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Anthropometrical parameters and physical fitness of college going adolescent girls residing in Mumbai

Abstract

Impaired physical fitness and malnutrition are important causes of overweight and obesity across the age and gender groups. Moreover, the increasing incidence of obesity is associated with complications such as diabetes, cardiovascular diseases and hypertension and hence is a serious cause of concern especially among younger generations including adolescents. The present study has been conducted to understand the influence of body composition on physical fitness among adolescent girls in the age group of 16-19yrs. 110 adolescent girls in the age group of 16–19years were selected using purposive sampling technique. The participants were categorized as per their BMI WHO,[1] into 4 groups; i.e. underweight (26.4%), normal (33.7%), Over-weight (10%) and obese (30%). They were assessed for anthropometric parameters (height, weight, waist circumference, hip circumference and waist to hip ratio), total body fat percent, physical fitness (aerobic capacity, muscular endurance and flexibility testing), and physical activity pattern. Highly significant difference was seen between the groups in the BMI, WHR and total body fat percent ($p<0.01$). There was a decrease in physical fitness with increased BMI. The study suggested a strong need to create awareness among the adolescents about the importance of regular physical activity and to maintain healthy body composition.

Keywords: over-weight, obesity, mumbai, impaired physical fitness, medical complications, adolescent girls, body composition, physical fitness

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Abbreviations: BMI, body mass index; WHO, world health organization; WHR, waist-to-hip ratio

Introduction

Overweight is associated with multiple co-morbidities such as type-2 diabetes mellitus, dyslipidemia, polycystic ovarian syndrome, cardiovascular diseases, hypertension, cancer, and metabolic syndrome, which are increasingly becoming common among children and adolescents. Obesity has become a global problem even among younger generations, affecting many low and middle income people, particularly in urban areas. The problem is of larger magnitude in developing countries such as India where insignificant proportion of the population belongs to younger age group. The rising prevalence of obesity in India and around the world may be attributed to various factors, such as sedentary life-style, unhealthy food habits and lack of physical activity in addition to lack of awareness about the consequences of obesity. Ruiz et al.,[2] showed that sedentary lifestyle was highly prevalent among European adolescents. However, data on body composition and physical fitness of adolescents is sparse. Hence, the present study aimed at determination of the anthropometric parameters and physical fitness of urban Indian adolescents (16–19years age) residing in the city of Mumbai.

Methodology

Hundred and ten (n=110) adolescent college going girls (16-19years) belonging to middle- and upper middle income group and residing in the city of Mumbai were selected using purposive sampling technique.

Body fat percentage was measured using Bioelectric Impedance Analysis method with the help of TANITA [BC- 601] machine. The results of the test were compared with norms of adolescent population given by Lohman.[3]

Anthropometric measurements including weight, height, waist circumference, and hip circumference were measured using weighing scale and measuring tape, and used to calculate wait-to-hip ratio and BMI.

Physical activity pattern was also studied using the questionnaire which helped to understand they life- style. Data were analyzed using SPSS version 16.0 to study the association between various parameters recorded.

Results and discussion

Overweight/obesity is a disorder of energy metabolism involving excessive adipose tissue stores, which may be associated with medical or psychosocial morbidity. The prevalence, as well as the severity of obesity in adolescents is increasing at an alarming rate around the world, making it one of the most serious health problems affecting this age group. Data obtained in the current study are presented and discussed below.

Anthropometric parameters & body composition

The BMI of the participants was assessed using the guidelines of WHO (2004) issued for Asians. According to their BMI, the participants were categorized into 4 groups; i.e. underweight (BMI-I i.e. BMI <18.5kg/m^2), normal (BMI-II, i.e. BMI<22.9kg/m^2), Over-weight (BMI-III i.e. BMI=23-24.9kg/m^2) and obese (BMI-IV i.e. BMI>25kg/m^2). Data collected on the body composition has been presented below.

Surprisingly, almost equal number of participants was seen in normal, underweight and obese categories indicating the presence of both over and under nutrition. Subramanyam et al.,[4] reported a 9.6% prevalence of overweight and 6% prevalence of obesity in 1981 to 1998 among adolescent girls between 10-15years belonging to affluent families of Chennai. In contrast, the present study revealed an alarmingly high prevalence among the adolescent girls i.e. 33%.

Both general and central adiposity was seen among the overweight and obese participants with significantly higher total body fat percent and WHR in (F=14.389, P=0.000 & F=4.363, P=0.006 respectively). Highly significant positive correlation of BMI was seen with WHR (R=0.519, P=0.000) and total fat percentage (R=0.296, P=0.002) across the groups. Central fatness using waist to hip ratio was also observed among UK children and adolescents in which the researchers made a quote that the waist circumference should be at least half than one's height McCarthy & Ashwell.[5] Adolescent obesity leads to serious health complications such as higher ambulatory blood pressure and carotid artery structural alterations Stabouli et al.,[6] and hence needs to be addressed. Moreover, overweight in adolescence is an indicator of overweight in adulthood and hence needs to be controlled at an early stage.

Physical fitness

The physical fitness of the participants in terms of their aerobic capacity, muscular endurance and flexibility was assessed using 12-minute copper test, push-ups and sit & reach tests.

It was observed that the aerobic capacity was lower in all the participants across the BMI categories while muscular endurance and flexibility were much higher than reference values. Over weight and under- weight girls showed poor muscular endurance and flexibility than other groups. However, there was not much difference between aerobic capacities across the groups. Among the parameters tested, muscular endurance was highly positively correlated to aerobic capacity (R=0.258, P=0.007). Thus the data revealed poor respiratory fitness among all the participants which might be due to their sedentary life style (Table 1) (Table 2).

Table 1 Anthropometric parameters & body composition of the participants with respect to their BMI (Mean±SD)

Body composition	BMI- I	BMI- II	BMI- III	BMI- IV
	n=29	n=37	n =11	n =33
Weight (kgs)	41.5±3.9	49.6±5.2	58.5 ±3.4	69.5±10.6
*Ref value (kg)	53.9-57.4	53.9-57.4	53.9-57.4	53.9-57.4
Height (cms)	156.3±4.4	155.9±6.2	157±4	152.1±25.6
*Ref value (cms)	162.6-163.3	162.6-163.3	162.6-163.3	162.6-163.3
BMI (kg/m^2)	17±1.2	20.4±1.3	23.7±0.5	98.4±400.5
**Ref Value (kg/m^2)	20.5-21.6	20.5-21.6	20.5-21.6	20.5- 21.6
Waist to hip ratio (cms)	0.8±0.05	0.8±0.04	0.9±0.07	0.9±0.05
*Ref value (cms)	0.8	0.8	0.8	0.8
Total fat percent	21.4±3.2	34.5±34.2	33.3±4.1	39.8±7.2
***Ref value(%)	20-30	20-30	20-30	20-30

*CDC,[7] **WHO,[8] *** Lohman[3]

Table 2 Physical fitness of the participants

Physical fitness parameters	BMI-I	BMI- II	BMI- III	BMI- IV
	n=29	n=37	n =11	n =33
Aerobic capacity (kms)	1±0.1	1±0.2	1±0.1	1±0.1
*Reference (kms)	1.8	1.8	1.8	1.8
Muscular endurance (no. of push-ups)	18.1±10.5	17.7±6.7*	16.1±8.8	18.7±6.7*
Reference (no of push-ups)	7.4	7.4	7.4	7.4
Flexibility	17.7±7.4	21.1±9.3	21.4±6	21.3±8.3
Reference*	35.2	35.2	35.2	35.2

*Ref, ACSM.[9]

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Conclusion

It was concluded from the results that both under nutrition and over nutrition were present among urban adolescents affecting their body fat percent while impairing their physical fitness. The study advises a serious change in the lifestyle of the adolescents in order to achieve optimum body composition and physical fitness.

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Conflict of interest

Author declares that there is no conflict of interest.

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