Original Article

Association Between Leucocytosis and in-Hospital Mortality in Patients Presenting with Acute Ischemic Stroke

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ABSTRACT

Objective: To determine the association between leucocytosis and in hospital mortality in patients presenting with acute ischemic stroke.

Study Design: Cohort study

Place and Duration of Study: This study was conducted at the Department of Medicine, Mayo Hospital Lahore from February 2015 to July 2015.

Materials and Methods: Four hundred and sixty patients were included. They were divided in two groups; patients with leucocytosis and patients without leucocytosis. All patients were managed indoor on standard protocol for acute ischemic stroke as per hospital routine and followed-up till discharge. During their stay at hospital, they were monitored on daily basis and, in-hospital mortality was labeled.

Results: The mean age was 49.17±13.58 years with male to female ratio was 2.04:1. Diabetes was found in 71.30% patients, hypertension in 36.5% patients and mortality occurred in 14.57% patients. The OR showed that there is approximately three times more chance of mortality in leucocytosis group as compared to normal WBC group patients i.e. OR=2.92.

Conclusion: There is 2.92 times high chance of in-hospital mortality in leukocytosis as compared to controls in patients presenting with acute ischemic stroke.

Key words: Acute ischemic stroke, Mortality, Diabetes mellitus, Diabetes mellitus, Hypertension, Leucocytosis

Citation of article: Safdar MN, Safdar Z, Tahira R, Shahid M, Hussain I, Randhawa FA. Association Between Leucocytosis and in-Hospital Mortality in Patients Presenting with Acute Ischemic Stroke. Med Forum 2019;30(12):16-19.

INTRODUCTION

Stroke is 2nd most leading cause of mortality all over the world. About 6.15million deaths occurred during 2008.[1] Ischemic stroke is highly prevalence, occurs in 87% cases is stroke while 10% had intracerebral hemorrhage, but 3% had subarachnoid hemorrhagic strokes.[2] Stroke-specific case fatality rates have been reported in several hospital-based studies in Pakistan and have varied from 7-20%.[3] Ischemic stroke can be the result of thrombosis or embolism.[4] Stroke can be characterized as rapid evolution of injury to the affected areas of tissues of brain. In very early phase, inflammation occurs which later develops the injury of affected areas of peri-ischemic brain. Hence it increases the tissues necrosis in ischemic penumbra. Leucocytosis is common in acute phase of ischaemic stroke.[5] There is a considerable evidence that leucocytosis may be an independent predictor for death in ischemic heart disease.[6] Studies conducted outside Pakistan have shown higher number of leukocytes was associated with fatal outcome in the first month of stroke.[7,8]

In our country no study has been conducted regarding prognostic significance of leucocytosis in ischemic stroke. This would be my maiden study in Pakistan to cover this aspect of stroke in Asian population. If this study also proves the association between leucocytosis and outcome of stroke, this would help the physicians to manage these high risk patients in ICU with frequent monitoring to assess development of any morbidity and its early management, hence helping in better care of patients and controversy would also be resolved. Physicians would also be able to explain prognosis of patients to the attendants in a better way.

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Received: June, 2019
Accepted: September, 2019
Printed: December, 2019

MATERIALS AND METHODS

This cohort study was conducted at Department of Medicine, Mayo Hospital Lahore from 1st February 2015 to 31st July 2015. Four hundred and sixty cases of new acute ischemic stroke were recruited.

Demographics were recorded. Patients were divided in two groups; patients with leucocytosis (Group A) and patients without leucocytosis (Group B) and each group comprised 230 patients. All patients of either gender age between 18-75 years, acute ischemic stroke and with leucocytosis on first day of admission (white cell count more than 10.0 x 1^{09} /L on CBC) and acute ischemic stroke and without leucocytosis on first day of admission were included. Those patients presenting with >12 hours between onset and hospital admission, evidence of infections evident by any of these (ESR >20mm/hr, chest x-ray and urine complete (WBCs >10/HPF) and urine and blood cultures at the time of admission and up to 7 days before and up to 4 days after admission, autoimmune disease and acute coronary syndrome on admission were excluded. All patients were managed indoor on standard protocol for acute ischemic stroke as per hospital routine and followed-up till discharge. During their stay at hospital, they were monitored on daily basis and, in-hospital mortality was labelled (patients dying within 7 days of admission). The data was entered and analyzed through SPSS-20.

RESULTS

The average age of patients was 49.17±13.58years. There were 67.17% male and 32.83% females. Male-to-female ratio was 2.04:1. The mean WBC count was 9.96±3.02. Diabetes was found in 71.3% patients and hypertension in 168(36.5%) patients (Table 1).

Table No.1: Demographic information of the patients (n=460)

Variable	Mean±SD
Age (years)	49.17±13.58
Male	309 (67.17%)
Female	151 (32.83%)
WBC Count	9.96±3.02
Diabetes	328 (71.3%)
Hypertension	168 (36.5%)

Table No.2: Association of mortality with leukocytosis (n=460)

Mortality	Group		Total
Yes	48	19	67
No	182	211	393

Relative risk = 2.92 (95% CI; 1.661, 5.164, p<0.001)

The study results showed that the mortality occurred in 67 cases in which 48 were from leucocytosis group and 19 were from Normal WBC group, similarly mortality was not occurred in 393 patients in whom 182 were from leucocytosis group and 211 were from normal WBC group patients. Statistically there is highly significant difference was found between the study groups and mortality (p=0.000). The OR value showed that there is approx. three times more chance of mortality in leucocytosis group as compared to normal WBC i.e. OR=2.92 (Table 2)

DISCUSSION

There is vast data available which showed significant association of long-term as well as short-term outcome (morbidity and mortality) with raised leukocyte count. A WHO study, in 1990 quoted incidence of mortality due to stroke in developing countries to be 73/100,000 per year.[9] Stroke is one of the leading cause of debility and 4thleading cause of mortality. In the United States, about 795,000 cases have new onset (610,000 cases) or recurrent (185,000 cases) episode of stroke every year. Epidemiologic data showed that about 82-92% strokes are ischemic in United States.[10]

According to WHO, all over the world, there are 15 million cases develop stroke every year. Among them, 5million die, while 5million develop permanent disability.[11] In United States, black people have .49 times high age-adjusted risk of death due to stroke than white people.[12] Hispanics have less occurrence of stroke than White and Black people but have high occurrence of lacunar strokes and in earlier age. Males have high risk than females for stroke; white males have 62.8 per 100,000 stroke incidence, with 26.3% mortality rate at end, while females have 59 per 100,000stroke incidence and mortality rate of 39.2%.[13] But stroke is usually considered to be a disease of older age, 1/3rd strokes develop in adults <65 years age group.[14] The risk of stroke rises with increasing age, mainly in adults >64 years, in whom 75% of all strokes occur.[13]

In our study the mortality occurred in 67 cases in which 48 were from leukocytosis group and 19 were from Normal WBC group, similarly mortality was not occurred in 393 patients in whom 182 were from leukocytosis group and 211 were from normal WBC group patients. According to the OR=2.92, there is more chance of mortality in leukocytosis group as compared to normal WBC group patients. Ganti et al[15] showed in their study that amongst the routine labs obtained in the emergency department in the evaluation of acute ischemic stroke, an elevated white blood cell count, low serum bicarbonate, and a high glucose level are independent predictors of 90-day mortality. Low serum calcium also appears to be associated with worse mortality, although our study design did not permit us to evaluate this result in the multivariate model with the others.

Furlan et al[8] concluded in their study that in cases of acute ischemic stroke, raised admission leukocyte count is independent predictor of stroke at time of admission, high risk of disability at discharge and 30days mortality. They showed that the high white blood cell counts (>10.0x 109/L) was significantly associated with mortality (18.2 %) as compared to normal WBC count (10.1%). However one study showed that the rate of

abnormal WBC count was 17.5% while normal WBC count was 82.5%. The in hospital mortality was 13.3% (22/165) with normal leucocyte count while 14.3% (5/35) with abnormal leukocyte count ($p>0.05$).[16] Another study had also matched results and reported that there was no association between leucocyte counts and mortality of ischemic stroke.[17]

Furman et al[18] demonstrated in their study that high leukocyte count is significantly associated with in-hospital mortality (adjusted odds ratio 2.8, 95% CI; 2.1–3.6 for Q4 compared to Q2 [normal range]) and heart failure (odds ratio 2.7, 95% CI; 2.2–3.4) for cases of acute coronary syndrome.

Nardi et al[19] found that raised leukocyte count in acute phase of cerebral ischemia is significantly associated with poor initial stroke severity, high NIHSS after 72h and raised modified Rankin score in patients with total anterior, partial anterior or posterior cerebral stroke, when controlled age, gender, dyslipidemia, atrial fibrillation and valvular heart diseases. Kazmierski et al[20] reported that there is significantly higher chances of in-hospital mortality in post-ischemic stroke cases with raised leukocyte count during first 12hours. The results of Blum study showed that presenting WBC is associated with short-term mortality after myocardial infarction. This finding is corresponding to, also matches with, previous epidemiologic data, associating WBC with developing cardiovascular diseases.[21]

Literature reported significant association between high leukocyte count and high risk of short and long-term for ischemic episodes and mortality in patients of acute coronary syndrome.[22-24] Notwithstanding these significant associations of total leukocyte count with cardiovascular risk, there is contradiction present regarding the level of leukocyte count, independent of smoking and gender and the at-risk people.

CONCLUSION

Our study results concluded that there is more chance of in hospital mortality found in leukocytosis group as compared to without leukocytosis group with [OR=2.92] in patients presenting with acute ischemic stroke.

Author's Contribution:

Concept & Design of Study:	Muhammad Naeem Safdar
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Data Analysis:	Muhammad Shahid, Irshad Hussain, Fawad Ahmad Randhawa
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Conflict of Interest: The study has no conflict of interest to declare by any author.

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