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Assessment of Selected Physical Fitness Parameters in Malaysian Female Medical Students

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Abstract:

Objective : *Due to dietary life style changes & physical inactivity prevalence of obesity, chronic non communicable diseases are on the rise. Even though adult population suffers from cardiovascular disorders, diabetes, hypertension etc. its roots are seen in childhood and adolescent age. It is observed that medical students have poorer fitness levels than students from non-health related disciplines. So aim of present study is to assess status of physical fitness and effect of obesity on it.*

Method : *For present study 45 female Malaysian medical students were studied. Physical fitness parameters like Body mass index (BMI), waist circumference, waist to hip (W/H) ratio, cardio-respiratory fitness ,body flexibility, peak anaerobic power were studied by standard method. Students were divided into four groups depending upon their BMI values. Physical fitness parameters were compared with standard classification.*

Results : *26.7% medical students were underweight. Values of physical fitness are on lower side when compared to standard classification. Obesity is associated with increased waist circumference and increased W/H ratio. However, no significant difference was observed for body flexibility and cardio respiratory fitness. Peak anaerobic power was significantly increased in obese students.*

Conclusion : *Percentage of underweight students is more in Malaysian medical students. Physical fitness is low compared with standard classification. So there is need for physical education and training for the medical students .*

Keywords: *Physical fitness, Body mass index(BMI), Body flexibility, Cardio respiratory fitness, Peak anaerobic power.*

I. Introduction

According to World Health Organization (1948) 'Health is a state of complete physical, mental and social well being and not merely an absence of disease' Physical fitness is very important component of good health.[1] Physical fitness is the prime criteria for the survival to achieve any goal and to lead healthy life.[2]

Due to industrialization and urbanization, dietary life style changes, physical inactivity, environmental pollution, stress and habits like alcohol consumption and cigarette smoking, prevalence of chronic non communicable diseases are increasing like cardiovascular disorders (coronary artery diseases, hypertension, etc) ,diabetes, obesity.[1,3,4,5]

Sedentary death syndrome(SEDS) – Review of the world literature over last 50 years has led to the conclusion that inactivity alone results in a constellation of problems and conditions leading to 'premature death'.[6] Health is possible if person is physically fit. Physical inactivity is the important cause for reduced fitness. Even though adult population suffers from cardiovascular disorders, diabetes, hypertension etc. its roots are seen in childhood and adolescent age.[7] It may be possible that medical students have poor fitness levels than students from non-health related disciplines. This is possibly because intense & vigourous academic course prevents them from engaging in regular exercise. So in present study few of the physical fitness parameters like Body mass index (BMI), waist to hip ratio (W/H ratio), cardio-respiratory fitness(VO2 max), body flexibility, peak anaerobic power were studied in Malaysian female medical students and compared with standard classification. Even though it is a pilot study, this will give us guide lines for further research from which large scale study can be carried out to confirm the findings. Early prevention is always better than disease itself. Program for physical fitness in medical education, and training can be implemented to maintain good physical health..

II. Material And Method

For the present study, 45 Malaysian female medical students were selected. Students were explained the procedure in detail & written consent was taken. Institutional ethical committee approval was also taken before starting the study. Study was conducted in morning hours at 10 to 11.30 A.M. All the subject's history was taken & clinical examination was carried out to rule out any major illness.

Inclusion Criteria :

1. Apparently healthy female Malaysian medical students.
2. Age Group – 17 to 24 years

Exclusion Criteria :

1. Disorders like respiratory diseases (Asthma, Bronchitis), cardiovascular diseases (like coronary artery disease , valvular heart disease, hypertension) etc.
2. Any musculoskeletal disorders like joint pain, fractures etc.
3. Anaemia.
4. Any endocrinal, C.N.S. or any other major disorders

Standing height was measured in cms .Height was measured to the nearest 0.1 cm. The body weight (BM) was measured to the nearest 0.1kg.

Body mass index (BMI): was calculated by formula

BMI = Body mass in kg. ÷ (Height in meter)^2

Students were divided into four groups as per BMI groups

1) Under wt. BMI <18.5
2) Normal wt. BMI from 18.5 to 24.99
3) Over wt.BMI 25 to 29.99
4) Obese BMI > 30

Waist to Hip Ratio(W/H):

Waist was measured at naval while standing relaxed, not pulling abdomen in. Hips were measured over the buttocks where girth is largest. Divide waist girth by hip girth.[6]

In all the BMI groups following physical fitness tests were performed.

1) Peak Anaerobic Power
2) Flexibility Test
3) Cardio respiratory fitness

1) Peak Anaerobic Power output : It was measured by vertical jump method.

Procedure :

1) Establish standing reach height. The subject, standing with preferred shoulder adjacent to a wall and feet flat on the floor, hand reaches as high as possible .
2) Bend knees to about 90^0 angle while moving arms back in a winged position.
3) Thrust forward & upward, touching as high as possible on the wall.
4) Perform three trials of the jump test. Use the highest score as the vertical height.
5) Compute vertical jump height (cms) as the difference between standing reach height and vertical height achieved in the jump.

Peak anaerobic power output was calculated by following equation.

PAP (w) = 60.7 VJ (cm) + 45.3 BM (kg) - 2055

PAP (w) - (peak anaerobic power output in watts), VJ (cm) – (Vertical jump height in cms),

BM (kg)[6] – (Body mass in kilograms).

2) Flexibility Test:

Subjects were asked to do little warm up before conducting the test.

Test 1: Hip & Trunk Flexibility (Modified Sit & Research Test)

Starting position: Sit on the floor with the back & head against a wall, legs fully extended with the bottoms of the feet against the sit & reach box. Place hands on top of each other, stretching arms forward while keeping head and back against the wall. Measure the distance from the finger tips to the box edge, with yard stick. This represents the zero or starting point.

Movement : Slowly bend and reach forward as far as possible (move head and back away from the wall) sliding the fingers along the yard stick; hold the final position for 2 seconds .

Score : Total distance reached to the nearest 0.1cm represents the final score.

Test 2 : Shoulder – Wrist Flexibility (Shoulder & Wrist Elevation Test)

Starting position:
Lie prone on the floor with the arms fully extended in front of the head. Grasp a yard stick with hands, shoulder width apart.

Movement :
Raise the stick as high as possible.

- Measure the vertical distance (nearest 0.1cm) the yard stick rises from the floor.
- Measure arm length from the acromial process to the tip of longest finger.
- Subtract the average vertical score from arm length.

Score :
Arm length – Vertical score (nearest 0.1cm)

3) Aerobic Fitness (VO2 max) Cardio respiratory fitness (VO2 Max) was measured by Step Test : Step test began after a demonstration and practice period
3 minute step test to evaluate heart rates after the exercise was used.

Material : 16.1/4 inch 3 steps Gymnasium benches

- Stop watch
- Metronome

Girls were asked to perform twenty two complete step–ups per minute, regulated by a metronome at 88 beats/minute. Subjects performed each stepping cycle to a four step cadence.

"Up-Up-Down-Down". After the completion of stepping students remain standing, while pulse rate was measured for 15 seconds, 5 – 20 seconds into recovery. Recovery heart Rate was converted to beats/minute (measured Heart Rate for 15 seconds x 4). VO2 max was calculated by a formula.
VO2 max = 65.81 – [0.1847 x step test pulse rate (beats/minute)].

Statistical methods used : Mean & standard deviation was calculated for all the parameters in Malaysian female medical students. ANOVA and Unpaired 't' test was applied to find out level significance.

III. Results

TABLE : 1 Showing number and percentage of students in various BMI groups of Malaysian female medical students

BMI groups	Malaysian Student
Underweight (<18.5)	12
	26.7%
Normal weight (18.5 - 24.99)	24
	53.3%
Overweight (25 - 29.99)	7
	15.6%
Obese (>=30)	2
	4.4%
Total	45
	100.0%

TABLE : 2

Showing :Number of students, minimum, maximum, mean and Std. deviation values of various physical fitness parameters studied in various BMI groups of Malaysian students.

BMI groups of Malaysian students		Waist circumference cms	Shoulder Wrist Flexibility cm	Hip Trunk flexibility cm	Waist to Hip ratio	Peak anaerobic Power Watts	VO2 max ml/Kg./min
Underweight (<18.5)	N	12	12	12	12	12	12
	Min.	57	14	8	0.65	1333.4	35.15
	Max.	75	46	44	0.82	2348.1	49.56
	Mean	63.83	24.96	30.96	0.7358	1854.050	42.0183
	Std. Deviation	5.391	10.325	10.582	0.05334	281.1672	4.59739
Normal weight (18.5 - 24.99)	N	24	24	24	24	24	24
	Min.	61	11	18	0.70	1696.7	38.11
	Max.	84	50	52	0.86	3058.4	47.34
	Mean	72.29	25.15	37.60	0.7562	2352.221	42.2483
	Std. Deviation	5.473	10.988	8.989	0.04771	361.0500	2.84948
Overweight (25 - 29.99)	N	7	7	7	7	7	7
	Min.	76	8	13	0.73	2150.6	39.22
	Max.	89	33	46	0.86	3209.7	47.34
	Mean	84.29	19.36	31.14	0.7857	2718.657	42.2271
	Std. Deviation	4.424	9.419	11.891	0.04756	313.4940	2.82826
Obese (>=30)	N	2	2	2	2	2	2
	Min.	94	8	29	0.84	3238.7	38.11
	Max.	94	49	29	0.84	3966.5	39.96
	Mean	94.00	28.75	29.00	0.8400	3602.600	39.0350
	Std. Deviation	0.000	28.638	0.000	0.00000	514.6323	1.30815
ANOVA test	F value	33.900	0.600	1.808	3.477	20.335	0.564
	p value	<0.001	0.619	0.161	0.024	< 0.001	0.642

Results:

1. Difference between waist circumferences, peak anaerobic power & waist to hip ratio of various B.M.I. groups is lowest in underweight and highest in obese students.
2. Difference between shoulder-wrist flexibility, hip trunk flexibility & VO2 max of various B.M.I. groups are not significant.

IV. Discussion

In present study it was observed that 15.6% Malaysian medical students are over weight and 4.4% are obese. So total 20 % students are over weight. Compared to standard values this is slightly more. Actually underweight student are 26% which is more compared to normal. There is increased mortality seen in underweight people. So underweight and overweight both are abnormal conditions. This study is carried out in Malaysian students who have come to India for medical education. Further research is required to find out causes of increased percentage of both over weight and under weight in these students.

Pattern of body adipose tissue independent of total body fat alters health risk. Fat deposition in the abdominal area (central or android type of obesity) increases the risk for heart diseases and glucose intolerance. Waist circumference alone or waist to hip ratio predicts central obesity. [6,9 10,11]

Waist to hip ratio should be less than 0 .8 in women and 0.95 in men. In our study Malaysian students are having these values within normal limits. However increased obesity is associated with increased waist circumference and W/H ratio.

In our study no significant differences were observed between obese and non obese students for Shoulder wrist flexibility and Hip trunk flexibility .Flexibility depends upon daily activity and sports. However, values when compared with standard classification as follows

Hip trunk - classification below 35 years of age[6]

Excellent - ≥ 45.46 cm.

Good - 42.41 to 45.46Cm. or (16.7 to 17.9 inch)

Average - 41.14 to 42.41Cm. or(16.2 to 16.7 inch)
Fair - 38.55 to 41.14 cms or(15.8 to 16.2 inch)
Poor - < 39.116 cm or (<15.4 inch)

In Malaysian students average value was 34.44 cm. So Hip trunk flexibility is poor.

Shoulder wrist flexibility classification for women is [6]
Excellent - 19.97 cms or less
Good -19.05 to 14.6 Cm
Average - 27.3 to 14.6 Cm
Fair - 29.84 to 27.94 Cm
Poor - 30.48 or more Cm

In Malaysian students average value is 24.36 cm, so overall flexibility is not good.

Increase in oxygen consumption occurs during exercise. Increase in intensity of exercise increases oxygen consumption. Further increase in intensity of exercise oxygen consumption reaches plateau i.e. not much increase in oxygen consumption. It is called as maximum oxygen uptake, maximal aerobic power, aerobic capacity, VO_2 max.VO_2 max provides a quantitative measure of a persons capacity for aerobic ATP resynthesis, this makes the VO2 max an important determinant of the ability to sustain high intensity exercise for longer period. Low level of cardio-respiratory fitness is a strong independent predictor of increased risk for both cardiovascular diseases and all causes of mortality[6] Few other workers have observed inverse relation between BMI and VO2 max.[11,12]. In our study no significant differences were observed between obese and non obese female medical students. Heredity, type of exercise training, age, gender, body composition decides or affects the VO2 max values. Average values for boys are 52 ml/kg/minute, while in girls average value is 40 ml/kg/minute, Cardiovascular fitness classification for women below or equal to 29 years of age is[6]

Excellent - ≥ 49ml/kg/min
Good - 39-48.9 ml/kg/min
Average - 31- 38.9 ml/kg/min
Fair - 24-30.9 ml/kg/min
Poor - < 23.9

When values of cardiovascular fitness were compared with standard classification, like poor, fair, average, excellent, good. VO2 max values of Malaysian students were average. Which indicates that cardio respiratory fitness is not poor but at the same time it is not good too. So there is need for further improvement.

For peak anaerobic power like vertical jump phosphogen system is used for energy purposes. Phosphogen system includes stored ATP and phospo creatinine which is useful for 8 to 10 seconds.

When Peak anaerobic power was compared with different BMI groups significant increase was observed in obese and overweight students. This could be because of changes in leg muscles due to daily working under overweight conditions. When muscle is working under more resistance muscle fibers get hypertrophied, increases number of myofibrils containg actin and myosin filaments. Actually in obese people all physical fitness parameters are on lower side or equal to non obese people, so this is an interesting finding for which further research is required to confirm the finding.

V. Conclusion

Percentage of underweight is more in Malaysian students. Further research is required to find out its causes. Physical fitness values are on lower side compared to normal classification of physical fitness parameters. So there is need for physical education and training for the medical students. There is need of implementation of sports and related activites to medical students, so as to maintain physical fitness standards.

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