

Assessment of some pulmonary parameters and cardiorespiratory fitness status in Nepalese medical students

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ABSTRACT

Some pulmonary function tests along with cardio respiratory fitness test were performed to assess the health status of the young (19-21 years) non-smokers Nepalese medical students. Results revealed that the vital capacity was 3.46 liters and 2.40 liters among the boys and girls respectively. PEFr was found to be 597.98 l/min among the boys and 456.53 l/min among the girls. Likewise, VO_2 max among the boys and girls were 54.32 ml/kg/min and 44.88 ml/kg/min respectively. It was evident from the result that the health status of the Nepalese medical students in the present study group was fairly well. It might be due to their health awareness, balanced-nutritious diet and the habits of occasional physical exercise.

Keywords: VC, PEFr, VO_2 max, Nepalese.

INTRODUCTION

Medical students of today are the physicians of tomorrow and a good physician must be physically fit and mentally alert. Sound health and physical fitness are positively associated with good mental health and well being. People who take regular physical exercise report less anxiety and depression and lower level of stress than do sedentary people.¹ Physical fitness is required not only by athletes for better performance but also by non athletes for maintenance of physical and mental health. Buffalo health study concluded that pulmonary function is the long term predictor for over all survival rates, in both the genders and could be used as a tool in general health assessment.^{2,3}

In the present study an attempt has been made to assess some pulmonary function and cardio-respiratory fitness among the medical students as pulmonary function tests (PFT) are one of the indicators of the health status of the individuals.⁴

SUBJECTS AND METHODS

Young (age 19 - 21 years), sedentary non smokers students (male= 52, female= 49) of Nepal Medical College participated as volunteers in this study. All the tests were performed in the laboratory maintained at 24-26 °C in between 10:30 and 11:30 AM. All the participants took breakfast at 7:30 AM. They had no history of any major diseases and were not under physical training program and/ or any medications. All were informed about the purpose, requirements and the experimental protocol of the investigation. All the experimental procedures were demonstrated to allay their apprehension. Height and weight of the subjects were measured with the help of height measuring stand and weighing machine (Krupps company manufacture by Dr Beli Ram and sons, 17 Asaf Ali road, New Delhi).

Body mass was measured to an accuracy of ± 0.25 kg and height to an accuracy of ± 0.5 cm. Body mass index (BMI) was calculated to assess whether they are obese, underweight or normal. Tidal volume (TV) and vital capacity (VC) were recorded in a spirometer.⁵ Peak expiratory flow rate (PEFR) was measured using Peak Flow meter (manufactured by Ferraris Medical Ltd, Edmonton, London) as per the standard method of Wright and Mc Kerrow (1959).⁶ Each subject blowed into the instrument with maximum force after full inspiration, three readings were taken and the best was recorded.⁷

To determine the VO_2 max, the Queen's College Step Test was performed using a stool of 16.25 inches (41.30 cm height). Stepping was done for a total duration of three minutes at the rate of 24 cycles per min. After completion of the exercise subjects were asked to remain standing comfortably and carotid pulse rate was noted from 6th to 20th sec of the recovery period. This 15 sec pulse rate was converted into heart rate per min and the following equation^{8,9} was used to predict VO_2 max.

VO_2 max (ml/kg /min) = 113.33 - (0.42 X Pulse rate/ min).

All the results were statistically evaluated by calculating z-scores between means.

RESULT

Comparative study of anthropometric parameters, some pulmonary function tests and VO_2 max amongst the male and female students are presented in table 1. PEFr, TV and VC were noted to be 30.0%, 15.0% and 42.0% more in males than that in females respectively. The cardiopulmonary fitness measured by VO_2 max is 21% more in male than that in the female counterpart.

Table-1: Comparative study of some anthropometric and pulmonary parameters along with VO₂max amongst the male and female Nepalese medical students.

Variables	Male (mean ± SD)	Female (mean ± SD)
Height (cm)	171.88 ± 5.54	158.06 ± 5.42**
Weight (kg)	62.86 ± 7.47	51.61 ± 5.49**
BMI	21.25 ± 2.13	20.66 ± 1.99*
TV (ml)	450.00 ± 60.23	390.81 ± 60.09**
PEFR (lit./min)	597.98 ± 58.90	456.53 ± 64.37**
VC (lit.)	3.46 ± 0.48	2.40 ± 0.30**
VO ₂ max (ml/kg/min)	54.32 ± 0.70	44.88 ± 0.74**

SD, standard deviation; **, difference is significant at $p < 0.01$; *, difference is significant at $p < 0.05$

DISCUSSION

According to the nomogram, the body mass index of our volunteers remained within the normal range i.e. they were neither obese nor thin, which corroborates the result of previous study.¹⁰ PEFR is considered as the simple index of pulmonary function to assess the ventilatory capacity. It is effort dependent and reflects mainly the caliber of the bronchi and larger bronchioles,¹¹ which are subjected to reflex bronchoconstriction.^{12,13} The result of the present study showed that the PEFR was better than that had been reported in the previous study⁵ indicating better pulmonary function in the present study group.

VO₂max is the indicator of person's aerobic power. During exercise, upto a point the increase in oxygen consumption is proportionate to energy expended and all the energy needs are met by aerobic process. So in a person, the more is the maximum oxygen consumption capacity (VO₂max), the more will be his/ her aerobic capacity.

VO₂max is the measure of the functional limit of the cardio-respiratory system and the single most valid index of maximal exercise capacity.⁸ It is the product of maximum cardiac output and maximal arterio-venous oxygen difference.¹⁴ As direct estimation of VO₂max is exhaustive, laborious and difficult experimental protocol, a reliable indirect method^{8,9} was followed for prediction of VO₂max. The result of the present study showed the VO₂max as 54.32 ml/kg/min for males and 44.88 ml/kg/min for females. Previously VO₂max of Nepalese males of the same age group was reported as 48.30 ml/kg/min.⁵ Comparative study revealed better PEFR and VO₂max values in the present series than that of previous series noted by Pramanik and

Roychowdhury,⁵ which might be due to more health awareness of the medical students and balanced nutritious food consumed by them. Nevertheless, there is always a scope for improvement. So regular physical exercise, yoga practice and relaxation exercises may produce even better results of PFT and cardio-respiratory fitness.

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