Original Article

The Relationship between the Intensity of Fever and Stroke Outcome at SKBZH/CMH Muzaffarabad

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ABSTRACT

Objective: The researchers wanted to discover how frequently and why acute stroke patients have fever, as well as any risk factors connected with it.

Study Design: Prospective study.

Place and Duration of Study: This study was conducted at the Department of Medicine, SKBZH/CMH Muzaffarabad AJK from January and December 2019.

Materials and Methods: This hospital-based study enrolled people who had an acute ischemic stroke to learn more about the pathogenesis. In this process, patients are examined. After an initial evaluation by an internist familiar with stroke treatment, patients are examined the next day by another neurologist. The patients admitted to the ER using the GCS and SSS (Scandinavian stroke scale). Patients are hospitalized for seven to 10 days after a first-day CT, second-day CT, and third-day MRI. A second CT scan determines the exact volume of the brain lesion. Holter monitoring, DSA, and transthoracic or transesophageal echocardiograms are all accessible. This is done using Rankin Scales and the Barthel Index.

Results: 37% of patients had a fever, 22.7 percent had a confirmed infection, and 14.8 percent had a fever but no other signs of sickness. Age was related with an increased risk of fever in univariate analysis ($P < 0.05$). Excessive intracerebral haemorrhage was closely linked with fever, mass effect (transtentorial herniation), intraventricular blood, and severe infarct ischemia ($P < 0.05$). Patients admitted with fever received lower Glasgow Coma Scale and Scandinavian Stroke Scale scores ($P < 0.05$). Urethral catheterization was associated with pre-existing infection risk variables but not with fevers prior to the invasive procedure ($P < 0.05$). The Barthel Index ($P < 0.05$) and Modified Rankin Scales ($P < 0.05$) both indicated lower scores in patients with fever ($P < 0.05$). Multivariate research revealed a strong association between fever and age, the Scandinavian Stroke Scale score, and the mass effect. These individuals ($P<0.05$) were found to be more likely to develop a fever early in the course of their illness than those who were ill. In a logistic regression research, only fever without a proven disease ($P < 0.05$) predicted fever.

Conclusion: Alternatively, individuals who have an acute stroke and afterwards develop a fever have suffered a severe stroke and/or undergone intrusive surgery. When your fever begins, the only method to determine if you're unwell is to check for an infection

Key Words: Intensity, Fever, Stroke, Muzaffarabad

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INTRODUCTION

Acute stroke patients are more likely to have a fever, which is usually caused by infection. Some patients with an acute stroke and a fever cannot be diagnosed. This increases unfavorable effects and overall medical costs for these patients, who are routinely prescribed broad-spectrum antibiotics. Fever bouts that do not respond to empirical antibiotics are thought to be caused by CNS lesions. Patients with a fever after an acute stroke had a worse prognosis[1,2,3]. However, nothing is known about acute stroke patients who develop fever.

Most stroke victims develop a temperature. High body temperature is linked to acute stroke severity, lesion size, mortality, and neurologic prognosis. Any infection should be extensively investigated utilizing body temperature markers. Two meta-analyses confirmed this, showing that raised body temperature after a stroke, regardless of origin, is associated with increased morbidity and mortality.

Infection is the most common cause of post-stroke fever. An ischemic stroke hospitalized 119 people, 25% of whom had fever (temperature > 38°C) within 24 hours and 32% developed fever (temperature > 37.5°C)

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within 48 hours. Fever within 48 hours of an ischemic stroke was likely caused by pneumococci, streptococci, E. coli, enterococci, and influenza virus type A. Surprisingly, most fevers are caused by an infectious or chemical pneumonia (83 percent).

The body's temperature may rise after a big stroke due to necrosis. Cerebral blood clots can cause non-infectious fever. Stroke patients commonly have a fever for the first two days after hospitalization.[2] However, the reasoning isn't always clear. Some writers claim that the onset of a fever reveals its underlying etiology. Fever induced by stroke-related pathologic processes often develops within 24 hours, but infection-related fever manifests later. Acute fever in stroke sufferers may indicate a neurological cause if no prior illness is present.[4,5,6]

This study's goal was to characterize infections in acute stroke patients and the relationship between stroke type and severity and fever with or without infection.

MATERIALS AND METHODS

This cohort study comprised acute stroke patients admitted to ICUs or medical units between January and December 2019. Except for patients with subarachnoid hemorrhage, who are frequently sent to a neurosurgical hospital and thus excluded from the study. Patient transfers, those with a fever or infection prior to the stroke, and those with primary or metastatic brain tumors were exempt from this rule.

This prospective hospital-based study enlisted stroke victims to better understand the pathophysiology. [3] Patients are examined. Immediately after a stroke diagnosis, patients are seen by another neurologist the next day. Between 4 and 6 persons. It assesses ER patients using the GCS and SSS (Scandinavian stroke scale). First, second, and third day CTs are followed by MRIs. A second CT scan determines the lesion's exact volume. Holter monitoring, DSA, and TTE are all available. strokes[7] NINCDS Rankin Scales and the Barthel Index[8, 9] are used.

Fever-related issues were investigated in the participants' medical records. A rise in body temperature over two days is required to be febrile. Everyone's axillae are temperature every three hours. Temperatures were rounded to half a degree Celsius for data processing. Doctors' notes, test findings, and x-rays revealed the patient's exact cause of high temperature. Unverified infections have an unknown cause. Nosocomial infections lasted more than 48 hours.[10,11]

Statistical Analysis: We used Kruskal–Wallis and Fisher's exact tests to compare categorical and continuous variables. The potential of independent parameters to discriminate between fevers with no reported infection and fevers with a recorded infection was examined using stepwise logistic regression. As illustrated in this graphic, variables were excluded from our model utilizing a stepwise procedure ($P > 0.05$).

RESULTS

A review of the medical records of 330 individuals was done. 376.6% of the population had a fever. Patients were infected 22.7% of the time, and 40% of those infections occurred during hospitalization. Although the infection rate was 14.8%, none of the patients became ill. According to Table 1, patients with acute stroke who are admitted to the hospital are more likely to get an infection than the general population. Infections of the respiratory and urinary tract systems were the most prevalent.

The term "fever" refers to a temperature of more than 100 degrees Fahrenheit (38 degrees Celsius) (univariate analysis). Men were significantly more likely to remain afebrile than women, with a P value < 0.05. There was a clear correlation between rising age and increased fever frequency (P <0.05). A logistic regression analysis revealed no statistically significant difference in gender between the two groups, transtentorial herniation, and intraventricular blood on CT scan in patients with intracerebral haemorrhage were all associated with fever rather than ischemic infarction in mass effect instances (P <0.05. Fever was related with an increased risk of ischemic infarction (P <0.05) and bleeding (P <0.05). Despite the absence of a known disease, patients with fever were admitted to the hospital with lower Glasgow Coma and Scandinavian Stroke Scale scores (P<0.05). When these individuals did not have fevers, their CPK levels were lowered (P <0.05). Indicators of infection risk had little effect on a fever (Table 2). Using an invasive technique, such as a urinary catheter or central line, was identified as a significant risk factor (P <0.05). The Modified Rankin Scale (P <0.05) and Barthel Index (P <0.05) revealed significantly worse outcomes in persons who suffered fever. Multivariate logistic regression was used to investigate fever, intracerebral haemorrhage, ischemic infarct, as well as age, gender, illness severity, and prognosis. Age (P< 0.05), SSS score (P <0.05), and mass effect (P <0.05) were all found to be significantly linked with fever.

Table No.1: Frequency of infections (%)

Causes of fever	Number of patients (%)	No. of patients with secondary infection (%)
Infections	75 (22.69)	2 (2.71)
Urinary tract	38 (11.52)	2 (5.29)
Respiratory tract	33 (10.00)	0 (0.00)
Primary bacteraemia	3 (0.99)	
Cholecystitis/cholangitis	1 (0.33)	0 (0.00)
Fever (without focused infection)	49 (14.80)	

Table No.2: Number of Patients (%)

Characteristics	No fever or infection (N=206)	Fever with or without infection (N=124)	P Value
Gender			
Males	126(61.1%)	58(47.04%)	0.013
Females	80(39.2%)	66(53.02%)	
Age in years (mean ±SD)	71.2 ±0.79	75.4 ±0.89	0.000
Type of stroke (CT scan findings)			
Ischaemic infarct	193(94.04%)	89(72.02%)	0.000
Intracerebral haemorrhage	13(6.02%)	35(28.01%)	
Other CT scan findings			
Mass effect	30(15.1%)	74(61.03%)	0.000
Transtentorial herniation	13(6.02%)	46(38.2%)	0.000
Intraventricular blood	0(0%)	18(15.02%)	0.000
Haemorrhagic transformation	14(7.1%)	15(12.03%)	0.112
Infarct size in cm^3 (mean ±SD)	13.91 ±2.12	48.91 ±5.55	0.000
Haemorrhage size in cm^3 (mean ±SD)	7.32 ±2.30	37.52 ±4.79	0.000
Clinical assessment on admission			
Glasgow Coma Scale (3–15) (mean ±SD)	14.01 ±0.22	9.89 ±0.41	0.000
Severe stroke (GCS<9)	10(5.02%)	49(40.1%)	0.000
Scandinavian Stroke Scale (0–58) (mean ±SD)	40.59 ±1.22	15.43 ±1.52	0.000
Severe stroke (SSS<29)	52(25.01%)	96(77.03%)	0.000
Serum Enzymes			
LDH (mean ±SD)	263.22 ±8.38	277.72 ±16.64	0.171
CPK (mean ±SD)	124.42 ±11.79	208.12 ±26.72	0.000
Risk factor for infection	77(38.01%)	48(39.42%)	0.833
COPD	7(3.2%)	6(5.1%)	0.555
CRF	10(5.02%)	7(6.03%)	0.812
Diabetes mellitus	59(29.14%)	31(25.03%)	0.515
Immunosuppression	3(1.1%)	0(0%)	0.229
Invasive procedure preceding fever	25(12.2%)	80(66.03%)	0.000
Urinary catheter	25(12.2%)	80(66.03%)	0.000
Endotracheal tube	0(0%)	1(1.1%)	0.369
Central line	0(0%)	3(2.12%)	0.050
Illness (outcome measures)			
Modified Rankin Scale (0–6) (mean ±SD)	2.41 ±0.12	4.89 ±0.14	0.000
Severe handicap or death (MRS>3)	61(35.05%)	109(92.3%)	0.000
Barthel Index (0–100) (mean ±SD)	69.42 ±2.45	26.01 ±3.68	0.000
Severe disability (BI<40)	47(24.07%)	60(76.03%)	0.000

DISCUSSION

According to this study, 22.7 percent of acute stroke patients had an infection. Most of those screened had a UTI. Patients with UTIs required increased in-hospital catheterization. It was formerly associated with infection. The inability to completely empty the bladder causes urine stasis and complicates catheter placement in stroke patients with severe symptoms [13,14]. Statistically, removing a urinary catheter increases the chance of urinary tract infections. Most respiratory infections were caused by the public. Aspiration pneumonia is a major cause of respiratory tract infections after a stroke [12,15]. No link was found between known infection risk factors and sickness onset. Infections can lessen the severity of a stoke. It's impossible to search every possible site. Infections were less prevalent in stroke survivors. Patients with severe stroke are more likely to aspirate due to toxicity in the dependent bronchi.

Regardless of infection, those with fever had a worse outcome. Previous research [1–2] connected high temperature to worse stroke outcomes. Frequent high fevers cause ischemic brain injury [1, 2].

14.8 percent of our sample had a fever for no apparent reason (39.5 percent of febrile patients). The medications had little effect on the sickness' intensity or duration. This study's main goal is to learn more about stroke patients who develop a fever but have no identified infection source. Two previous investigations looked at stroke severity, outcome, and fever. Various disorders release interleukin-1, TNF-, and IL-6 into the bloodstream. In those with CNS issues, pyrogens can produce fever [16-21].

Infection markers may be used to distinguish between infection-induced and causative agent-induced fever in the future. CRP levels in severe stroke patients are unknown (CRP). Elevated CRP in acute stroke victims may help diagnose fever. C-reactive protein levels are higher in infection than in inflammation. Procalcitonin rises during illness. Procalcitonin secretion increases with bacterial endotoxin[22-24].

This study found that the first fever was the only predictor of central origin fever using logistic regression (fever of central origin). No incubation period makes sense if "central fever" is the genesis of all non-specific fevers. Even after removing observer bias, we need patient medical data to estimate the cause of fever. Each patient was treated independently, thus finding the source of the fever took time. Major stroke victims are more prone to infections and fevers, hence the two categories may overlap. Subclinical problems are more common after a stroke. The discoveries' significance is currently being studied.

CONCLUSION

According to statistics from the recent study, patients with fever have a worse prognosis and develop fever early in cases where a source of infection has not been identified.

Author's Contribution:

Concept & Design of Study:	Munazza Nazir
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Conflict of Interest: The study has no conflict of interest to declare by any author.

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