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STUDY TO KNOW THE INCIDENCE OF LEUCOCYTOSIS IN ACUTE ISCHEMIC STROKE AND ITS EFFECT ON SHORT TERM MORBIDITY

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Abstract:
Background: *Stroke is a major health problem worldwide because of its high risks of morbidity and mortality. Approximately 15 million people worldwide suffer from stroke annually of which 5.5 million die while the remaining are left with permanent disability and over 50 % of cases occur in Asians. Aim of the study was to find out the incidence of leucocytosis in acute ischemic stroke and its effect on short term morbidity.*
Study Design: *Descriptive Cross-Sectional study.*
Place and Duration of Study: *This study was conducted at the Department of Neurology, Civil Hospital Quetta for six months January, 2020 to July, 2020.*
Materials and Methods: *Data was collected by non-probability consecutive sampling technique. 126 adult patients with ischemic stroke were included in the study. Full blood count was obtained for all patients on admission and possibility of infection ruled out with history and relevant clinical examination. Presence of disability was assessed using Modified Rankin Scale (mRS).*
Results: *A total number of 126 patients having ischemic stroke were included in this study. The mean age was 61.9 years. 114 (64.4%) were males. Leukocytosis was seen in 61(76.25%) of the patients with significant morbidity, whereas 19(23.75%) of patients with morbidity had no leukocytosis. In patients without any significant morbidity leukocytosis was seen in only 12(26.09%) of the patients.*
Conclusion: *It is concluded from this study that early leukocytosis in ischemic stroke patients is associated with increase morbidity and can therefore be considered as a prognostic factor.*
Key Words: *Leukocytosis, Ischemic Stroke, Morbidity.*

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INTRODUCTION:

Stroke is a major health problem worldwide because of its high risks of morbidity and mortality. [1] Approximately 15 million people worldwide suffer from stroke annually of which 5.5 million die while the remaining are left with permanent disability and over 50 % of cases occur in Asians.[2-4] Ischemic Stroke accounts for over 50 % of all types of stroke.[5] Inflammation and inflammation-related atherosclerosis play a crucial role in Ischemic stroke progress and prognosis. [5]

Exact data about the incidence and prevalence of stroke in Pakistan is lacking but the burden is assumed to be high because of the high prevalence of major risk factors for stroke in our population.[6] An episode of neurological dysfunction caused by focal cerebral, spinal, or retinal infarction attributable to ischemia, based on pathological, imaging, or other objective evidence of cerebral, spinal cord, or retinal focal ischemic injury in a defined vascular distribution; or clinical evidence of cerebral, spinal cord, or retinal focal ischemic injury based on symptoms persisting ≥24 hours or until death, and other etiologies excluded.7 The burden of ischemic stroke is increasing worldwide because of the rise in the major risk factor for ischemic stroke i.e. hypertension, diabetes, obesity, smoking and dyslipidemia.[8]

Leukocytosis is an elevation of the concentration of leukocytes or white blood cells in blood, and is generally considered to be present when the white cell count (WCC) exceeds 11 × 10^9/l. [9] Widely considered to be an indicator of infection or inflammation, leukocytosis can also occur in a variety of other clinical situations, such as trauma, exercise, therapy with drugs such as steroids or lithium, malignancy, poisoning, psychosis and diabetic ketoacidosis.[9,10] Leukocytosis may represent an 'acute phase marker' analogous to C-reactive protein (CRP) or the erythrocyte sedimentation rate (ESR). Interestingly, raised circulating catecholamines can cause leukocytosis, perhaps as part of a generalized stress response.[9,10]

A large study showed that higher admission leukocyte count was associated with several fold increase risk of dependency and death among acute cerebral infarction patients. The same study showed that short term morbidity was 29.6% using modified Rankin scale (mRS)>2. [11] A large prospective observational study showed that an elevated leukocyte count in the acute phase is a significant independent predictor of poor initial stroke severity, poor outcome at 72 hours and discharge disability.[12] One of the study evaluating role of leukocytosis and high ESR in acute ischemic strokes showed that raised WBC was associated with increased undesirable results while releasing from hospital as well as in hospital mortality. [13] Recruitment of neutrophils can be detected as early as 5 hours after stroke onset and peaks at 24 hours. [14] Work over the past few decades indicates that aspects of inflammatory response may in fact be detrimental to final stroke outcome. In the acute setting inflammation appears to have a detrimental effect, and anti-inflammatory treatments have been studied as a potential therapeutic target.[15]

The rationale of the study was to investigate the frequency of leukocytosis obtained at admission in first ever acute ischemic stroke patients and its effect on early outcome in terms of morbidity using a Modified Rankin scale (mRS) at discharge. Varying conclusions have been drawn on the relationship of leukocytosis and stroke, a greater understanding of leukocytes contribution in acute ischemic stroke and its effect on morbidity and mortality is still required. Although international studies on this topic have been done, local data on this aspect of stroke is lacking. Better understanding of the effect of leukocyte count in the acute phase of stroke might have profound implications for the acute management of stroke, and it might improve clinical outcome.

MATERIALS AND METHODS:

This cross sectional study This study was conducted at the Department of Neurology, Civil Hospital Quetta for six months January, 2020 to July, 2020. Patients with both gender and above 18 years of age with ischemic stroke were included. An episode of neurological dysfunction caused by focal cerebral, spinal, or retinal infarction attributable to ischemia, based on pathological, imaging, or other objective evidence of cerebral, spinal cord, or retinal focal ischemic injury in a defined vascular distribution; or clinical evidence of cerebral, spinal cord, or retinal focal ischemic injury based on symptoms persisting ≥24 hours or until death, and other etiologies excluded.7Leukocytosis was defined as WBC count ≥11,000cells/cmm. [9] Short term morbidity was defined as moderate or severe disability on discharge using Modified Rankin Scale (mRS)>2.[16] Patients with focal neurological deficit due to transient ischemic attacks, haemorrhagic stroke and with other causes of stroke, i.e. hereditary, metabolic, acquired coagulopathies, drugs, and all other causes of stroke were excluded from study. Similarly, all patients with other causes of leukocytosis e.g.: Infections, blood disorders, drugs (e.g. steroids) were excluded from study.

All patients who presented with acute ischemic stroke were selected by consecutive non probability sampling and were admitted to Neurology ward. Detailed history and clinical examination was performed for all patients. Early CT scan head was performed for all patients to rule out haemorrhage. Relevant neuroimaging was performed to rule out other causes of stroke like MRI for space occupying lesions, CTA (CT angiography) for carotid or vertebral artery dissection where ever indicated.

CBC was collected at admission. All other causes of leucocytosis were ruled out with detailed history and clinical examination, and relevant investigations like urine RE, chest X- ray, Ultrasound abdomen. Temperature monitoring was carried out through out admission. All the data was stored and analysed on SPSS version 16. Descriptive statistics were used to calculate Mean ± SD for numerical variables like age. Frequencies and percentages were calculated for categorical variables like gender, leukocytosis and morbidity. Leukocytosis was stratified among age and gender to see effect modifiers. All results were presented in the form of tables. Chi square test was applied to see the effect of leukocytosis on morbidity.

RESULTS:

There were 126 patients in our study. Mean age was 61.9 years ± 14.49 with age range from 20 years to 99 years. Most of the patients presented in 6th decade of life followed by 7th and 5th decade. There were114 (64.4%) male and 63 (35.6%) female patients with male to female ratio of 1.8:1.Out of the 126 patients presenting with ischemic stroke 66.7 % were hypertensive, 23.7% were diabetics and 14.3% had heart disease.(Table 2) Out of the 126 patient's leukocytosis was seen in 73 (57.9%), whereas normal counts in 53 (42.1%). Out of 66 males 38 (57.57%) and 60 females 35 (58.3%) had leukocytosis. The mean leukocyte count was 11800 with range from 4400 to 27000.

Leukocytosis was seen in 61(76.25%) of the patients with significant morbidity as defined by mRS scale (>2), whereas 19(23.75%) of patients with morbidity had no leukocytosis. In patients without any significant morbidity leukocytosis was seen in only 12(26.09%) of the patients. (P value <0.05).

Table No.1: Age and gender distribution

Mean Age		61.9 ± 14.49
Gender	Male	114 (64.4%)
	Female	63 (35.6%)
Risk Factors	Diabetes	31(24.6%)
	HTN	84(66.7 %)
	Heart Diseases	18(14.3%)
Leukocytosis	Yes	73(57.9%)
	No	53(42.1%)
mRS at discharge	>2	80(63.4%)
	<2	46(36.6%)

Table No.2:Morbidity in patients with Leukocytosis.

Leukocy-tosis	mRS		Total
	>2	<2	
Yes	61(83.6%)	12(16.4%)	73(57.9%)
No	19(35.8%)	34(74.2 %)	53(42.1%)
Total	80(57.9%)	46(42.1%)	126(100%)

DISCUSSION:

Most of our study participants presented in 6th decade of their life with male predominance. This is well supported by the fact that age and gender is one of the non modifiable risk factor of stroke. [8] HTN followed by DM and then Heart diseases were present as risk factors of stroke. They are well studied risk factors for stroke. [8] Leucocytosis was found in 57% of ischemic stroke patients in our study. This observation is supported by a study by Nikanfar et al, which stated 46.7% of the patients had leukocytosis in his study. [13] The slightly higher count could be because we relied on clinical examination and only basic investigations were carried out to rule out infection, rather than obtaining cultures.

In our study leucocytosis was seen in 76.25% of patients with significant morbidity. Similar results were obtained in a study done in Poland to determine

the predictive value of leukocyte count at admission. It was concluded in this study that an increase in the WCC within the first 12 hours of stroke was an independent and strong predictive factor for adverse outcome. [10]

A study by Nardi et al which included 811 patients yielded similar results. They found out that higher leukocyte counts predicted a worst clinical presentation and poor functional outcome in terms of morbidity (p<o.o5). [12] A study by Peng et al was carried out in china which yielded similar results. It was concluded in this study that higher leukocyte counts at admission were associated with several fold increased risk of dependency (morbidity). [11] In our study morbidity was observed in 63% of the patients. These counts were comparable to a study conducted in Canada by Buck et al where morbidity was seen in 54.7%.[17] The slightly higher percentage of morbidity in our study could be the limited resources translated into lack of intensive care facilities, limited number of nurses and rehabilitation team to most of our stroke patients.

This study has some limitations. This is a cross-sectional study, and the cause and effect relationship between total leukocyte count and long term morbidity or outcome cannot be determined. Secondly we did not carry out complete workup to explore other causes of leukocytosis in detail.

CONCLUSION:

It is concluded from this study that leukocytosis in the early phase of ischemic stroke is more frequently observed in patients with significant morbidity and therefore can be considered as an important prognostic factor. Determining whether suppressing the early leukocyte response can help reduce the propagation of ischemic damage should continue to be an important goal of future investigations.

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