

Research Article

Determinants of Metabolic Syndrome in Acute Ischemic Stroke patients

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Abstract: The aim of the study was to identify the determinants of metabolic syndrome and their association with ischemic strokes in those patients admitted in medical wards in a tertiary care centre in Thiruvananthapuram based on clinical features and laboratory parameters. Patients admitted in medical wards with acute ischemic stroke who were above 45 years age, who had no previous history of CAD, POVD, CVA or valvular heart diseases were taken as cases and their almost age as well as sex-matched bystanders who do not had any disease were taken as controls. 112 cases and 112 controls were selected for the study. Data was collected by taking detailed history from patients and their bystanders (if patient is too sick relevant data collected from bystanders), clinical examination and obtaining various lab parameters. The study showed significant association with diabetes, high blood pressure values and higher Body Mass Index (BMI) values with stroke but did not show any significant association between hyperlipidemia and stroke. The study also showed significant association of metabolic syndrome with Ischemic stroke.

Keywords: Metabolic syndrome, Diabetes mellitus, Body Mass Index, Hypertension, Ischemic stroke, Microalbuminuria

INTRODUCTION

Stroke is a leading cause of death and disability in developing countries [1, 2]. Stroke or Cerebrovascular Accident (CVA) is defined as abrupt onset of a neurological deficit that is attributable to a focal vascular cause. Stroke has occurred if the neurologic signs and symptoms last for more than 24 hours. The contribution of established vascular risk factors to ischemic strokes has not been evaluated systematically in Kerala [2]. The combinations of these risk factors known as Metabolic Syndrome is receiving increased attention nowadays due to changing lifestyle. Determinants of metabolic syndrome are high BP, high fasting blood sugar, abdominal obesity and high cholesterol [3, 4, 5]. While the pathogenesis of the metabolic syndrome and each of its components is complex and not well understood, central obesity [6, 7] and insulin resistance are acknowledged as important causative factors. There are no well-accepted criteria for diagnosing the metabolic syndrome. The criteria proposed by the National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III) [6], with minor modifications, are currently recommended and widely used. In our study we aimed to identify the determinants of metabolic syndrome and their association with ischemic strokes in those patients admitted in medical wards in a tertiary care centre based on clinical features and laboratory parameters. The study was based on the hypothesis that metabolic syndrome is a strong contributor of ischemic strokes.

MATERIAL AND METHODS

This study is done in patients admitted with Ischemic Strokes under Medicine Department in a Tertiary Care Centre in Thiruvananthapuram, Kerala over a period of one year. Around 6 – 10 acute stroke patients were admitted in the wards daily. Diagnosis confirmed by CT scan done under Radiology Department. Controls were selected from, among the bystanders of these patients. Various laboratory facilities were also available in this hospital so that all tests required for the study were done in hospital. Patients admitted in medical wards with acute ischemic stroke who were above 45 years age, who had no previous history of CAD, POVD, CVA or valvular heart diseases were taken as cases and their almost age as well as sex-matched bystanders who do not had any disease were taken as controls. The study & control population included 112 patients & bystanders respectively. Data was collected by taking detailed history from patients and their bystanders (if patient is too sick relevant data collected from bystanders), clinical examination and obtaining various lab parameters according to the following proforma.

In data analysis, proportion of exposure among cases and controls were worked out. Odds ratio of exposure was determined. Logistic regression and adjusted odds ratio were worked out.

RESULTS

Total of 112 cases and 112 controls were enrolled in the study. Median ages of cases were 61.8 and of controls were 58.5 years. Majority of age group in both groups were between 50-59 years (comprises 38.4% in

study group and 41.1% in control group). Males outnumbered females in both groups (60.7% males and 39.3% females in study group and 53.6% males and 46% females in control group). Study group had 41.1% of smokers and control group had 23.2% of smokers. History of smoking shows significant association with stroke (OR -2.31). Study group had 21.4% alcoholics and 14.3% in control group. No significant association of stroke with alcoholism found in this study. 68.8% of study group had hypertension and 29.5% in control group had hypertension. This reveals strong association of hypertension with stroke. Those having BP more or equal to 130/85 were 99.1% in study group and in control it was 89.3%. There was a strong association with high BP and stroke. Mean systolic BP in study group was 164.4 mm of Hg. Mean systolic BP in control group was 141.8 mm of Hg. Mean diastolic BP in study group was 98.6 mm of Hg. Mean diastolic BP in control group was 87.2 mm of Hg. Mean weight in study group was 74.6 kg and in control was 68.6 kg. BMI more or equal to 30 kg/m² in study group was 37.5% and in control was 16.1% (OR - 3.13). There was significant association of BMI with stroke. Average waist circumference in study group was 102 ±13.1 and in control was 99.4 ±13.7 cm. Study group had 32.1% diabetic patients 19.6% in control group. There was significant association (OR - 1.94) of diabetes with stroke in this study. Patients in study group having FBS more or equal to 100 mg% were 76.8% and in control

group it was 73.2%. Triglycerides in study group having more or equal to 150 mg% were 15.2% and in control group it was 20.5%. Study group having HDL less or equal to 40 mg% were 38.4% and in control group 36.6%. No significant association got between hyperlipidemia and stroke. Significant urine microalbuminuria in study group was 31.3% and in control group were 8.0%. There was strong association (OR - 5.2) of this with ischemic stroke found in this study. Patients having metabolic syndrome by National Cholesterol Education Program Adult Treatment Panel (NCEP ATP III) criteria (Table.1) in study group were 71.4% and in control group were 51.8%. This shows significant association (OR - 2.31) of metabolic syndrome with ischemic stroke. Patients having metabolic syndrome by international Diabetes Federation (IDF) criteria (Table 2) in study group were 79.5% and in controls were 60.7%. This shows significant association (OR - 2.5) of metabolic syndrome with ischemic stroke. Based on any criteria, metabolic syndrome in study group was 82.1% and in controls was 61.6%. There was strong association (OR - 2.87) of metabolic syndrome with ischemic stroke. Based on any criteria, in study group, 73.5% of males and 95.5% of females had metabolic syndrome and in control group 55% of males and 69.2% of females had metabolic syndrome. This showed females had more prevalence of metabolic syndrome in this study.

Table 1: ATP III criteria for identification of metabolic syndrome

<ul style="list-style-type: none"> • Abdominal obesity (waist circumference): men > 102 cm (40 in); women > 88 cm (35 in) • Triglycerides ≥ 150 mg/dl • HDL cholesterol: men < 40 mg/dl; women < 50 mg/dl • Blood pressure ≥ 130/≥ 85 mmHg • Fasting glucose ≥ 110 mg/dl

Table 2: The International Diabetes Federation (IDF) definitions

Raised triglycerides	≥ 150 mg/dL (1.7 mmol/L) or specific treatment for this lipid abnormality
Reduced HDL cholesterol	< 40 mg/dL (1.03 mmol/L) in males < 50 mg/dL (1.29 mmol/L) in females or specific treatment for this lipid abnormality
Raised blood pressure	systolic BP ≥ 130 or diastolic BP ≥ 85 mm Hg or treatment of previously diagnosed hypertension
Raised fasting plasma glucose	(FPG) ≥ 100 mg/dL (5.6 mmol/L), or previously diagnosed type 2 diabetes If above 5.6 mmol/L or 100 mg/dL, OGTT is strongly recommended but is not necessary to define presence of the syndrome.

DISCUSSION

Risk factors for type 2 diabetes mellitus and cardiovascular disease are usually present together. This condition is known as metabolic syndrome. The World

Health Organization (WHO), IDF and the NCEP ATP III definitions of metabolic syndrome are different. Insulin resistance seems to be the underlying mechanism linking different components of the

syndrome together. Insulin resistance has strong association with central or abdominal obesity. Increased tendency to develop central obesity makes Asian Indians prone to develop metabolic syndrome, which has resulted in the growing epidemic of type 2 diabetes, stroke and coronary heart disease currently sweeping the Indian subcontinent. In this study also we got strong association of metabolic syndrome with ischemic stroke, whichever criteria we followed. Also females have more prevalence of metabolic syndrome than males (in study group, 73.5% of males and 95.5% of females had metabolic syndrome and in control group 55% of males and 69.2% of females had metabolic syndrome). Based on any criteria, metabolic syndrome in study group was 82.1% and in controls was 61.6%. There was strong association (OR - 2.87) of metabolic syndrome with ischemic stroke in this study also. Various determinants of metabolic syndrome like HTN, DM, increased waist circumference and BMI, urine micro albuminuria also showed strong association with ischemic stroke. In this study, hyperlipidemia did not show any significant association as expected. Components of metabolic syndrome and smoking were also associated with ischemic stroke strongly. Novel markers for additional metabolic measurements like hsCRP, adiponectin, fasting insulin levels, DEXA, etc. were not measured due to lack of lab facilities in our institution for the same. In short, this study concluded the clustering of cardiovascular risk factors called metabolic syndrome increases the risk of cardiovascular morbidity, and its identification may thus be important in risk assessment and treatment of patients.

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