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Assessment of physical fitness of undergraduate medical students as assessed by cardiorespiratory efficiency tests in sports physiology laboratory

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Abstract

Background: Most often, it is of interest to know the individual's capacity for physical work. A reduction of this capacity might be the first sign of disease. Further, the lack of physical activity and sedentary lifestyles in the young generation particularly students have been a matter of concern in recent days. Cardiorespiratory fitness is one of the most important parameters of physical fitness and is assessed by cardiorespiratory efficiency tests. These tests include assessment of VO_2 Max, 40mm Hg Test, Breath Holding Test.

Aim: To study the physical fitness of undergraduate medical students based on the assessment of cardiorespiratory efficiency tests in Sports Physiology Laboratory of MGIMS

Methods: A total of 60 MBBS students (32 boys and 28 girls) of Mahatma Gandhi Institute of Medical Sciences, Sevagram, Wardha were included in the study from different levels of the course within the age group of 17-25 years. History was recorded followed by anthropometry and clinical examination. Body mass index (BMI) and Body surface area (BSA) were calculated. Resting pulse rate and blood pressure, resting respiratory rate, VO_2 Max, Physical fitness index (PFI), breath holding time (BHT), and 40 mm Hg endurance test time were measured. Statistical analysis was done using SPSS software version 16.

Results: The mean value of BMI (Body mass index) was 22.15 ± 1.98 . The mean value of BSA (Body surface area) was 2.43 ± 0.12 . The mean value of PFI (%) was 79.12 ± 4.53 . The mean value of 40 mm Hg endurance test (seconds) was 38.96 ± 4.62 . The mean value of BHT (seconds) was 45.13 ± 5.98 . The VO_2 Max value evaluated by modified Harvard step test using Astrand-Ryhmig Nomogram was 42.17 ml/kg/min (range, 31 to 56 ml/kg/min)

Conclusion: Baseline normative data for parameters of cardiorespiratory efficiency tests namely VO_2 Max, Physical fitness index (PFI), breath holding time (BHT), and 40 mm Hg endurance test time were established in the present study which have laid the foundation for future studies.

Keywords: VO_2 max, breath holding, endurance, medical students

Introduction

Today's time is an era where sports professionals as well as amateurs, have entered the international arena and soaring number of college going boys and girls are taking part in competitions where titles and records are won or lost by the smallest fraction of a time or distance.

Lack of physical activity and sedentary lifestyles in the young generation particularly students have been a matter of concern in recent days. If there is a decrement in the individual's capacity for doing physical work it might be the first clue of a pathology^[1].

A current research on physical fitness of college students conducted suggested that approximately 35% of all college students are overweight or obese, with many at risk for weight gain during college years^[2].

With rapid urbanization, industrialization, and increasing level of affluence, the price that the society is paying is in the form of tremendous load of "non-communicable diseases." About 3.3% of all deaths can be attributed to physical inactivity. World-wide estimates as per a recent WHO report indicates that on a long-term, physical inactivity carries an increased risk of 1.05 to 2.63 times for Ischaemic Heart Disease (IHD), 1.2 to 2.89 times for hypertension and

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stroke, 1.08 to 4.31 times for diabetes type II, 1.02 to 2.5 times for colonic cancer, 1.02 to as much as 5 times for breast cancer, and 1.02 to 1.37 times for osteoporosis. It is also estimated by the WHO that globally, over 1 billion adults are overweight and 3 million are obese^[3].

Obesity has been the focus of majority of body composition related studies. Many studies have demonstrated a linear, longitudinal relationship between obesity and Coronary Heart Disease (CHD)^[4, 5] The Body Mass Index (BMI) is the most practical way to evaluate the degree of excess weight in adults^[6, 7]

Cardiorespiratory fitness is one of the most important parameters of physical fitness and is assessed by cardiorespiratory efficiency tests. These tests include assessment of VO₂ Max, 40mm Hg Test, Breath Holding Test, etc., which are generally considered as field methods. Other methods use sophisticated instruments, e.g. bicycle ergometry, treadmill test.

Aim of the study

To study the physical fitness of undergraduate medical students based on the assessment of cardiorespiratory efficiency tests in Sports Physiology Laboratory of MGIMS

Material and Methods

Study Setting

Study was carried out in the Sports Physiology Laboratory of Department of Physiology of MGIMS, Sevagram, Wardha

Study design

It was a Cross sectional, analytical, descriptive pilot study.

Study participants

A total of 60 MBBS students (32 boys & 28 girls) of Mahatma Gandhi Institute of Medical Sciences, Sevagram, Wardha will be included in the study from different levels of the course within the age group of 17-25 years.

Methodology

History was recorded followed by anthropometry & clinical exam Body mass index (BMI) and Body surface area (BSA) were calculated. Resting pulse rate & BP, resting respiratory rate, VO₂ Max, Physical fitness index (PFI), breath holding time (BHT), and 40 mm Hg endurance test time were measured.

Data Analysis

All data was collected; tabulated and statistical analysis was done using SPSS software. The values of study parameters have been presented as mean ± standard deviation (SD).

Inclusion criteria

- Give written informed consent.
- Not having any medical or psychiatric illness

Exclusion criteria

Subjects suffering from chronic debilitating diseases as

- hypertension, diabetes,
- ischemic heart disease, cardiac arrhythmias,
- retinopathy, nephropathy,
- respiratory diseases;
- psychiatric illness
- smokers

Results

The mean age of male and female subjects was 17.52 ± 2.01 and 17.46 ± 1.95 years, respectively, and the difference was not statistically significant. The difference of height between two groups was not statistically significant. The mean weight for the males was 70.36 ± 1.54, and for females was 62.43 ± 2.31 kg and the difference was statistically significant (P < 0.001).

The mean value of BMI (Body mass index) was 22.15 ± 1.98. The mean value of BSA (Body surface area) was 2.43 ± 0.12. The mean value of PFI (%) was 79.12 ± 4.53. The mean value of 40 mm Hg endurance test (seconds) was 38.96 ± 4.62. The mean value of BHT (seconds) was 45.13 ± 5.98. The VO₂ Max value evaluated by modified Harvard step test using Astrand-Ryhmig Nomogram was 42.17 ml/kg/min (range, 31 to 56 ml/kg/min)

Discussion

The present research was conducted to study the cardiorespiratory efficiency to evaluate status of the physical fitness of undergraduate medical students.

The aerobic capacity of an individual is also called maximal oxygen uptake or maximum oxygen consumption (VO₂ max).^[8, 9] It has been found as one of the most applicable parameters that can measure the cardiorespiratory efficiency of an individual^[10, 11].

Gupta *et al*^[12] in a recent study have also assessed BMI, BSA, resting respiratory rate, pulse rate, BP, VO₂ max and PFI. Our findings are in agreement to those found in their study.

A study was carried out by Bute *et al*.^[12] on 50 females between the age group of 18-22 yrs. who were divided into two groups, study group (25 athletes) and control group (25 non-athletes) The maximum oxygen uptake (VO₂ max) was compared between cases and controls by using Queen' college step test. The mean VO₂ max (ml/kg/min) i.e. 24.12 ± 2.3 in females of our study corroborates well with the value of females with sedentary life style which was 25.08 ± 3.48.

Not many studies have been conducted in this part of the country as far as normative data establishment is concerned so we could not compare our findings with other regions of the sub-continent. However this study is a crucial pioneering attempt which is although a baby step currently but eventually it may prove to be giant leap later.

Conclusion

Baseline data for parameters of cardiorespiratory efficiency tests were established in the present study which have laid the foundation for future studies on athletes and sports persons who will be assessed in sports physiology lab using sophisticated instruments. This study may be of use to make the young generation of medical students aware about the importance of physical fitness assessment as to prevent lifestyle related chronic diseases.

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