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RESEARCH ARTICLE

STUDY OF CARDIOVASCULAR ENDURANCE IN NEWLY ADMITTED MEDICAL STUDENTS.

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Abstract

Introduction: Physical fitness is necessary for all the activities of ours in the daily routine. A sedentary lifestyle and low physical fitness is the most prevalent modifiable risk factor for non-communicable diseases or lifestyle diseases. Physical activity and regular light to moderate exercise may reduce the risk of lifestyle diseases and death especially from cardiovascular diseases and related comorbidities like hypertension, diabetes and obesity. Step test provides a submaximal measure of cardiovascular endurance.

Objectives: This study is undertaken to assess cardiovascular endurance in newly admitted MBBS student of Health University of Haryana.

Material and Method: This study was conducted on 180 MBBS first professional students. Amongst the participant students 97 were male and 83 were female students. Modified Harvard step test i.e. Master step test for cardiovascular endurance was used. Participants were screened for any recent illness or any limiting factor to perform master step test. Scores were interpreted as per General Physical fitness test chart of Master Step test. Statistical tests including chi square were used and p value calculated for two groups.

Results: It was observed that amongst total 180 students 47% students have poor cardiovascular endurance, 48.5% students have average and 4.5% have good cardiovascular endurance. Male students have 20% poor, 70 % average and 10% good score while 68% female students have poor, 30% average and only 2% have good cardiovascular endurance. There is significant difference of proportion in two groups of male and female students in respect of cardiovascular fitness.

Conclusion: Cardiovascular endurance according to Master step test score was found more on average side in male students but poor in female students. Physical activity thus found to be low in newly admitted MBBS students and thus it is advised that Physical and cardiorespiratory exercise modules should be included in the Medical education curriculum.

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Introduction:-

Sedentary life style is a seriously growing health problem. Epidemiological study has shown that sedentary life style will contribute to the early onset and progression of life style disease such as cardiovascular disease, hypertension, diabetes and obesity.[1] Physical fitness is a powerful health index and cardiovascular fitness is the most relevant health related physical fitness component[2]. Low physical fitness mainly cardiorespiratory 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]Physical hard works like fishing is associated with more physical fitness (cardiovascular fitness) and muscle mass, but less fat percentage than sedentary population.[4] 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 efforts. 5 There are evidences 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 workload ,makes it difficult for medical students to maintain a regular exercise program, hence there is deterioration of nearly all aspects of health.[6] Physical inactivity has a major health effect worldwide. Decrease in or removal of this unhealthy behaviour could improve health substantially.[7]

The prevalence of chronic disease throughout the world has lead scientists and health professionals to consider various means of primary disease prevention and secondary disease treatment. As more countries incorporate physical activity and exercise as part of primary and secondary prevention strategies, chronic diseases such as CVD, type 2 diabetes, stroke, cancer, and many others, along with their health care costs will be reduced while the quality of life is improved.

Material And Methods:-

This study was conducted in Department of Physiology, Pt. B D Sharma PGIMS Rohtak(Haryana, India). A total number of 180 newly admitted MBBS students of 18-22 age group and of both male and female sexes were included. They were grouped in two groups, Group A having 97 male students and group B having 83 female students. Height and weight were recorded and Body mass Index was calculated accordingly applying formula. Students who were suffering from any recent illness and chronic illnesses and physical limitations to perform the Step Test were excluded from the study. Equipment used in Harvard Step that is Master Step was used. Master Step test involves pulse counting when the subject steps on and off a platform at a frequency of 30 per minute. The step is 20 inches (50 cm) for male of average built and height and 17 inches (42 cm) for female short legged males, adolescent and elderly. The description is given as per Harvard Fatigue laboratory Test. The subject steps on and off a platform at a frequency of 30 per minute with 4 distinct foot movements as-

1. Right foot on
2. Both feet on
3. Right foot off
4. Left foot off

Subject may lead with his left foot if he wishes to and must straighten his back and between step 2 and 3 and between 4 and 1. Regularity of exercise is maintained by using Metronome.

Before starting the test subject is explained of the procedure and related anthropometric measurements are taken. Resting pulse rate is noted a stop watch is started at the beginning of the exercise. Duration of exercise to the nearest second is noted, if he consistently fails to keep time over 20 seconds in a single stretch then he is stopped, else he may stop voluntarily at any time and the observer ends the exercise in any case after 5 minutes. The subject sits down for one minute immediately after he ceases to exercise. After exactly one minute recorded on stop watch, pulse rate of subject was counted for 30 seconds. The duration of effort of exercise and pulse count in 30 seconds then applied to the table of efficiency test [8] and the corresponding value was noted, which gave an index of fitness. For finding out the score-

GENERAL PHYSICAL FITNESS TEST

Duration of effect	Heartbeats from 1 to 1:30minutes in recovery										
	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85-89	90-over
0-29"	5	5	5	5	5	5	5	5	5	5	5
30"-59"	20	15	15	15	15	10	10	10	10	10	10
1'0"-1'29"	30	30	25	25	20	20	20	20	15	15	15
1'30"-1'59"	45	40	40	35	30	30	25	25	25	20	20
2'0"-2'29"	60	50	45	45	40	35	35	30	30	30	25
2'30"-2'59"	70	65	60	55	50	45	40	40	35	35	35
3'0"-3'29"	85	75	70	60	55	55	50	45	45	40	40
3'30"-3'59"	100	85	80	70	65	60	55	55	50	45	45
4'0"-4'29"	110	100	90	80	75	70	65	60	55	55	50
4'30"-4'59"	125	110	100	90	85	75	70	65	60	60	55
5'0"	130	115	105	95	90	80	75	70	65	65	60

Interpretations : Below 5 Poor
Average 50-80
Good Above 80

INSTRUCTIONS:1. Find appropriate line for duration of effect.
2. Find appropriate column for the pulse rate.
3. Read of this score, where the line and column intersec.

Reference : Morehouse and Miller, Physiology of Exercise 5:269, 1967

Mark duration of effort on line A
Place a persplex set square with one edge along the line A and its right angle at the point marked.

Determine the point of intersection of the vertical edge of the set square with the appropriate pulse count (line B)
Draw a horizontal line through this point intersection line.

This point is the index of fitness. The line F and E indicate upper and lower limits of normal subjects. The same table was used for the subjects whether tested for 50 cm or 42 cm step test.

Assessment of body mass index (BMI): The body mass index (or Quetelet Index) is the statistical measure which compares a person's weight and height by the following formula:

BMI =Mass (kg)/ (Height in m)^2.

The WHO regards a BMI of less than 18.5 as underweight, 18.5 to 24.9 as normal weight, while a BMI greater than 25 is considered overweight and above 30 is considered obese.

Observation And Results:-

In our study we considered Body mass index as a criteria and comparison between male and female students. Mean score of 21.4 kg/m^2 was observed during the study for whole sample with a range of 16.2 kg/m^2 to 32.0 kg/m^2. Body mass index was observed within normal range with a little variation between group A and group B (23.7 kg/m^{2}vs 19.2 kg/m^2).

Cardiovascular Endurance score adapted was found with a mean value of 61.75 amongst group A and 41.75 amongst group B with overall mean value of 52.09. 22% group A and 72% of group B subjects performed poor on the Step test contrasting to the fact that 68% of group A subjects performed average on Step test compared to only 28% in group B. Only 11% group A subjects performed good on Step test but only 1.5% i.e. only one subject found good amongst group B. Thus values for group B that comprise of females are lower than Group A comprising of males and statistically significant results were obtained. Same observations were reported earlier by Karandikar MS et al[5], TongprasertS et al[9].

There is significant difference in proportions between group A and group B cardiac efficiency values for <50(poor, chi square value 32.492) and 50-80(average, chi square value 44.286) (p value <0.0001) in both the cases. While p value is 0.0187 in case of good cardiac efficiency (chi square value 5.527) indicating no significant difference of proportion. In all cases degree of freedom calculated to be 1.

Table1:-Showing Body mass index of group-wise and total newly admitted MBBS students.

Sr no.		Body Mass Index		
	Reference value	Total students 180	Group A 97students.	Group B 83 students
1.	<18.5 (Underweight)	18(10%)	09(9%)	09(12%)
2.	18.5-24.9 (Normal weight)	139(77%)	77(80%)	62(74%)
3.	25.0-29.9 (overweight)	18(10%)	09(9%)	9(11%)
4.	>30.0 (Obese)	5(3%)	02(2%)	3(3%)

Table 2:-Showing Cardiac Efficiency Score of group-wise and total newly admitted MBBS students.

Sr no.		Cardiac Efficiency score			P value
	Reference value	Total students=180	Group A 97 students	Group B 83 students	
1.	<50 (Poor)	84(47%)	23(21%)	61(72%)	P<0.0001
2.	50-80(Average)	86(48%)	65(68%)	21(28%)	P<0.0001
3.	>80(Good)	10(5%)	09(11%)	1(1.5%)	p=0.0187

Discussion:-

Health as holistic concept includes body free from physical, mental and overall growth and development of a person in the society. Today due to sedentary lifestyle non communicable diseases are on the rise. Modifiable risk factors if considered and taken into action such diseases can be well kept at bay. Physical inactivity is major risk factor in aetiology of lifestyle diseases. These lifestyle diseases have a strong association with unhealthy lifestyles habits like inappropriate nutrition, lack of exercise, smoking, alcoholism, improper daily routine including sleeping habits. Strong evidence shows that physical inactivity increases the risk of many adverse health conditions, including major non-communicable diseases such as coronary heart disease, type 2 diabetes, and breast and colon cancers, and

shortens life expectancy. Because much of the world's population is inactive, this link presents a major public health issue[10].As compared with the general level of physical growth, the means of step-test index were found higher in rural groups than in urban ones, and higher in southern groups than in northern ones. The highest means of index was found in the rural groups in having the lowest socioeconomic status, and also the lowest means found in metropolis groups having the highest socioeconomic status. These gaps were due to the change of life style, absence of physical exercise and relatively to the high body weight of the high socioeconomic-level groups. Among the obesity, overweight and normal-weight youths, the means of step-test index was shown in a gradient decrease tendency, and those significant gaps might be found between the obesity and the overweight, and the overweight and the normal-weight groups, showing that there should be harmful influences of overweight and obesity on the youth's cardiovascular function[11]. Healthy and active societies are more developed in every sense of life. A healthy society has great positive impact on social, economic, political, environmental and cultural issues. Social strength is increased in a healthy society where healthy individuals contribute more to the society and also efficiently due to the fact that total employment remains on higher side and thus productivity of the nation increases. Also low absenteeism due to less illness in a society contributes to high productivity and less burden on healthcare system. Increased psychological wellbeing and capacity to avert stressors also improves overall societal growth. During late 20^{th} and 21^{st} century it became evident that mortality due to lifestyle diseases increased and will surpass the rate due to infectious and other diseases as a whole. Modifiable risk factors if taken care of and a routine of preventive measures followed may increase overall health. Healthy lifestyle including physical activity and regular exercise with balanced nutritional diet and good psychological health is demand of time.

Medical education worldwide is tough, laborious, time consuming and demanding. It includes pre-clinical training in initial years to clinical exposure in later years. Medical student during the course of the medical education is subjected to different kinds of stressors pre-dominantly the pressure of academics leading to the successful completion of the educational course[6]. 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[12]. In a similar study performed on 115 MBBS students revealed low physical fitness in medical students, VO2 max, 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[13]. Thus physical activity and regular exercise is necessary to maintain normal body mass index and good cardiovascular and respiratory health. It is now a days becoming a basic necessity as food and shelter to work out also. Various types of exercise modules ranging from leisure walk to brisk walk and jogging, running, dance exercise, swimming etc. are now in trend. A healthy society must make a community program which should include involvement of schools, colleges and workplaces. Some countries have included physical fitness programmes at every level in society. India too introduced yoga programs as government initiative. Higher levels of physical activity and exercise with yoga and meditation in society may lead to good physical fitness which in turn delays causes of morbidity and mortality due to lifestyle diseases.

Conclusion:-

Physical activities amongst medical students were found low due to various factor stressors including academic burden to uncertain timings of clinics and training classes. Various other contributing factors must also be looked for. So there arises need for involvement of medical students in physical activities and sports so that future clinicians can become healthy. An environment conducive to their holistic growth must be provided. Girl students must be encouraged to participate in physical activities and sports as they lag behind in physical fitness. Clinicians must consider preserving functional fitness by recommending regular exercise and physical activity irrespective of body mass index. Such studies should be conducted for other group of individuals also and people in general must be made aware of importance of physical fitness and regular exercise.

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