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Effect of Exercise On Oxygen Saturation and Heart Rate in Healthy Young Adults of Different Body Mass Index.

Anupama N¹, Rekha D Kini^{1*}, Vishnu Sharma M², Bhagyalaksmi K¹, Nayanatara AK¹, Sneha Shetty¹, Elizabeth Josy Panikulam¹, and Anshuman¹.

¹Department of Physiology, Kasturba Medical College, Manipal University, Mangalore, Karnataka, India.

²Department of Respiratory Medicine, A J Institute of Medical Sciences, Mangalore, Karnataka, India.

ABSTRACT

Sedentary people with low level of physical activity are at higher risk of heart disease. This study was done with to find the effect of exercise on oxygen saturation and heart rate in healthy young adults of different body mass index. This was a cross- sectional study done on 136 medical students of 17-25years. 56 subjects who were doing minimum 30min of exercise per day for 3 days a week were control and another 80 subjects who did not do any type of exercise were cases. Informed consent and approval from the college ethics committee was taken. BMI was calculated and subjects were divided into normal, low and high BMI groups. The 6-min walk test was conducted according to a standardized protocol. Oxygen saturation and pulse rate were assessed at the start and end of the 6-min walk test using Pulse Oximetry. A statistical package SPSS Version 17.0 used. P≤ 0.0 considered significant. The oxygen saturation of normal BMI non-exercising subjects (97.52 ± 1.82) were low compared to exercising subjects (98.17 ± 0.44) and it was statistically significant (P< 0.05). Physical exercise done only three to four times a week in young adults improves oxygen saturation and heart rate.

Keywords: Body mass index, exercise, heart rate, oxygen saturation,

*Corresponding author

INTRODUCTION

Increased use of technology is leading to higher level of physical inactivity in people of all age group. This is one of the reasons for obesity. Obesity is a health hazard which leads to many metabolic complications like type II diabetes, dyslipidemia and cardiovascular diseases and negatively associated with pulmonary functions [1]. It is a well-known fact that physical exercise is necessary to maintain physical fitness [2].

The oxygen concentration in the blood can be rapidly and easily measured by a non-invasive technique pulse oximetry which detects the oxygen saturation of hemoglobin and gives an early warning of hypoxemia [3, 4]. The oxygen saturation of the red blood cells when it passes through lungs is 95 to 100 percent in an adult at basal condition. During exercise the oxygen saturation decreases in individuals who are not physically fit and they cannot deliver enough oxygen to the exercising muscles [5]. The heart rate of an adult indicates the vagal tone and the sympathetic activity on the heart [6]. Studies done on heart rate and blood pressure changes to exercise and immediately after exercise shows that slow recovery of increased heart rate following exercise predicts future cerebrovascular accidents and mortality [7]. Studies done on women shows that increased Body mass index and abdominal adiposity is directly associated with coronary heart disease [8]. Reports show that sedentary people with low level of physical inactivity are at higher risk of heart disease than the active people [9]. Therefore, this study has been done to see the effect of exercise in young individuals of different body mass index on the heart rate and oxygen saturation.

MATERIAL AND METHODS

This was a cross-sectional study. A total of 136 medical students of age group 17-25 years of Kasturba Medical College, Mangalore were included in the study. 56 subjects who were doing minimum 30 min of exercise per day for 3 days a week were taken as exercising (control) group and another 80 subjects who do not do any type of regular exercise were selected as non-exercising (case) group. A standard informed consent was taken from all the subjects following approval from the college ethics committee. Data was collected using questionnaire. Anthropometric measurements like height and weight were taken. Standing height was taken to the nearest of centimeters without wearing shoes on a wall mounted measuring tape. Weight was recorded with a least count of 100 grams without wearing shoes and with light cloths on a weighing machine.

Body mass index was calculated by the formula of weight (in Kg) and height (in meters). $BMI = \frac{\text{Weight (Kg)}}{(\text{height in meters})^2}$. The subjects were divided into three groups based on the Body Mass Index according to the WHO recommendations[10] for Asian population into normal group ($BMI 18.5-25$), low BMI group ($BMI \leq 18.5$) and high BMI ($BMI 25-30$).

Six-Minute Walk Test: The 6-min walk test was conducted according to a standardized protocol [11]. Subjects were instructed to walk from one end to the other of a 100-ft. distance in their own pace, in 6 min duration. Oxygen saturation (SaO_2), and pulse rate were assessed at the start and end of the 6-min walk test using Pulse Oximetry.

Pulse Oximetry: The procedure of Pulse oximetry to measure the pulse rate & oxygen saturation is explained to the subjects. Pulse rate & Arterial oxygen saturation is recorded from all the subjects before & after six minute walk test by fixing the instrument to the finger. Care is taken as the subject is not wearing a dark colour nail polish or not having any bruise under the nail, as discoloration of the nail bed can affect the transmission light through the finger.

Blood Pressure of all the subjects was also recorded by auscultatory method before & within 5 minutes after the six minute walk test.

Inclusion Criteria: Healthy Medical students.

Exclusion criteria: Subjects with chronic illness, under long term medication, anemic and subjects with very dark skin.

Statistical Analysis: A statistical package SPSS Version 17.0 was used. The data was expressed as mean \pm SD. Student unpaired 't' test was used to do the analysis. $P \leq 0.05$ was considered as significant

RESULTS

The oxygen saturation of normal BMI non-exercising subjects were low compared to exercising subjects and it was statistically significant. The pulse rate of normal BMI non-exercising subjects were high compared to exercising subjects but without any statistical significance.

Table: Comparison of Pulse rate and oxygen saturation between exercising and non-exercising group after 6minutes walk test.

Parameters	Exercising		Non-exercising	
	Pulse (beats per minute)	Oxygen saturation (%)	Pulse (beats per minutes)	Oxygen saturation (%)
Low BMI(n=14)	105.35±21.44	98.07±0.61	99.78±20.72 ^{NS}	98.28±0.46 ^{NS}
Normal BMI (n=40)	109.97±19.29	98.17±0.44	117.32±23.11 ^{NS}	97.52±1.82*
HighBMI (n=14)	114.35±12.65	98.07±0.47	116±18.36 ^{NS}	98.14±0.36 ^{NS}

NS-not significant when exercising group compared with non-exercising group.

*P<0.05 when exercising group compared with non-exercising group.

DISCUSSION

Oxygen saturation is a measure of how much oxygen each red blood cell is carrying. The oxygen level in the blood is regulated very precisely and specifically balanced. When the oxygen levels are right, blood is able to deliver oxygen to the muscles and help them to function properly. The oxygen saturation was significantly low in the non-exercising group saying that lack of exercise has a deconditioning effect on the body. Heart rate is under the control of both sympathetic and parasympathetic branch of autonomic nervous system. At the initial phase of exercise, HR increase is mediated primarily by withdrawal of parasympathetic activity. After a HR of nearly 100 beats per minute, the HR increase is due to increased sympathetic activity which acts slower on HR than parasympathetic system [12]. Heart rate changes during exercise and immediately after exercise shows prognostic value and indicates the impairment in autonomic functions. Slow recovery of heart rate after exercise predicts future cerebrovascular accidents and mortality [7 & 13].

CONCLUSION

Physical exercise done only three to four times a week in young adults improves oxygen saturation and reduces the heart rate. This proves the importance of physical exercise in young adults. Exercise improves cardiac functioning thus may prevent the occurrence of cardiac diseases in adults and middle aged individuals.

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