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Association between Patients with Metabolic Syndrome and Other Various Factors Defining Metabolic Syndrome: A Cross-Sectional Study

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ABSTRACT

Background: Risk factors can lead to clinical conditions, like metabolic syndrome, that predisposes the development of cardiovascular diseases.
Objective: The goal of this population-based, prospective and non-randomised cohort study was to study the association between patients with metabolic syndrome and other various factors defining metabolic syndrome.
Methods: All the patients referred to the department of Medicine, Al-Ameen Medical college hospital and District Hospital, Vijayapur, Karnataka, India over a period of twenty-two months extending from December 2013 to September 2015 were considered in this study.
Results: In the current study, out of 100 patients, 62.9% patients had metabolic syndrome with positive family history of hypertension, diabetes mellitus. 70.8% patients had metabolic syndrome with positive history of smoking. 64.3% patients had metabolic syndrome with positive history of alcohol .73.9% patients had metabolic syndrome with positive history of IHD. 87% of the patients with metabolic syndrome had SBP> 130 mmHg, and 78.85% patients had DBP>85 mmHg. And metabolic syndrome was observed in 71.8% patients on anti hypertensive drugs. The mean level of total cholesterol, LDL cholesterol, triglyceride is increased whereas the mean level of anti-atherogenic HDL cholesterol is low in subjects with MS. At least one lipid abnormality was present in > 95 % of cases. Around 81% subjects with BMI <25 (out of 38) had metabolic syndrome and 58% subjects with BMI>25(out of 62) had metabolic syndrome.
Conclusion: All the components defining the metabolic syndrome correlated positively with the abdominal obesity. Systolic blood pressure values were significantly higher than diastolic blood pressure in subjects with abdominal obesity. Metabolic syndrome has multiple risk factors determined by various aspects like the race, the life style, geographical factors larger study is needed to understand the correlation between various components defining it. A healthy lifestyle, that includes avoiding tobacco exposure and proper weight control, must be encouraged in this high-risk population.

Keywords: Cardiovascular diseases; Overweight; Risk factors; Smoking

INTRODUCTION

Metabolic syndrome (MS) is a multiplex risk factor for atherosclerotic cardiovascular disease (ASCVD) [1]. It consists of an atherogenic dyslipidemia ((i.e., elevated triglycerides and apolipoprotein B (apo-B) and low high-density lipoprotein cholesterol (HDL-C)), elevation of blood pressure and glucose, prothrombotic and proinflammatory states [2]. The risk of ASCVD accompanying the

MS is approximately doubled compared with an absence of the syndrome. The MS appears to promote the development of ASCVD at multiple levels. Elevations of apoB containing lipoproteins initiate atherogenesis and drive lesion development. Atherosclerotic plaque development is accelerated by low levels of HDL-C, by elevated glucose levels and by inflammatory cytokines [3].

MS is a complex web of metabolic factors that are associated with a 2-fold risk of CVD and a 5-fold risk of diabetes. Individuals with MS have a 30%–40% probability of developing diabetes and/or CVD within 20 years, depending on the number of components present [4].

In the United States (US), the prevalence of the MS in the adult population was estimated to be more than 25%. Similarly, the prevalence of MS in 7 European countries was approximately 23%. It was estimated that 20%–25% of South Asians have developed MS and many more may be prone to it [5]. The main reason why MS is attracting scientific and commercial interest is that the factors defining the syndrome are all factors associated with increased morbidity and mortality in general and from CVD in particular [6].

In view of this the objective of the current study was to study the association between patients with metabolic syndrome and other various factors defining metabolic syndrome.

MATERIAL AND METHODS

This cross-sectional, population-based, retrospective and non-randomised cohort study was conducted in the department of Medicine, Al-Ameen Medical college hospital and District Hospital, Vijayapur, Karnataka, India over a period of twenty-two months extending from December 2013 to September 2015.

Patients with abdominal obesity after informed consent were included in the study. All the participants were subjected for detailed medical history, clinical examination (weight, height, abdominal circumference) and investigations (lipid profile, FBS, PPBS, serum creatinine, Blood urea, ECG, USG abdomen).

Inclusion Criteria included patients with waist circumference > 89 cm in men and >80 cm in women. (As per NCEP Adult Treatment Panel III - ATPIII). Exclusion criteria included causes of abdominal distension due to conditions other than obesity that include hypothyroidism, paralytic ileus, ascites, pregnancy, intra abdominal tumors, organomegaly and cushings syndrome.

Various factors defining metabolic syndrome in this study include family history, smoking, alcohol, ischemic heart disease (IHD), hypertension and body mass index.

The collected data was coded and entered in Microsoft excel wherein the data was represented as frequency, percentages, and graphs. Descriptive statistics were used to describe the study variables of the subjects. Quantitative data variables were represented by using mean and standard deviation and qualitative data variables were represented by using proportions and percentages. Association between study risk factors and the prevalence of metabolic syndrome was tested using chi-square test. The P-values were corrected by the Bonferroni method and a P-value <0.05 was regarded as statistically significant. Data was analyzed using Statistical Package for Social Sciences (SPSS) software (version, 16) for statistical analysis.

RESULTS

This cross-sectional, population-based, retrospective and non-randomised cohort study was conducted in the department of Medicine, Al-Ameen Medical college hospital and District Hospital, Vijayapur, Karnataka, India over a period of twenty-two months extending from December 2013 to September 2015. In this study, a total of 100 patients were studied to study the association between patients with metabolic syndrome and other various

factors (family history, smoking, alcohol, ischemic heart disease (IHD), hypertension and body mass index) defining metabolic syndrome. The following data makes an attempt to summarize the details of observations noted during the study.

Prevalence of metabolic syndrome with respect to family history and present history

Table 1: Prevalence of metabolic syndrome with respect to family history and present history

Family h/o and habits		Metabolic syndrome				
		Present		Absent		P value
		No.	%	No.	%	
Family History	No (n=65)	45	69.2	20	30.8	0.518
	Yes (n=35)	22	62.9	13	37.1	
Smoking	No (n=52)	33	63.5	19	36.5	0.433
	Yes (n=48)	34	70.8	14	29.2	
Alcohol	No (n=72)	49	68.1	23	31.9	0.719
	Yes (n=28)	18	64.3	10	35.7	
IHD	No (n=77)	50	64.9	27	35.1	0.422
	Yes (n=23)	17	73.9	6	26.1	

As shown in Table 1 the current study, out of 100 patients, 62.9% patients had metabolic syndrome with positive family history of hypertension, diabetes mellitus. 70.8% patients had metabolic syndrome with positive history of smoking. 64.3% patients had metabolic syndrome with positive history of alcohol.73.9% patients had metabolic syndrome with positive history of IHD.

Prevalence of metabolic syndrome with respect to Hypertension profile

Table 2: Prevalence of metabolic syndrome with respect to Hypertension profile

Hypertension profile		Metabolic syndrome				
		Present		Absent		P value
		No.	%	No.	%	
SBP	Normal (n=52)	27	51.9	25	48.1	<0.001
	SBP >130mmHg (n=48)	6	12.5	42	87.5	
DBP	Normal (n=48)	22	45.8	26	54.2	0.009
	DBP >85 mmHg (n=52)	11	21.2	41	78.8	
On anti HTN drugs	No (n=61)	22	36.1	39	63.9	0.415
	Yes (n=39)	11	28.2	28	71.8	

As shown in Table 2 the current study, out of 100 patients, 87% of the patients with metabolic syndrome had SBP> 130 mmHg, and 78.85% patients had DBP>85 mmHg. And metabolic syndrome was observed in 71.8% patients on anti hypertensive drugs.

Prevalence of metabolic syndrome with respect to Lipid profile of patients

Table 3: Prevalence of metabolic syndrome with respect to Lipid profile of patients

Lipid profile		Metabolic syndrome				
		Present		Absent		P value
		No.	%	No.	%	
CHO grp	Normal (n=53)	31	58.5	22	41.5	0.05
	Abnormal (n=47)	36	76.6	11	23.4	
LDL grp	Normal (n=27)	11	40.7	16	59.3	0.001
	Abnormal (n=73)	56	76.7	17	23.3	
HDL grp	Normal (n=64)	35	54.7	29	45.3	<0.001
	Abnormal (n=36)	32	88.9	4	11.1	
TGA grp	Normal (n=42)	16	38.1	26	61.9	<0.001
	Abnormal (n=58)	51	87.9	7	12.1	

As shown in Table 3 the current study, out of 100 patients, the mean level of total cholesterol, LDL cholesterol, triglyceride is increased whereas the mean

level of anti-atherogenic HDL cholesterol is low in subjects with MS. At least one lipid abnormality was present in >95% of cases.

Prevalence of metabolic syndrome with respect to BMI of patients

Table 4: Prevalence of metabolic syndrome with respect to BMI of patients

BMI(kg/m2)	Metabolic syndrome				
	Present		Absent		P value
BMI < 25 (n=38)	No.	%	No.	%	
	31	81.0	7	19.0	0.005
BMI >25 (n=62)	36	58.0	26	42.0	

As shown in Table 4 the current study, out of 100 patients, 81% subjects with BMI <25 (out of 38) had metabolic syndrome and 58% subjects with BMI>25 (out of 62) had metabolic syndrome.

DISCUSSION

The prevalence of MS is increasing worldwide [7]. Whereas MS and its components are known as cardiovascular risk factors, is expected that prevalence of this syndrome be higher in patients with CVD than in general population [8]. Previous studies demonstrated that the prevalence of MS was different among some variables, such as gender, age, education, BMI and levels of physical activity [9-11]. The reason for all patients presented hypertension could be through 1) hypertension is the leading cause of CVD; 2) as shown before, the majority of our sample was composed by elderly (with a mean age of 51.0 years) and aging is responsible for artery stiffness, that predispose to hypertension [12].

Previous studies tried to identify the influence of some risk factors in the prevalence of MS [11,13]. And these studies demonstrated that women have a higher risk of developing MS, whereas one study found that male were at increased risk [14]. This could be explained through the age of people in study, since the prevalence of MS increases with menopause and depending of the age of women, the prevalence can change [15]. Despite prevalence of MS in this study was not different between gender and did not affect the number of components of MS, it is important to remind that MS was present in 61.5% of women and 70% of men.

The association between body weight and prevalence of MS has been demonstrated before, in different ways. In one study, the risk of MS was higher in obese subjects [11]. Another study showed that prevalence of MS increases as well BMI rises [16]. Another study, using two diagnosis criteria showed that an abnormal BMI (low or high) provided a higher risk to develop MS [13]. In accordance to the results of this study, they found a higher risk to MS in individuals with overweight. To highlight the importance of body weight in MS, a longitudinal study concluded that the development of MS was slower in subjects without overweight.

In our study, the subjects revealed stronger associations with multiple risk factors and when we assessed independently waist circumference is more predictive of metabolic syndrome comparing other anthropometric measurements like BMI. Although neither BMI nor waist circumference provides a complete picture of overall risk, the waist circumference of the subjects from the present study revealed stronger associations with multiple risk factors This finding suggests that waist circumference can be used to screen the general population. Our observations are co-relating with Shaper et al, Shepherd et al, Lofgren et al, Wei Shen et al and Deepa et al [17-21]. Waist circumference measurement appears to provide more comprehensive information on the potential occurrence of other risk factors for CHD, including diastolic blood pressure, the presence of the MS, and high plasma TG.

There are some limitations of this study. First, the sample-size was small. Second, a cross-sectional study cannot provide sufficient evidence of causality.

CONCLUSION

All the components defining the metabolic syndrome correlated positively with the abdominal obesity. Systolic blood

pressure values were significantly higher than diastolic blood pressure in subjects with abdominal obesity. Metabolic syndrome has multiple risk factors determined by various aspects like the race, the life style, geographical factors larger study is needed to understand the correlation between various components defining it. A healthy lifestyle, that includes avoiding tobacco exposure and proper weight control, must be encouraged in this high-risk population.

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Ethical Approval: Approved

REFERENCES

1. Grundy SM. Metabolic syndrome update. Trends in cardiovascular medicine. 2016 May 1;26(4):364-73.
2. Myers J, Kokkinos P, Nyelin E. Physical activity, cardiorespiratory fitness, and the metabolic syndrome. Nutrients. 2019 Jul;11(7):1652.
3. Vona R, Gambardella L, Cittadini C, Straface E, Pietraforte D. Biomarkers of oxidative stress in metabolic syndrome and associated diseases. Oxidative medicine and cellular longevity. 2019 Oct;2019.
4. Wu X, Du R, Hu C, Cheng D, Ma L, Li M, Xu Y, Xu M, Chen Y, Li D, Bi Y. Resting heart rate is associated with metabolic syndrome and predicted 10-year risk of cardiovascular disease: a cross-sectional study. Journal of diabetes. 2019 Nov; 11(11):884-94.
5. He Y, Li Y, Bai G, Zhang J, Fang Y, Zhao L, Zhao W, Yang X, Ding G. Prevalence of metabolic syndrome and individual metabolic abnormalities in China, 2002-2012. Asia Pacific journal of clinical nutrition. 2019 Sep;28(3):621-33.
6. Marcotte-Chénard A, Deshayes TA, Ghachem A, Brochu M. Prevalence of the metabolic syndrome between 1999 and 2014 in the United States adult population and the impact of the 2007–2008 recession: an NHANES study. Applied Physiology, Nutrition, and Metabolism. 2019;44(8):861-8.
7. Farmanfarma KK, Kaykhaei MA, Adineh HA, Mohammadi M, Dabiri S, Ansari-Moghaddam A. Prevalence of metabolic syndrome in Iran: A meta-analysis of 69 studies. Diabetes & Metabolic Syndrome: Clinical Research & Reviews. 2019 Jan 1;13(1):792-9.
8. Zhang J, Liu Q, Long S, Guo C, Tan H. Prevalence of metabolic syndrome and its risk factors among 10,348 police officers in a large city of China: A cross-sectional study. Medicine. 2019 Oct;98(40).
9. Deedwania PC, Gupta R, Sharma KK, Achari V, Gupta B, Maheshwari A, Gupta A. High prevalence of metabolic syndrome among urban subjects in India: a multisite study. Diabetes & Metabolic Syndrome: Clinical Research & Reviews. 2014 Jul 1;8(3):156-61.
10. Moreira GC, Cipullo JP, Ciorlia LA, Cesarino CB, Vilela-Martin JF. Prevalence of metabolic syndrome: association with risk factors and cardiovascular complications in an urban population. PloS one. 2014 Sep 2;9(9):e105056.
11. Yu S, Guo X, Yang H, Zheng L, Sun Y. Metabolic syndrome in hypertensive adults from rural Northeast China: an update. BMC public health. 2015 Dec;15(1):1-8.
12. Lee HY, Oh BH. Aging and arterial stiffness. Circulation Journal. 2010: 1010120923-.
13. Tachebele B, Abebe M, Addis Z, Mesfin N. Metabolic syndrome among hypertensive patients at University of Gondar Hospital, North West Ethiopia: a cross sectional study. BMC cardiovascular disorders. 2014 Dec;14(1):1-9.
14. Sobko T, Trindade D, Lao QX, Wong M, Io TK, Wa CK, Gu K. Men in Macau SAR have higher prevalence in metabolic syndrome and among related metabolic components: a cross-sectional Macau Health Survey. BMC Public Health. 2014 Dec; 14(1):1-8.
15. Jouyandeh Z, Nayebzadeh F, Qorbani M, Asadi M. Metabolic syndrome and menopause. Journal of Diabetes & Metabolic Disorders. 2013 Dec;12(1):1-4.

16. Binh TQ, Phuong PT, Nhung BT. Metabolic syndrome among a middle-aged population in the Red River Delta region of Vietnam. BMC endocrine disorders. 2014 Dec;14(1): 1-9.
17. Shaper AG, Pocock SJ, Walker M, Cohen NM, Wale CJ, Thomson AG. British Regional Heart Study: cardiovascular risk factors in middle-aged men in 24 towns. Br Med J (Clin Res Ed). 1981 Jul 18; 283(6285):179-86.
18. Shepherd J, Blauw GJ, Murphy MB, Cobbe SM, Bollen EL, Buckley BM, Ford I, Jukema JW, Hyland M, Gaw A, Lagaay AM. The design of a prospective study of pravastatin in the elderly at risk (PROSPER). The American journal of cardiology. 1999 Nov 15;84(10):1192-7.
19. Lofgren I, Herron K, Zern T, West K, Patalay M, Shachter NS, Koo SI, Fernandez ML. Waist circumference is a better predictor than body mass index of coronary heart disease risk in overweight premenopausal women. The Journal of nutrition. 2004 May;134(5):1071-6.
20. Paniagua L, Lohsoonthorn V, Lertmaharit S, Jiamjarasrangsi W, Williams MA. Comparison of waist circumference, body mass index, percent body fat and other measure of adiposity in identifying cardiovascular disease risks among Thai adults. Obesity research & clinical practice. 2008 Sep 1;2(3):215-23.
21. Deepa R, Sandeep S, Mohan V. Abdominal obesity visceral fat and type 2 diabetes-Asian Indian Phenotype.

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