



ORIGINAL RESEARCH PAPER

Physiology

CARDIORESPIRATORY FITNESS IN FIRST YEAR MBBS STUDENTS OF NMC,PATNA

KEY WORDS: Physical fitness , 40 mm Endurance test , Fatigue index , VO2max

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ABSTRACT

Introduction: Physical fitness is the basis of all the activities of our society. A sedentary lifestyle and low physical fitness is the most prevalent modifiable risk factor and even predictor of both cardiovascular disease and all causes of morbidity and mortality. Physical activity and regular exercise may reduce the risk for the chronic diseases and death especially from coronary heart diseases.
Objectives: This study is undertaken to assess cardio respiratory fitness of first year MBBS students.
Material and method: The study was conducted on 100 healthy first year MBBS students in the age group of 18 to 22years, of the NMCH Patna . Students were divided into two groups; Group I included 64 male students and group II included 36 female students. Height, weight and body surface area were measured. The fitness level of students was measured by 40 mm Endurance test, Fatigue index and VO2 max. VO2 max was determined by Harvard step test.
Observation and results: The study revealed low physical fitness in medical students. In our study, VO2max, fatigue index and 40 mm endurance test values were found to be lower in females than in males and the difference was found to be statistically significant.
Conclusion: The study concluded that physical activity was found to be low amongst the medical students. Hence, we recommend regular physical exercise in medical curriculum.

INTRODUCTION

Medical students of today are the physicians of tomorrows and a good physician must be physically fit and mentally alert¹. Physical fitness is a powerful health index and cardiovascular fitness is the most relevant health related physical fitness component². Low physical fitness mainly cardio respiratory fitness seems to be a potent risk factor and stronger predictor of both cardiovascular and all causes morbidity and mortality than any other well established risk factors^{3,4}

It is known that physical fitness not only refers to cardio respiratory fitness and muscle strength but also to coordination and flexibility that is the full range of physical qualities which can be considered

as an integrated indicator of the different functions and structures involved in performance⁴. Physical fitness is used in two close meanings: general fitness-a state of health and well-being and specific fitness – the fitness to perform a specific task requiring muscular efforts⁵. It is maintained by healthy life styles, including habitual physical activity. It provides healthy impact on cardio respiratory system. Physical fitness depends on several factors like heredity, environment, socioeconomic status, regular exercise, diet and nutrition, and proper rest⁶.

There is evidence that students of medical school exercise with less frequency , do not maintain a balanced diet and subjected to different kind of stress predominantly heavy academic work load ,makes it difficult for medical students to maintain a regular exercise program, hence there is deterioration of nearly all aspects of health^{5,7}. It is assumed that the medical students have a greater knowledge about healthy life styles and dietary habits when compared to other students. One of the most important factors for predicting the physical condition of medical students is their own attitudes toward health promotion, illness prevention and exercise. However there is no evidence to indicate that this knowledge translates into practice in terms of maintaining good health. Healthy habits among medical students are even more important as they are future physicians¹.

Inadequate physical activity is responsible for about one third of deaths due to coronary heart disease, diabetes & colon cancer. Rising levels of obesity are also contributing to these diseases. This has reached epidemic proportions in many parts of the developing world and is beginning to affect developing countries like India as well⁵.

Several studies have established that physical fitness and health can assist in the prevention of chronic degenerative diseases, thus providing better health and quality of life. Beginning an active lifestyle could significantly reduce mortality from these events. With smaller increase in physical activity practices, mortality from these conditions combined could be reduced by as much as 5-6% or 30000- 35000 deaths per year⁸. Thus emphasis has been laid on assessing cardiopulmonary efficiency in medical students to determine the physical fitness and plan suitable strategies if necessary. If properly assessed, it is highly valuable health and life expectancy indicator. This study will allow these medical students to develop maximum physical potential while improving physical and mental health and attenuate the deleterious consequences of sedentary lifestyle.

Material and methods

This study was conducted in the Department of Physiology, Nalanda medical college and hospital, Patna. A total number of 100 first year MBBS students were included. They were of 18-22 years of age. They were grouped into two groups. Group I included 64 male students and group II included 36 female students. Height, weight and body surface area were measured.

Students suffering from any physical or medical abnormality like cardiopulmonary disorders, endocrine disorders, chronic diseases, were excluded from the study. Students involved in any kind of physical training were also excluded. Consent was taken from each participant. Subjects were instructed to take their last meal at least two hours before conducting the test in order to avoid the specific dynamic action (SDA) of food. All the procedures were carried out and measurements were taken in temperature of 20° - 25°C. Each subject was given sufficient rest before each procedure to get accurate result.

The fitness level of an individual was found out by performing the following tests:

1. Body Surface Area-It is the measured orcalculated surface of a human body. Dubois and dubois formula was used for estimating body surface area (BSA)⁹.

$$BSA (m^2) = 0.007184 \times \text{Weight (Kg)}^{0.425} \times \text{Height (cm)}^{0.725}$$

2. 40mm Endurance Test (Flack's Air-Force

Manometer Test): The subject was asked to take a deep inspiration, close the nostrils and blow into the mercury manometer to raise the pressure to a level of 40mm Hg. Care was taken so as avoid the use of cheeks to maintain the level of 40mm. During this event, the pulse was noted & was not allowed to increase till the breaking point. The maximum time the subject can hold the breath was noted¹⁰

3. Determination of VO2 max (maximum aerobic power) It is also called as the maximum oxygen uptake or maximum oxygen consumption. Harvard step test (HST) was used as an exercise test for evaluation of maximal aerobic power. The pulse was measured for one complete minute immediately after exercise. Body weight was obtained from Body weight scale & pulse rate was joined in the Astrand's Ryhming Nomogram to obtain the value of VO2 max¹¹.

4. Determination of Physical Fitness Index (PFI)

PFI was calculated by measuring heart rate after performing Harvard step test (HST) which is a common method used to assess cardio respiratory fitness. It is based on the heart rate recovery following a given work load of 5 minutes. The subject was instructed to step up and down on a⁵¹

cm high bench for 5 minutes or up to exhaustion. Exhaustion is defined as the time when the subject cannot maintain the stepping rate for 15 seconds when the rate of stepping is set at 30 cycles per minute. Each cycle constituted 1step up and 1 step down. Immediately at the end of this protocol, the subject was asked to sit down. The pulse was counted between 1 to 1.5 minutes, 2 to 2.5 minutes and 3 to 3.5minutes⁵.

The study was approved by the institutional ethics committee. For each parameter, the mean value and standard deviation were calculated. Statistical analysis was done by using Unpaired't' test to test whether the differences in means were statistically significant. All the calculations and statistics were done using Microsoft Excel 2007. A 'p' value of less than 0.001 (p < 0.001) was considered to be statistically highly significant.

Observation and Results

Table 1 (Physical fitness parameters of first year MBBS students)

Sr no.	Parameter	Groups		'p' value
		Group I (Male) Mean ± S.D.	Group II (Female) Mean ± S.D.	
1	Body weight (cms)	56 ±9.16	47.78±8.78	
2	Height (cms)	188.61 ±9.12	157.24 ±7.27	
4	B S A (sqmt)	1.61 ±0.15	1.45 ±0.14	0.0001**
5	Fatigue index	59.26± 10.37	49.97±8.92.	0.0001**
6	Vo2 max(ml/Kg/min)	52.11± 8.80	43.70±8.28	0.0001**
6	40 mm Endurancetest (sec)	43.47 ±5.49	34.63±9.97	0.001*

The mean ± SD of body weight, height and body surface area in group I was 56 ±9.16, 188.61 ±9.12 and 1.61 ±0.15 respectively and in group II; it was 47.78 ±8.78 ,157.24 ±7.27 and 1.45 ±0.14 respectively.(Refer to table 1)

The mean ± SD of Fatigue index in group I was 59.26± 10.37 and in group II; it was 49.97 ±8.92. The mean ± SD of VO2 max in group I was 52.11± 8.80 and in group II; it was 43.70 ±8.28. The mean ± SD of 40 mm endurance test in group I was 43.47 ±5.49 and in group II; it was 34.63 ±9.97. When the mean values of body surface area, VO2 max and fatigue index were compared in group 1 and group 2, it showed the difference between the two groups to be statistically highly significant with 'p' value 0.0001. When the

mean values of 40 mm endurance test were compared in group 1 and group 2, the difference between the two groups was found to be statistically significant with 'p' value 0.001. (Refer to table 1)

Discussion

Physical inactivity is the fourth leading risk factor for global mortality. These diseases have been strongly associated with unhealthy lifestyles habits, including inappropriate nutrition, lack of exercise, smoking, alcohol consumption, caffeine overuse and improper sleeping habits. Healthy active living benefits both individuals and society in many ways, for example, by increasing productivity, improving morale, decreasing absenteeism, and reducing health care costs. Other benefits include improved psychological well being, physical capacity, self esteem and the ability to cope with stress. It is well established that regular moderate or vigorous intensity exercise will lower the risk and symptoms associated with co morbidities of obesity. This trend is present in all societies, rich and poor, developed and developing. During the 20th century, the leading causes of death shifted from infectious to chronic diseases: cardiovascular disease, cancer, and diabetes are now among the most prevalent, costly, and preventable of all the health problems¹.

A medical student during the course of the medical education is subjected to different kinds of stressors predominantly the pressure of academics leading to the successful completion of the educational course⁵. The present education system has helped to improve the education standards. But, the non active sedentary stressful life has made the youth physically unfit. Now, the time has come to consider about the physical fitness and exercise in this adult group.

Realizing this fact, educationalists have recommended minimal physical exercise in the curriculum⁶. Physical Fitness Index scores are useful measure of fitness for strenuous exercises. Physical fitness has three main aspects: static fitness (absence of disease), dynamic fitness (ability to perform strenuous work) and motor skill fitness. Of these three, dynamic fitness is very important and can be measured by the Harvard Step Test.⁹

Aerobic capacity or maximum oxygen uptake capacity (VO2 max) has been widely considered to be reliable and valid measure of cardio respiratory fitness¹². Hence we studied these parameters in our institute.

In our study, body surface area in males and females were 1.61 ±0.15 and 1.45 ±0.14 respectively. In females, values were lower as compared to males and values were found to be statistically highly significant. VO2 max in males and females were 52.11± 8.80 and 43.70 ±8.28 respectively. In females, values were lower as compared to males and values were found to be statistically highly significant. Fatigue index in males and females were 59.26± 10.37 and 49.97 ±8.92 respectively. In females, values were lower as compared to males and values were found to be statistically highly significant. 40 mm endurance test in male and female were 43.47 ±5.49 and 34.63 ±9.97 respectively. In females, values were lower as compared to males and values were found to be statistically significant.

Similar findings that is low physical fitness were seen in studies done by Karandikar MS et al, Sharma P et al, TongprasertS et al¹³ but these studies have not shown comparison between male and females.

Physical inactivity has a major health effect worldwide. Decrease in or removal of sedentary life style could improve health substantially¹⁴.

Frequent physical activity is an important behaviour for individual and population health. To promote and maintain health, all healthy adults aged 18–65 yr need moderate-intensity aerobic physical activity for a minimum of 30 min on five days each week or vigorous-intensity aerobic activity for a minimum of 20 min on three days each week. Also, combinations of moderate- and vigorous-intensity activity can be performed to meet this recommendation. For example, a person can meet the

recommendation by walking briskly for 30 min twice during the week and then jogging for 20 min on two other days. Persons who wish to further improve their personal fitness, reduce their risk for chronic diseases and disabilities or prevent unhealthy weight gain may benefit by exceeding

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