Original Article

Association between physical activity levels and central obesity in a cohort of college students in Tamilnadu, India

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Abstract

Background: Obesity is a major risk factor for type 2 diabetes, hypertension, hyperlipidemia, and cardiovascular disease, and it is common across the globe in the current scenario. Body mass index is a predictor of the morbidity and mortality that are due to numerous diseases. In addition, it has been established that abdominal obesity, assessed by waist circumference (WC), predicts obesity-related health risk. **Objective:** Our study aims to find out if there is any aassociation between Physical activity levels and Central obesity in a cohort of college students. **Methodology:** This cross sectional study was done among a random sample of 320 Arts and Science college students belonging to Kancheepuram in Tamil Nadu. The waist circumference was measured as per standard protocol with a non stretchable measuring tape. The International Physical Activity Questionnaire (IPAQ) was used to assess the level of physical activity of the individuals. The data was compiled and analysed using SPSS- version 17. p value < 0.05 was considered to be statistically significant. **Results:** Out of the 320 study subjects, 63 (19.7%) had central obesity. It was observed that 83 (25.9%) were indulging in high level of physical activity, whereas 126 (39.4%) and (111) 34.7% of the subjects were indulging in moderate and low levels of physical activity respectively. The association between physical activity and obesity was found to be statistically significant. **Conclusion:** The long-term deleterious consequences of central obesity are significant and needs to be addressed more vigorously by the medical fraternity to bring in a sense of awareness among the society at large about of the benefits of physical activity.

Key Words: Central obesity, Waist circumference, Physical activity.

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INTRODUCTION

The epidemic of obesity is increasing at alarming proportions all over the globe. The prevalence of obesity exceeds 50% in many parts of the world.[1] This problem of overweight and obesity has been a major public health concern in many developed countries in Europe region and other countries in the west for the past three decades. But, in the recent times, even developing countries have seen surge in the prevalence of obesity.[2] Studies have shown that excessive body weight has serious consequences on health, like increase in Low density Lipoprotein level and triglycerides. It increases insulin resistance too. Obesity, as such is a leading cause of many non-communicable diseases, including Cardio vascular disease, cancer, depression, osteoarthritis, and type 2 diabetes.[3,4] This problem of non communicable diseases is expected to snowball into a major problem in the near future. There are projections attributing 73% of the deaths and 60% of the burden of disease, by the year 2020 to the impact of non communicable diseases across the globe.[5] Though Body Mass Index (BMI) is the official standard to measure obesity, its major problem is that it reflects total body fat and not the way the fat is distributed. For example, muscular individuals like athletes might have a BMI of more than 30, but very little body fat. There is a stronger correlation between central obesity and metabolic risk factors, than with that of BMI.[6] Central obesity or abdominal obesity, as such is a major

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clinical and public health problem. Studies have shown that central obesity itself is an independent risk factor for coronary artery disease, hypertension, dyslipidemia and type 2 diabetes.[7] Visceral fat can cause more harm than subcutaneous fat. This is explained by the concept of lipotoxicity. Visceral fat cells release their products of metabolism directly into the portal system. When visceral fat cells containing excess of triglycerides release fatty acids into the liver, these free fatty acids get accumulated in pancreas, heart and other organs, apart from the liver. This results in organ dysfunction.[5] Studies have shown that the best way to measure central obesity is by measuring the Waist circumference.[8] The risk of myocardial infarction, cardiovascular death, and all-cause death rise in parallel with waist circumference[9] The international diabetic federation has given a guideline to classify a person to be centrally obese or not. Different cut off values are used for different ethnic groups or countries. For south Asians, to measure central obesity, the cut off as defined by International Diabetic federation is $\geq$ 90 cms for males and $\geq$ 80 cms for females.[10]

MATERIALS AND METHODS

This study was done as a cross sectional study among a random sample of 320 Arts and Science college students belonging to Kancheepuram in Tamil Nadu. Students belonged to both sexes, and were undergoing graduate and postgraduate degree programs in either Arts or Science discipline. An informed consent was obtained from each student who was willing to participate in the study. A brief pretested questionnaire was used to collect background particulars.

The waist circumference was measured as per standard protocol with a non stretchable measuring tape. A female investigator was always present while measuring the waist circumference of female subjects. The International Physical Activity Questionnaire (IPAQ)[11] was used to assess the level of physical activity of the individuals. The validity and reliability of the questionnaire had been highlighted in many studies.[12]

Based on the responses given by the subjects to the questions in IPAQ, regarding their day to day physical activity, they were classified as belonging to three physical activity levels.

High Physical activity

If the subject fits into any one of the following two categories, he or she is classified as one indulging in High Physical activity. That is, if the subject reported vigorous intensity activity on at least three days, aggregating 1500 MET minutes per week or they reported a combination of walking and moderate or vigorous intensity activities accumulating a minimum of 3000 MET minutes per week.

Moderate Physical Activity

If the subject indulges in three or more days of vigorous physical activity for a minimum of 60 minutes per day, or 5 or more days of moderate intensity activity and/or walking for a minimum of 30 minutes per day or 5 or more days of any combination of walking, moderate or vigorous intensity activities so as to accumulate at least 600 MET minutes per week.

Low physical activity

The subjects had reported activity that is lower than the two categories outlined above, or there is no activity reported.[11]

The data was compiled and analysed using Statistical Package for Social Sciences, (SPSS- version 17). Tests of significance were applied wherever it was necessary.

RESULTS

A total of 320 individuals participated in this study. Out of them, 146 (45.6%) were males and the rest 174 (54.4%) were females. When they were categorised based on their waist circumference, it was observed that 63 (19.7%) had central obesity and the rest were not centrally obese (figure-1). On looking into the levels of physical activity in the study subjects, it was observed that only 83 (25.9%) were found to be indulging in high level of physical activity, whereas (126) 39.4% and (111) 34.7% of the subjects were indulging in moderate and low levels of physical activity respectively (figure –2).

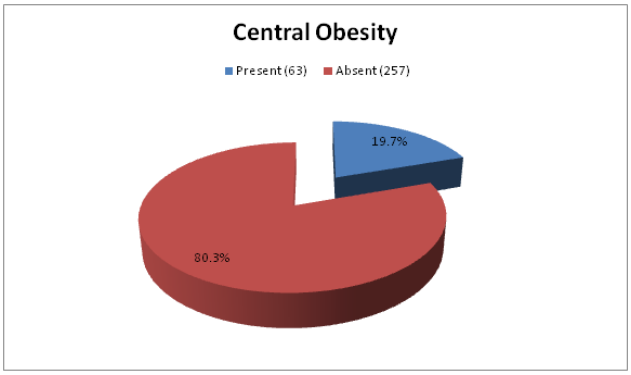

Figure 1: Prevalence of Central obesity among the study subjects

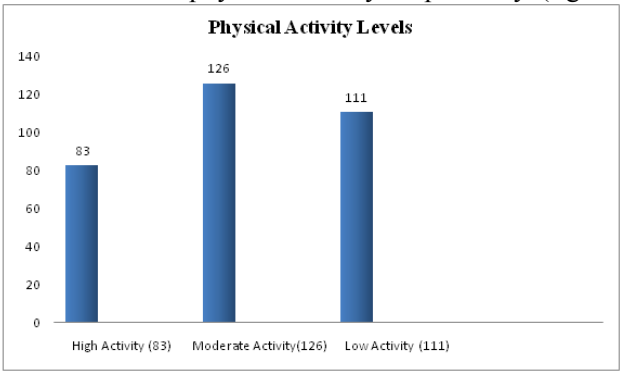

Figure 2: Different levels of physical activity among the subjects

The prevalence of Central obesity among the males and the females was found to vary. It was observed that only 13.7% males were centrally obese, whereas nearly double that number of females had central obesity. This difference in the prevalence of central obesity among the sexes was found to be statistically significant (Table – 1). Similarly the sexes had no similarity in their physical activity levels. Around 57.83% of males were found to be highly active, whereas, only 42.17% of females were in the same level of activity. On the contrary more females reported low levels of physical activity compared to males. This difference in the levels of physical activity among the male and female subjects was found to be statistically significant (Table-2)

Table 1: Table showing the difference in the prevalence of Central obesity among the male and female subjects

Sex	Central Obesity		X^2 / P-Value (df= 1)
	Present	Absent	
Male	20 (13.7%)	126 (86.3%)	
Female	43(24.71%)	131(75.29%)	6.091 / <.025

Table 2: Table showing the difference in the levels of physical activity among male and female subjects

Physical activity levels	Male	Female	X^2 / P-Value (df – 2)
High Activity	48(57.83%)	35(42.17%)	16.401 / <.001
Moderate Activity	64(50.79%)	62(49.21%)	
Low Activity	34(30.63%)	77(69.37%)	

The association between physical activity and central obesity was estimated. It was observed that among those subjects, who were highly active, the prevalence of central obesity was only 8.43% and among those who reported low levels of physical activity, the prevalence of central obesity was 27.03%. This association between physical activity and obesity was found to be statistically significant. (Table-3)

Table 3: Table showing the association between the different physical activity levels and central obesity in the subjects

Physical activity levels	Central Obesity		X^2 / P-Value (df – 2)
	Present	Absent	
High Activity	7 (8.43%)	76 (91.57%)	10.501 / <.005
Moderate Activity	26(20.63%)	100(79.37%)	
Low Activity	30(27.03%)	81(72.97%)	

DISCUSSION

In this study done on a selected sample of college students in the state of Tamil Nadu, the prevalence of central obesity was found to be 19.7%. Various studies across the globe as well as in India reported varied prevalence rates. In a study done by Luiz *et al*[13] among adolescent school students from public schools around Brazil, is was observed that the prevalence of central obesity was 10.2% when the 90th percentile was used as a cut off, and 25.2% were centrally obese when 75th percentile was used. In another study done by Mogre *et al* in Tamale in Ghana, the prevalence of central obesity was 31.2%[14] In another study done by Reddy *et al* among an industrial population in India, 31.9% were centrally obese.[15] Both those studies that was done amongst adult population in Ghana and India respectively, showed a higher prevalence of Central obesity. This difference in the prevalence could be attributed to the fact that both those studies were done among adults residing in cities.

In the present study, it was observed that more female subjects were centrally obese, than their male counterparts. Among the females, the prevalence rate of central obesity was 24.7%, whereas among the male subjects, only 13.7% were centrally obese. Various studies from other developing countries across the globe show a similar trend.[16,14] whereas, a study done by Stewart-Knox B *et al*[17] in Europeans reported the contrary. This could be due to the fact that the above quoted study was done in a developed country, and moreover, in the present study, more male subjects were physically active than the female subjects. When the study subjects were classified into three categories based on their level of physical activity as per the guidelines formulated by the International Physical Activity Questionnaire, it was observed that 25.9% of them belonged to the High activity category, 39.4% belonged to the moderate activity class, and 34.7% exhibited low activity. In the study done by Mogre *et al*, the distribution of study subjects among the three activity levels, low, moderate and high, was 57%, 32.3% and 10.8% respectively. In that study the majority of the study subjects had reported low activity. That could be because of the difference in the sampling unit of both studies. Mogre *et al*[14] had chosen adult subjects for study, whereas, this present study was done among college students who were comparatively more active. This study observed a significant difference in the levels of physical activity among male and female subjects. Among the male subjects, 57.83% were highly active, whereas, only 42.17% of the female subjects were highly active. Similarly, 69.37% of females belonged to the Low activity group, when compared to 30.63% males in the same category. A study done by Kharche *et al*[18] among college students in India also reported a similar finding, wherein, there was a significant difference in the physical activity levels of the male and female subjects, with the later being less active than the former. This study observed a negative correlation between Physical activity and Central obesity. Out of the study subjects who

belonged to the High activity group, only 8.43% had Central obesity, whereas, among those who were in the low activity group 27.03% were centrally obese. Similar findings were reported by Kaye *et al* in the year 1990[19], where they found a negative association between physical activity and Waist-hip–ratio.

CONCLUSION

The findings of this study further collaborates the fact that the prevalence of Central Obesity is significantly high in this country. This article had already discussed about the long term health consequences of Central obesity in the introductory part. One of the most important risk factor for the development of Central Obesity is inadequate physical activity. This study also points to that direction. Hence, this issue needs to be addressed at the individual, community, and the state/national level, before it snowballs into a major public Health problem, as in many western countries.

REFERENCES

1. Balkau B, Deanfield JE, Despres JP, Bassand JP, Fox KA, Smith SC, Jr., Barter P, Tan CE, Van Gaal L, Wittchen HU, Massien C, Haffner SM (2007) International Day for the Evaluation of Abdominal Obesity (IDEA): a study of waist circumference, cardiovascular disease, and diabetes mellitus in 168,000 primary care patients in 63 countries. Circulation 116(17)**:** 1942-1951.
2. Wang H, Du S, Zhai F, Popkin BM (2007) Trends in the distribution of body mass index among Chinese adults, aged 20-45 years (1989-2000). International journal of obesity (2005) 31(2)**:** 272-278.
3. Abdominal obesity and your health. Harvard Health Publications – March 2009 update - http://www.health.harvard.edu/family_health_guide/abdominal-obesity-and-your-health
4. Visscher TL, Seidell JC (2001) The public health impact of obesity. Annu Rev Public Health 22:355–375
5. Mufunda J, Chatora R, Ndambakuwa Y, Nyarango P, Kosia A, Chifamba J, Filipe A, Usman A, Sparks V (2006) Emerging non-communicable disease epidemic in Africa: preventive measures from the WHO Regional Office for Africa. Ethn Dis 16(2):521–526
6. Ducimetiere P, Richard J, Cambien F. The pattern of subcutaneous fat distribution in middle-aged men and the risk of coronary heart disease: the Paris Prospective Study. Int J Obes.1986;10:299-40.
7. Larsson B, Svardsudd K, Welin L, et al. Abdominal adipose tissue distribution, obesity, and risk of cardiovascular disease and death: 13 years follow up of participants in the study of men born in 1993. Br Med J. 1984;288:1401-4.
8. Grundy SM, Hansen B, Smith JR, Cleeman JI, Kahn RA; American Heart Association; National Heart, Lung, and Blood Institute; American Diabetes Association. Clinical Management of Metabolic Syndrome: Report of the American Heart Association. Circulation. 2004;109:551-6.
9. Dagenais GR, Yi Q, Mann JF, Bosch J, Pogue J, Yusuf S. Prognostic impact of body weight and abdominal obesity in women and men with cardiovascular disease. Am Heart J. 2005;149:54-60.
10. Epidemiology Task Force Consensus Group. The metabolic syndrome − a new worldwide definition. Lancet. 2005;366:1059-62.
11. International Physical Activity Questionnaire (IPAQ). IPAQ Scoring Protocol. Available online:https://sites.google.com/site/theipaq.
12. Craig, C.L.; Marshall, A.L.; Sjostrom, M.; Bauman, A.E.; Booth, M.L.; Ainsworth, B.E.; Pratt, M.;Ekelund, U.; Yngve, A.; Sallis, J.F.; et al. International physical activity questionnaire:12-Country reliability and validity. Med. Sci. Sport. Exercise 2003, 35, 1381–1395.
13. Luiz H. M. Griz, Maira Viegas, Mauro Barros et.al. Prevalence of central obesity in a large sample of adolescents from public schools in Recife, Brazil. Arq Bras Endocrinol Metab.2010;54/7:607-611
14. Mogre V, Mwinlenaa PP, Oladele J, Amalba A (2012) Impact of physical activity levels and diet on central obesity among civil servants in Tamale metropolis. J Med Biomed Sci 1(2):1–9
15. Reddy KS, Prabhakaran D, Chaturvedi V, Jeemon P, Thankappan KR, Ramakrishnan L, Mohan BV, Pandav CS, Ahmed FU, Joshi PP, Meera R, Amin RB, Ahuja RC, Das MS, Jaison TM (2006) Methods for establishing a surveillance system for cardiovascular diseases in Indian industrial populations. Bull World Health Organ 84(6)**:** 461-469.
16. Oghagbon K, Odili V, Nwangwa E, Pender K (2009) Body mass index and blood pressure pattern of students in a Nigerian University. Int J Health Res 2:2
17. Stewart-Knox B, E Duffy M, Bunting B, Parr H, Vas de Almeida MD, Gibney M (2012) Associations between obesity (BMI and waist circumference) and socio-demographic factors, physical activity, dietary habits, life events, resilience, mood, perceived stress and hopelessness in healthy older Europeans. BMC Public Health 12:424
18. Jayshree S Kharche, Pranitha Ashok, Robin G Raju, B Balasubramanian. Gender difference in MET score and waist to hip ratio in young adults. International Journal of Biomedical and Advance Research 2014: 05 (07)
19. Kaye SA, Folsom AR, Prineas RJ, Potter JD, Gap-stur SM (1990) The association of body fat distribution with lifestyle and reproductive factors in a population study of postmenopausal women. Int J Obes 14(7)**:** 583-591.

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