ORIGINAL RESEARCH PAPER
Volume - 14 | Issue - 04 | April - 2025 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

CLINICO DEMOGRAPHIC AND RADIOLOGICAL PROFILE OF SYMPTOMATIC INTRACRANIAL ATHEROSCLEROTIC DISEASE PATIENTS

Neurology

Ira Chaudhary	Department of Neurology, Mahatma Gandhi Medical College and Hospital, Jaipur, India
Gourav Goyal	Department of Neurology, Mahatma Gandhi Medical College and Hospital, Jaipur, India
Kashish Chaudhary	Department of Medicine, Government Medical College, Faridkot, Punjab.
Himanshu Kaushal	Department of Neurology, Mahatma Gandhi Medical College and Hospital, Jaipur, India

ABSTRACT

With a 15% chance of recurrence, intracranial atherosclerotic disease is one of the main causes of stroke. Finding the profile of risk factors and arteries that are more frequently affected in ICAD patients is vital. Thus, the goal of the study was to examine the clinical, radiological, and demographic profiles of patients who had symptomatic intracranial atherosclerotic disease. Retrospective analysis of patients with ages ranging from 18 to 100 years old who were admitted to a tertiary care hospital in India between January 2019 and December 2023 was conducted. Patients with angiographically proven intracranial atherosclerotic disease and symptoms suggestive of cerebral ischemia were included in this investigation. Among 200, 131 patients based on inclusion criteria were enrolled in the study and variables including demographics, risk factors, the vessel implicated, and degree of stenosis were evaluated. 131 of the 200 patients that were examined were part of the ICAD group, and their mean age was 62.60±10.94 years. In both groups, males were more frequently impacted. Smoking, drinking, CAD, diabetes mellitus, hypertension, and dyslipidemia were more common in the ICAD group (no statistical significance).The supraclinoid region of the ICA was the most frequently afflicted artery (left, 38.46 > Right, 23.07%), ; anterior circulation >posterior circulation (87.79 vs. 39.69).53.3% of supraclinoid ICA patients had moderate stenosis. In order to enhance preventative measures and identify new treatment targets, our study established the relationship between modifiable and non-modifiable risk factors and ICAD as well as the artery segment involved.

KEYWORDS

ICAD, clinical, radiological, demographic, profile.

INTRODUCTION

Cerebrovascular disease (CVD) is one of the primary causes of death worldwide. The most common cause of stroke globally is intracranial atherosclerotic disease ; however, different populations have varying prevalence rates of ICAD, with Asians, Hispanics, and African Americans looking to be the most impacted [1,36] In the first year, even with the finest medical care, patients with symptomatic ICAD have an increased risk of recurrent stroke of 12% [2] and up to 38% in certain cohort studies[3] . About half of the risk occurs in the first month due to the non-linear nature of this risk.[4-6] The term "intracranial atherosclerotic disease," or "ICAD," refers to atherosclerosis of the major cerebral arteries at the base of brain.[1,7-9]

In Asians, it is the cause of 30% to 50% of strokes. [10] The introduction of multislice CT allows for a thorough, high-resolution examination of cerebral vessels. CT angiography is the first-choice imaging modality for stroke patients[11] Using the established technique for the Warfarin-Aspirin Symptomatic Intracranial Disease Study (WASID), CT angiography determines the degree of stenosis of intracranial and extracranial vessels. [12] For the detection of occlusion and stenosis, CT angiography offers a strong positive predictive value of over 50% together with good sensitivity. When determining the precise location of artery occlusion in an acute ischemic stroke, CTA looks to be as accurate as more invasive procedures like DSA, but with comparatively lower risks and costs.[13]

Individuals who have experienced an acute ischaemic stroke or transient ischemic stroke are very susceptible to an early recurrence of stroke.[14] Earlier research has linked a number of risk factors—such as smoking, hyperlipidemia, advanced age, and male gender to large artery atherosclerosis, though the findings are debatable[15-17] Determining the risk factors for large artery atherosclerosis is crucial for developing better preventive measures.

So our aim of study was to identify clinico-demographic profile, risk factor profile and arteries affected with subsegment analysis for developmemt of better primary and secondary prevention measures and development of future management strategies. When reviewing the five distinct etiological subtypes of ischemic stroke, patients with large-artery atherosclerosis had the highest likelihood of experiencing an early recurrent stroke mainly involving territory of internal carotid artery.[18]

MATERIALS AND METHODS

In a tertiary care hospital in patients with symptoms suggestive of cerebral ischaemia and angiographically confirmed cerebrovascular atherosclerotic disease were included in this retrospective analysis from January 2019 to December 2023. 200 patients were included in this study. The patients' ages ranged from 18 to 100 years.

Patients with cerebral vascular atherosclerotic disease were selected using the North American symptomatic carotid endarterectomy trial approach [19] . This method included patients whose extracranial and intracranial arteries showed at least 30% narrowing in their luminal diameter on conventional angiography. The degree of stenosis was divided into four groups based on NASCET criteria: <50%, 50-69%, 70-99%, and 100% (occlusion).Near occlusion was included in the 70-99% stenosis category.

Hypertension was defined as having two separate readings of a systolic blood pressure of more than 140 mmHg or a diastolic blood pressure of more than 90 mmHg, or as being on antihypertensive medication. If the patient's fasting blood glucose level was more than 125 mg/dl and they were taking insulin or oral hypoglycemic medications at the time, they were diagnosed with diabetes mellitus. Dyslipidemia was defined by a history of the use of lipid-lowering drugs, fasting serum total cholesterol concentrations of ≥ 200 mg/dL, low-density lipoprotein cholesterol concentrations of ≥140 mg/dL, high-density lipoprotein cholesterol concentrations of ≤ 40 mg/dL, and triglyceride concentrations of ≥150 mg/dL. According to Centre for Disease Control and Prevention (CDC) current smoker is a person that has smoked 100 cigarettes in their lifetime and currently smokes either every day or some days. Coronary artery disease is defined as myocardial impairment due to an imbalance between coronary blood flow and myocardial requirements caused by changes in the coronary circulation. IHD comprises acute and temporary as well as chronic conditions, and may be due to functional changes or organic disease.

Patients were split into two groups based on whether or not they had ICAD. For each group, the risk factor , clinical profile and demographic data were examined. The most often afflicted arterial segment in the ICAD group was examined, and subsegmental analysis was also conducted. Statistical analysis was performed using SPSS version 22 and p value of less than 0.05 was considered significant.

RESULTS

200 patients in all were included and split into ICAD and non-ICAD groups. Patients in the ICAD group had an average age of 62.60 ±

10.94 years, while those in the non-ICAD group had an average age of 61.1± 10.46 years. The ICAD and non-ICAD groups showed a higher prevalence of males affected (73.3 vs. 79.7%), however, there was no statistical difference between the ICAD and non-ICAD groups .(P value: 0.34389; 0.31503) (Table1, 2).

When comparing the ICAD group to the non-ICAD group, the following risk factors showed higher frequency of association: hypertension (71% vs. 62.3%), diabetes mellitus (48.1% vs. 37.7%), dyslipidemia (32.8 vs. 24.6%), smoking (40.5% vs. 39.1%), coronary artery disease (9.2%. vs 7.2%) and alcoholism (9.2 vs. 7.2%). Regarding risk variables, there was no statistically significant association between the ICAD and non-ICAD groups. (Table 1, 2).

In terms of the clinical profile, the ICAD group had a higher frequency of focal neurological deficit, altered sensorium, vomiting, and seizures than the non-ICAD group (Table 1).

Angiographic Findings

On angiography, 200 individuals with angiographically confirmed cerebrovascular atherosclerotic lesions were examined. 52 of the 131 patients with atherosclerotic lesions in intracranial cerebral arteries had isolated involvement in intracranial arteries.(Fig-1).Among 52 individuals, the supraclinoid portion of the internal carotid artery was the most frequently afflicted artery (23.07% right side ; 38.46% left side). In terms of anterior circulation, MCA(19.23 % right; 30.8 % left), Cavernous ICA(17.3% right vs 23.07% left), ACA (3.85 right; 7.7 % left), ophthalmic (3.85 right), and communicating (3.85% right) came next. The most commonly afflicted artery in the posterior circulation was the vertebral artery's V4 segment (11.5%), which was followed by the PCA (7.7 right, 9.6% left), and the basilar artery (5.8%).(Table 4).

The anterior circulation was impacted more than the posterior circulation overall (87.79% vs. 39.69%).When the anterior and posterior circulation of the right and left sides were examined, the supraclinoid section of the ICA, which is more prevalent on the left than the right, showed statistical significance (Table 3) (P value: 0.04237).

In the ICAD group, the majority of patients exhibited mild stenosis (50%) followed by moderate (32.6%), severe (13.46%), and complete occlusion (3.85%) stenosis.

Subsegmental analysis revealed that the majority of patients (53.3%) had a moderate degree of stenosis in the supraclinoid artery, which is most frequently impacted in ICAD cases. The most frequently damaged artery in the posterior circulation, the vertebral artery's V4 segment, displayed severe stenosis in the majority of patients (75% on the right and 87.5% on the left). (Table 5)

DISCUSSION

Because the risk of stroke recurrence is substantial, even with aggressive medical treatment, ICAD presents a challenge for stroke prevention. [2] South Asians, who make approximately 25% of the global population, are an ethnic group that is expanding quickly and has particular genetic, biological, and environmental risk factors. [20-21] In affluent nations, Indians have a greater stroke death rate than White people. As a result, researching risk variables is crucial to enhancing preventative tactics and identifying novel therapy targets. In order to examine several factors related to age, sex, hypertension, diabetes mellitus, dyslipidemia, smoking, coronary artery disease, the artery implicated, subsegmental analysis, and degree of stenosis, we retrospectively evaluated 131 individuals with intracranial atherosclerosis.

Our research indicates that the ICAD group had a higher frequency of risk factor profile than the non-ICAD group. Seizures, altered sensorium, vomiting, and focal neurological impairments were more common in the ICAD group than in the non-ICAD group. In the ICAD group, anterior circulation was more impacted than posterior circulation. Supraclinoid portion of the ICA was the anterior circulation artery most frequently impacted, with a majority of patients exhibiting a moderate degree of stenosis.

The most significant risk factor for cerebral atherosclerosis is age[7,22-23]. Numerous autopsy and imaging investigations demonstrated that intracranial atherosclerosis (ICA) is more common and severe in older adults across all analyzed racial groups, with a different course of the disease than in extracranial arteries.[24-27] Patients with ICAD had an average age of 62.60± 10.94 years. Age-wise, there was no statistically significant difference between the ICAD and ECAD groups, which is similar to a meta analysis in the Asian population that found no statistically significant difference between the ICAD and non-ICAD groups.[16]

Our analysis revealed a majority of men over women in terms of gender. It was similar to a study by Kimde et al. that revealed a male preponderance [28]vs a study by Lei C. et al. that revealed a female preponderance[15,29]Furthermore, we did not discover any statistical distinction between the ICAD and non-ICAD cohorts. This disparity can be linked to the fact that male and female diseases progress differently. In contrast to women, who display comparatively modest atherosclerotic lesions until the sixth decade, with rapidly growing lesions thereafter, men showed a large increase in cerebral lesions in the fourth and fifth decades, which continuously progress with age. The degree of cerebral atherosclerosis was similar in the eighth and ninth decades for both sexes, but in the ninth and tenth decades, women had higher atherosclerotic scores. A unique risk factor profile stemming from the action of sex hormones, such as the established hypocholesterolemic effect of estrogens, has been proposed as an explanation for the observed sex variations. [30]

The association between hypertension and ICAD has been validated by numerous clinical investigations [28,31]Furthermore, the degree of ICAD has been connected to hypertension. Studies have indicated that populations with African and Asian heritage had higher rates of hypertension, which could account for their greater incidence of intracranial atherosclerosis. The current study also found that ICAD patients had a higher frequency of hypertension, but there was no statistically significant difference between the ICAD and non ICAD groups.

Certain risk factors, such as dyslipidemia and diabetes, have been shown to have a stronger correlation with intracranial atherosclerosis than with extracranial atherosclerosis. [32-33] One of the most prevalent forms of dyslipidemia in China is low high-density lipoprotein cholesterol, which has been linked to the development of intracranial atherosclerotic disease in a cohort of acute ischemic stroke patients. Our investigation, however, did not discover this association.

A few research revealed that smoking—particularly the length of time one smokes—may increase the incidence of cerebral lesions. Nonetheless, there are little comprehensive research on how smoking affects cerebral atherosclerosis. [1]In our investigation, the ICAD (40.5%) group and the non-ICAD (39.1%) group smoked nearly at the same rates.

Intracerebral lesions were associated with extensive coronary atherosclerotic disease,[8,11,60] and patients with contemporaneous lesions were at higher risk of experiencing further (fatal) vascular events. [24,34] According to our research, the ICAD group had a higher prevalence of coronary artery disease (9.2%) than the non-ICAD group (7.2%).Nevertheless, no statistical correlation was discovered.

Lesions in ICAD are mostly located in the anterior circulation. [35]Additionally, our research revealed that anterior circulation was more involved than posterior circulation. Resch J et al. and Mathur K et al. state that ICA was more frequently impacted in ICAD, mostly in the cavernous but also in the supraclinoid region [25-26]Additionally, our research revealed that the supraclinoid segment had the most engagement.

In terms of degree of stenosis, the majority of patients (<50%) had mild stenosis, which was followed by moderate, severe, and finally total occlusion.

In the majority of patients, the supraclinoid portion of the ICA displayed moderate stenosis.

Study Limitations

Our study's retrospective design, which increased its bias, was one of its drawbacks. Extrapolating our findings to the full population is difficult because we only used data from one centre for our study. Finally, because there was only one radiologist participating as an observer, observation bias was a greater risk.

CONCLUSION

In conclusion, ICAD remains a significant cause of ischemic stroke worldwide, particularly in certain ethnic groups. Our study contributes to the understanding of ICAD by highlighting specific demographic and clinical characteristics. Key takeaways include the higher prevalence of certain risk factors in ICAD patients, the predominance of anterior circulation involvement, and the varying degrees of stenosis observed. While some findings align with existing literature, others, such as the relationship between sex, smoking, and dyslipidemia with ICAD, warrant further exploration. Overall, these insights are valuable for developing more effective preventive strategies and targeted therapies for ICAD, especially in high-risk populations such as South Asians.

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