International Journal of Yoga, Physiotherapy and Physical Education
ISSN: 2456-5067; Impact Factor: RJIF 5.24
Received: 16-04-2019; Accepted: 19-05-2019
www.sportsjournal.in
Volume 4; Issue 4; July 2019; Page No. 76-81

Prevalence of obesity, physical inactivity, and altered cardiorespiratory fitness among high school students

Dr. Murali Sivanandam[1], Ashwini V[2], Dr. Shwetha SS[3]

[1] Associate Professor, RV College of Physiotherapy, affiliated to Rajiv Gandhi University of Health Sciences, Bengaluru, Karnataka, India

[2] Student, RV College of Physiotherapy, affiliated to Rajiv Gandhi University of Health Sciences, Bengaluru, Karnataka, India

[3] Assistant Professor, RV College of Physiotherapy, affiliated to Rajiv Gandhi University of Health Sciences, Bengaluru, Karnataka, India

Abstract

Method: The investigator obtained ethical clearance from institution and permission from school authorities and carried out an observational study amongst 105 high school students of R.V Educational Institutions, Bengaluru through convenient sampling. A written signed informed consent from the parent/legal guardian and a written signed informed assent from the student were taken. The investigator screened the subjects in the selected class for meeting the requirements of inclusion and exclusion criteria. Data was collected using self-administered Physical Activity Questionnaire for adolescents (PAQ A), Body Mass Index (BMI) and 20m shuttle run test.

Results: 105 high school students participated in the study out of which 37.14% (n=39) were males and 62.85% (n=66) were females, with the mean age of 14.11 ± 0.80years. 43.80% (n=46) of the population were underweight, out of which 20% (n=21) were males and 23.8% (n=25) were females.6.6% (n=7) were overweight, out of which 2.85% (n=3) were males and 3.8% (n=4) were females. 99.04% of the population were found to be moderately physically active. Mean cardiorespiratory fitness assessment by measuring VO2 max was 36.21±6.15ml/kg/min,13.3% (n=14) had very poor cardiorespiratory fitness and all of them were males, 48.57% (n=51) had fair cardiorespiratory fitness out of which 12.38% (n=13) and 36.19% (n=38) were males and females respectively,9.52% (n=10) had excellent cardiorespiratory fitness and out of which 4.76% (n=5) were males.1.9% (n=2) had superior cardiorespiratory fitness and all of them were females.

Conclusion: In the studied population prevalence of obesity is null but overweight is seen, most of the children were underweight and most are moderately physically active and have fair cardiorespiratory fitness levels. Hence focus should be on maintaining overweight children under normal BMI and nourishment to the underweight children. Programmes to stimulate physical activity and to improve cardiorespiratory fitness should be initiated.

Keywords: obesity, physical inactivity, cardiorespiratory fitness, cardiovascular diseases, BMI

Introduction

Overweight and obesity are excessive fat accumulations in the body which are linked to serious diet-related non-communicable diseases that affect human health [1]. Dietary and lifestyle factors play an important role in the development of non-communicable diseases, like diabetes, hypertension, cardiovascular diseases and obesity [2] and these are identified to be the major predisposing factors, making India the highest country with loss in productive years of life [3, 4].

Consumption of high-energy, high fat diets and deterioration in dietary quality coupled with sedentary behaviour often causes accumulation of adipose tissue and consequently, a progressive rise of overweight. Amount of energy intake and weight are strictly related to insulin resistance, low-grade inflammation and increased risk of cardio-metabolic abnormalities [5].

It is now common to find undernutrition and obesity existing side-by-side with in the same country, the same community, and the same household. Children in low and middle income countries are vulnerable to inadequate nutrition; at the same time, they are exposed to high fat, sugar, salt, energy dense, micronutrient-poor foods, which tend to be lower in cost, but also lower in nutrient quality. These dietary patterns in conjunction with lower levels of physical activity result in sharp increase in childhood obesity while undernutrition issues remain unsolved [6].

Contrary to westernized societies, in India and more generally in South -Asian countries, overweight and fat deposals are mostly visible through abdominal adiposity. A high rate of overweight and a general trend of obesity on an abdominal level are quite frequent also in early age, as shown by surveys on children and adolescents. A reduction in outdoor activities and a preference for indoor activities such as TV viewing could partially explain the rise in childhood obesity rates [7, 8]. Physical inactivity is one of the major factors that lead to obesity.

The World Health Organization (WHO) defines Physical activity as any bodily movements produced by skeletal muscles that substantially elevate energy expenditure [9]. Physical activity is important for improving cardiorespiratory fitness. Several studies have demonstrated that more active children have better cardiorespiratory fitness than inactive ones [10-12].

Physical activity in adolescence has several health benefits, such as weight control and maintenance and reduction of

cardiovascular risks, depression [13, 14]. The benefits provided by the regular practice of physical activity during childhood and adolescence are important for the biological process of human growth and development because they enable improvement of cardiovascular, metabolic, skeletal muscle functions and assist with the control and reduction of body fat [15].

Cardiorespiratory fitness is the ability of the circulatory and respiratory systems to supply oxygen to skeletal muscles during sustained physical activity. CRF is the interaction between the heart and the lungs in determining overall fitness [16-18]. Cardiorespiratory fitness has been considered as a direct measure of the physiological status of the individual [19, 20].

The gold standard for the measurement of cardiorespiratory fitness is the maximal oxygen uptake (VO2max). The level of cardiorespiratory fitness is highly associated with the performance of other health-related fitness parameters such as strength and power output in young people and in adults [21].

Children with high cardiorespiratory fitness and low body mass index (BMI) have a lower metabolic syndrome risk compared to those with low cardiorespiratory fitness and high BMI [22, 23]. Adolescents should engage in moderate to vigorous intensity physical activities for at least 60 minutes a day, thus reaching 300 minutes a week. Such activities may be practiced at school or not, either consisting of supervised or unsupervised practice [24].

World Health Organization global estimates found that the prevalence of overweight and obesity among children and adolescents aged 5-19 has risen dramatically from just 4% in 1975 to just over 18% in 2016. The rise has occurred similarly among girls and boys: in 2016 18% girls and 19% of boys were overweight. 124 million children and adolescents were obese in 2016 [25].

Prevalence data from 52 studies conducted in 16 out of 28 states in India were included in analysis. The pooled data after 2010 estimated a combine prevalence of 19.3% of childhood overweight and obesity which was a significant increase from the earlier prevalence of 16.3% reported in 2001-2005 [26]. Adolescents are also one of the vulnerable groups to overweight and obesity that could result in premature deaths and disabilities in adulthood [1, 27, 28]. Prevalence of overweight and obesity among adolescent school children in South Karnataka was found to be 9.9% and 4.8% respectively [29].

Cardiovascular diseases (CVD) have now become the leading contributor of mortality in India [30, 31]. Numerous studies have shown that physical inactivity and poor cardiorespiratory fitness (CRF) and obesity are associated with mortality and morbidity from CVD [32-35].

Globally, 81% of adolescents aged 11-17 years were insufficiently physically active in 2010. Adolescent girls were less active than adolescent boys, with 84% versus 78% not meeting WHO recommendations. Environmental factors such as high density traffic, pollution, lack of parks, sidewalks, sports facilities, fear of violence and crime in outdoor areas can discourage people from being more active [36].

Moreover, cohort studies have evidenced that physical inactivity during childhood and/or adolescence tends to continue into adulthood, becoming difficult to change [37]. Therefore, programs to stimulate physical activities in this age range should be a priority for public health policies and a focus for teachers.

Studies also show that health professionals need to encourage better fitness and resolve obesity-related problems in children to ensure overall positive health during their childhood and into adulthood [38].

Materials and Methods

Research Design: Observational study

Sources of Data

- R.V Public School, Bengaluru
- R.V Girls High School, Bengaluru

Duration- 6 months

Sample technique- Convenient sampling

Sample size

Total 105 samples were taken

$$\mathbf{n = \frac{Z^2_{\alpha/2} \times pq}{d^2}}$$

Inclusion criteria

- School children studying in high school belonging to age group 13-18 years
- Subjects whose parents /legal guardian are willing to sign the written informed consent
- Subjects who are willing to sign the written informed assent and participate

Exclusion criteria

- Physical impairments or disabilities
- Any systemic illness

Informed consent of the subject was taken, after explaining the purpose of the study and assuring them of confidentiality.

Equipment

- Bathroom scale
- Stadiometer
- Whistle
- Cones
- Metronome
- 5meter measuring tape
- A clear pathway with distance 20meters
- Physical activity questionnaire for adolescents (PAQ A)
- Stationeries

Procedure

The investigator obtained ethical clearance from the institute. All participants completed the Physical Activity Questionnaire for Adolescents (PAQ-A). It is a 9 item, seven days self-report recall questionnaire developed to assess general levels of physical activity for high school students and it provides a summary of physical activity score, derived from 8items (9th item does not factor into the overall score), each score on a 5-point scale.

Height and weight were recorded by the investigator and BMI was calculated and classified as per the WHO standards for age group 5-19 years.

$$\mathbf{BMI\ (Kg/m^2) = \frac{Weight(Kgs)}{[Height^2](m)}}$$

Cardiorespiratory fitness was assessed using multi stage

20meter shuttle run test and test was carried out on the school playgrounds. Subjects were asked to run back and forth on a 20 meter course and touch the 20m line, the speed was increased continuously every minute by 0.5 km/h. The pace was maintained using a metronome. The 20meter course has to be completed within the next beep. The interval between these beeps will be reduced every minute in order to elicit the speed increments. When the subjects could no longer keep the pace or who did not reach the line within the beep more than two times were asked to terminate the test and the number of shuttles were recorded and used to calculate the maximum oxygen uptake (VO2 max).

$$VO_2max = 0.276x + 27.504 \text{ ml/kg/min}$$

Where,
x = number of shuttles

Statistical analysis

Data collected for this study were analysed using the descriptive statistics like computing the mean and standard deviation (SD). The categorical variables were analysed using frequencies and percentages and results are given in terms of test photographs, tables and figures in the following pages.

Results

Age and sex distribution

Table 1: Age (years) and Sex Cross tabulation

	Sex		Total
	Male	Female	
Age (years) 13-14	32(30.47%)	39(37.14%)	71(67.61%)
15-16	07(6.6%)	27(25.71%)	34(32.38%)
Total	39(37.14%)	66(62.85%)	105(100%)
Mean age ± SD	14.11 ± 0.80years		

*Brackets represent percentage

Table 1 represents the age and sex cross tabulation of 105 high school students. The mean age was 14.11 ± 0.80years. 30.47% of males and 37.14% of females were there in the age group of 13-14 years. 6.6% of males and 25.71% of females were present in the age group of 15-16 years. Total 37.14% of males and 62.85% of females were there.

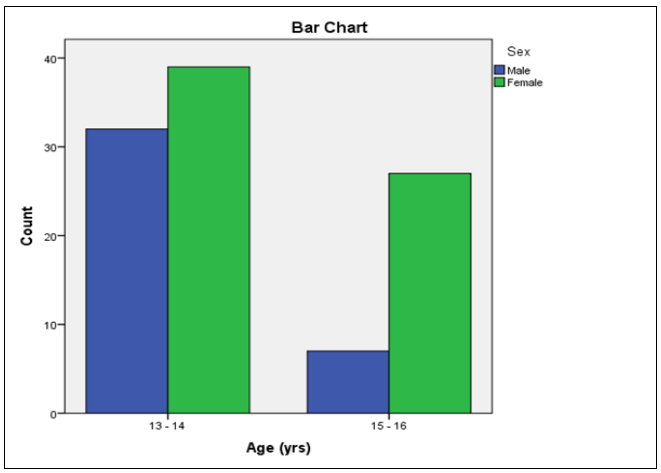

Fig 1: Age and sex distribution

The above figure represents the age and sex distribution

Table 2: BMI and Sex Cross tabulation

BMI	Sex		Total
	Male	Female	
Underweight	21(20%)	25(23.80%)	46(43.80%)
Normal	15(14.28%)	37(35.23%)	52(49.52%)
Overweight	3(2.85%)	4(3.80%)	7(6.6%)
Total	39(37.14%)	66(62.85%)	105(100%)
Mean BMI ± SD	19.27±3.34 kg/m^2		

*Brackets represent percentage

Table2 represents BMI and sex cross tabulation of 105 students. Mean BMI was 19.27±3.34. 43.80% were underweight (20% males and 23.80% females).49.52% were normal (14.28% males and 35.23% females).6.6% were overweight (2.85% males and 3.80% females)

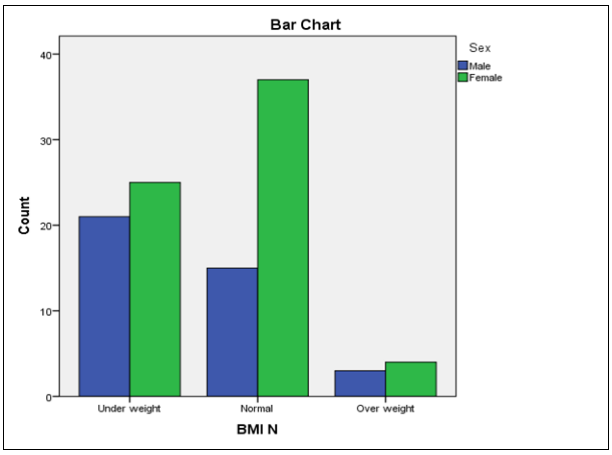

Fig 2: BMI and Sex distribution

The above figure represents the BMI and sex distribution

Table 3: PAQ-A and Sex Cross tabulation

PAQ-A	Sex		Total
	Male	Female	
Low 1	0	1(0.95%)	1(0.95%)
Moderate 1.1- 4.9	39(37.14%)	65(61.90%)	104(99.04%)
Total	39(37.14%)	66(62.85%)	105(100%)

*Brackets represent percentage

Table3 represents physical activity questionnaire score and sex cross tabulation of 105 students. 99.04% (37.14% males and 61.90% females) of the total population were found to be moderately physically active.

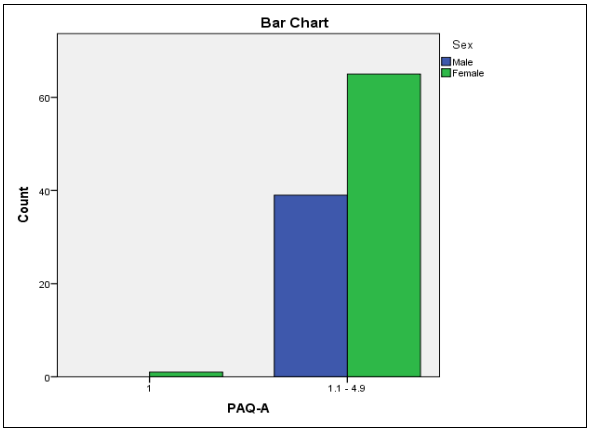

Fig 3: PAQ-A and sex distribution

The above figure represents the PAQ-A and sex distribution

Table 4: VO2max and Sex Cross tabulation

$VO2_{max}$	Sex		Total
	Male	Female	
Very Poor	14(13.3%)	0	14(13.3%)
Poor	2(1.9%)	13(12.38%)	15(14.28%)
Fair	13(12.38%)	38(36.19%)	51(48.57%)
Good	5(4.76%)	8(7.61%)	13(12.38%)
Excellent	5(4.76%)	5(4.76%)	10(9.52%)
Superior	0	2(1.9%)	2(1.9%)
Total	39(37.14%)	66(62.85%)	105(100%)
Mean $VO2_{max}$ ± SD	36.21±6.15 ml/kg/min		

*Brackets represent percentage

Table 4 represents the VO2 max and sex cross tabulation of 105 subjects
Mean vo2max was 36.21±6.15ml/kg/min
13.3% had very poor cardiorespiratory fitness and all of them were males.
14.28% (1.9% males and 12.38% females) had poor fitness.
48.57% had fair cardiorespiratory fitness out of which 12.38% and 36.19% were males and females respectively
12.38% (4.76% males and 7.61% females) had good cardiorespiratory fitness.
9.52% had excellent cardiorespiratory fitness and out of which 4.76% were males.
1.9% had superior cardiorespiratory fitness and all of them were females.

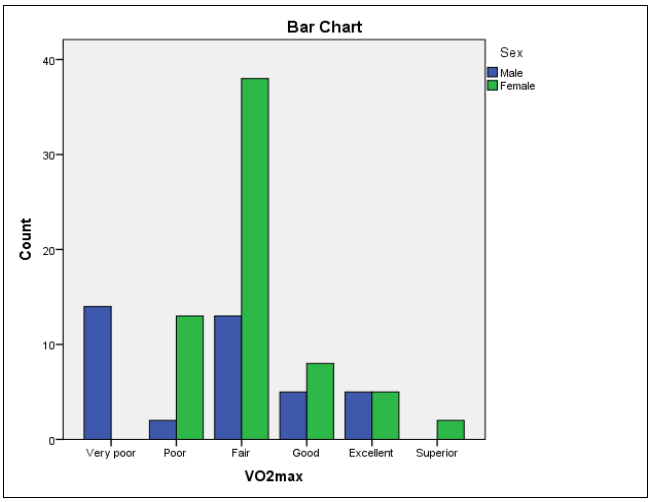

Fig 4: VO2max and sex distribution

The above figure represents the cardiorespiratory fitness and sex distribution

Discussion

This study intended to find out the prevalence of obesity, physical inactivity and to assess the level of cardiorespiratory fitness among high school students and found that prevalence of obesity was null in the studied population.
M Shashidhar Kotian *et al*. found the prevalence of overweight to be 9.9% in South Karnataka and Ramesh K found 12% overweight prevalence in Kerala. A similar study was carried out in Urban Ludhiana by Daisy A. David *et al*. and found 15.5% of overweight prevalence. A cross sectional study in North Ethiopia showed a prevalence of 12.3% overweight. The current study has shown relatively lesser prevalence of overweight as compared to underweight, which was found to be more.
BMI was used and classified as per international classification of underweight, overweight and obesity according to BMI (WHO, 2014).Cardiorespiratory fitness was assessed by calculating $VO2_{max}$ using 20m shuttle run test and categorized as per the physical fitness specialist certification manual, the Cooper Institute for Aerobics Research, TX, revised 1997 printed in Advance fitness assessment and exercise prescription, 3rd edition Vivian H Heyward 1998-p48.
BMI and physical activity are significantly correlated with cardiorespiratory fitness level [39] In the current study; most of the subjects had only fair level of CRF and moderate level of physical activity. Pei-Lin Hsieh *et al*. found that significantly higher level of cardiorespiratory fitness was found in children who engaged in regular physical activity than in children who engaged only in irregular physical activity. Anthony D. Okely *et al*. conducted a study in Australia from 1997 to 2004 and found that Cardiorespiratory fitness was higher among the most socially advantaged boys and girls.
Bandyopadhyay *et al*. conducted a study on college students and found that cardiorespiratory fitness was normal which is well correlated with physical parameters.
This study was done on an urban population where there is good motor vehicle transport facility which adds to lesser physical activity such as walking or cycling.
The environmental factors such as high density traffic, pollution, lack of parks, sidewalks, sports facilities, fear of violence and crime in outdoor areas can discourage children from participating in physically active games/sports. Parents play a major role in keeping their children physically active. Promoting physical activity and outdoor sports becomes an important responsibility of parents/caregivers of young children.
Miriam Reiner *et al*. conducted a systematic review and found that physical activity appears to have positive long term effect on preventing noncommunicable diseases such as obesity, coronary heart disease, type2 diabetes mellitus, Alzheimer's disease and dementia. Camilo J. Ruggergo *et al*. observed that cardiorespiratory fitness had a small but significant protective effect against developing depression among middle school girls.
Schools should provide access to safe spaces and facilities for physical activity, promote healthy lifestyle that includes regular physical activity, discourage the use of or withholding of physical activity as punishment, encourage parents to be physically active role models as recommended by Centre of Disease Control and Prevention (CDC).
Hence, it is advised that, children should be actively involved in sports and other related physical activities, which would promote cardiorespiratory fitness and reduce overweight in them, thereby minimizing the risk of cardiovascular related diseases in the early adulthood.

Conclusion

In the studied population prevalence of obesity is null but overweight is seen, most of the children were underweight and most are moderately physically active and have just fair cardiorespiratory fitness levels. Hence focus should be on maintaining overweight children under normal BMI and nourishment to the underweight children. Programmes to stimulate physical activity and to improve cardiorespiratory fitness should be initiated.

Acknowledgment
First of all I would like to thank my college for providing me an opportunity for conducting my research study. I would like to thank my family, friends, and all those who have helped me during my research work. Also; I would like to thank all the subjects who volunteered to be a part of my research work.

References

1. Ofei F. Obesity- a preventable disease. Ghana Medical Journal. 2005; 39(3):98-101.
2. Achal Gulati, Alexander Hochdorn, Haralappa Paramesh *et al*. Physical Activity Patterns Among School Children in India. Indian J Pediatr. 2014; 81(Suppl 1):S47-S54.
3. Artero EG, Jackson AS, Sui X, Lee DC, O'Connor DP, Lavie CJ, *et al*. Longitudinal algorithms to estimate cardiorespiratory fitness: Associations with nonfatal cardiovascular disease and disease-specific mortality. J Am Coll Cardiol. 2014; 63:2289-96.
4. Timpka S, Petersson IF, Zhou C, Englund M. Muscle strength in adolescent men and risk of cardiovascular disease events and mortality in middle age: A prospective cohort study. BMC Med. 2014; 12:62.
5. Phillips CM, Dillon C, Harrington JM, McCarthy VJ, Kearney PM, Fitzgerald AP, *et al*. Defining metabolically healthy obesity: role of dietary and lifestyle factors. PLoS One. 2013; 8:e76188.
6. WHO. Obesity and overweight, Fact sheet N∘311, September 2006.
7. Ramachandran A, Snehalatha C. J Obes. 2010. doi:10.1155/2010/ 868573.
8. Ramachandran A, Chamukuttan S, Shetty SA, Arun N, Susairaj P. Obesityin Asia–isit different fromrestofthe world. Diabetes Metab Res Rev. 2012; 28:S47-51.
9. WHO. Physical Inactivity: A Global Public Health Problem. Geneva: World Health Organization, 2014.
10. Aires L, Pratt M, Lobelo F, Santos RM, Santos MP, Mota J. Associations of cardiorespiratory fitness in children and adolescents with physical activity, active commuting to school, and screen time. J. Phys. Act. Health. 2011; 8:S198-S205.
11. Boddy LM, Fairclough SJ, Atkinson G, Stratton G. Changes in cardiorespiratory fitness in 9–10.9 year old children. Med. Sci. Sport. Exercise. 2011, doi:10.1249/MSS.0b013e3182300267.
12. Parikh T, Stratton G. Influence of intensity of physical activity on adiposity and cardiorespiratory fitness in 5–18 year olds. Sport. Med. 2011; 41:477-488.
13. Shepard RJ. Physical activity, fitness and health: the current consensus. Quest. 1995; 47:288-303.
14. Blair SN, Brodney S. Effects of physical inactivity and obesity on morbidity and mortality: current evidence and research issues. Med Sci Sports Exerc. 1999; 31(Suppl.):S646-62.
15. Strong WB, Malina RM, Blimkie CJ, Daniels SR, Dishman RK, Gutin B, *et al*. Evidence based physical activity for school-age youth. J Pediatr. 2005; 146:732-7.
16. Artero EG, Jackson AS, Sui X, Lee DC, O'Connor DP, Lavie CJ, *et al*. Longitudinal algorithms to estimate cardiorespiratory fitness: Associations with nonfatal cardiovascular disease and disease-specific mortality. J Am Coll Cardiol. 2014; 63:2289-96.
17. Harris J, Cale L. A review of children's fitness testing. Eur Phys Educ Rev. 2006; 12:201-25.
18. Clark E. The Validity, Reliability and Physiological Foundations of a VO2 max Test Versus a Predictive Maximal Oxygen Uptake Test. Emily Clark. Available from: http://www.emilymayclark. wordpress.com/2012/01/30/the-validity-reliability-and-physiological-foundations-of-a-vo2max-test-versus-a-predictive-maximal-oxygen- uptake-test/. [Last cited on 2018 Oct 07]
19. Mc Ardle WD, Katch FI, Katch VL. Essentials of Exercise Physiology. 3rd ed. Lippincott Williams and Wilkins: Philadelphia PA, 2006.
20. Jonathan M, Mc Gavock BD, Torrance K, Mc Guire A, Wozny PD, Lewanczuk RZ. Cardiorespiratory Fitness and the Risk of Overweight in Youth: The Healthy Hearts Longitudinal Study of Cardiometabolic Health. Obesity 2009; 17:1802-7.
21. Ortega FB, Ruiz JR, Castillo MJ, Sjo¨stro¨m M. Physical fitness in childhood and adolescence: a powerful marker of health. Int J Obesity. 2008; 32:1-11.
22. Padilla-Moledo C, Castro-Pinero J, Ortega FB, Mora J, Marquez S, Sjostrom M, *et al*. Positive health, cardiorespiratory fitness and fatness in children and adolescents. Eur. J. Public Health. 2012; 22:52-56.
23. Wang D, Li Y, Lee SG, Wang L, Fan J, Zhang G, Wu J, *et al*. Ethnic differences in body composition and obesity related risk factors: Study in Chinese and white males living in China. PLoS One. 2011, 6, doi:10.1371/journal.pone.0019835.
24. Strong WB, Malina RM, Blimkie CJ, Daniels SR, Dishman RK, Gutin B, *et al*. Evidence based physical activity for school-age youth. J Pediatr. 2005; 146:732-7.
25. https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight (Last accessed on 2019 Feb 9).
26. Harish Ranjani, Mehreen TS, Rajendra Pradeepa, *et al*. Epidemiology of childhood overweight and obesity in India: A systematic review. Indian J Med Res. 2016; 143(2):160-174.
27. WHO. Global Strategy on Diet, and Physical Activity and Health. Why does childhood over weight and obesity matter? http://www.who.int/dietphysicalactivity/childhood consequences/en/.
28. WHO. Adolescents: health risks and solutions, 2014. http://www.who.int/mediacentre/factsheets/fs345/en/.
29. Shashidhar Kotian M, *et al*. Prevalence and Determinants of Overweight and Obesity Among Adolescent School Children of South Karnataka, India. Indian journal of Community Medicine. 2010; 35(1):176-178.
30. Lopez AD. Assessing the burden of mortality from cardiovascular diseases. World Health Stat Q 1993; 46:91-6.
31. Reddy KS, Yusuf S. Emerging epidemic of cardiovascular disease in developing countries. Circulation 1998; 97:596-601.
32. McGavock JM, Torrance BD, McGuire KA, Wozny PD, Lewanczuk RZ. fitness and the risk of overweight in youth: The Healthy Hearts Longitudinal Study of Cardiometabolic Health. Obesity (Silver Spring) 2009; 17:1802-7.
33. Artero EG, Jackson AS, Sui X, Lee DC, O'Connor DP, Lavie CJ, *et al*. Longitudinal algorithms to estimate

cardiorespiratory fitness: Associations with nonfatal cardiovascular disease and disease-specific mortality. J Am Coll Cardiol. 2014; 63:2289-96.
34. Timpka S, Petersson IF, Zhou C, Englund M. Muscle strength in adolescent men and risk of cardiovascular disease events and mortality in middle age: A prospective cohort study. BMC Med. 2014; 12:62.
35. Nes BM, Vatten LJ, Nauman J, Janszky I, Wisløff U. A simple nonexercise model of cardiorespiratory fitness predicts long-term mortality. Med Sci Sports Exerc 2014; 46:1159-65.
36. Cuenca-García M, Artero EG, Sui X, Lee DC, Hebert JR, Blair SN. Dietary indices, cardiovascular risk factors and mortality in middle-aged adults: Findings from the Aerobics Center Longitudinal Study. Ann Epidemiol. 2014; 24:297-303.e2.
37. https://www.who.int/news-room/fact-sheets/detail/physical-activity (Last accessed on 2019 Feb 9).
38. Aarnio M, Winter T, Peltonen J, Kujala UM, Kaprio J. Stability of leisuretime physical activity during adolescence - a longitudinal study among 16-, 17- and 18-year-old Finnish youth. Scand J Med Sci Sports. 2002; 12:179-85.
39. Pei-Lin Hsieh, Min-Li Chen, *et al*. Physical Activity, Body Mass Index, and Cardiorespiratory Fitness among School Children in Taiwan: A Cross-Sectional Study, Int. J. Environ. Res. Public Health. 2014; 11:7S275-7285.
40. Pei-Lin Hsieh, Min-Li Chen, Chiu-Mieh Huang, *et al*. Physical Activity, Body Mass Index, and Cardiorespiratory Fitness among School Children in Taiwan: A Cross-Sectional Study. Int. J. Environ. Res. Public Health. 2014; 11:7275-7285.