exercise respiratory rates and respiratory rate recovery following Astrand-Ryhming step test and Peak expiratory flow rates (PEFR) between students of Medical Education (ME)).

Material & Methods: The present study was conducted at Government medical college, Bettiah, Bihar, India. The study was conducted on 100 healthy medical students students after completion of 1 year of course in the college. Permission to conduct the study was obtained from the institutional ethical committee and principal of the college.

Results: The comparison of mean resting, peak exercise, and 5 min after ARST respiratory rates showed that all the differences were statistically highly significant. The increase in respiratory rate at the end of Astrand-Rhyming Step test (ARST) and Percent recovery respiratory rate (Percent RRR) at the end of 5 min recovery after ARST over pre -test between showed significant results. The mean PEFR±1SD in ME students was 460.2±66.4 and the difference was statistically highly significant.

Conclusion: The present study revealed that the important parameters of pulmonary fitness like Respiratory rates and PEFR among ME students. Beneficial effects of exercise are well known since the ancient Vedas. The present attractive education system has helped to improve the education standards, but the non-active sedentary stressful life has made the youth physically unfit. Regular physical activity is an essential part of the healthy life style and should be encouraged among medical students.

Keywords: Respiratory Rate, PEFR, Medical Education.

Introduction

Sedentariness is the practice of living in one place for a long time. [1] According to a survey report conducted in 2008, by the United States National Health Survey, 36% of adults are totally inactive while 59% have never participated in vigorous physical activity lasting more than 10 minutes per week. [2] Physical fitness is required not only by athletes for better performance but also by non-athletes for maintenance of physical and mental health. A sedentary lifestyle can contribute to ill health and adverse effects. [1] Physical fitness is required not only by athletes for

better performance but also by non-athletes for maintenance of physical and mental health. Heavy academic workloads in medical schools make it difficult for medical students to maintain a regular exercise program. Physical Education class provides a great variety of activities and high intensity exercises for students. Sedentary living affects people in such a way that it makes them lazy and prone to fatigue. By being inactive muscle tissues are lost which causes muscle atrophy and makes us lose strength, making a person physically weak and fatigue. Aging process can also be accelerated with no physical activity, decreasing the immunity system and giving rise to various diseases. Inadequate physical activity and low levels of fitness in adults contribute to then adequate physical activity and low levels of fitness in adults contribute to the development of obesity, type-2 diabetes mellitus, hypertension, the metabolic syndrome, hypercholesterolemia, myocardial infarction, osteoporotic fractures, depression and some cancers. [3] A sedentary lifestyle is the most modifiable risk factor for cardiovascular diseases. It is also important for a sedentary population to indulge themselves in regular exercise to maintain proper health as it has been shown that physical inactivity and a negative lifestyle in the sedentary population have seriously threatened the health and it deteriorates the human body. [4]

"Abnormal or excessive accumulation of fats in the body that might be harmful to an individual is termed as obesity. [5] Work done by the World Health Organization shows that global obesity rates have more or less tripled since 1975. As of 2016, more than a third of adults are overweight while nearly a tenth are obese. [6] Obesity is a significant health risk; its prevalence now indicates a near-pandemic. Obesity dramatically heightens the risk of diseases like type II diabetes, myocardial infarction, and various types of cancers. It is thus hazardous to both the quality and expectancy of life. [7] A multitude of factors such as food habits, lifestyle, and the complicated interactions between genetic, cultural, and socioeconomic forces are all fundamental causes of obesity. [8] Peak expiratory flow rate (PEFR) is a person's maximum speed of expiration. It measures the airflow through bronchi and thus the degree of obstruction in airways. PEFR is the maximum rate of airflow that can be generated during forced expiratory manoeuvre starting from total lung capacity. It is measured by using a standard Wright Peak Flow meter or mini-Wright meter. [9] Aerobic training is responsible for metabolic adaptations that allow more efficient adjustment of energy expenditure during exercise recovery. [10]

To date there are very few studies evaluating the relationship between sedentary behaviour and pulmonary function in a population who works for more than half a day i.e., 6-8hrs continuously in front of technologies (mainly desk jobs) with no sign of physical activities. Sedentary lifestyles could be associated with less efficient pulmonary functions. Hence, the current study was undertaken to compare important pulmonary fitness parameters between students of Medical Education (ME).

Material & Methods

The present study was conducted at Government medical college, Bettiah, Bihar, India. The study was conducted on 100 healthy medical students after completion of 1 year of course in the college. Permission to conduct the study was obtained from the institutional ethical committee.

Inclusion Criteria:

- Healthy male students of medical.
- Aged between 18-25 years after completion of I year study course.

Exclusion Criteria:

Subjects with:

- Cardiovascular diseases
- Respiratory diseases
- Musculoskeletal, Neuromuscular, Endocrine disorders.
- Allergic disorders.
- Alcoholism/smoking habit.
- Chronic infection /disease.
- Acute illness at the time of study.

Methodology

Details of study were explained and a written consent was taken from subjects. All the study parameters in both the groups were recorded during morning hours between 9 am to 11 am at room temperature to avoid any possible diurnal variation effect. Subjects were told to report an hour before experiment. They were asked to refrain from heavy meal or drinking coffee/tea, at least for an hour and allowed to take rest for half an hour before the experiment.

Astrand-Rhyming Step test (ARST) [11]: ARST for men requires subjects to step up and down on a 40 cm (16 inch) bench for 5 min at rate of 90 steps/min (22.5 cycles of stepping) or until exhaustion. The procedure of exercise test was explained to the subjects and demonstrated beforehand and subjects were made to take a pretest to allay apprehension. [12]

Respiratory rate in cycles/ min: Respiratory rate in cycles/ min was recorded for three times. First before the step test, second immediately from 15 seconds to 30 seconds after the test and third time at 5 min after the test without the knowledge of the subject. Respiratory rates were recorded as RRR, RRE and RR5 respectively.

Percent recovery respiratory rate at the end of 5 min recovery was calculated by using formula, [13]

Percent recovery respiratory rate =

$$\frac{(RRE-RR5)\ x100}{RRE-RRR}$$

Peak Expiratory Flow Rate (PEFR) in lit/min: Under aseptic precautions, the subject was asked to blow forcefully after deep inspiration into the mini-Wright's.

Peak Flow meter (PEAK FLOW MASTER CIPLA MUMBAI-INDIA). The calibrations are from 60-800 liters per minute. Three readings were taken in standing position and the best was considered.

Statistical Analysis

Data was analysed by through SPSS for Windows (Version 16. Chicago). Unpaired 't' test & Chi-square test was used. $P>0.05$ was considered statistically not significant (NS) and $P<0.05$ was considered statistically significant (S). $P<0.001$ was considered statistically highly significant.

Results

Table 1: Comparison of respiratory rates in cycles/min between students of medical

Parameters	Medical EducationMean ± SD	p value
RRR	18.2±1.5	<0.001
RRE	34.6±5.8	<0.001
RR5	28.2±3.5	<0.001

The comparison of mean resting, peak exercise, and 5 min after ARST respiratory rates showed that all the differences were statistically highly significant.

Table 2: Comparison of increase in respiratory rate at the end of Astrand-Rhyming Step test (ARST) and Percent recovery respiratory rate (Percent RRR) at the end of 5 min recovery after ARST over pre -test between students of medical

Increase in respiratory rate at end of ARST over pre -test		Percent recovery respiratory rate at the end of 5 min recovery after ARST over pre –test	
Medical Education	p value	Medical Education (Percent	p value

(RRE- RRR)		RRR)	
15.5±5.2	<0.001	42%	<0.001

The increase in respiratory rate at the end of Astrand-Rhyming Step test (ARST) and Percent recovery respiratory rate (Percent RRR) at the end of 5 min recovery after ARST over pre -test between showed significant results.

Table 3: Comparison of PEAK expiratory flow rate between students of medical

Parameter	Medical EducationMean ± SD	p value
PEFR Liters/min	460.2±66.4	<0.001

The mean PEFR±1SD in ME students was 460.2±66.4 and the difference was statistically highly significant.

Discussion

Peak expiratory flow is a measurement of the movement of air into and out of the lungs during various breathing maneuvers. [14] In effect of postural changes, lung volumes in normal subjects were significantly higher in a standing position. [15] Other studies reported that in healthy subjects spirometric indices were higher in the standing in comparison with the sitting position, [16] whereas some other studies have reported no differences between spirometric values obtained in lying, sitting, and standing positions. [17] Persson et al [18] pointed out that there is an urgency to reach a better understanding of the relationship of impaired pulmonary function to disease in order to undertake preventive measures. Buffalo health study concluded that pulmonary function is a long-term predictor for overall survival rates in both genders and could be used as a tool in general health assessment. [19]

The comparison of mean resting, peak exercise, and 5 min after ARST respiratory rates showed that all the differences were statistically highly significant. Similar increases in respiratory rate following exercise are reported in other studies also. [20,21] This is due to a rapid neurogenic component and a slower humoral component according to the neurohumoral theory of exercise hyperpnoea. As person begins to exercise the respiration increases in depth and rate in proportion to concentration of CO2 in blood. [22] The increase in respiratory rate at the end of Astrand-Rhyming Step test (ARST) and Percent recovery respiratory rate (Percent RRR) at the end of 5 min recovery after ARST over pre -test between showed significant results. Similar to the findings of the present study, Izedebska E et al [23] and Khodnapur IP et al [24] also have demonstrated a significantly lower resting respiratory rates in trained young normotensive and trained residential school children respectively. Studies done by Alpert JS et al, [25] and Pierce AK et al, [26] have also reported diminished resting respiratory rate after training in patients with chronic obstructive pulmonary disease.

Regular aerobic training is associated with several cardiovascular, pulmonary and muscular adaptations leading to improvement in metabolic regulation. [27] These changes lead to lesser increase in respiratory rate and faster recovery of respiratory rate in trained individuals following exercise. The mean PEFR±1SD in ME students was 460.2±66.4 and the difference was statistically highly significant.. PEFR is effort dependent and also reflects the status of larger airways. [28] It is a measurement which is dependent upon several variables including airway resistance, maximal voluntary muscular effort and possible compressive effect of the maneuver on thoracic airways. [29] Aerobic training causes regular forceful inhalation and deflation of the lungs for

prolonged periods. This in turn leads to strengthening of respiratory muscles and structural charges in the airways which increase PEFR values in trained subjects. [30] No improvement of PEFR in trained subjects in the study by Hulke SM et al, [26] could be due to lesser duration and moderate degree of exercise not involving respiratory system performed by the subjects in their study.

Conclusion

The present study revealed that the important parameters of pulmonary fitness like Respiratory rates and PEFR among ME students. Beneficial effects of exercise are well known since the ancient Vedas. The present attractive education system has helped to improve the education standards, but the non-active sedentary stressful life has made the youth physically unfit. Regular physical activity is an essential part of the healthy life style and should be encouraged among medical students.

References

1. Gabaccia DR. Food, mobility, and world history. In the Oxford handbook of food history 2012 Oct 16 (pp. 305-324). New York: Oxford University Press.
2. Iosrjce. Sedentary Lifestyle: Health Implications [Internet]. Slideshare.net. 2020. Available from: https:// www. slideshare.net/iosrjce/sedentary-lifestyle-healthimplications
3. Kim J, Must A, Fitzmaurice GM, Gillman MW, Chomitz V, Kramer E, McGowan R, Peterson KE. Relationship of physical fitness to prevalence and incidence of overweight among schoolchildren. Obesity research. 2005 Jul;13(7):1246-54.
4. Tongprasert S, Wattanapan P. Aerobic capacity of fifth-year medical students at Chiang Mai University. Journal-Medical Association of Thailand. 200 7 Jul 1;90(7):1411.
5. World Health Organization. Overweight and obesity.
6. Fact sheets. Detail. Obesity and overweight.
7. Blüher M. Obesity: global epidemiology and pathogenesis. Nature Reviews Endocrinology. 2019 May;15 (5):288-98.
8. Apovian CM. Obesity: definition, comorbidities, causes, and burden.
9. Joshi V, Shah S. Effect of Body Mass Index (BMI) on Peak Expiratory Flow Rate in young adults. IAIM. 2016; 3(5):85-8.
10. Short KR, Sedlock DA. Excess postexercise oxygen consumption and recovery rate in trained and untrained subjects. Journal of applied physiology. 1997 Jul 1;83(1):153-9.
11. Marley WP, Linnerud AC. Astrand-ryhming step test norms for college students. British Journal of Sports Medicine. 1976 Jun;10(2):76.
12. Badami S, Baragundi M. Effects of sedentary life style on respiratory rates and peak expiratory flow rate among medical students. Indian Journal of Clinical Anatomy and Physiology. 2017 Jan;4(1):100-3.
13. Patil RB, Doddamani BR, Bhutkar M, Awanti SM. A comparative study of physical fitness among rural farmers and urban sedentary group of Gulbarga District. Al. Ameen J. Med. Sci. 2012; 5(1):39-44.
14. Crapo RO. Pulmonary-function testi ng. N Engl J Med 1994;331:25-30.
15. Appel MA, Childs AN, Healey EL, Markowitz ST, Wong SA, Mead JE. Effect of posture on vital capacity. Journal of Applied Physiology. 1986 Nov 1;61(5):1882-4.
16. Lalloo UG, Becklake MR, Goldsmith CM. Effect of standing versus sitting position on spirometric indices in healthy subjects. Respiration. 1991;58 (3-4):122-5.
17. Badaruddin M, Uddin MB, Khalun MF, Ahmad K. Study on peak expiratory flow rate in different positions. Dinajpur Med Coll J 2010 ;3:17-8.

18. PERSSON C, BENGTSSON C, Lapidus LE, RYBO E, THIRINGER G, Wedel HA. Peak expiratory flow and risk of cardiovascular disease and death: a 12-year follow-up of participants in the population study of women in Gothenburg, Sweden. American journal of epidemiology. 1986 Dec 1;124(6):942-8.
19. Holger J, Schunemann, Joan Dorn, Brydon JB, Grant, Warren Winkelstein, Jr., Maurizio Trevisan. Pulmonary. Function is a Long-term Predictor of Mortality in the General Population: 29-Year Follow-up of the Buffalo Health Study. CHEST 2000; 118(3): 656–664.
20. Smilee JS, Samuel TV. Comparative study of Aerobic power in North and South Indians. J Biomed Sci and Res 2010;2(3):155-161.
21. Smilee JS, Nagaraja S, Ajay KT, Vivian ST. Aerobic Capacity in untrained young Indian men. Calicut Medical Journal 2008;8(2):1-9.
22. Izdebska E, Izdebki J, Cybulska I, Makowiecka C, Trzebski A. Moderate exercise training reduces arterial chemoreceptor reflex drive in mild hypertension. J physiol pharmacol 2006;57(11):93-102.
23. Khodnapur JP, Bagali SC, Muller LM, Dhanakshirur GB, Aithala M. Role of Regular Exercise on VO2 max and Physiological parameters among Residential and non- residential school children of Bijapur. International J of Biomed and Adv Res 2012;3(5):397-400.
24. Alpert JS, Bass H, Szucs MM, Banas JS, Dalen JE, Dexter L. Effects of Physical Training on hemodynamics and pulmonary function of rest and during exercise in patients with chronic obstructive pulmonary disease. Chest 1974;66(6):647-51.
25. Pierce AK, Taylor HF, Archer RK. Responses to exercise training in Patients with emphysema. Arch Intern Med 1964;113:28-36.
26. Short KR, Sedlock DA. Excess post exercise oxygen consumption and recovery rate in trained and untrained subjects. J Appl Physiol 1997;83:153-159.
27. Mead J, Tumer JM, Macklem PT, Little JB. Significance of the relationship between lung recoil and maximum expiratory flow. J Appl physiol 1967;22:95-108.
28. Ramchandra K, Srinivasaiah S, Giliyaru S, Eregowda A. Study of PEFR in urban lower and middle class high school children at Bangalore, India. Int J Contemp Pediatr 2016;3 (1):189-192.
29. Thaman RG, Arora A, Bachhel R. Effect of Physical Training on Pulmonary Function Tests in Border Security Force Trainees of India. J Life Sci 2010;2(1):11-15.
30. Hulke SM, Phatak MS. Effect of endurance training on lung function: a Longitudinal study. Int J Biol Med Res 2011; 2(1):443-446.