ISSN: 2581 – 3633
PubMed - National Library of Medicine - ID: 101745081

International Journal of Medical Science and Advanced Clinical Research (IJMACR)

Available Online at:www.ijmacr.com

Volume – 6, Issue – 3, May - 2023, Page No. : 186 - 192

Study of Clinical Profile, Quantitative RBC and Platelet Profile of patients with acute ischemic & hemorrhagic stroke in tertiary care hospital

[1]Nikita Borate, Department of General Medicine, BJMC, Pune 411045, India

[2]Rohidas T. Borse, Department of General Medicine, BJMC, Pune 411045, India

[3]Meenal Chandanwale, Department of General Medicine, BJMC, Pune 411045, India

Corresponding Author: Nikita Borate, Department of General Medicine, BJMC, Pune 411045, India

How to citation this article: Nikita Borate, Rohidas T. Borse, Meenal Chandanwale, "Study of Clinical Profile, Quantitative RBC and Platelet Profile of patients with acute ischemic & hemorrhagic stroke in tertiary care hospital", IJMACR- May - 2023, Volume – 6, Issue - 3, P. No. 186 – 192.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Introduction

Stroke or cerebrovascular accident is a rapidly growing epidemic and the leading cause of mortality as well as morbidity worldwide and in India[1]. It is defined as a sudden onset of a neurological deficit caused by an acute focal injury to the central nervous system due to a vascular cause[2]. Strokes which can be ischemic, hemorrhagic or venous[3] may have multiple etiologies and may be influenced by a number of factors[4] some more common than the others. The study of these clinical factors may allow us to predict who is more likely to suffer from which type of stroke and take preventive measures for the same.

Stroke is a vascular entity and therefore the pathological process[5] of development of a stroke involves complex inflammatory reactions[6], recruitment of platelets and RBCs in forming thrombi or emboli. The study of these hematological[7] parameters can point us to certain patterns in patients of acute stroke; thereby helping us to better predict the development[8] and outcome of the stroke as well as understand the type of treatment to be administered in such patients.

Materials and Methods

A cross sectional observational study was conducted over the period of 2 years between 2020-2022 with a sample size of 200 patients with radiologically confirmed acute stroke; either ischemic or hemorrhagic.

Results

During the study, 200 patients were evaluated who satisfied the inclusion criteria, out of which 91 patients suffered from ischemic stroke, 95 patients from hemorrhagic stroke and 14 patients suffered from cortical venous sinus thrombosis.

1. Distribution of Site of Stroke 51.6% ischemic strokes were seen in single site while 70.5%

hemorrhagic strokes occurred in gangliocapsular region.

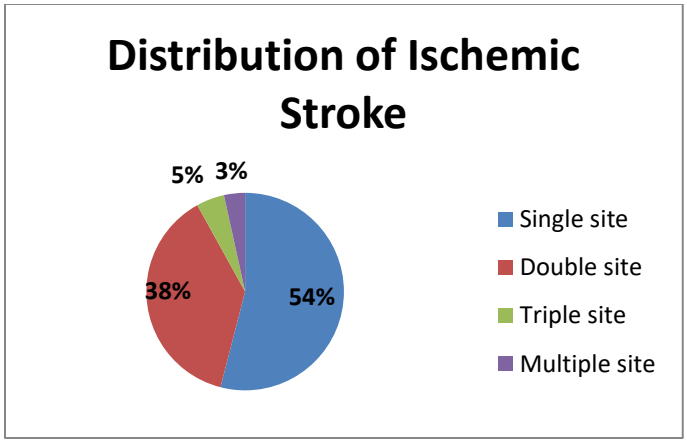

Fig 1: Showing distribution of site of ischemic stroke

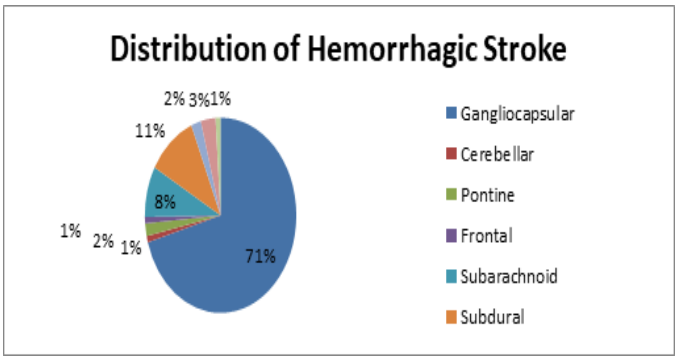

Fig 2: Showing distribution of site of hemorrhagic stroke

Age and stroke

The majority of the ischemic strokes (44%) were present in the 61-80yrs group with mean age being 57.1yrs. On the other hand, the majority of the hemorrhagic strokes (45.3%) were present in the 41-60yrs group with the mean age being 56.3yrs. Although this may be used as a reference value, the results were not statistically significant.

Age group		Total (N=186)	Stroke subgroups		P
			Ischemic (N=91)	Haemorrhagic (N=95)	
21 to 40	Number (%)	25 (13.4%)	8 (8.8%)	17 (17.9%)	0.19
41 to 60	Number (%)	81 (43.5%)	38 (41.8%)	43 (45.3%)	
61 to 80	Number (%)	72 (38.7%)	40 (44.0%)	32 (33.7%)	
>80	Number (%)	8 (4.3%)	5 (5.5%)	3 (3.2%)	

Table 1: Showing Age Group distribution between ischemic and hemorrhagic strokes

Gender and stroke

It was observed that the majority of strokes both ischemic and hemorrhagic occurred more in the males than the females with 75.8% of the total strokes occurring in males while remaining 24.2% in females. 73.6% of ischemic strokes and 77.9% of hemorrhagic strokes occurred in the males. However, this observation was not statistically significant.

Gender		Total (N=186)	Stroke subgroups		P
			Ischemic (N=91)	Hemorrhegic (N=95)	
Male	Number (%)	141 (75.8%)	67 (73.6%)	74 (77.9%)	0.608
Female	Number (%)	45 (24.2%)	24 (26.4%)	21 (22.1%)	

Table 2: showing gender distribution between ischemic and hemorrhagic strokes

Comorbidities and stroke

A significant 72.5% of ischemic strokes and 67.4% of hemorrhagic strokes had presence of comorbidities. Diabetes was associated with ischemic strokes (28% vs15.8%). In comparison, hemorrhagic strokes occurred more in presence of HTN(44.2% vs39.6%) & IHD(7.4% vs5.5%).

Diabetes Mellitus		Total (N=186)	Stroke subgroup		P
			Ischemic (N=91)	Hemorrhagic (N=95)	
Yes	Number (%)	41 (22.0%)	26 (28.6%)	15 (15.8%)	**0.036**
No	Number (%)	145 (78.0%)	65 (71.4%)	80 (84.2%)	

Table 3: Showing comorbidities distribution between ischemic and hemorrhagic strokes

Type of Heart Disease		Total (N=186)	Stroke subgroup		P
			Ischemic (N=91)	Hemorrhagic (N=95)	
HTN	Number (%)	78 (41.9%)	36 (39.6%)	42 (44.2%)	0.521
IHD	Number (%)	12 (6.5%)	5 (5.5%)	7 (7.4%)	0.603
RVHD	Number (%)	1 (0.5%)	1 (1.1%)	0 (0.0%)	0.3

Table 4: Showing types of heart diseases between ischemic and hemorrhagic strokes

Addictions and stroke

Alcohol intake associated with hemorrhagic stroke (15.8% vs7.7%) but both alcohol and smoking seen in

ischemic(26.4% vs11.6%). These results were statistically found to be significant.

Addictions		Total (N=186)	Stroke subgroup		P
			Ischemic (N=91)	Hemorrhagic (N=95)	
Alcohol	Number (%)	22 (11.8%)	7 (7.7%)	15 (15.8%)	**0.001**
Smoking	Number (%)	28 (15.1%)	19 (20.9%)	9 (9.5%)	
Both	Number (%)	35 (18.8%)	24 (26.4%)	11 (11.6%)	
NA	Number (%)	65 (34.9%)	21 (23.1%)	44 (46.3%)	
NO	Number (%)	32 (17.2%)	19(20.9%)	13(13.7%)	

Table 5: Showing addictions distribution between ischemic and hemorrhagic strokes

Clinical presentation of stroke

The most common symptom of presentation in acute strokes is limb weakness which is found in 76.3% of the patients. In hemorrhagic strokes, the most common symptom of clinical presentation is altered sensorium (57.9%) followed by headache and vomiting. Ischemic strokes on the other hand present most commonly with limb weakness (91.2%), speech disturbances or cranial nerve dysfunction. Seizures may be seen in both. All the results below were found to be statistically significant.

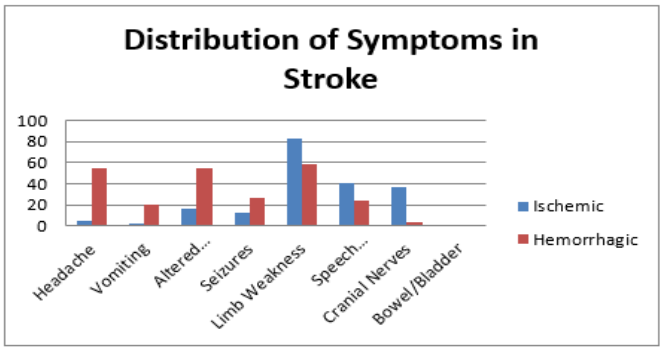

Fig 3: Distribution of symptoms between ischemic and hemorrhagic strokes

Quantitative RBC profile

It was found that majority of the population belonged to the normal range category group followed by low range of Hemoglobin, RBC count, MCV, MCHC and MCH. RDW on the other hand had majority of the population under the high range category. 7.7% of patients with ischemic stroke had a low RBC count while 17.9% of patients with hemorrhagic stroke had a low RBC count. The observation was statistically significant for RBC count and it was more significant for hemorrhagic stroke than ischemic stroke.

RBC Indices		Total (N=186)		Stroke subgroup				P
				Ischemic (N=91)		Hemorrhagic (N=95)		
		Number	%	Number	%	Number	%	
HB	Low (< 11)	40	21.5%	17	18.7%	23	24.2%	0.131
	Normal (11-18)	143	76.9%	74	81.3%	69	72.6%	
	High (>18)	3	1.6%	0	0.0%	3	3.2%	
RBC count	Low (< 3.5)	24	12.9%	7	7.7%	17	17.9%	0.013
	Normal (3.5-5.6)	158	84.9%	84	92.3%	74	77.9%	
	High (>5.6)	4	2.2%	0	0.0%	4	4.2%	
RDW	Low (< 11.5)	1	0.5%	0	0.0%	1	1.1%	0.124
	Normal (11.5-14.5)	142	76.3%	75	82.4%	67	70.5%	
	High (>14.5)	43	23.1%	16	17.6%	27	28.4%	
HCT	Low (< 32)	11	5.9%	6	6.6%	5	5.3%	0.357
	Normal (32-54)	173	93.0%	85	93.4%	88	92.6%	

	High (>54)	2	1.1%	0	0.0%	2	2.1%	
MCV	Low (< 79)	22	11.8%	14	15.4%	8	8.4%	0.331
	Normal (79-101)	157	84.4%	74	81.3%	83	87.4%	
	High (>101)	7	3.8%	3	3.3%	4	4.2%	
MCHC	Low (< 31)	25	13.4%	9	9.9%	16	16.8%	0.381
	Normal (31-37)	159	85.5%	81	89.0%	78	82.1%	
	High (>37)	2	1.1%	1	1.1%	1	1.1%	
MCH	Low (< 26)	21	11.3%	9	9.9%	12	12.6%	0.713
	Normal (26-36)	162	87.1%	81	89.0%	81	85.3%	
	High (>36)	3	1.6%	1	1.1%	2	2.1%	

Table 6: Showing quantitative RBC profile between ischemic and hemorrhagic strokes

Quantitative platelet profile in stroke

It was found that majority of the population belonged to the normal range category group followed by low range of MPV, Platelet Crit and Platelet Count. PDW on the other hand had majority of the population under the high range category. 19.8% of patients with ichemic stroke had a high platelet crit while 17.9% of patients with hemorrhagic stroke had a low platelet crit. The observation was statistically significant and it was more significant for ischemic stroke to have a higher platelet crit than hemorrhagic stroke to have a lower platelet crit.

Platelet Indices		Total (N=186)		Stroke subgroup				P
				Ischemic (N=91)		Hemorrhagic (N=95)		
		Number	%	Number	%	Number	%	
MPV	Low (< 9)	32	17.2%	19	20.9%	13	13.7%	0.194
	Normal (9-17)	154	82.8%	72	79.1%	82	86.3%	
	High (>17)	0	0.0%	0	0.0%	0	0.0%	
PDW	Low (< 0.13)	0	0.0%	0	0.0%	0	0.0%	0.66
	Normal (0.13-0.28)	153	82.3%	76	83.5%	77	81.1%	
	High (>0.28)	33	17.7%	15	16.5%	18	18.9%	
PLT CRIT	Low (< 0.22)	29	15.6%	12	13.2%	17	17.9%	0.021
	Normal (0.22-0.24)	133	71.5%	61	67.0%	72	75.8%	
	High (>0.24)	24	12.9%	18	19.8%	6	6.3%	
PLT COUNT	Low (< 120)	17	9.1%	6	6.6%	11	11.6%	0.499
	Normal (120-500)	167	89.8%	84	92.3%	83	87.4%	
	High (>500)	2	1.1%	1	1.1%	1	1.1%	

Table 7: showing quantitative platelet profle between ischemic and hemorrhagic strokes

Outcome

A significant 56% of the patients with ischemic stroke were discharged while 31.9% of them succumbed. Comparatively, 68.4% of the patients with hemorrhagic stroke succumbed while 17.9% of them were discharged and 4.2% of them underwent surgical intervention. This being a statistically significant result favors the observation that the mortality is higher in hemorrhagic strokes as compared to ischemic strokes.

Final Outcomes		Total (N=186)	Stroke subgroup		P
			Ischemic (N=91)	Hemorrhagic (N=95)	
DAMA	Number (%)	19 (10.2%)	11 (12.1%)	8 (8.4%)	<0.0001
DEATH	Number (%)	94 (50.5%)	29 (31.9%)	65 (68.4%)	
DISCHARGE	Number (%)	68 (36.6%)	50 (56.0%)	17 (17.9%)	
NEUROSURGERY	Number (%)	5 (2.7%)	1 (1.1%)	4 (4.2%)	

Table 8: Showing Outcome between ischemic and hemorrhagic strokes

Fig 12: Table showing comparison between RBC count and platelet profile with outcome of stroke

Comparison between RBC count and Platelet Crit with Outcome of Stroke

Two significant parameters in the above analysis (with reference to Table 16 and 17) were the low RBC count in hemorrhagic strokes and high platelet crit in ischemic strokes. It is seen that a lower RBC count has a greater percentage of non-survivors as compared to survivors i.e. patients with stroke that have a low RBC count on presentation are more likely to have a negative outcome. This result is statistically more significant for hemorrhagic strokes as compared to ischemic.

A high platelet crit on the other hand has a greater percentage of survivors as compared to non-survivors i.e. patients with stroke that have a higher platelet crit on presentation are more likely to have a positive outcome. This result is statistically more significant for ischemic strokes as compared to hemorrhagic.

Discussion

In the present study, the prevalence of low RBC count was 67.3% in the present study that is near the maximum reported prevalence among geriatrics in a systematic review of the literature by **Beghe et al**. However, there are not many studies related to hemorrhagic stroke and RBC count. It was found in my study to be statistically significant that both ischemic and hemorrhagic strokes have a lower RBC count and that it was more significant for hemorrhagic than ischemic. A plausible explanation for this finding could be the loss of blood or formation of hematoma in hemorrhagic strokes leading to a decrease in red cell mass. The usual catastrophic transformation of hemorrhagic strokes could also be one factor why acute intracerebral or subarachnoid bleeding may lead to the patients having a lower RBC count. An additional significant finding in my study was that patients who had a lower RBC count had a greater

percentage of non-survivors. This parameter can therefore be used as guideline to predict the outcome of the stroke, more for hemorrhagic than ischemic.

Bassiony et al[9] study revealed that MPV was significantly higher in the stroke group (10.4 ± 2.3 fL) than in the healthy group (8.7 ± 1.3 fL) (P < 0. 001). MPV was an independent predictor of poor short-term outcome of acute stroke after controlling for confounders. The mean PCT was found to be significantly higher in the disease group.

A study conducted by **T. O' Malley et al**[10] suggested that the direct association between a higher platelet volume and platelet crit suggests the possibility that activation of megakaryocytes, as heralded by an increase in MPV, is a feature of ischemic stroke. It could be postulated that the increase in MPV and larger platelets may have contributed to the development of the stroke rather than simply being a consequence of the acute event itself.

The platelet crit was found to be statistically higher in patients of ischemic stroke when compared to hemorrhagic stroke in my study population. The other parameters however were not statistically significant.

Patients with a higher platelet crit in my study population however were found to have a greater percentage of survivors than non-survivors, which was more significant for ischemic than hemorrhagic stroke. A plausible explanation for this could be that a higher platelet crit and therefore a higher number of immature platelets organize together to form a thrombus which acts as an easy target for antiplatelet drugs, leading to a greater chance for survival of these patients.

Conclusion

Ischemic strokes common at single site, younger age group, in presence of diabetes, alcohol and smoking. Present commonly with limb weakness & have high platelet crit.

Hemorrhagic strokes common at gangliocapsular site, older age group, in presence of HTN/IHD, alcohol, present with headache, with low RBC count & high mortality.

Patients with a low RBC count generally have greater mortality while those with a higher platelet crit have a greater number of survivors.

Gender, Hb, HCT, RDW, MCHC/MCH, MPV, PDW, Pltcount has no bearing for ischemic or hemorrhagic stroke.

References

1. Brandi R. French. (2016) Acute Ischemic Stroke: Current Status and Future Directions. National Library of Medicine.
2. John Hopkins Medicine. Types of Strokes. https://www.hopkinsmedicine.org/health/conditions-and-diseases/stroke/types-of-stroke
3. J Neurosci Rural Pract. (2013 Oct-Dec). Cerebral sinus venous thrombosis. National Library of Medicine.
4. Jeetendra Gupta. (May 2018). Environmental Pollutants and Aggressive Climatic Conditions: Combination Scaffolds of Brain Stroke. https://www.researchgate.net/figure /Types-of-brain-stroke_fig1_325430017
5. Broughton B.R., Reutens D.C., Sobey C.G. Apoptotic mechanisms after cerebral ischemia. Stroke. 2009;40:e331–e339. doi: 10.1161/STROKEAHA.108.531632.
6. Woodruff T.M., Thundyil J., Tang S.C., Sobey C.G., Taylor S.M., Arumugam T.V. Pathophysiology, treatment, and animal and cellular models of human ischemic stroke. Mol.

Neurodegener. 2011;6:11. doi: 10.1186/1750-1326-6-11.

7. Gelderblom M., Leypoldt F., Steinbach K., Behrens D., Choe C.U., Siler D.A., Arumugam T.V., Orthey E., Gerloff C., Tolosa E., et al. Temporal and spatial dynamics of cerebral immune cell accumulation in stroke. Stroke. 2009;40:1849–1857.
8. Suh S.W., Shin B.S., Ma H., Van Hoecke M., Brennan A.M., Yenari M.A., Swanson R.A. Glucose and NADPH oxidase drive neuronal superoxide formation in stroke. Ann. Neurol. 2008;64:654–663. doi: 10.1002/ana.21511.
9. Al-Amir Bassiouny Mohamed, The mean platelet volume and plateletcrit as predictors of short-term outcome of acute ischemic stroke. The Egyptian Journal of Neurology, Psychiatry and Neurosurgery. 2019 [pubmed]
10. O'Malley T., Langhorne P., Elton R. A., Stewart C. Platelet size in stroke patients. Stroke. 1995; 26 (6) : 995–999.