Prognostic Significance of Total Leucocytes Count in Acute Ischemic Stroke

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ABSTRACT

Introduction: The Stroke is a third leading cause of death worldwide and the most common condition of limiting daily activities of elderly. Experimental models of stroke have shown that within minutes of onset of focal ischemia there is activation of microglia followed by increased trafficking of leucocytes into the ischemic territory. Aim of the study was to estimate the WBC count in acute Ischemic stroke patients and to study the correlation between WBC count at admission and short-term outcome in Acute Ischemic Stroke.

Material and methods: A Prospective Observational study was conducted in MMC and RI, Mysuru in April 2016 to September 2016. All Acute Ischemic stroke patients admitted to our hospital within 72hrs of onset of symptoms during a period of 6 months from April 2016 to September 2016 were taken into study. A preformed proforma meeting the objectives of the study was prepared and recoding of data was done.

Result: We have included 102 cases in our study, in that 52 (51%) were in the age group of 61 to 80 years range, in that 34 (33.3%) female and 68 (66.7%) were male. The main symptoms in our study were headache in 80 [78.4%] cases, vomiting and giddiness in 66 [64.7%] cases and dysphagia in 37 [36.3%] cases. The right hemiplegia was the most common clinical diagnostic condition found in 45 [44.1%] cases. The main lesions are left frontal lobe infarction in 37 [36.3%] cases, right frontal lobe infarction in 34 [33.3%] cases. The disability assessment was done by using modified Rankin's scale with respect to total leucocytes count, in that 23 (22.54%) cases had MRS of 5 with the mean total leucocytes count of 12286.83± 3022.38 cells/micro litre of blood and with MRS of 6, only 10 (9.8%) Cases were found in relation to Total leucocytes count of 15652.10±3764.29 cells/micro liters of blood.

Conclusion: Our study found that, there is a positive association between elevated Total leucocytes count and acute ischemic stroke events. This study once again reiterates that, the Inflammation is a navel and independent risk factor for acute ischemic stroke. So that the inflammation must be targeted, while managing Acute ischemic stroke cases to reduce the disability, dependency and mortality.

Keywords: Total Leucocytes Count, Acute Ischemic Stroke, Modified Rankin's Scale, Canadian Neurological Scale.

INTRODUCTION

The Stroke is a third leading cause of death worldwide[1,2] and the most common condition limiting daily activities of living aged people.[3] The annual incidence of stroke is 145 per 100000 persons per year, out of this 80% of cases are seen as ischemic stroke events.[4] Experimental models of stroke have shown that within minutes of onset of focal ischemia there is activation of microglia followed by increased trafficking of leucocytes into the ischemic territory.[5-7] However there is no consensus about the correlation between Total Leucocytes count and prognosis after onset of acute ischemic stroke. There are so many studies showed that Total Leucocytes counts are significantly elevated in Acute ischemic damage to the Brain. The purpose of the present study is to prove that there is a positive correlation between acute inflammatory response as a risk factor and Acute ischemic stroke. This study is also done to predict the dependency, disability, severity and mortality due to Acute ischemic stroke with respect to the level of Total Leucocytes count.[8,9]

Aim of the study was to estimate the WBC count in acute Ischemic stroke patients and to study the correlation between WBC count at admission and short-term outcome in Acute Ischemic Stroke.

MATERIAL AND METHODS

A Prospective Observational study was conducted in MMC and RI, Mysuru in April 2016 to September 2016. All Acute Ischemic stroke patients admitted to our hospital within 72hrs of onset of symptoms during a period of 6 months from April 2016 to September 2016 were taken into study. Sample Size was 102 cases

Method of Study

A preformed proforma meeting the objectives of the study was prepared. After obtaining clearance from Institutional Ethics committee, MMC and RI, Mysuru with the number EC REG:ECR/134/Inst/KA/2013 dated; 30th March 2016 and after getting Informed consent, patients admitted to hospital within 72 hrs of onset of symptoms of stroke with CT or MRI evidence of Acute Ischemic stroke were included in the study. Baseline data were collected within 24hrs of admission, we have recorded the following data for each patient: name, age, sex, h/o presenting symptoms, other medical history, life style, risk factors, complications, clinical laboratory tests and Imaging data (CT and/or MRI). The WBC counts were measured at admission using a fully automated haematology analyser. If the patient died in the hospital, a study staff member will record the death. If the patient survived the acute stroke, then severity at discharge is evaluated by Canadian neurological scale and disability and dependency are assessed by Modified Rankin Scale and patient is followed up to 30 days after discharge and assessed the outcome.

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Inclusion criteria

Acute Ischemic stroke patients admitted to hospital within 72hrs of onset of symptoms of stroke.

Exclusion criteria

Patients with trauma, surgery, neoplasm, active infection, immunosuppressed patients, haematological diseases, inflammatory diseases, severe hepatic illness, renal diseases, acute metabolic diseases, intoxications and Acute coronary syndromes.

STATSTICAL ANALYSIS

The association between WBC count and study outcomes-death or dependency, is analysed through contingency table, probability, and frequency. Summary statistics is done by proportions, mean, median, and standard deviation. The inferential statistics is done by, ANOVA and person correlation. All measurements are done using SPSS version 21.0. value $p < 0.05$ is considered as statistically significant.

RESULTS

The acute inflammation is a known independent risk factor for acute ischemic stroke,which has been proved by so many studies in the past. This study shows the association between Total Leucocytes count and acute ischemic stroke. We have included 102 cases in our study,in that 52 (51%) were in the age group of 61 to 80 years range,8 [7.8%] were between 81 to 90 years, 34 [33.3%] were between 41 to 60 years age group and 8 [7.8%] were in 21 to 40 years age group. In this total study population 34 (33.3%) were female and 68 (66.7%)were male. The main presenting symptoms in our study in decreasing order were headache in 80 [78.4%]cases, vomiting and giddiness in 66 [64.7%] cases, Speech involvement in 49 [48%]

cases,right sided upper and lower limb weakness in 40 [39.2%] cases,dysphagia in 37 [36.3%] cases, left sided upper and lower limb weakness in 36 [35.3%] cases, loss of consciousness in 32 [31.4%] cases [Table-1].

The right hemiplegia was the most common clinical diagnostic condition found in our study, constitutes about 45 [44.1%] cases, Left hemiplegia found in 35 [34.3%] cases, VBI in 23 [22.5%] cases and Extrapyramidal invovolvement was found in 4 cases [3.9%].

The CT scan findings of our study cases in decreasing order are, left frontal lobe infarction in 37 [36.3%] cases, right frontal lobe infarction in 34 [33.3%] cases, left parietal lobe infarction in 33 [32.4%] cases, right parietal lobe infarction in 31 [30.4%] cases, cerebellar infarction in 25 [24.5%] cases, left internal capsule infarction in 23 [22.5%] cases and right internal capsule infarction in 19 [18.6%] cases [Table-2].

The mean total leucocytes count found in our study are 11063.21±3537.08 cells/micro litre of blood. The assessment of severity of Acute ischemic Stroke is done by using Canadian Neurological Scale [CNS] with respect to Total Leucocytes count, where the very severe stroke is found in 18 [17.6%] cases with CNS scale of below 4 (P value <0.001) [Table-3].

The disability assessment is done by using modified Rankin's scale with respect to total leucocytes count, in that 23 (22.54%) cases had MRS of 5 with the mean total leucocytes count of 12286.83± 3022.38 cells/micro liters of blood, with the MRS of 6, only 10 (9.8%)Cases had Total leucocytes count of 15652.10±3764.29 cells/micro liters of blood (P value of <0.001) [Table-4]. The outcome of our study after one month of follow up with respect to Total leucocytes count was 9 (8.8%) cases were died with mean total leucocytes count of 15869±3925.79 cells/micro litre of blood, the dependency is found in 61 (59.8%)

		n	%
Symptoms	Right sided upper and lower limb weakness	40	39.2%
	Left sided upper and lower limb weakness	36	35.3%
	Dysphagia	37	36.3%
	Seizures	4	3.9%
	Speech invovlement	49	48.0%
	Unsteadiness of gait	15	14.7%
	Vomiting and giddiness	66	64.7%
	Headache	80	78.4%
	Loss of Consciousness	32	31.4%
Table-1: Presenting symptoms			

		n	%
CT Findings	Right Temporal lobe infarction	8	7.8%
	Right frontal lobe infarction	34	33.3%
	Right Parietal lobe infarction	31	30.4%
	Right Occipital lobe infarction	2	2.0%
	Left Temporal lobe infarction	10	9.8%
	Left Frontal lobe infarction	37	36.3%
	Left Parietal lobe infarction	33	32.4%
	Left Occipital lobe infarction	2	2.0%
	Brain Stem infarction	16	15.7%
	Cerebellar infarction	25	24.5%
	Left Internal Capsule infarction	23	22.5%
	Right internal Capsule infarction	19	18.6%
Table-2: Distribution of CT Scan findings			

		Total Leucocyte Count /ccm			
		n	Mean	SD	
Severity of Stroke (Canadian Neurological Scale)	Very Severe Stroke (<4)	18(17.6%)	13786.50	4227.42	P value
	Moderate Stroke (4-8)	50(49%)	11296.42	2973.71	< 0.001
	Mild Stroke (>8)	34(33,3%)	9278.50	2923.16	
Table-3: Severity of Stroke (Canadian Neurological Scale)and TLC Distribution					

		Total Leucocyte Count /cmm of blood			
		n	Mean	SD	
MRS	.00	4(3.92%)	8010.00	2844.48	
	1.00	16(15.68%)	9484.56	4278.97	P value<0.001
	2.00	14(13.72%)	8195.86	2651.89	
	3.00	17(16.66%)	10900.06	2344.99	
	4.00	18(17.64%)	11416.28	994.30	
	5.00	23(22.54%)	12286.83	3022.38	
	6.00	10(9.8%)	15652.10	3764.29	
Table-4: Correlation between MRS [modified Rankin's scale] and TLC					

cases as against total leucocytes count of 11685.49± 2856 cells/microlitre of blood, the independent cases were 30 (29.4%) against total leucocytes count of 8567.03±2685.21 cells/microliter of blood and 2 [2%] cases were improved with respect to 7900 ±1838.48 cells/microliter of blood [p value<0.0001]. The lesser the number of Total Leucocytes count, better is the recovery from stroke with treatment as compare to cases with high Total cell count.

DISCUSSION

The inflammation is a known independent risk factor for ischemic stroke, which needs to be suppressed to bring down the severity of blood vessels occlusion due to atherosclerotic plaque. The leucocytes are the important inflammatory mediator cells, which will be elevated in any acute insult to the body cells. The elevated cells are considered as markers of insult to brain tissue in acute ischemia and used to know the severity and prognosis of acute ischemic stroke in our study.[8-10] In this study we have selected 102 cases,in that 68 [66.7%] male and 34 [33.3%] female with the age between 21 to 90 years, more number of cases are between 61 to 80 years, constitutes about 52 [51%], around 34 [33.3%] cases are in the age between 41 to 60 years. which is compared with the study by Wade S.Smith[10],Where his study said that, the acute ischemic stroke is common in the age group of above 60 years with predominantly common in male smokers. The main symptoms and signs seen in our study are headache,vomiting, giddiness, speech involvement and right sided hemiplegia [Table no.1]. The most common sites involved in ischemic injury are left frontoparietal and right frontoparietal region [Table 2], which was compared with the study by Manish Mittal, where his study shows that,dominant middle cerebral [40.9%] and anterior cerebral arteries [86.4%] are involved predominantly. Which once again reiterates that Anterior circulation territory is the most common site for acute ischemic stroke due to thromboembolism.Based on Canadian Neurological scale (CNS) Acute ischemic stroke severity is assessed, with respect to the level of Total leucocytes count.The CNS score of less than 4 had very severe stroke [17.6%] with total leucocytes count of 13786.50±4227.42 cells/microliter of blood, the CNS score of more than 8 had less severe stroke [33.3%], with total leucocytes count of 9278.50±2923.16cells/

microliter of blood [Table no.3]. The above observations proved that, there is direct correlation between Acute inflammatory response and stroke severity. The higher the total leucocytes count, indicates more severe the ischemic damage to the brain, more the brain damage, more severe is the disability, mortality and dependency. So that it further confirms that inflammation is an important risk factor of acute ischemic stroke and it needs to be suppressed to prevent major insult to brain in the acute period,[12-15] which is statistically significant p value <0.001. To assess the Disability due to acute ischemic,we have used Modified Rankin Scale [MRS]. The MRS in our study with Total leucocytes count of 15652.10±3764.29 is 6 found in 10 [9.8%] cases, [the MRS >6 indicates death], [p value <0.001], [Table no.4]. Which shows that, higher the inflammation,the more severe the disability due to stroke,once again reinforces that acute inflammation is an important independent risk factor for acute ischemic stroke.Which needs to be suppressed in the management of the ischemic stroke to reduce the mortality and morbidity.[16,17] In the Asian population study, the researchers found that, a positive association between increased Total leucocytes count and the risk of acute ischemic stroke, but they did not find any significant relationship between Total leucocytes count and the risk of hemorrhagic stroke.[18] These above results are also found in our data, but our study did not go about the relationship between acute ischemic stroke and WBC subtypes. The one more study found that Total leucocytes counts mainly neutrophil counts were independently associated with the recurrent ischemic stroke events in high risk populations.[19] The outcome of our study after one of month of follow up is, death seen in 9 [8.8%] cases in relation with the Total leucocytes count of 15869±3925.79 /microliter of blood and dependency is found in 61 [59.8%] /microliter of blood cases in relation with Total leucocytes count of 11685.49±2856.Once again higher the Total Leucocytes count in Acute ischemic stroke, more is the mortality. The reason why increased Total leukocyte counts or its subtypes increases the ischemic stroke and cardiovascular risk is still not completely known. Several potential mechanisms have been proposed to link between elevated Total leucocytes count and enhanced atherogenesis.[20] The Neutrophils plays a key role in atherosclerotic plaque development and its instability[21], the Neutrophils also releases autacoids, which are responsible for

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vasoconstriction and platelet aggregation.[22] The Monocytes are known to be involved in the pathogenesis of atherosclerosis and they are present in all the phases of atherogenesis.[21] The Monocyte-derived macrophages releases cytokines and other oxidant radicals, which can cause endothelial cells injury and thrombus formation.[23] Also the lymphocytes play a key role in chronic inflammatory condition, and the subset of T lymphocytes, may be associated with cardiovascular ischemia and recurrent ischemic stroke events.[24-26]

CONCLUSION

Our study found that, there is a positive association between elevated Total leucocytes count and acute ischemic stroke events. This study once again reiterates that, the Inflammation is a navel and independent risk factor for acute ischemic stroke. So that the inflammation must be targeted, while managing Acute ischemic stroke cases to reduce the disability,dependency and mortality.

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