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Evaluation of Physical Fitness Profile of Medical Students.

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ABSTRACT

Background: The physical fitness profile of medical students who are future promoters and educators of health care, is not adequate enough to cope up with the demands of medical profession. The purpose of this study was to assess the physical fitness profile of medical students on the basis of cardiovascular and muscular fitness parameters and to find an association between BMI and cardiorespiratory fitness. **Methods:** we conducted an observational, analytical study in the Department of Physiology, Himalayan Institute of Medical Sciences (HIMS), Dehradun, Uttarakhand. We included 60 MBBS students (18-25 years), who volunteered for the study, both males and females studying in HIMS. The anthropometric parameters like Height, Weight, and BMI, waist circumference, hip circumference and waist: hip ratio were assessed on day one of the study. On the same day muscular fitness parameters like Sit and reach test, vertical jump test and sit-up test were done. On eighth day, cardiorespiratory fitness parameters in terms of VO2max, was assessed using Beep test, of the same subjects and results recorded. **Results:** After informed and written consent was taken, 60 students including 30 males and 30 females were assessed. The mean flexibility score in males was -1.73 and in females was 3.6 ($p<0.01$). The mean number of sit-ups performed by males was 23.2 and by females was 16 ($p<0.01$). The mean height in cm. that could be reached by males in a vertical jump was 38.33 cm. and by females it was 29.5 cm ($p<0.01$). The mean value of VO2 max in males was 35.15 ml/kg/min and in females it was 30.00 ml/kg/min. ($p<0.01$). **Conclusion:** As educators and promoters of health care, it is important to increase awareness among students so that they become role models for their patients. Our results show that overall health status of our Medical students is not adequate enough. Males had higher aerobic physical fitness as compared to that of females, exception being the flexibility scores which were better in females. Regular physical exercise is known to have beneficial effects on health. Realizing the fact that diseases are related to lack of fitness, a need to counteract a sedentary lifestyle with planned physical activity through sports and formal exercise is required.

Keywords: Medical Student, Physical Fitness.

INTRODUCTION

Physical activity and exercise are often used interchangeably, but these terms are not synonymous. Physical activity is defined as any bodily movement produced by the contraction of skeletal muscles that result in a substantial increase over resting energy expenditure.[1] Exercise is a type of physical activity consisting of planned, structured, and repetitive bodily movement done to improve or maintain one or more components of physical fitness.[2]

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Physical fitness can be classified into health-related and skill-related fitness. Health-related fitness consists of five components: cardio respiratory endurance, muscular endurance, muscle strength, flexibility, and body composition and is determined by a combination of regular activity and genetically inherited ability.[3]

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 health problems.[4] These diseases have been strongly associated with unhealthy lifestyle habits, including inappropriate nutrition, lack of exercise, smoking, alcohol consumption, caffeine overuse, and improper sleeping habits.[5] Nowadays physical fitness among medical as well as dental college students is a questionable fact due to various reasons like unawareness of exercise, computing, TV watching, fast food habits, video games, academic stress & rat competitions etc. Therefore, we conducted the present study to evaluate the total physical fitness comprising of cardiorespiratory fitness and muscular fitness which includes muscular endurance, core stability and flexibility so that to design an individualized and practically feasible fitness program for the under graduate medical students addressing the various fitness components in which they are lacking.

MATERIALS AND METHODS

Subjects- we assessed 60 MBBS students (30 males and 30 females) who volunteered for this study and took written informed consent from them. The study was conducted in the Department of Physiology, Himalayan Institute of Medical Sciences (HIMS), Swami Ram Nagar, Dehradun, over a period of 12 months. Prior approval for the study was taken from Himalayan Institute of Medical Sciences ethics committee.

All the students were between 18-25 years and a detailed history of their habits, and daily activities was taken and students with history of any chronic illness or musculoskeletal injuries were excluded.

Data collection- Demographic indices and physiological parameters were recorded that included age, sex, address, occupation, pulse, and blood pressure. Anthropometric parameters were measured and recorded. Height was measured as standing height, without shoes with light clothes, on the wall mounted measuring tape in cms to the nearest of 1 cm. Weight (WT) was recorded with light clothes without shoes using "Krups" weighing machine to the least of 100 grams (gm). Body mass index (BMI) was calculated using the formula: weight in kilogram divided by height in metre (Kg/m).[6] Waist circumference (WC) was calculated by using a flexible non-stretchable measuring tape. Hip circumference (HC) was calculated by using a flexible non-stretchable measuring tape. Waist to Hip ratio was calculated by using the formula: waist circumference divided by hip circumference.

On day 1, along with anthropometric parameters, muscular fitness parameters were also recorded. After a warm up of 10 minutes, following tests were done: Sit and Reach test for Assessment of Flexibility of hamstrings and lower back.[7]

Vertical jump (VJ) test for muscle power- The peak power was calculated using the formula: Peak power (watts) = 78.5 x VJ (cm) + 60.6 x mass (kg) -15.3 x height (cm)- 1308

Sit Ups test for assessment of muscular endurance and core stability of abdominal muscle.[8] After a gap of one week (day 8) cardiorespiratory parameters were recorded, after a warm up of 10 minutes, by using the test 20m multi stage shuttle run or beep test.[9] VO2max was calculated using the formula:

VO2max (ml/kg/min) = 5.857 x Maximal Speed achieved (km/hr) - 19.458 Statistical Analysis- Interpretation and statistical analysis was done using SPSS Software version 20.0 and Microsoft Excel Software. Descriptive statistics were expressed as percentage, mean and standard deviation. The statistical analysis of difference of mean/proportion for anthropometric measurements (height, weight,

BMI) and various physical fitness parameters between male and females were assessed by using parametric tests (Unpaired 't' test). Significant levels were set at $p<0.05$.

RESULTS

The anthropometric parameters of all the 60 subjects is shown in [Table 1].

Table 1: Anthropometric parameters in all subjects (n=60).

S. No	Parameter	Mean ± SD	Range
1	Height (cm)	166.08±7.54	152-186.00
2	Weight (kg)	70.91±11.86	55-115.00
3	BMI (kg/m^2)	25.58±2.81	19.72-33.24
4	Waist Circumference (cm)	83.65±11.80	64-114.00
5	Hip Circumference (cm)	97.01±8.67	74-127.00
6	Waist to Hip Ratio	0.86± **0**.07	0.74-0.98

The comparison of muscular fitness parameters recorded in all the subjects showed statistically significant differences in the mean scores of males and females. It was observed that the mean flexibility score in males was -1.73 while in females it was 3.6 which was statistically significant ($p<0.01$). The mean number of sit-ups performed by males was 23.2 and by females was 16 which was statistically significant ($p<0.01$). The mean height in cm. that could be reached by males in a vertical jump was 38.33 cm. and by females it was 29.5 cm ($p<0.01$), also statistically significant. This is shown in [Table 2 & Figure 1].

Table 2: Comparison of Muscular fitness parameters in studied male and female subjects.

S. No	Parameters	Male(n=30)	Female(n=30)
1	Flexibility Score	-1.733±4.955	3.600±3.400
2	Situps No.	23.200±6.189	16.200±8.491
3	Vertical Jump (cm)	38.333±4.634	29.500±7.277
4	Peak Power (watt)	3759.677±751.623	2462.190±627.860

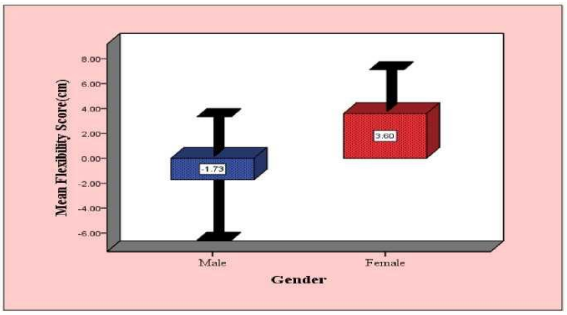

Figure 1: Comparison of Mean Flexibility Score between male (n=30) and female (n=30) subjects.

[Table 3] demonstrates a comparison between cardiorespiratory fitness parameters, indicated by VO2 max, in male and female subjects. The mean value of VO2 max in males was 35.15 ml/kg/min and in females it was 30.00 ml/kg/min. which again Showed statistically significant difference ($p<0.01$).

Table 3: Comparison of Cardiorespiratory fitness parameters in studied male and female subjects.

S. No	Parameters	Male(n=30)	Female(n=30)
1	Beep Score	6.508±.947	4.928±.746
2	VO2 max (ml/kg/min)	35.154±3.183	30.007±2.497

[Table 4 & Figure 2] show correlation of VO2 max and BMI in all the studied subjects. In males, mean value of VO2 max was 35.14 ml/kg/min and mean BMI 'j was 26.35 kg/m and it showed a negative correlation (r= -0.84) which was also statistically significant (p<0.01). On the other hand, in case of females, mean VO2'j max was 30.00 ml/kg/min and mean BMI was 24.80 kg/m which also showed a negative correlation (r= -0.12) but was not statistically significant (p=0.51).

Table 4: Comparison of Cardiorespiratory fitness parameters in studied male and female subjects.

S. No	Parameters	VO2 Max (ml/kg/min)	BMI (kg/m^2)	r-value	p-value
1	Male (n=30)	35.154 ±3.183	26.353 ±3.094	-0.843	p<0.01
2	Female (n=30)	30.007 ±2.497	24.809 ±2.306	-0.124	0.514
3	Total (n=60)	32.58 ±3.84	25.58 ±2.81	-0.223	p<0.01

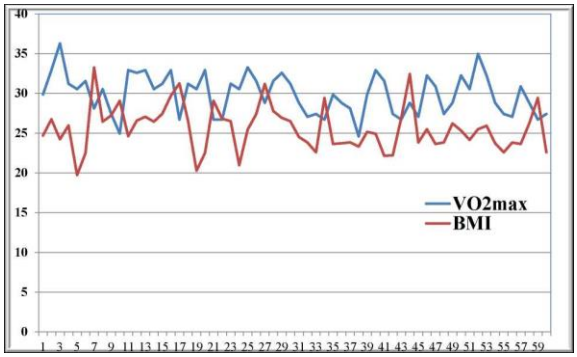

Figure 2: Correlation of VO2 max and BMI.

DISCUSSION

Being physically active every day is enjoyable and safe for most of the people. Factors that determine the level of an individual's physical fitness are multidimensional and hierarchical. More contemporary terminology has defined physical fitness as a set of attributes that people have or achieve that relate to their ability to perform physical activity.[10] Speculation continues as to what factors contribute to physical fitness. The literature supports three vital factors: cardiorespiratory endurance, muscular endurance, and muscular strength.[11] The increase in sedentary lifestyles, the decrease in work-related physical activity, and reduced leisure time activity identifies a trend towards physical inactivity.[12]

In recent years, several studies have demonstrated that change in lifestyle has severely affected the health of people. The age group that bears the maximum toll of such changes is the youth all over the world. Doctors are well positioned to provide physical activity counselling to patients. Research shows that clinical providers who themselves act on the advice they give provide better counselling and motivation of their patients to adopt such health advice.[13] Many studies were conducted in the medical students in the similar age group as ours and found closely related results.[1,14,15]

According to range of BMI recommended by Health ministry and Diabetes Foundation of India in 2008, all the males were found obese and females were found overweight in our study (6). A similar set of findings was observed by other studies also that followed the Indian population standards.[15-17]

According to the WHO criteria for abdominal obesity: waist-hip ratio above 0.90 for males and above 0.85 for females,[18] our studied subjects lie outside the high risk zone. Abdominal obesity is fat distribution in the region of abdomen which predisposes an individual to high risk of development of cardiovascular disease and diabetes mellitus. An older study conducted in students of similar age group found that men have higher anthropometric measurements than women.[19] This finding is in concordance with the current study where it was observed that for males the mean WC is approximately 10.3 cm greater than for all females, and the mean WHR is 0.08 higher for men.

The various muscular fitness parameters recorded in this study were flexibility score, sit-ups number and vertical jump. The flexibility of hamstrings and lower back muscles was tested by Sit-and-reach test in this study and it was seen that males show considerably lower levels of flexibility indicated by their negative flexibility score. Our results are consistent with the findings of many other studies which reported better performance for female students in sit and reach test.[20-23]

The vertical jump test and situps test done to evaluate muscular endurance in our subjects showed that physical fitness performance was better in male students, except for sit and reach test, in which female students performed better. This observation is supported by other similar studies done in the past.[1,16,24] The results of this study suggest that female students have lower levels of aerobic fitness compared with male students. Our findings are in agreement with another study that have examined aerobic fitness levels in African- American adults.[25] According to observations of the Amsterdam Growth and Health Longitudinal Study, physical activity levels affect aerobic power during puberty and later in life.[26]

This study also assessed cardiorespiratory fitness parameters like VO2 max using 20 m multistage shuttle running test (MST). In a different study conducted in students of Madrid University, using the same test and among the same age group as ours,

it was seen that VO2 max score was better in those subjects.[24] Another study conducted in Nepalese boys also showed better results than the current study.[27] This shows that the cardiorespiratory fitness status of MBBS students is not at par with other students from different streams. In this study it was seen that VO2max values are significantly higher in male subjects than female subjects ($p<0.01$) which is in accordance to some other studies.[28-30] But according to the internationally accepted VO2 max norms given by Leger and Lambert,[9] both our male and female subjects have poor cardiorespiratory fitness status. These norms state that Males and Females in the age group of 18-24 years should have minimum VO2 max (mean) of 51.6±7.8 ml/kg/min and 39.3±8.3 ml/kg/min, respectively.

In the present study it was observed that VO2 max and BMI of the studied subjects shows a significant negative correlation ($r=-0.22$, $p<0.01$) which means that with increasing BMI a progressive decrease in maximal oxygen consumption capacity (VO2 max) of the body occurs. However, in females this correlation was not significant ($p=0.51$), but in males, a highly significant correlation was seen ($p<0.01$).

In this study we observed that the overall levels of fitness in the MBBS students of Himalayan Institute of Medical Sciences is poor and not meeting the requirements and demands of the profession. This observation is supported by many studies quoted above and could be due to lack of physical activity among these students.

CONCLUSION

The present attractive education system has helped to improve the educational 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 the younger age group. This study showed that the overall physical fitness profile of MBBS students of HIMS is not adequate enough to cope up with the demands of medical profession. As educators and promoters of health care, it is important to increase awareness among students so that they become role models for their patients.

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