

Role of body mass index on physical fitness index in two different age groups of healthy young males from north interior Karnataka, India.

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Abstract: The body mass index (BMI) is an index of weight adjusted for height. It is one of the useful tools for diagnosing obesity or malnutrition; however, such diagnosis should take into account a person's age, gender, fitness, and ethnicity. The objective of this study was to evaluate the BMI and physical fitness index (PFI) of healthy subjects consists of early part and late part of youth of north interior Karnataka, India and also to find out the influence of BMI on PFI in same subjects as such study in this area is least done by competent researchers. Twenty five young, healthy adults belonging to age group of 17-21 years were selected as Group I and fifteen young healthy adults belonging to age group of 29-40 were selected as Group II subjects in this study. The present study reveals that physical anthropometric parameters were found to be within the expected range of normal in both Group I and Group II subjects of north interior Karnataka which reflects the adequate nutrition, socioeconomic status and normal life style of these individuals. In this study, no correlation was found between BMI and PFI score and a positive correlation was observed between BMI and waist hip ratio in both the age groups.

Keywords: BMI, Waist Hip ratio, PFI.

Introduction

The BMI is an index of weight adjusted for stature. It is one of the useful tools for diagnosing obesity or malnutrition; however, such diagnosis should take into account a person's age, gender, fitness, and ethnicity. The BMI has also been associated with mortality, with lower values generally correlating with longer life. Because ethnicity has been shown to require adjustments to the levels of concern for the BMI, care must be taken when comparing different population groups. For example, Asian populations may require a lower BMI to describe health risk, while Pacific populations, specifically Hawaiian, may require a higher threshold or higher level of BMI to indicate that an individual is at risk. This variation can be explained by body type [1]. Fat redistributes centrally, with increases in waist circumference thought to reflect increases in visceral fat with age [2]. BMI and waist circumference have been used to evaluate health risks associated with overweight and obesity. Because both are easy measures to do, standardization of both are encouraged for widespread use as a reference. Additionally, the two measurements have been used in an algorithm with a cardiovascular risk index to determine which individuals would benefit most from weight loss [1]. Harvard step test introduced by Brouha et al (1943) is widely regarded as a useful test of fitness for strenuous exercise in young men and with appropriate modification in young women [3]. Physical fitness has three main aspects. These are static fitness (absence of disease), dynamic fitness (ability to

perform strenuous work) and motor skills fitness. Of these three, the dynamic fitness is very important in athletes which can be measured by Harvard step test [4]. This test has become well known to study cardio vascular fitness by American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD) who recommended this test to study health related physical fitness programme in youth [5]. The objective of this study was to evaluate the BMI and PFI of healthy subjects consists of early part and late part of youth of north interior Karnataka (Bijapur, Bidar, Gulbarga and Raichur), India as such study in this area is least done by competent researchers and also to find out the influence of BMI on PFI in same subjects.

Materials and Methods

Twenty five young, healthy adults belonging to age group of 17-21 years, representing early part of youth were selected as Group I and fifteen young healthy adults belonging to age group of 29-40 years representing later part of youth, were selected as Group II in this study after ruling out the cardio respiratory disorders and diabetes mellitus. The selected subjects were asked to come in the morning hours in the laboratory with a light breakfast. The height was measured in centimeter (cm) on a wooden stadiometer, weight was recorded in kilogram (kg) on weighing scale, the body surface area (m^2) was calculated with the help of Dubois nomogram, the body mass index (BMI) was derived by Quetelet's index from body weight/(height)². The waist circumference (WC) was measured in centimeters (cm) in a standing position with a tape at the level of narrowest circumference viewed from the front [6], hip circumference (HC) was measured in centimeters (cm) in standing position with a tape at the largest horizontal circumference around the buttocks [7]. After completing the measurements the waist circumference was divided by the hip circumference to determine the waist -hip ratio (WHR) [8], Physical fitness index was measured by using Harvard step test method [9]. The experimental protocol was approved by Institutional Ethical Committee as per the guidelines of declaration of Helsinki 1975. All the values (mean \pm SD) of Group I and Group II subjects were compared by student unpaired 't' test. $p < 0.05$ has been considered as level of significance in all the cases. Percentage change of various parameters between Group I and Group II was also studied. Correlation analysis was done between various parameters in Group I and Group II subjects separately by Window 98 MS Excel software.

Results and discussion

Table 1 depicts physical anthropometry of Group I and Group II subject. It shows though statistically not significant but there is percentage increase in weight, BSA, BMI and waist hip ratio of Group II subjects as compared to Group I subjects. The mean weight of Group I and Group II subjects were found to be within normal range i.e. 42.7 kg to 66.0 kg and 48.8 kg to 75.6 kg respectively, when compared to their

age-matched Indians [10] and Western counterparts [11]. It indicates the adequate nutrition, similar socioeconomic condition and normal life style of the individuals. In our study the mean BMI of Group I and Group II subjects were also found to be within the normal BMI range for their respective age groups which corroborates the similar observations of Shetty and Jame [12].

Table 1: Physical Characteristics

Parameters	Group I (17 – 21 yrs)	Group II (29 – 40 yrs)	Unpaired 't' test Group I vs Group II	% Change
Age (years)	18.00 ± 0.90	34.30 ± 3.86	-	
Height (cm)	170.24 ± 17.76	168.46 ± 5.12	t=0.872, p>0.1	-1.04
Weight (kg)	63.00 ± 15.00	67.00 ± 12.00	t=0.1869, p>0.1	+ 6.31
BSA m ²	1.708 ± 0.251	1.770 ± 0.159	t=0.984, p>0.1	+ 4.11
BMI (kg/m ²)	21.51 ± 3.88	23.59 ± 3.703	t=1.688, p>0.1	+ 9.66
WHR	0.827 ± 0.047	0.905 ± 0.048	t=0.024, p>0.1	+ 9.43

All the values are Mean ± SD Group I (n=25), Group II (n=15)

Table 2: Physiological Parameters

Parameters	Group I (17 – 21 yrs)	Group II (29 – 40 yrs)	Unpaired 't' test Group I vs. Group II	% Change
Resting Pulse Rate (bpm)	74.44 ± 9.40	67.86 ± 7.20	t=2.485, p<0.02**	-8.83
Resting SBP(mmHg)	114.72 ±	115.46 ±	t=0.216, p>0.1	+ 0.64
Resting DBP(mmHg)	11.10 76.00 ± 10.39	10.18 77.33 ± 7.88	t=1.93, p<0.1	+ 7.4
PFI score	56.96 ± 8.43	66.28 ± 8.59	t=3.34, p<0.01***	+ 4.41

All the values are Mean ± SD Group I (n=25), Group II (n=15)

Table 3 shows a significant positive correlation between BMI and waist hip ratio in both the Groups. Recent studies have indicated that waist circumference alone may be a better indicator of intra abdominal fat and risk of obesity related problems [13]. As per the waist to hip circumference ratio rating scale, the risk of disease for the men are classified into high risk (> 1.0), moderately high risk (0.9 to 1.0) and optimal low risk (<0.9) respectively [8]. In our study, the observed WHR of Group I subjects were found to be lower than the above mentioned classified range. In case of observed WHR, Group II subjects were fallen into moderately high risk category. This may be due to age related and lack of physical exercise leading to an increased deposition of abdominal fat in Group II subjects. Many cross-sectional and longitudinal studies show age-related changes in body fat distribution [14-16]. Therefore, evaluation not only of the degree of obesity, but also of body fat distribution seems to be very important in elderly subjects. Several studies have used

waist girth, waist-to-hip ratio (WHR) and sagittal abdominal diameter (SAD) for classifying different types of fat distribution and to predict visceral fat accumulation [17]. Tracy has concluded that abdominal fat is a key regulatory site for the general processes of inflammation, coagulation, and fibrinolysis. These processes may be altered by behaviors, such as diet and exercise, that affect fat deposits, as well as by medications, in both positive and negative ways. These effects have also long-term implications for chronic outcomes such as cardiovascular diseases and type-2 diabetes [18].

Table 3: The Correlation values of Physical vs. Physiological parameters

Parameters	Group – I (17 – 21 yrs)			Group – II (29 – 40 yrs)		
	r	t	p	r	t	p
BMI vs. PFI scores	0.23216	3.60	>0.1	0.2927	0.441	>0.1
BMI vs. Waist hip ratio	0.6624	0.652	<0.001**	0.7495	0.641	<0.01**

All the values are Mean \pm SD Group I (n=25), Group II (n=15)

Table 2 shows statistical significant decrease in resting pulse rate in Group II compared to Group I subjects. It also shows significant increase in PFI score in Group II subjects in comparison to Group I subjects. No statistically significant changes were found in blood pressure (SBP and DBP) in Group II subjects compared to Group I subjects. But a percentage increase of resting Systolic and Diastolic blood pressure in Group II were found as compared to Group I subjects. The PFI score of both Group I and Group II subjects were found to fall in poor category as per the referred classification [19], although their BMI is within normal range. Physical fitness Index of a person represents cardiovascular fitness and it depends on the post exercise recovery of the frequency of the heart beat. Hence it may be postulated from the present study that BMI of both the studied groups may not have significant influence on PFI. Our observations are also supported by the studies done by Dhara and Khaspuri [20-21]. A significantly greater PFI scores of Group II subjects may be due to decrease resting pulse rate which indicates Group II subjects are physically more active than Group I subjects.

Hence it may be concluded from the present study that physical anthropometric parameters i.e. height, weight, BSA, BMI and waist hip ratio were found to be within the expected range of normal in both Group I and Group II subjects of north interior Karnataka. This indicates the adequate nutrition, common socioeconomic status and normal life style of these individuals. In this study, no correlation was found between BMI and PFI score hence it may be postulated that BMI of both the studied groups may not have significant influence on PFI. and a positive correlation was observed between BMI and waist hip ratio in both the age groups.

Reference

1. <http://www.fag.org/nutrition/Ar-Bu/Body Mass Index.html>.
2. Tamara B. Harris. Invited Commentary: Body Composition in Studies of Aging: New Opportunities

- to Better Understand Health Risks Associated with Weight. *Am J Epidemiol* 2002; 156:122-124
3. Brouha L, Heath CW, Graybiel A. A Step Test: A simple method of measuring Physical Fitness for hard muscular work in adult men. *Rev. Cand Biol* 1943; 2: 89-91
 4. Chatterjee S, Chatterjee P and Dipali Saha. PFI of Different Groups of female athletes by modified Harvard Step test. *Ind.J. Physiol and Allied Sci* April 2002; 56(2): 61-70.
 5. Safrit MJ, Introduction to measurement in physical education and exercise science (times mirror ed.) Mosby College Publishing: 251
 6. Tanphaichitr V, Leelahagul P. Prevalence of obesity and its associated risk in urban Thais. In: Oomuray, Tarui S, Inoue S, Shimazu T, eds. *Progress in obesity research*, 1990; London: John Libbey: 649-653.
 7. Stefanick LM, Mackey S, Sheehan M, Ellsworth N, Haskell LW, Wood DP. Effects of Diet and Exercise in Men and Postmenopausal women with low levels of HDL cholesterol and high levels of LDL cholesterol. *The New Engl. Journal of Med.* July 1998; 339(1):12-19
 8. Powers, Scotts K, Dodd Stephen. Fitness Evaluation: Self Testing. Chapter 2. In: *Total Fitness, Exercise Nutrition, wellness*. 34-40.
 9. Neisner JS, Laurie JA, Human Biology- A guide to field methods. 2nd edn, Oxford and Edinburgh; Blackwell Scientific Publishers, 1969; 325-328
 10. Antia FP, *Clinical Dietetics and Nutrition* (2nd Edn.), New Delhi, Oxford University press, 1973; 642
 11. Maxcy-Rosenau. In *John Last Public Health and Preventive Medicine* (11th Edn.), Appleton-Century Crofts 1980; 1473
 12. Shetty PS, James WPT. Body Mass Index, A measure of chronic energy deficiency in adults. In *FAO and Food and Nutrition* 1994; FAO, ROME: 56
 13. WHO/NUT/NCD/98.1. Obesity, Preventing and managing the global Epidemic. WHO, 1998 Geneva
 14. Enzi G, Gasparo M, Biondetti PR, Fiore D, Semisa M, Zurlo F. Subcutaneous and visceral fat distribution according to sex, age, and overweight, evaluated by computed tomography. *Am J Clin Nutr* 1986; 44:739
 15. Borkan G, Hulth D, Gerzof S, Robbins A, Silbert C. Age changes in body composition revealed by computed tomography. *J Gerontol* 1983; 38: 673-677
 16. Van der Kooy K, Seidell JC. Techniques for the measurement of visceral fat: a practical guide. *Int J Obes Relat Metab Disord* 1993; 17: 187-196.
 17. Turcato E, Bosello O, Francesco V Di, Harris T B, Zoico E, Bissoli L, et al. Waist circumference and abdominal sagittal diameter as surrogates of body fat distribution in the elderly: their relation with cardiovascular risk factors. *International Journal of Obesity* August 2000; 24 (8): 1005-1010
 18. Tracy Russel P. Is Visceral Adiposity the "Enemy Within"? *Arteriosclerosis, Thrombosis, and vascular Biology* 2001; 21: 881
 19. Das KK, Dhundasi SA. Physical fitness: A longitudinal study among muslim children of Bijapur (Karnataka). *Ind.J.Physiol Pharmacol* Oct.2001;45(4): 457-462.
 20. Dhara PC and Khaspuri G. Influence of muscularity and body fatness on Endurance capacity and Physical Efficiency in Adolescent and Adult Bengalee Boys. *Ind. J. Physiol and Allied Sci* Jan 1996; 50(1): 7-13.
 21. Bose K, Ghosh A, Roy S and Gangopadhyay S. The relationship of age, body mass index and waist circumference with blood pressure in Bengalee Hindu male jute mill workers of Belur, West Bengal, India. *Anthropologischer Anzeiger (Germany)*, 2005; Vol. 63 (2): 205-212.

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