Original Article ISSN (O):2395-2822; ISSN (P):2395-2814

To Study the Association of Cerebrovascular Disease with Metabolic Syndrome in Western Uttar Pradesh

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Received: July 2019
Accepted: July 2019

ABSTRACT

Background: Objective: To Study the association of cerebrovascular disease with metabolic syndrome. **Methods:** A Total 104 patients were included in this study & investigated for cerebrovascular disease associated with metabolic syndrome or not. A study of presence or absence of metabolic syndrome in cerebrovascular disease was done. P value was calculated by using analysis of variance test (ANOVA) & P value <0.05 was considered as statistically significant. **Results:** Total 104 patients were included in this study in 72 patients (69.23%) were suffering from metabolic syndrome and 32 patient (30.77%) were not suffering from metabolic syndrome. Most of the patients suffering from cerebrovascular disease associated with metabolic syndrome were of older age groups (61.11%)>61 years. Second most common group was (22.22%) 51-60 years. Other patients of cerebrovascular disease not suffering from metabolic syndrome (56.25%) in 51-60 years followed by (31.25%) in 41-50 years. Amongst the patients suffering from cerebrovascular accident and metabolic syndrome males outnumbered females, although this data is not statistically significant p=0.4. Among the Cerebrovascular accident patient group prevalence was highest therefore raised fasting blood sugar (n=58) (80.55%) and low HDL values (75.2%), whereas it was highest for Hypertension (88.89%). In the cerebrovascular accident group out of total 104 patients 72%(n=72) were suffering from metabolic syndrome and 30.77%(n=32) were not suffering from metabolic syndrome there is positive correlation between metabolic syndrome and cerebrovascular accident .Using Test for equality for proportion (z-score) this data is found to be statistically significant. **Conclusion:** In cerebrovascular accident group (total patients =104) 67.5%(n=108) were having 3 risk factors, 50%(n=80) were having 4 risk factors and 11.25%(n=18) were having 5 risk factors of metabolic syndrome among the cases .Among the patients suffering from cerebrovascular accident (total patients =104) the prevalence of hypertension was 88.89%(n=64),of low HDL was 75.2%(n=54),of high TGs was 80.55%(n=58),of raised waist circumference was 58.32%(n=42) and of increased fasting blood sugar was 80.55%(n=58) in the case group.

Keywords: Lipid level, Coronary artery disease (CAD), Metabolic syndrome(MS), High density lipoprotein (HDL),Low density lipoprotein (LDL),Triglycerides(TGL) ,NCEP ATP III,NAFLD(Non-alcoholic fatty liver disease).

INTRODUCTION

Whereas the previous epidemic of coronary heart disease between 1910 and the 1960s was largely attributed to increased intake of saturated fat, it is quite plausible that the current epidemic of obesity and metabolic syndrome will lead the new epidemic of coronary heart disease, throughout the world. Because MS is associated with increased risk of CHD, it has also been called the "Deadly Quartet" or "cardiovascular dysmetabolic syndrome.[1,2] The metabolic syndrome, a concurrence of disturbed glucose and insulin metabolism, overweight and abdominal fat distribution, mild dyslipidemia and hypertension, is associated with subsequent development of type 2 diabetes mellitus and cerebrovascular disease (CVD).[3] Metabolic syndrome is a combination of medical disorders that increase the risk of developing cerebrovascular disease and diabetes. It affects one in five people, and prevalence increases with age. Some studies estimate the prevalance in the USA to be up to 25% of the population.[4] Metabolic syndrome is also known as metabolic syndrome X, syndrome X, Insulin resistance syndrome, Reaven's syndrome, and CHAOS (Australia). Symptoms and features are:

- Fasting hyperglycemia —diabetes mellitus type2 or impaired fasting glucose, impaired glucose tolerance, or insulin resistance.
- High blood pressure
- Central obesity (also known as visceral, male-pattern or apple-shaped adiposity), overweight with fat deposits mainly around the waist; Decreased HDL cholesterol; Elevated Triglyceride; Associated

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diseases and signs are: hyperuricemia, fatty liver (especially in concurrent obesity) progressing to non-alcoholic fatty liver disease, polycystic ovarian disease (in women) and Acnathosis nigricans. According to Scott Grundy, University of Texas Southwestern Medical School, Dallas, Texas, the intent was just to update the NCEP ATP III definition and not create a new definition.3,5:Elevated waist circumference: Men — Equal to or greater than 40 inches (102 cm) ,Women — Equal to or greater than 35 inches (88 cm) Elevated triglycerides: Equal to or greater than 150 mg/dL Reduced HDL ("good") cholesterol: Men — Less than 40 mg/dL ,Women — Less than 50 mg/dL Elevated blood pressure: Equal to or greater than 130/85 mm Hg or use of medication for hypertension .Elevated fasting glucose: Equal to or greater than 100 mg/dL (5.6 mmol/L) or use of medication for hyperglycemia.

MATERIALS AND METHODS

The study was approved by the Ethical Committee of the Institute. This was a hospital based cross-sectional study conducted between May 2018 to May 2019 in the Department of General Medicine, Saraswathi Institute of Medical Science, Pilkhuwa, Hapur Uttar Pradesh, India. A total of 104 patients were included in the study. All patients of age more than 40 yrs, who admitted in ICU for cerebrovascular accident. All Demographic data such as age, sex, height and weight were recorded. A detailed clinical history for all the patients was taken and careful general examinations were done. The Exclusion criteria are patient on lipid lowering drugs, When Alcohol consumption is>30gm/d and >20gm/d in male and female respectively, Diabetes mellitus and very low and high Body Mass Index (BMI). BMI was calculated by using the formula [weight (kg)/height (meter2)]. Lipid profile such as total cholesterol, serum triglycerides, serum high-density lipoprotein (HDL), serum low-density lipoprotein (LDL) and serum very low-density lipoprotein (VLDL) was measured. ECG, TMT, Troponin-T or Echocardiography proven of all the patients was done for diagnosing and proven ischemic heart disease. Case selection- Patients in above mentioned groups must fulfill the criterion for metabolic syndrome, which were as following ; (1) Elevated waist circumference: Men — Equal to or greater than 40 inches (102 cm), Women — Equal to or greater than 35 inches (88 cm), (2) Elevated triglycerides: Equal to or greater than 150 mg/dL, (3) Reduced HDL ("good") cholesterol: Men-Less than 40 mg/dL, Women — Less than 50 mg/dL, (4) Elevated blood pressure: Equal to or greater than 130/85 mm Hg or use of medication for hypertension, (5) Elevated fasting glucose: Equal to or greater than 100 mg/dL (5.6 mmol/L) or use of medication for hyperglycemia. (3 out of 5 must be present). Control Selection- (1) Control subjects were selected from the patients who were admitted in our hospital due to coronary artery disease but were not suffering from metabolic syndrome. (2) Control subjects were matched according to age and sex group. Informed consent was taken from each of the patients before including them in this study.

Statistical analysis

Data was collected and analyzed using SPSS software. The dichotomous/categorical variables were compared by using Chi- square exact test. More than two continuous variables were compared by using Kruskall- wallis test with multiple comparison tests. P value was calculated by using Analysis of variance test(ANOVA) , Z score Test for equality for proportion (z-score) and p value <0.05 was considered statistically significant.

RESULTS

Table 1: Sample selection-case and control groups

Patients of cerebrovascular disease suffering from metabolic syndrome	72	69.23%
Patients of cerebrovascular disease not suffering from metabolic syndrome	32	30.77%

Most of the patients suffering from cerebrovascular accident with metabolic syndrome were of older age groups (>61years). Second most common group was 51-60years. Most of the patients suffering from coronary artery disease without metabolic syndrome were of older age groups (>61years) followed by 41-50years.

Table 2: Frequency distribution of cases and controls in different age groups

Variable	Patients of CVA suffering from metabolic syndrome	Patients of CVA not suffering from metabolic syndrome	
Age (in years)			
41-50	12(16.67%)	10(31.25%)	22
51-60	16(22.22%)	4(12.50%)	20
>60	44(61.11%)	18(56.25%)	62
Total	72	32	104

Table 3: Distribution among Gender wise

Variable	Patients of CVA suffering from metabolic syndrome	Patients of CVA not suffering from metabolic syndrome	Significance	P value
Male	48(66.67%)	26(81.25%)	X2=2.295 df=1	0.1297
Female	24(33.33%)	6(18.75%)		

Among the patients suffering from cerebrovascular disease & metabolic syndrome males outnumber females, although this data is not statistically significant.

Table 4: Frequency of Metabolic Syndrome in cerebrovascular disease

Patient groups	Metabolic syndrome present	Metabolic syndrome absent	Significance
Type of vascular disease			Z-score
Cerebrovascular disease	72(69.23%)	32(30.77%)	3.60727

[Table 4] show In the cerebrovascular disease group out of total 104 patients 72 patients (69.23%) are suffering from metabolic syndrome. Using Test for equality for proportion (z-score) this data is found to be statistically significant (Z score=3.60727)

Table 5: Frequency distribution of components of Metabolic Syndrome

Patient groups	patients with CVA& Metabolic syndrome	patients of CVA without Metabolic syndrome
Risk factors		
1.hypertension	64(88.89%)	20(62.51%)
2.FBS>100	58(80.55%)	2(6.25%)
3.raised waist circumference	42(58.33%)	2(6.25%)
4.low HDL values	54(75%)	2(6.25%)
5.high TGs values	58(80.55%)	2(6.25%)

Among the cerebrovascular disease patients group prevalence was highest that for raised Fasting blood sugar (n=58) (80.55%) & low HDL values (n=54) (75%) whereas it was highest that for hypertension (n=64) (88.89%). The low prevalence of hypertension may be due to reduced LV contractile function secondary to ischemic myocardial dysfunction. Among the female patients maximum were suffering from raised fasting blood sugar values 86.95% (n=44) followed by raised waist circumference 82.60% (n=40) and least with low HDL values 73.91% (n=36), high TGs values 73.91% (n=36) and hypertension 73.91% (n=36). Among the patients suffering from coronary artery disease (total patients =44) the prevalence of hypertension was 18.18% (n=8), of low HDL was 68.18% (n=30), of high TGs was 9.09% (n=4), of raised waist circumference was 13.63% (n=6) and of increased fasting blood sugar was 18.18% (n=8) in the control group. Case control study is recommended to find better understanding of association of metabolic syndrome in patients of cerebrovascular disease.

DISCUSSION

The present study was undertaken with the aim: To study the association of cerebrovascular disease with metabolic syndrome. The sample for patient group was drawn from the patients admitted in the medicine and neurology department. A total number of 104 patients of coronary artery disease were screened for metabolic syndrome who fulfilled the selection criteria as case group. The patients who were not suffering from metabolic syndrome are taken as control group. National Cholesterol Education Program adult treatment panel-III (ATP-III) was taken as a criterion to define metabolic syndrome. Which is as following; (1) Elevated waist circumference: (A) Men — Equal to or greater than 40 inches (102 cm), (B) Women — Equal to or greater than 35 inches (88 cm). (2)Elevated triglycerides: Equal to or greater than 150 mg/dL. (3) Reduced HDL ("good") cholesterol: (A) Men — Less than 40 mg/dL, (B) Women — Less than 50 mg/dL. (4) Elevated blood pressure: Equal to or greater than 130/85 mm Hg or use of medication for hypertension. (5) Elevated fasting glucose: Equal to or greater than 100 mg/dL (5.6 mmol/L) or use of medication for hyperglycemia. (3 out of 5 must be present). In the present study, the overall prevalence of metabolic syndrome was found 69.37% in patient groups. The prevalence was 70% in cerebrovascular disease group. No subject of control group could complete the criteria for the metabolic syndrome. The data shows that there is a positive correlation of cerebrovascular disease with metabolic syndrome. Ninomiya et al,[19] have evaluated the association between Metabolic syndrome and history of myocardial infarction and/or stroke among the participants in the Third National Health and Nutrition Examination Survey (NHANES III). On the basis of participants self-reported histories, they found that the presence of metabolic syndrome was associated with increased risk of myocardial infarction and stroke.[6] These findings give further credence to the prevailing thinking that the presence of Metabolic syndrome identifies a cohort of the population that is at substantial risk of cerebrovascular disease .There are only limited previous data showing the association of Metabolic syndrome with cerebrovascular disease.[7,8] The study by Lakka et al,[7] prospectively examined the relationship between Metabolic syndrome and cerebrovascular disease and overall mortality rate in middle-aged men participating in the population-based Kuopio Ischemic Heart Disease Risk Factor Study, who were followed up for 11.4 years. Using both the ATP III (Third Report of the Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults [Adult Treatment Panel III]) and World Health Organization definitions, Lakka et al,[7] demonstrated that even in the absence of diabetes or prior cerebrovascular disease, the presence of Metabolic syndrome was associated with significant increase in the risk of cerebrovascular disease and all-cause mortality. According to Northern Manhattan Study,[9] The metabolic

syndrome was associated with increased risk of cardiovascular events after adjustment for socio-demographic and risk factors. The effect of the metabolic syndrome on cerebrovascular diseases, risk was greater among women than men and among Hispanics compared with blacks and whites. The conclusion is that the metabolic syndrome is an important risk factor for cerebrovascular disease, with differential effects by sex and race/ethnicity. According to American Stroke Association meeting report 10 (07 Feb 2004) The Metabolic syndrome - the simultaneous occurrence of multiple cardiovascular risk factors - may almost double the risk of stroke, researchers reported today at the American Stroke Association's 29th International Stroke Conference. The findings suggest that treating the risk-factor components of metabolic syndrome might reduce stroke risk before the onset of Type 2 diabetes. In the present study the prevalence of metabolic syndrome and associated diseases (cerebrovascular disease) increases with age. In the study maximum numbers of patients were more than 61 years of age, next more common age group was 51 to 60 years. According to study by Alberti KG et al,[11,18] the prevalence of metabolic syndrome increases with age , with nearly 60% of women ages 45-49 and 45% of men ages 45-49 meeting National Cholesterol Education Program adult treatment panel-III criterion. Greater industrialization worldwide is associated with rising rates of obesity, which is anticipated to dramatically increase prevalence of the metabolic syndrome, especially as the population ages. In the present study, among the male patients of metabolic syndrome, frequency of hypertension was highest and that for waist circumference was lowest among the different components of metabolic syndrome. Among the female patients of metabolic syndrome, frequency of raised fasting blood sugar was highest followed by raised waist circumference and that for Low HDL values, High TGs values & Hypertension were lowest among the different components of metabolic syndrome. According to National Health and Nutrition Examination Survey (NHANES) III12Increases in waist circumference predominate in women whereas fasting triglycerides >150 mg/dL and hypertension are more likely in men. In the present study the frequency of cerebrovascular disease were higher among individuals with sedentary working habits. The frequency of cases in the sedentary working habits group was almost double than that of active labourers group. It suggests that sedentary life style is a risk factor to develop atherosclerotic vascular diseases secondary to increased incidence of metabolic syndrome in this population groups. Although this data was not found to be statistically significant. According to International Journal of Epidemiology,[13] lack of physical activity is a modifiable risk factor for both total stroke and stroke subtypes. Moderately intense physical activity is sufficient to achieve risk reduction. According to The Framingham Study overall mortality and mortality due to cerebrovascular and ischemic heart disease were inversely related to the level of physical activity for men.[14] The effect of being sedentary on mortality is rather modest compared to the effects of other risk factors but, in mortality due to ischemic heart disease, it persists when these factors are taken into account. For women, the effect is negligible. In occlusive peripheral arterial disease, and cardiac failure, an inverse relationship is noted, but does not reach statistical significance. There is a statistically significant association with incidence of ischemic heart disease and with incidence of all forms of cerebrovascular disease when they are taken together. Little correlation was noted between physical activity level (at the generally low level found) and the level of major risk factors. In the present study the frequency of cerebrovascular disease were higher among individuals residing in urban or relatively industrialized areas of state. In the cerebrovascular disease group 38% cases were residing in urban areas whereas only 34.1% cases were residing in rural areas, although this data is not statistically significant. It may be due to the difference in the approachability of these two population groups attending the hospital. Frenk, et al,[15] have argued that many of the non-communicable diseases like heart disease , stroke and cancer are a result of defective process of industrialization that has placed more value on economic growth rather than on human welfare. In developing countries the unequal distribution of wealth and health service coverage results in the widening of the gap in the health status among social classes and geographical regions. Omran noticed as a general pattern, irrespective of the epidemiological transition model, that mortality decline due to non-communicable diseases like heart disease, stroke and cancer starts among the higher social classes with the lower classes eventually catching up.[16,17]

CONCLUSION

In this study we have found that cerebrovascular disease with metabolic syndrome are common in Indian society & is in increasing trend. Apart from this other causes of cerebrovascular disease with metabolic syndrome is sedentary life style & less work by Indian society especially in urban area. We found abnormal lipid profile levels amongst patients with fatty liver. In last we recommended that a large case control study is required to find better understanding of cerebrovascular disease with metabolic syndrome.

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How to cite this article: Yatish, Tyagi A, Saran A, Khari S, Kem A. To Study the Association of Cerebrovascular Disease with Metabolic Syndrome in Western Uttar Pradesh. Ann. Int. Med. Den. Res. 2019; 5(5):SG01-SG05.

Source of Support: Nil, **Conflict of Interest:** None declared