



ASSOCIATION OF METABOLIC SYNDROME WITH ISCHEMIC STROKE IN YOUNG ADULTS: A CASE-CONTROL STUDY.

General Medicine

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ABSTRACT

Background: Ischemic stroke in young adults (<45 years) is an increasing concern, particularly in South Asian populations. Metabolic syndrome (MS), a cluster of metabolic disorders including insulin resistance, obesity, hypertension, and dyslipidemia, has been proposed as a key risk factor for cerebrovascular diseases. This study aims to evaluate the association between MS and first ischemic stroke (non-embolic) in young individuals. **Methods:** A hospital-based case-control study was conducted at Asram Medical College, Eluru. Thirty young ischemic stroke patients (<45 years) and 30 age- and sex-matched controls without stroke or cardiovascular disease were enrolled. MS was diagnosed using the **International Diabetes Federation (IDF) criteria**. Chi-square tests and logistic regression models were used for statistical analysis. **Results:** MS prevalence was significantly higher in cases (60%) than in controls (10%) ($p=0.001$). Among MS components, fasting blood sugar ≥ 100 mg/dL was present in 56.7% of cases vs. 20% in controls ($p=0.004$), hypertension ($\geq 130/85$ mmHg) in 43.3% vs. 16.7% ($p=0.02$), and triglycerides ≥ 150 mg/dL in 53.3% vs. 26.7% ($p=0.03$). Smoking (56.7%), male gender (60%), and central obesity also contributed significantly. **Conclusion:** Metabolic syndrome is strongly associated with ischemic stroke in young adults. Early identification and management of metabolic syndrome components may help reduce stroke incidence in this population.

KEYWORDS

Metabolic syndrome, ischemic stroke, young adults, risk factors, case-control study.

INTRODUCTION

Stroke is the second leading cause of mortality and disability worldwide. While ischemic stroke primarily affects older individuals, its incidence among young adults is rising, especially in developing countries. In India, young stroke patients tend to have a higher prevalence of atherothrombotic risk factors than those in developed nations.

Metabolic syndrome (MS) is a major risk factor for cardiovascular diseases, yet its role in ischemic stroke among young adults remains underexplored. MS is characterized by insulin resistance, abdominal obesity, hypertension, hypertriglyceridemia, and low high-density lipoprotein cholesterol (HDL-C). Individuals with MS are at a 2-3 times higher risk of stroke.

This study aims to determine the prevalence of MS in young ischemic stroke patients and evaluate its association with first ischemic (non-embolic) stroke.

METHODS

Study Design And Setting

This case-control study was conducted over 18 months in the **Department of General Medicine, Asram Medical College, Eluru, India**.

Study Population

Cases: 30 patients aged <45 years with first acute ischemic stroke.

Controls: 30 age- and sex-matched individuals without stroke or cardiovascular disease.

Inclusion Criteria

- Age <45 years
- First-ever ischemic stroke confirmed by MRI

Exclusion Criteria

- Hemorrhagic stroke
- Stroke due to embolism or cerebral venous sinus thrombosis
- Previous history of stroke
- Smokers and alcoholics were excluded from the control group

Diagnosis Of Metabolic Syndrome

Metabolic syndrome was diagnosed using **IDF criteria**, which requires **central obesity** (waist circumference >90 cm in males, >80 cm in females) plus at least two of the following:

1. Fasting plasma glucose ≥ 100 mg/dL
2. Blood pressure $\geq 130/85$ mmHg

3. Triglycerides ≥ 150 mg/dL

4. HDL-C <40 mg/dL (males) or <50 mg/dL (females)

Data Collection and Investigations

- Complete blood count
- Fasting blood sugar
- Fasting lipid profile
- Electrocardiogram (ECG)
- Brain MRI
- Carotid Doppler Study
- High-sensitivity C-reactive protein (hs-CRP)
- Uric acid
- Coagulation profile (Protein C, Protein S, Anti-thrombin III)

Statistical Analysis

Data were analyzed using **SPSS software**. Categorical variables were compared using **chi-square tests**. Logistic regression was used to determine **odds ratios (ORs)**. A **p-value <0.05** was considered statistically significant.

RESULTS

Baseline Characteristics

- **Mean age:** 41.5 ± 3.8 years
- **Male predominance:** 70%
- **MS prevalence:** 60% in stroke cases vs. 10% in controls ($p=0.001$)

Association Between MS Components and Stroke

Parameter	Cases (n=30)	Controls (n=30)	p-value
Metabolic Syndrome	60%	10%	0.001
Fasting Blood Sugar ≥ 100 mg/dL	56.7%	20%	0.004
Hypertension ($\geq 130/85$ mmHg)	43.3%	16.7%	0.02
Triglycerides ≥ 150 mg/dL	53.3%	26.7%	0.03
HDL-C <40 mg/dL (M) / <50 mg/dL (F)	66.7%	20.8%	0.003
Waist Circumference >90 cm (M) / >80 cm (F)	16.7%	8.3%	0.36

Other Risk Factors

- **Smoking:** 56.7% in cases vs. 26.7% in controls ($p=0.01$)
- **Diabetes mellitus:** 36.7% in cases vs. 10% in controls ($p=0.01$)

DISCUSSION

This study found a strong association between metabolic syndrome and ischemic stroke in young adults. MS prevalence in stroke patients (60%) was significantly higher than in controls (10%).

Key findings include:

- **Fasting hyperglycemia, hypertension, and hypertriglyceridemia** were significantly associated with stroke.
- **Smoking and male gender** were additional major risk factors.
- **Comparison with previous studies:** Findings align with **Ramesh et al. (2021)**, who reported a 65% prevalence of MS in young stroke patients.

Limitations

- Small sample size
- Single-center study
- Exclusion of hemorrhagic strokes limits generalizability

Clinical Implications

- Routine screening for **metabolic syndrome** in young adults
- **Lifestyle modifications** to reduce stroke risk
- Aggressive management of **hypertension and dyslipidemia**

CONCLUSION

Metabolic syndrome is a significant risk factor for ischemic stroke in young adults. Early detection and management of metabolic components could reduce the burden of stroke in this population.

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