

CARDIOPULMONARY FITNESS TEST IN MEDICAL STUDENTS OF NEPAL

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ABSTRACT

Young apparently healthy, sedentary non smokers [male students (n) =100, female students (n) =100 of age group 18-22 years] from undergraduate student of Nepal Medical College, Kathmandu, Nepal were selected to assess the health status. The Queen's College step test was performed on a stool of 16.25 inches (or 41.3 cm) height for a total duration of 3 min at the rate of 24 cycles/ minute for male and 22 cycles/ min for female which was set by a metronome. In the present study, the result showed that the average VO_{2max} was 47.5 ml/kg/min for males and 38.4 ml/kg/min for females, thereby suggest that the health status of the medical students is in excellent condition- and it might be due to intake of balanced-nutritious diet and/or health awareness among medical students.

KEYWORDS

Fitness, nepalese, VO_{2max}

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INTRODUCTION

Fitness is the ability of the organism to maintain the homeostasis as closely as possible to the resting state during strenuous exercise and to restore it promptly after exercise.¹ The intelligence and skill can only function at the peak of their capacity when the body is healthy, strong and physically fit.² Physical fitness is required not only by athletes for better performance but also by non athletes for maintenance of physical and mental health.

Medical students of today are future doctors and they must keep their body fit so that they can discharge their duties to the patients and the society in a better way. It will be better if they can be informed about their physical fitness-especially cardio-respiratory fitness time to time so that they can maintain their health properly. In the present study an attempt has been made to assess cardio-respiratory fitness, one of the indicators of the health status of the individuals, among the medical students of Nepal Medical College, Jorpati, Kathmandu, Nepal.

MATERIALS AND METHODS

Young apparently healthy, sedentary non smokers [male students (n=100), female students (n=100)] of age group 18 to 22 years were selected for the study on the basis of random sampling from undergraduate students of Nepal Medical College. During orientation program, the experiment protocol and objectives of the study were fully explained to them.

The participants were requested to abstain from beverages like coffee for preferably 12 hours, strenuous physical activity and alcohol for at least a day prior to fitness test. The experiment was done at 10-11 AM in the month of January-March 2016. The room temperature was maintained at 22-26°C. The participants had no history of any major disease and did not follow any physical training program. Their height and weight were measured with the help of height measuring stand and weighing machine. Body mass index (BMI) was calculated to assess whether they were obese, underweight or normal, considering the classification for Asian population.³ The Queen's College step test was performed on a stool of 16.25 inches (or 41.3 cm) height for a total duration of 3 min at the rate of 24 cycles/ minute for male⁴ and 22 cycles/min for female⁵ which was set by a metronome. After completion of the exercise, the participant was asked to remain standing and the carotid pulse rate was measured from 5 to 20 seconds of the recovery period. This 15 second pulse rate was converted into beats/min and the following equation was used to predict the maximum oxygen uptake capacity.⁴⁻⁶

For Males: $VO_{2\max}$ (ml/kg/min) = $111.33 - (0.42 \times \text{pulse rate in beats per min})^4$

For Females: $VO_{2\max}$ (ml/kg/min) = $65.81 - (0.1847 \times \text{pulse rate in beats per min})^5$

RESULTS

Comparative study of anthropometric parameter and $VO_{2\max}$ amongst male and female participants are presented in table 1. The average height, weight, BMI for male and female were 167.68 cm and 158.05cm, 63.21kg and 52.6 kg, 21.75 kg/m² and 20.80 kg/m² respectively. The predicted mean $VO_{2\max}$ for male and female were 47.5 ml/kg/min and 38.4 ml/kg/min respectively.

Table 1: Comparative study of some anthropometric parameters along with $VO_{2\max}$ amongst the male and female Nepalese medical students.

Variables	Female (mean±SD)	Male (mean±SD)	Remarks
Height(cm)	158.05±5.52	167.68±4.46*	Significant
Weight(kg)	52.6±4.28	63.21±5.37*	Significant
BMI(kg/m ²)	20.80±1.68	21.75±2.31*	Significant
$VO_{2\max}$ (ml/kg/min)	38.4±4.73	47.5±6.57*	Significant

SD, Standard deviation; *, difference is significant at $p < 0.05$

DISCUSSION

According to the body mass index for Asian populations, the body mass index (BMI) of the participants were found to remain within the normal range i.e. they were neither obese nor thin.³

The abbreviation for the rate of oxygen usage under maximal aerobic metabolism is $VO_{2\max}$.⁷ Maximal oxygen uptake ($VO_{2\max}$) is widely accepted as the single best measure of cardiovascular fitness and maximal aerobic power.⁸ $VO_{2\max}$ measures the maximum amount of oxygen that the body can utilize during exercise, for generating the energy needed in the muscles.⁹ It is the product of maximum cardiac output and maximal arterio-venous oxygen difference.¹⁰ The highest ever recorded $VO_{2\max}$ is 94 ml/kg/min in men and 77 ml/kg/min in women. Both were cross-country skiers.¹¹ $VO_{2\max}$ averages about 38 ml/kg/min in active healthy men and about 29 ml/kg/min in active healthy women.¹²

Present study showed the average $VO_{2\max}$ was 47.5ml/kg/min for male and 38.4ml/kg/min for female. The cardiopulmonary fitness measured in term of $VO_{2\max}$ showed 23.7% more in male than female counterpart.

Absolute values of $VO_{2\max}$ are typically 40-60% higher in men than in women.¹² Higher level of testosterone in men shows 10-14% increases in hemoglobin, resulting in increase in oxygen carrying capacity of blood thereby increasing $VO_{2\max}$ in male.¹³ Furthermore, the strength of the ventilatory muscles also contribute to increase $VO_{2\max}$ in male.¹⁴

Thus, VO_{2max} of our participants is above the average value of active healthy men and women, and according to Katch *et al*,¹⁵ our participants VO_{2max} lies in excellent category which is also noted by Pramanik and Roychowdhury,¹⁶ for Nepalese students of the same age group. It may be due to more health awareness of medical students and/or intake of balance diet.

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