Journal of Taibah University Medical Sciences (2017) 12(2), 178–182

Taibah University

Journal of Taibah University Medical Sciences

www.sciencedirect.com

Brief Communication

The relationship of abdominal girth with blood pressure, blood sugar and lipid profile among cardiac patients

Sasmita Das, PhD [a], Nikee Minz, MSc [a] and Mahesh C. Sahu, PhD [b,*]

[a] *SUM Nursing College, Siksha O Anusandhan University, K-8, Kalinga Nagar, Bhubaneswar, Odisha, India*
[b] *Directorate of Medical Research, Institute of Medical Science and SUM Hospital, Siksha O Anusandhan University, Bhubaneswar, India*

Received 2 September 2016; revised 14 October 2016; accepted 17 October 2016; Available online 15 November 2016

Abstract

Objectives: This study aimed to characterize and identify the relationship of abdominal girth with blood pressure, blood sugar and lipid profile among cardiac patients.

Methods: A total of 100 patients with diagnosed cardiac problems were recruited from the outpatient clinic of a multi-speciality hospital. For data collection, a self-administered questionnaire was used to gather information about patients' demographics and socio-economic status. In addition, an assessment tool on the Physical and Laboratory Characteristics was employed. The data were analysed using *t* tests, Pearson correlations and chi squared tests.

Results: The findings of the study showed that there was a significant positive correlation of abdominal girth with blood pressure, blood sugar and lipid profile, as the R-values were reported to be 0.32, 0.28, 0.02, 0.32, 0.32, 0.28 and 0.18. There was no significant association of the selected demographic variables with abdominal girth, blood pressure, blood sugar or lipid profile among the selected cohort of patients.

Conclusion: Lifestyle factors contribute significant risk in the development of abdominal obesity, metabolic syndrome and cardiovascular diseases. This study recommends a careful monitoring of risk factors at an early age, which would go a long way towards reducing the burden of abdominal obesity and obesity related cardio metabolic risk.

Keywords: Abdominal girth; Blood pressure; Blood sugar; Cardiac patients; Lipid profile

Introduction

In today's society, people aim for a modern lifestyle, one that requires more time spent on economic growth and leaves less time for self-health care. Abdominal obesity is an increasingly important health problem worldwide, including in developing countries, such as India. Abdominal obesity is becoming increasingly prevalent among urban Indians. The prevalence of abdominal obesity is growing in Western populations, possibly due to a combination of low physical activity and high-calorie diets, as well as in developing countries, where it is associated with the urbanization of populations. Regional fat distribution, particularly abdominal obesity, is considered to be important for the development of insulin resistance, metabolic syndrome and coronary heart disease.[1] High levels of abdominal fat are linked with diabetes and heart disease.[2] The prevalence of abdominal obesity and the dysmetabolic state is higher in urban Asian Indians in north India and requires an immediate public health intervention.[3]

* Corresponding address: Institute of Medical Science and SUM Hospital, Siksha O Anusandhan University, K-8, Kalinga Nagar, Bhubaneswar 751003, Odisha, India.
E-mail: mchsahu@gmail.com (M.C. Sahu)

Peer review under responsibility of Taibah University.

ELSEVIER Production and hosting by Elsevier

 http://dx.doi.org/10.1016/j.jtumed.2016.10.007

Fat around the midsection is a good indicator of increased risk for metabolic syndrome, high blood pressure, heart disease and diabetes, and abdominal obesity is a greater risk factor than general obesity.[4] Abdominal obesity is an important public health problem worldwide, and its prevalence is increasing in both developed and developing nations along with changes in dietary habits and physical activity levels. Individuals who are overweight are at higher risk for a variety of disabling and life-threatening chronic conditions. Abdominal obesity is considered to be an independent predictor of cardiovascular risk factors, morbidity, and mortality.[5] Routine measurement of waist circumference is considered to be a convenient and inexpensive measure in primary care to provide a clinical marker for risk of cardiovascular disease and diabetes in all regions of the world, including in patients of "normal" weight.[6] Recent changes in the diet and physical activity of people residing in Odisha have also added to the problem of adnominal obesity. It is the consequence of increased urbanization and mechanization. Rising abdominal obesity has increased the risk of cardiovascular disease in Odisha.[7]

Abdominal obesity poses a major and increasing challenge to health worldwide. Reliable estimates of the worldwide prevalence of abdominal obesity are needed to quantify the associated health risk. Therefore, the present study aimed to determine the relationship of abdominal girth with blood pressure, blood sugar and lipid profile among patients attending a cardiac clinic. A proper standard protocol is to be established in the health care setting for routine measurement and risk assessment of the general population.

Materials and Methods

Study design

This is a descriptive correlative study conducted with a questionnaire and assessment tool regarding the Physical and Laboratory Characteristics to assess the relationship of abdominal girth with blood pressure, blood sugar and lipid profile.

Samples and data collection

This study includes the data of patients attending the outpatient department of a national university hospital from April 2015 to May 2015 for the treatment of cardiac problems. The selection criteria were as follows: cardiac patients aged 20 years or older who had been advised to undergo laboratory investigation based on their blood sugar and lipid profile and those who were aware of the purpose of the research and agreed to participate. We excluded clients who had any of the following conditions: pregnancy, ascites, abdominal distension and mental disease (e.g., schizophrenia or depressive disorder).

A total of 120 people participated in the study; however, 100 were chosen and others were excluded due to inadequate responses. To verify the statistical power of our sample size, the formula $N = (Z^2 \times P \times P)/e^2$ was used. By using the above formula, the sample size was $N = 86.6$ and the Z value was 1.96. In this study, out of every 15 patients admitted with cardiac problems, one patient was associated with an angiography procedure. Therefore, the 'p' value is 1/15, or 0.06, and 'e' is tolerable error, which was 0.05. However, for uniformity and availability, we used a sample size of 100. Based on these results, our sample size seemed appropriate. To conduct this study, the objectives, methodology, participant rights, questionnaire on socio-demographic variables and assessment tool on the Physical and Laboratory Characteristics were reviewed and approved by the Institutional Review Board. To maintain consistency in the research method among researchers, a research director provided instructions on the survey before data collection. Researchers first confirmed patients who met the criteria for this study. The objectives and process of the study were explained to the target patients verbally and in writing. If they agreed to participate in the study, they were asked to provide written informed consent. Data collection took approximately 15 min. Data were collected anonymously to protect the participants' rights and privacy. It was agreed that the data would not be used for other purposes. They were also informed that they could quit at any time during data collection.

Description of tools

1) TOOL A: Self-structured interview questionnaire

   Tool A consists of 2 sections:

   SECTION − I: Contains socio-demographic information of patients attending a cardiac OPD in the form of a self-structured interview questionnaire. The tool was prepared as closed-ended questions containing 14 items.

   SECTION − II: Contains the Modified Kuppuswamy's Socio-economic Status Scale, which encompasses education, occupation and income.

2) TOOL B: Contains assessment data from the physical and laboratory characteristics of the study population. It contains 5 items that are recorded from the sample profile.

Data analysis

The collected data were analysed using SPSS version 20.0. The demographic, physical and laboratory characteristics of the target patients were analysed using the frequency, percentage and mean. Correlation coefficients were used to assess the relationship with and within abdominal girth, lipid profile, blood sugar and blood pressure. Chi-square tests and analyses of variance were used to determine whether there was any association between the selected socio-demographic variables with abdominal girth, lipid profile, blood sugar and blood pressure.

Results

The distribution of subjects according to demographic variables

The distribution of subjects according to the demographic variables were as follows: 31% of people were within the age group of 41−50 yrs and 51−60 yrs; 63% were female; 90% were married; 58% were a part of a nuclear family; 54% lived

in an urban residence; 69% had a mixed diet; 69% were Hindu; 29% had a previous history of hypertension; 59% performed aerobic types of exercise; 36% performed exercise every day of the week; 41% performed moderate intensity daily activity; 41% always felt stressed; 28% had a family history of DM; and 29% had other habits. The distribution of subjects according to Kuppuswamy's socio-economic status represented that 35% belonged to the upper (I) socio-economicclass, which included 39% who were graduates or post-graduates; 28% who were clerical workers, shop owners, or farmers; and 35% who had a family income > Rs 45,751.

Relation between abdominal girth and blood pressure, blood sugar and lipid profile

There was a significant positive relationship between abdominal girth and systolic blood pressure, diastolic blood pressure, fasting blood sugar, triglycerides, total cholesterol, LDL and HDL, as their R-values were 0.32, 0.28, 0.02, 0.32, 0.32, 0.28 and 0.18, respectively, among patients attending a cardiac OPD. This means that if the abdominal girth leads to increased blood pressure, then blood sugar and lipid profile will also increase; conversely, if abdominal girth leads to decreased blood pressure, then blood sugar and lipid profile will decrease (Table 1).

Association of the selected demographic variables with abdominal girth, blood pressure, blood sugar and lipid profile

The chi-square association of selected demographic variables with abdominal girth was not statistically significant, as the calculated value was less than the tabulated value at the 0.05 level of significance. Systolic blood pressure was not statistically significant, as the calculated value was less than the tabulated value at the 0.05 level of significance. The association of selected demographic variables with diastolic blood pressure was not statistically significant, as the calculated value was less than the tabulated value at the 0.05 level of significance. A previous history of any illnesses and family history of any illnesses did show statistically significant associations with the selected demographic variables, as the calculated values were 13.83 and 13.39, respectively, which are higher than the tabulated value at the 0.05 level of significance. Fasting blood sugar was also not statistically significant, as the calculated value is less than the tabulated value at the 0.05 level of significance. Gender, type of exercise and frequency of exercise were found to have statistically significant associations with the selected demographic variables, as the calculated values were 4.62, 10.91 and 8.18, respectively, which are higher than the tabulated value at the 0.05 level of significance. Triglycerides were not statistically significant, as the calculated value is less than the tabulated value at the 0.05 level of significance. Similarly, the frequency of exercise was found to have a statistically significant association with the selected demographic variables as the calculated values were 10.43, which was higher than the tabulated value at the 0.05 level of significance. Total cholesterol was not statistically significant, as the calculated value was less than the tabulated value at the 0.05 level of significance. Low density lipoprotein (LDL) was not statistically significant, as the calculated value as less than the tabulated value at the 0.05 level of significance. The area of residence was found to have a statistically significant association with the selected demographic variables, as the calculated values were 4.48, which was more than the tabulated value at the 0.05 level of significance. HDL was not statistically significant at the 0.05 level of significance. The area of residence was also found to have statistically significant associations with the selected demographic variables, as the calculated χ^2 value was 4.48, which was more than the tabulated value at 0.05 level of significance.

Association of systolic blood pressure with fasting blood sugar, triglycerides and total cholesterol

ANOVA was used to investigate significant differences of systolic blood pressure within fasting blood sugar, triglycerides and total cholesterol, which revealed that there was no significant difference within normal and abnormal systolic blood pressure in association with fasting blood sugar, triglycerides and total cholesterol at the 0.05 level of significance.

Discussion

Recently, the number of patients with cardiovascular problems in Odisha has been increasing, and rapid urbanization and lifestyle patterns have become the most typical factors to cause cardiac problems. Therefore, this study is meaningful in that it investigated the relationship of abdominal girth with blood pressure, blood sugar and lipid profile in cardiac clients in Odisha. Our findings provide a better understanding of this issue and establish basic data for nursing interventions.

Table 1: Correlation between abdominal girth and blood pressure, blood sugar and lipid profile.

Item	Mean	SD	"r" value	Inference
Abdominal girth	98.23	13.17		
Systolic blood pressure	132.9	12.95	0.32	Moderately positive correlation
Diastolic blood pressure	89.64	12.27	0.28	Moderately positive correlation
Fasting blood sugar	137.94	36.42	0.02	Moderately positive correlation
Triglycerides	186.12	53.36	0.32	Moderately positive correlation
Total cholesterol	181.03	40.63	0.32	Moderately positive correlation
Low density lipoprotein (LDL)	119.59	33.25	0.28	Moderately positive correlation
High density lipoprotein (HDL)	52.39	10.89	0.18	Moderately positive correlation

In the present study, 31% of participants were in the age groups of 41–50 yrs and 51–60 yrs old, whereas the study findings of Mohsen Janghorbani et al.[8] indicated that there was an increasing prevalence of abdominal obesity with increasing age, including 22.3% in the 15- to 24-year age group to 84.7% in the 55- to 64-year age group. In the current study, 63% of subjects were male and 37%, were female, which is supported by a similar study of Masoud Amini et al.,[9] which showed that the majority of abdominal obesity is more common among men than women (54.5% vs. 12.9%) and increase with age. The present study identified that there was a significant moderately positive relationship between abdominal girth, systolic blood pressure, diastolic blood pressure, fasting blood sugar, triglycerides, total cholesterol, LDL and HDL. Another similar research study by Nitesh Mishra et al.[10] showed that abdominal obesity was positively correlated with TG, TC and LDL and negatively with HDL. To support the same findings, another similar study by Mari Odamaki et al.[11] showed that BMI, subcutaneous fat areas and visceral fat areas were all associated with serum triglycerides, HDL and cholesterol. Another similar study by Liu et al.[12] described that abdominal obesity, which was highly correlated with BMI, was significantly associated with all of the tested cardio metabolic risk factors, including systolic blood pressure, triglycerides, and fasting plasma glucose, and inversely correlated with high density lipoprotein cholesterol. Additionally, significant correlations existed with waist circumference and hypertension, diabetes, and metabolic syndrome in both sexes, even after adjusting for BMI, age, smoking and alcohol use. A study by Sumit Garg et al.[13] partially supports the present study by showing that waist circumference best correlates with all of the parameters of the lipid profile.

Nurses should be able to use this knowledge upon screening people who attend a cardiac OPD. In each and every patient who attends a cardiac OPD, it is essential to assess BMI, fasting blood sugar, blood pressure and the lipid profile to perform an effective cardiovascular risk assessment and allow for the early detection of metabolic diseases.

This study has several limitations. First, the study was limited to a small group of 100 patients attending a cardiac OPD, Therefore, the generalization of the results could be limited. Second, the study was confined to people of a specific region. Third, the study was limited to the samples that were present at the time of data collection. Further studies should be conducted at different health care centres and geographical regions of Odisha to overcome these limitations. Despite these limitations, this is the first study to address the relationship of abdominal girth with blood pressure, blood sugar and lipid profile among the cardiac patients.

Conclusion

The accumulation of fat in the abdomen region has been described as the type of obesity that offers the greatest risk toward health. Based on the findings of the present study, it can be concluded that there are significant associations between abdominal girth with blood pressure, blood sugar and lipid profile among patient's attending a cardiac OPD. The strengths of the study include the use of large samples of each gender as well as a wide age range of subjects. The study confirms the hypothesis that a large abdominal girth is related to high fasting plasma glucose and insulin levels and an abnormal lipid profile relative to their lean peers. This study highlights the critical importance of early identification and intervention of abdominal obesity to avert its long-term consequences and to protect the community against the risk of cardiovascular diseases. The findings reveal that there should be proper risk assessment tools or protocols developed to assess patients attending a cardiac OPD.

Monitoring risk factors at an early age would go a long way toward reducing the burden of abdominal obesity related cardio metabolic risk. People should be encouraged to improve their lifestyle habits for weight management and to improve insulin sensitivity. Proper health education and awareness about the need for routine assessment and laboratory tests will help people to detect risk factors early on, thus lowering the risk of diseases and increasing the likelihood of primary interventions.

Conflict of interest

The authors have no conflicts of interest to declare.

Ethical approval

This study was approved by the competent authority of our university.

Authors' contributions

SD conceived, designed study and provided research materials, NM conducted research and collected and organized data. MCS analyzed and interpreted data. All authors have critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

Acknowledgments

The authors are grateful to Prof. Manoj Ranjan Nayak, President, and Er. Gopabandhu Kar, Managing Member, and Siskha O Anusandhan University, Bhubaneswar for extended facilities in research.

References

1. Misra A, Khurana L. The metabolic syndrome in South Asians: epidemiology, determinants, and prevention. **Metab Syndr Relat Disord 2009**; 7(6): 497–514.
2. National Institute of Health, NHLBI. *What are the health risks of overweight and obesity*; 2009.
3. Bhardwaj S, Misra A, Misra R, Goel K, Bhatt SP. High prevalence of abdominal, intra-abdominal and subcutaneous adiposity and clustering of risk factors among urban Asian Indians in North India. **PLoS One 2011**; 6(9). http://journals.plos.org/plosone/10.1371/journal.pone.0024362.
4. Park HS, Oh SW, Cho SI, Choi WH, Kim YS. The metabolic syndrome and associated lifestyle factors among South Korean adults. **Int J Epidemiol 2014**; 33: 328–336.

5. Flegal KM, Zimmet P, Shaw J, IDF Epidemiology Task Force Consensus Group. The metabolic syndrome – a new worldwide definition. **Lancet 2005**; 366: 1059–1062.
6. Beverley B, Hillier T, Vierron E, D'Hour A, Lépinay P, Royer B, Born C. **Diabetologia 2005**; 48(4): 801–802. Epub 2005 Mar 4.
7. Kumanyika SK, Obarzanek E, Stettler N, Bell R, Field AE, Fortmann SP, Franklin BA, Gillman MW, Lewis CE, Poston WC, Stevens J. Population-based prevention of obesity the need for comprehensive promotion of healthful eating, physical activity, and energy balance: a scientific statement from American Heart Association Council on Epidemiology and Prevention, Interdisciplinary Committee for Prevention (formerly the expert panel on population and prevention science). **Circulation 2008 Jul 22**; 118(4): 428–464.
8. Mohsen J, Barzin M, Asghari G, Hosseinpanah F, Mirmiran P, Azizi F. The association of anthropometric indices in adolescence with the occurrence of the metabolic syndrome in early adulthood: Tehran lipid and glucose study. **Pediatr Obes 2011**; 8(3): 170–177.
9. Masoud A, Schneider HJ, Glaesmer H, Klotsche J, Bohler S, Lehnert H, Zeiher AM, et al. Accuracy of anthropometric indicators of obesity to predict cardiovascular risk. **J Clin Endocrinol Metab 2014**; 92: 589–594.
10. Nitesh MP, Sweta KL. Serum lipid profile levels in obese and non-obese males in Andhra Pradesh **2012**; 20: 203–227.
11. Mari O, Fox CS, Massaro JM, Hoffmann U. Abdominal visceral and subcutaneous adipose tissue compartments: association with metabolic risk factors in the Framingham Heart Study. **Circulation 1998**; 116(1): 39–48.
12. Liu, Kim DJ, Bergstrom J, Barrett CE, Laughlin GA. Visceral adiposity and subclinical coronary artery disease in older adults: Rancho Bernardo Study. **Obesity 2010**; 16(4): 853–858.
13. Sumit G, Morrow DA, Gersh BA. *Chronic coronary artery disease. Braunwald's heart disease*. 8th ed. Philadelphia: W.B. Saunders Company; 2012. pp. 1353–1354.

How to cite this article: Das S, Minz N, Sahu MC. The relationship of abdominal girth with blood pressure, blood sugar and lipid profile among cardiac patients. J Taibah Univ Med Sc 2017;12(2):178–182.