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Prevalence of Acute Coronary Syndrome and Various Risk Factors in Patients with Acute Stroke

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Abstract: ***Background: After acute coronary syndrome (ACS), stroke is the second leading cause of death worldwide. Both diseases share many risk factors such as hypertension, diabetes, dyslipidemia, and smoking. Patients with ACS are at great risk of recurrent ischemic events such as ischemic strokes, one of the most feared cardiovascular events because of the risk of long - term disability. We tried to estimate the prevalence of underlying ACS among patients with acute stroke. Methods: This cross - sectional study was done at Super Speciality Block L. L. R. M., Medical College, Meerut (UP). A total of 221 acute stroke cases were selected for the study. Detailed history, investigations, and physical examinations were done. The primary outcome was the prevalence of ACS and secondary outcomes were the prevalence of hypertension, smoking, dyslipidemia, diabetes mellitus, and previous history of stroke in stroke patients. Results: Most of the patients that presented to us were above 50 years of age with the mean age of 58years (SD = 9.16years). Male predominance was seen with a total of 152 (69%) cases. Out of 221patients, 98 (44%, p >0.05) had underlying ACS, with 66 cases (67%) with unstable angina, 24 (25%) with non - ST - elevation myocardial infarction (NSTEMI), and 8 (8%) with ST – elevation myocardial infarction (STEMI). Prevalence of risk factors in 221 stroke cases were, hypertension (176, 79%) and smoking (155, 71%). These results were statistically significant (p <0.05). Prevalence of Diabetes mellitus (102, 46%), Dyslipidemia (98, 44%), obesity (36, 16%) and previous stroke history (12, 6%) was statistically insignificant (p > 0.05). Conclusion: Acute coronary syndrome is still frequently present in patients with acute stroke. The need ofthe hour is to manage ACS efficiently so that its deadly complications such as stroke can be prevented.***

Keywords: acute coronary syndrome, stroke, hypertension, dyslipidemia, diabetes mellitus, smoking, obesity

1. Introduction

Stroke is the second leading cause of death worldwide after acute coronary syndrome (ACS). A lot of risk factors such as hypertension, diabetes, dyslipidemia, and smoking are shared by both disease. ACS is diagnosed when patients present with unstable angina, non - ST – elevation myocardial infarction (NSTEMI), or ST - elevation myocardial infarction (STEMI). Such patients have a wide spectrum of risks for death and cardiovascular ischemic events. Careful risk assessment of ACS patients helps clinicians to determine prognosis and may, therefore, beuseful in guiding management and providing valuable information to patients [1, 2]. ACS and some subtypes of ischemic stroke share similar pathophysiology, including inflammation and the development of atherosclerosis. The acute coronary syndrome can itself be a risk factor for stroke due to thromboembolism, or ischemia - induced atrial fibrillation, orstasis of blood. Several scoring methods, including GRACE (Global Registry of Acute Coronary Events) [3], TIMI (Thrombolysis in Myocardial Infarction) [4], and PURSUIT (Plateletglycoprotein IIb/IIIa in Unstable angina). Stroke is a rare but serious complication of acute coronary syndrome. The present study aims to check how many of the stroke patients presenting in the emergency and outpatient department have the underlying acute coronary syndrome.

2. Materials and Methods

Study design

This cross - sectional study took place at the Super Speciality Block, Lala Lajpat Rai Memorial, Medical College, Meerut, UP, India. Ethics committee approval was taken. The non - probability consecutive sampling technique was used. A sample of 221 acute stroke cases, from January 2022 to January 2023, presenting in emergency, outpatient and inpatient departments, was taken on board to fill a questionnaire form. Inclusion criteria were age 30 - 80, either gender and diagnosed stroke either hemorrhagicor ischemic. Exclusion criteria were patients with age less than 30 years or greater than 80years, patients with chronic obstructive pulmonary disease, meningitis, Dilated cardiomyopathy, chronic kidney disease, malignancy. American Heart Association definitions for ACS subtypes were used. Unstable angina is defined as anginal pain that occurs in a resting state with neither ST - segment elevation, no relevated biomarkers of myocardial ischemia. NSTEMI is defined as chest pain with elevated biomarkers of myocardial ischemia (cardiac enzymes, troponins) but no ST - segment elevations.

STEMI is defined as chest pain with elevated biomarkers of myocardial ischemia and ST - segment elevations or new - onset left bundle branch block. Stroke was defined as neurological dysfunction caused by an ischemic or hemorrhagic event with residual symptoms at least 24h after onset or leading to death [6].

Outcomes

The primary outcome of our study was to know the prevalence of acute coronary syndrome in stroke patients on retrospective analysis, and which type of acute coronary syndrome was most prevalent among them. As our secondary outcomes, characteristics of the patients such as age, gender, diabetes mellitus, hypertension, dyslipidemia, smoking, and previous stroke episode were noted down and their prevalence in stroke patients was taken into consideration.

Data Collection

A total of 221 stroke patients that met our inclusion criteria were selected and they were properly educated about the study (mostly attendents). Informed consent was taken from all of them. Stroke type was diagnosed mostly by brain computed tomography (CT) scan or magnetic resonance imaging (MRI) to detect either infarction or hemorrhage (intracerebral, subdural, or subarachnoid). A detailed history and physical examinations were done. Each patient underwent a series of investigations including CT scan brain, ECG, transthoracic echocardiography, HbA1C, lipid profile, and carotid Doppler studies. Their previous records of the acute coronary syndrome were checked thoroughly. Information regarding the use of ACS medication, any ACS intervention that has been done previously, hospital admissions, previous ECGs, cardiac biomarker reports, and echocardiography reports, was taken.

3. Data analysis

Data was entered and analyzed in Microsoft Office Excel 2016 and SPSS Statistics version 19 (IBM Corp., Armonk, NY). Mean and standard deviations were calculated for continuous variables such as age, and the student's t - test was used for analysis. Frequencies and percentages were calculated for categorical variables such as ACS, diabetes mellitus, hypertension, gender, dyslipidemia, smoking, and previous stroke. The Chi - square test was used for analysis. All the data was compiled in the form of flowcharts, spreadsheets, and histograms.

4. Results

The mean age of the patients was 58 years ± 9.16 years (standard deviation). The minimum age of stroke presentation was 38 years and the maximum age of presentation was 78 years asshown in Table 1. Out of 221 cases that were recruited in the study, 162 (73%) were above 50years of age and 59 (27%) were under the age of 50 years at the time of presentation as shown in Figure 1.

Table 1: Age distribution

	Minimum	Maximum	Mean	SD
Age	38	78	58	9.16y

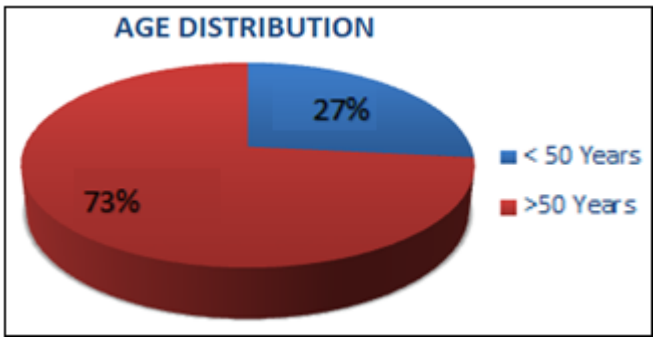


Figure 1: Age distribution pie chart

Non - probability consecutive sampling technique was followed. Out of 221 cases, 152 (69%) male patients, and 69 (31%) female patients presented to us. This showed male predominance in stroke cases concluding that male gender itself possesses more risk for stroke occurrence. The results are displayed in Figure 2.

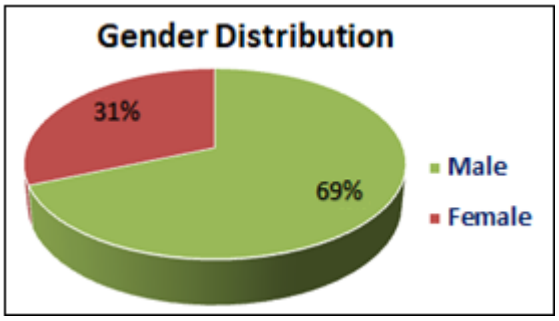


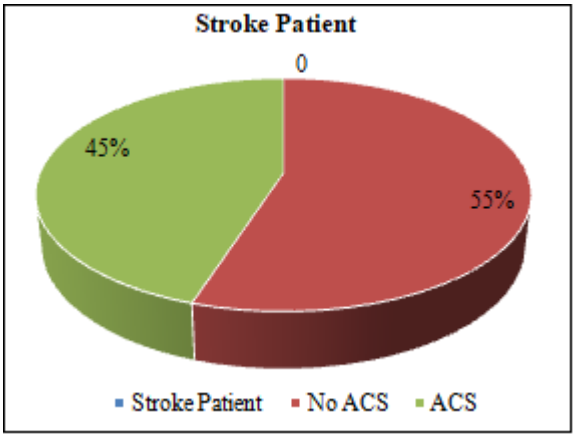
Figure 2: Gender distribution pie chart

As our primary outcome we analyzed that out of 221 cases, 98 cases i. e.45% (p >0.05) hadunderlying acute coronary syndrome associated with stroke, and 123 cases i. e.55% (p < 0.05) hadno underlying acute coronary syndrome in an association. Among the 98 ACS cases, 66 (67%) had unstable angina, 24 (25%) had NSTEMI, and 8 (8%) had STEMI. The data is compiled inTable 2 and presented graphically in Figure 3.

Table 2: Prevalence of ACS in acute stroke

Stroke patients	**No ACS 123**		**ACS 98**	
N=221		Unstable angina	NSTEMI	STEMI
Number		66	24	8
Percentage		67%	25%	8%

ACS: Acute coronary syndrome; NSTEMI: Non - ST - elevation myocardial infarction; STEMI: ST - elevation myocardial infarction.



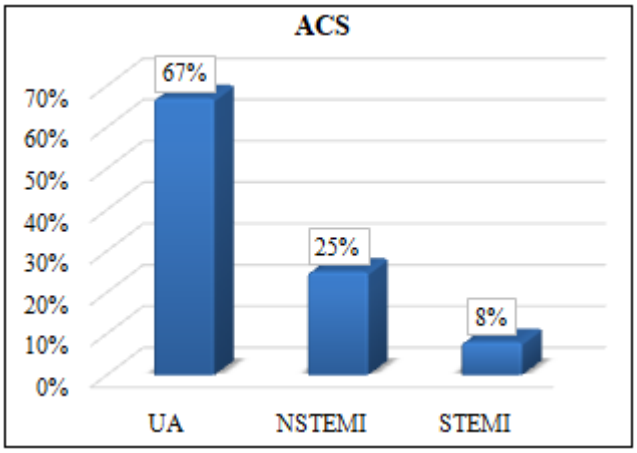


Figure 3: Prevalence of ACS in acute stroke

ACS: Acute coronary syndrome; NSTEMI: Non - ST - elevation myocardial infarction; STEMI: ST - elevation myocardial infarction.

We studied the prevalence of risk factors that were present in the stroke patients that were included in the study. Questionnaires of our study included questions about the risk factors that are associated with stroke according to the American Academy of Neurology and the American Heart Association and were filled by the attendants of the patients mostly. This showed that among 221 stroke patients, 176 (79%) had hypertension, 155 (71%) had smoking history, 102 (46%) had diabetes mellitus, 98 (44%) had dyslipidemia, 36 (16%) were obese and 12 (6%) had the previous history of stroke or TIA. These results are displayed in the following Figure 4.

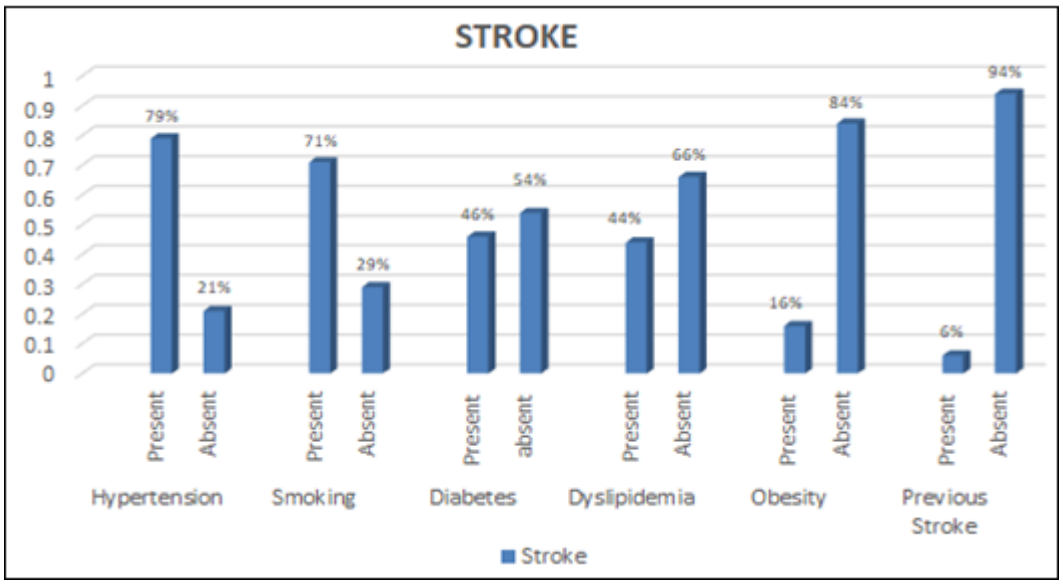
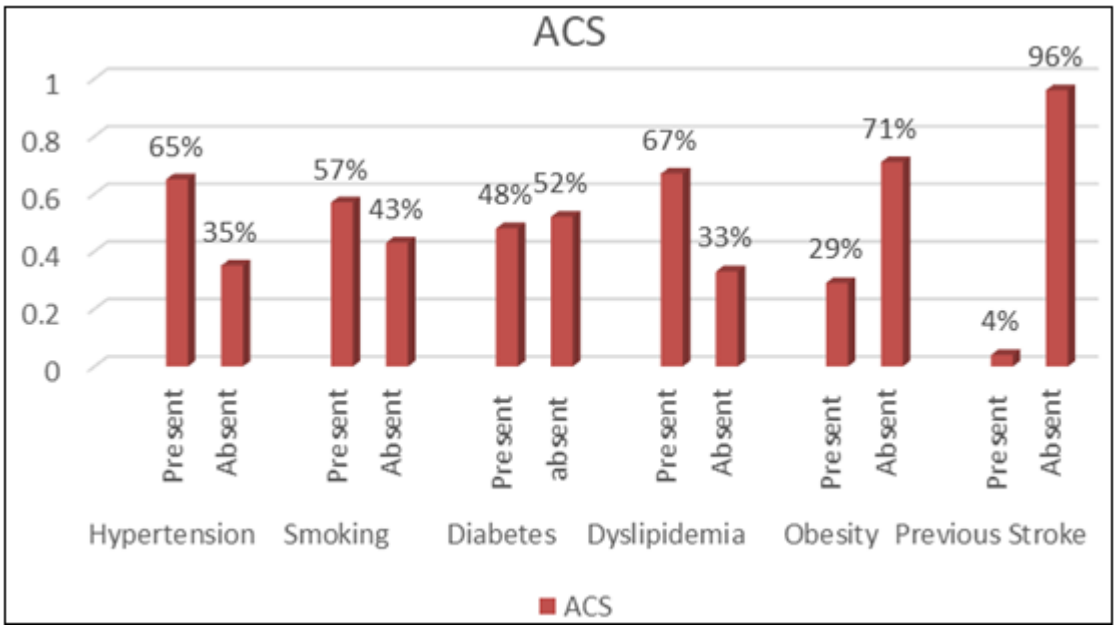


Figure 4: Risk factors frequencies in stroke patients



Stratification of hypertension, smoking, diabetes mellitus, dyslipidemia, obesity, and previous stroke, and acute coronary syndrome is given in Table3. This table shows that hypertension is strongly associated with both stroke and ACS with 79%and 65% ($p < 0.05$) occurrence respectively and so is smoking with 71% and 57% ($p<0.05$)

Table 3: Prevalence of various risk factors in acute stroke

Risk factors	Status	Stroke patients	Percentage	ACS	Percentage	P value
Hypertension	Present	176	79%	64	65%	<0.05
	Absent	45	21%	34	35%	
Smoking	Present	155	71%	56	57%	<0.05
	Absent	66	29%	42	43%	
Diabetes	Present	102	46%	48	48%	>0.05
	Absent	119	54%	50	52%	
Dyslipidemia	Present	98	44%	66	67%	<0.05
	Absent	123	66%	32	33%	
Obesity	Present	36	16%	28	29%	>0.05
	Absent	185	84%	70	71%	
Previous stroke	Present	12	6%	4	4%	>0.05
	Absent	209	94%	94	96%	

5. Discussion

We did a cross - sectional study to estimate the prevalence of acute coronary syndrome in patients with acute stroke onset. Patients who experience acute coronary syndrome are at heightened risk of recurrent ischemic events [7 - 9]. These events are not limited to the coronary vascular bed but also include ischemic strokes, one of the most feared cardiovascular events because of the risk of long - term disability [10]. Hence, we tried to estimate the prevalence of underlying ACS among patients with acute stroke and the result came out to be 44% ($p > 0.05$) and was not statistically significant. However, It shows that ACS is still very much prevalent in stroke. Apart from the fact that the pathophysiology and most of the risk factors for stroke and ACS are similar, ACS itself is a risk factor for ischemic stroke mostly due to stasis of blood in ventricles, ACS induced a trial fibrillation and turbulence of blood can cause clot formation in chambers of the heart which can dislodge and travel through major arteries towards brain causing a stroke.

Studies also indicate that myocardial infarction is a major risk factor for acute stroke onset [11, 12]. Most of the cases that presented to us were above the age of 50 years. And the mean age came out to be 58 years. It is explained partly by the fact that with age the vessels become less elastic and more fragile, and also that the aged people have increased number of co - morbidities like hypertension, diabetes, and dyslipidemias. Similarly, the male gender was found to have a higher incidence of stroke with up to the four - fold increased risk of stroke. Hence age and gender are uncontrollable risk factors and independent predictors of acute stroke onset. Most of the risk factors identified in this study correlated with those that have been identified in other studies.

It is interesting to note that most of the risk factors for stroke in the cases we studied, closely mirror those contained in the CHA2DS2 – VASc scoring system, which was derived and validated as a tool for stroke risk stratification in patients with a trial fibrillation [13 - 15]. When compared with control/placebo, oral anticoagulation (OAC) therapy reduces the risk of stroke by 64%, and the risk of death by 26% [16]. A systematic review and meta - analysis on CHA2DS2 - VASc risk factors as predictors of stroke after acute

coronary syndrome also studied that they have statistically significant predictive value for stroke on set in the patients having underlying ACS [17].

Our study indicates that both hypertension and diabetes mellitus are common in patients with stroke and ACS. Hypertension was 79% prevalent in stroke patients and 65% in ACS patients. Similarly, diabetes mellitus was 46% prevalent in stroke and 48% in ACS patients. These risk factors cause atherosclerosis and arteriosclerosis which can lead to turbulence of blood flow, plaque formation, and rupture leading to thrombus formation and ischemic events, commonly in heart and brain [18 - 21]. Dyslipidemia is also found commonly in stroke and ACS patients. Our study showed 44% and 67% prevalence, respectively. A large randomized controlled trial on3216 patients showed that adults with both high triglyceride (TG) and low high – density lipoprotein cholesterol (HDL - C), particularly those with diabetes, have increased risks of coronary heart disease and stroke. In particular, those with an LDL - C level of ≥130 mg/dL may have an increased risk of incident stroke [22].

Cigarette smoking is an important risk factor for all - cause mortality as well as vascular disease mortality [23, 24]. Many prospective cohort studies conducted in Western populations, as well as Asian populations, have indicated a strong and independent relationship between cigarette smoking and risk of stroke [25 - 28]. Our study also showed a high prevalence of smoking in stroke patients which is 71%. The prevalence of obesity and previous stroke history came out tobe 16% and 6% and the results were statistically insignificant. Maybe because the study sample was not high enough to prove the association.

6. Conclusions

Acute coronary syndrome is still frequently present in patients with acute stroke. Older age andmale gender are independent predictors of stroke occurrence. Risk factors such as hypertension, dyslipidemia, lack of exercise, smoking, and diabetes mellitus are also increasingly prevalent. The need of the hour is to manage ACS efficiently so that its deadly complications such as stroke can be prevented from occurring.

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