https://doi.org/10.29309/TPMJ/2023.30.07.7491

The Professional Medical Journal
www.theprofesional.com
2023, Volume, 30 Issue, 07

ORIGINAL ARTICLE

Frequency of hyperthermia in acute ischemic stroke patients presenting to tertiary care hospital.

Farhan Zeb[1], Imran Qadir[2], Sheraz Zafar[3], Sobia Ahmed Qureshi[4], Asif Khan[5], Saqib Parveiz[6]

Article Citation: Zeb F, Qadir I, Zafar S, Qureshi SA, Khan A, Parveiz S. Frequency of hyperthermia in acute ischemic stroke patients presenting to tertiary care hospital. Professional Med J 2023; 30(07):841-845. https://doi.org/10.29309/TPMJ/2023.30.07.7491

ABSTRACT… Objective: To determine frequency of hyperthermia in acute ischemic stroke patients. **Study Design:** Descriptive Cross-sectional study. **Setting:** Department of Medicine, M T I-H M C, Peshawar. **Period:** January, 2020 to Dec, 2020. **Material & Methods:** All patients admitted through emergency Deptt was included in the study keeping in view inclusion criteria. All patients' axillary temperatures were checked using a mercury thermometer at the time of admission and every six hours for three days. To determine whether hyperthermia met the practical meaning of the term, daily follow-up was conducted. All of the data was entered into a pre-designed proforma. **Results:** Mean age was recorded as 65.5+7.67 years and mean BMI was 26+1.65kg/m2. 107 (51.94%) patients were recorded as male patients, 99 (48.05%) patients were recorded female patients.32 (15.53%) patients were recorded with hyperthermia. Risk factors were traced in 91.26% had history of hypertension, 84.46% had diabetes mellitus and 78.15% had smoking history. P-value with advancing age (p=0.020) and severity of stroke (p=0.278). **Conclusion:** It has been concluded in our study that hyperthermia in ischemic stroke should be looked as it has significant impact on the outcome.

Key words: Acute Ischemic Stroke, Diabetes Mellitus, Hyperthermia, Hypertension.

INTRODUCTION

Stroke is a leading cause of death globally, especially in middle and higher income countries.[1] In both ischemia (IS) and intracerebral hemorrhagic (ICH) stroke, hyperthermia is a sign of bad prognosis.[2]

A negative result following an ischemic or hemorrhagic stroke is unfavourable demonstrated by clinical data that indicate an increased body temperature. This finding leads to the development of two potential therapeutic approaches: induced hypothermia, which targets core body temperature below 36.5°C, and fever therapy that aims to maintain normothermia.[3]

Although hypothermia has been used for various purposes over several decades, its efficacy in the treatment of ischemic stroke is debatable. Several trials have proven its safety and feasibility; however, more robust, randomized clinical trials with large volumes of patients are needed to fully establish its utility in the clinical setting.[4]

After an ischemia stroke, tissues are preserved and damage is minimized by the powerful restorative measure of hypothermia. Induced hypothermia impacts almost all biochemical, molecular, and cellular events in cell death to support tissue preservation, according to experimental data and clinical experience. Recent research indicates that hypothermia may also positively influence the natural healing and restorative qualities. The many protective benefits of therapeutic hypothermia have demonstrated that, following a severe ischemic stroke, neuroprotection needs multitarget strategies.[5]

In a study, hyperthermia occurred in 17 (or 16%) of the ischemic stroke patients. Patients under 60 years of age had a hyperthermia prevalence of 26%, while patients over 60 years of age had

1. Specialist Registrar Medicine, Hayatabd Medical Complex, Peshawar, Pakistan.
2. Specialist Registrar Medicine, Hayatabd Medical Complex, Peshawar, Pakistan.
3. Postgraduate Resident Medicine, Hayatabd Medical Complex, Peshawar, Pakistan.
4. Postgraduate Resident Medicine, Hayatabd Medical Complex, Peshawar, Pakistan.
5. Postgraduate Resident Medicine, Hayatabd Medical Complex, Peshawar, Pakistan.
6. Medical Officer, Tehsil Headquarter Hospital Puran Shangla, Pakistan.

Correspondence Address:
Dr. Saqib Parveiz
Tehsil Headquarter Hospital Puran Shangla, Pakistan.
saqib.pervez69@gmail.com

Article received on: 14/03/2023
Accepted for publication: 17/05/2023

a hyperthermia prevalence of 7.1% (p=0.008). According to gender stratification, 14.8% of male patients experienced fever, compared to 17.8% of female patients (p=0.43).[6]

The acutely ischemic or traumatized brain is excessively prone to the harmful effects of even moderate increases in brain temperature, which is why this research aims to identify the incidence of hyperthermia in acute ischemic stroke patients. We will be able to determine the therapeutic effectiveness and safety of frank hypothermia in patients with acute stroke with the help of this research. Furthermore, this research will provide evidence that is convincing enough to support the current advice that fever be treated aggressively in acute stroke and trauma patients, even if "minor" in degree and delayed in start. Additionally, we will be able to recommend that sufficient body temperature be kept for at least the first few days following an acute stroke in a safe normothermic range (for example, 36.7°C to 37.0°C [98.0°F to 98.6°F]).

MATERIAL & METHODS

In the Department of Medicine, a descriptive cross-sectional study was done in MTI-HMC, Peshawar from January, 2020 to Dec, 2020. Sample Size: It was 206 keeping 16%1 proportion of hypothermia after acute ischemic stroke with level of significance 5%, confidence interval 95%, margin of error 5%, through the use of non-probability sampling technique. Inclusion Criteria: Patients of both male and female gender having age between 40 to 80 Years and having acute ischemic stroke confirmed on CT Brain. Patients with acute hemorrhagic stroke, subarachnoid hemorrhage, intracerebral bleed, cerebellar bleed, tumor, trauma, central nervous system infection, systemic diseases like chronic renal failure, cardiac failure, chronic liver disease, sepsis, recent history of any brain surgery, and fever prior to the onset of acute ischemic stroke were excluded from this study.

Data Collection Procedure

This study was conducted following permission from the hospital's research and ethical committees. The goal and benefits of the study were described to the patient, and written informed consent was acquired from them. All patients admitted through emergency deptt was included in the study keeping in view inclusion criteria. All patients' axillary temperatures were measured using a mercury thermometer at the time of admission and every 6 hours for three days. Daily monitoring was done to determine whether hyperthermia, as defined by operational definition, was present or not. A predesigned proforma attached to this study contains all the data that was collected.

Data Analysis Procedure

SPSS version 22.0 was used for data entry. For quantifiable factors like age, mean and SD were determined. For gender, the start of symptoms, and hyperthermia, frequencies and percentages were determined. Age, gender, and the degree of ischemia stroke were used to stratify hyperthermia to examine impact changes. The post-stratification student chi-square test was used, with a P value of 0.05 being considered significant. All findings were shown as diagrams and charts.

RESULTS

As per descriptive statistics, mean age was recorded as 65.5+7.67 yesrs, mean BMI was 26+1.65kg/m2. As per age wise distribution, 103 (50%) patients were recorded in 40-65 years age group where as in age group 66-80 years, 103 (50%) patients were recorded in it. As per gender wise distribution, 107 (51.94%) patients were recorded as male patients, 99 (48.05%) patients were recorded female patients. As per frequencies and percentages for hyperthermia, 32 (15.53%) patients were recorded with hyperthermia. 188 (91.26%) patients were recorded as hypertensive. 174 (84.46%) patients were having diabetes. 161 (78.15%) patients were found to have been smokers (Table-I). As per severity of stroke, 70 (33.98%) patients were recorded with mild stroke, 96 (46.60%) patients were recorded with moderate stroke and 40 (19.41%) patients were recorded with severe stroke (Table-II). Stratification of hyperthermia with respect severity of stroke are recorded at (Table-III).

	Frequency	Percentages
Hyperthermia	32	15.53%
Hypertension	188	91.26%
Diabetes Mellitus	174	84.46%
Smoking	161	78.15%

Table-I. Risk factors

Severity of Stroke	Frequency	Percentages
Mild	70	33.98%
Moderate	96	46.60%
Severe	40	19.41%
Total	206	100%

Table-II. Frequency and percentages of stroke severity

Severity of Stroke	Hyperthermia		P-Value
	Yes	No	
Mild	13 (6.31%)	57 (27.66%)	0.278
Moderate	16 (7.76%)	80 (38.83%)	
Severe	03 (1.45%)	37 (17.96%)	
Total	32 (15.53%)	174 (84.46%	

Table-III. Stratification of hyperthermia with severity of stroke

DISCUSSION

The pathophysiology of and therapeutic significance of post-ischemic stroke hyperthermia, a frequent but undesirable occurrence, are not completely understood.[7] The lesion in the brain itself may cause hyperthermia in ischemic stroke patients. However, the development of inflammation and biochemical processes linked to brain ischemia is also significant. The penumbra, a region of temporarily diminished neuronal function encircling the infarct, becomes a permanent injury as a result of hyperthermia, which amplifies ischemic processes within the penumbra.[8] As a result, it appears that hyperthermia that develops after an ischemic stroke both causes and contributes to the development of cerebral infarcts. Clinical and laboratory study demonstrate that ischemic brain injury and stroke prognosis are exacerbated by hyperthermia. Increased body temperature within the first 24 hours of the illness is particularly linked to the harmful impacts of hyperthermia in human stroke.

Stroke is a major cause of mortality worldwide, particularly in middle and upper income countries.[1] When a stroke is ischemic (IS) or hemorrhagic (ICH), hyperthermia is a sign that the patient will have a bad prognosis.[2]

A negative result following an ischemic or hemorrhagic stroke is plainly demonstrated by clinical data that indicate an increased body temperature. This finding leads to the following two potential therapeutic approaches: (2) Induced hypothermia, which aims to lower central body temperatures to 36.5°C, and (1) fever therapy with the goal of maintaining normothermia.[3]

Although hypothermia has been used for various purposes over several decades, its efficacy in the treatment of ischemic stroke is debatable. Several trials have proven its safety and feasibility; however, more robust, randomized clinical trials with large volumes of patients are needed to fully establish its utility in the clinical setting.[4]

Long recognized as a powerful neuroprotective treatment that protects cells and reduces damage after an ischemic stroke, hypothermia. Induced hypothermia impacts almost all biochemical, molecular, and cellular events in cell death to support tissue preservation, according to experimental data and clinical experience. Recent study indicates that hypothermia may also positively influence the natural healing and restorative qualities. The many protective benefits of therapeutic cooling have demonstrated the need for multitarget strategies to achieve neuroprotection after severe ischemic stroke.[5]

In a study, hyperthermia occurred in 17 (or 16%) of the ischemic stroke patients. Patients under 60 years of age had a hyperthermia prevalence of 26%, while patients over 60 years of age had a hyperthermia prevalence of 7.1% ($p=0.008$). According to gender, 14.8% of male patients ($p=0.43$) experienced fever, compared to 17.8% of female patients.[6] Patients with hyperthermia were reported in 15.53% of our study. One significant secondary cause of post-stroke fever may be the frequent presence of superimposed illnesses in stroke patients. Regardless the cause of hyperthermia after an ischemic stroke, pharmacological antipyretic medicine is advised as any hyperthermia may worsen the stroke's prognosis. The regular application of chemical

or manual cooling treatment in acute ischemic stroke is presently not supported by data from randomised studies. Further study into the processes that cause hyperthermia and its role in increasing the severity of stroke damage may result in novel and significant therapeutic methods. This is the first study on the topic to come from Pakistan, to our understanding. As a result, it primarily plays the part of an observational study, and its conclusions will act as the starting point for future research on this subject. The average age of subjects in this study was 60.1+9.5 years. With a male to female ratio of 1.3:1, there were 45 (42.5%) females and 61 (57.5%) males. The male to female ratio was found by Saini et al.12 to be 1.3:1, indicating male supremacy. That is in a survey of 106 cerebral stroke patients, 17 (16%) experienced hyperthermia. Saini et al.[9] stated that 15.9% of patients in their study had acquired hyperthermia. In our study, mean and S D s for age was recorded as 65.5+7.67, 107 (51.94%) patients were recorded as male patients, 99 (48.05%) patients were recorded as female patients. In our study, 15.53%) patients were recorded with hyperthermia.

150 patients with Hyperthermic Stroke(HS), 150 patients with additional Hyperthermia related illnesses(HRI), and 150 patients without HRIs were included, the incidence of acute ischemic stroke (AIS) was higher in patients with HS compared to other HRI and control patients (12% vs. 6% vs. 4.67%, p=0.038).[10]

Only the first 12 hours after the start of symptoms did patients with hyperthermia have substantially greater glutamate levels. Body temperature and the amounts of glutamate (r = 0.52; p=0.0001) and glycine (r = 0.62; p=0.0001) in the CSF were linked. Although this impact was reliant on the glutamate effect, body temperature was strongly correlated with the severity of a stroke and the extent of the infarct.[11]

In one study, 46.7% of patients had microalbumin (MA). On Day 1 and Day 2, 18.3% of patients and 25% of patients, respectively, had hyperthermia. It was discovered (both P=0.05) that albuminuria on Day 2 and body temperature on Days 1 and 2 were correlated. In the group of patients who had both MA and hyperthermia on Day 2, the mortality was considerably greater (73% vs 10% after 90 days; P=0.0001; and 73% vs 18% after 1 year, P=0.005).[12]

There were a total of 106 ischemic stroke patients included. A total of 17 (16%) ischemic stroke patients had hyperthermia. When the incidence of hyperthermia was stratified by age, individuals younger than 60 years old had a higher rate of development of the condition (26% vs. 7.1%, p=0.008).[13] According to a research conducted on Japanese patients, the hyperthermia group's final modified Rankin Scale ratings were greater than those of the non-hyperthermia group. The non-hyperthermia group had considerably higher survival rates than the hyperthermia group, according to the Kaplan-Meier model (hazard ratio, 5.3; 95% confidence intervals, 1.2-24.8).[14] Patients with a history of hyperthermia at Yalgado Ouedraogo University Teaching Hospital had a mortality rate of 39%, with a male to female ratio of 37.6% to 41.6%.[15]

CONCLUSION

It has been concluded in my study that hyperthermia in ischemic stroke should be looked as it has significant impact on the outcome.

REFERENCES

1. Chen LF, Cheng YC, Hsu LC. **Bacterial pneumonia following acute ischemic stroke**. J China Med Assoc 2013:76; 7882. doi.org/10.1016/j.jcma.2012.10.005

2. Campos F, Sobrino T, VieitesPrado A, PérezMato M, RodríguezYáñez M, Blanco M, et al. **Hyperthermia in human ischemic and hemorrhagic stroke: Similar outcome, different mechanisms.** PLoS One 2013; 8(11):e78429. DOI: 10.1371/journal.pone.0078429

3. Bernd K Rainer K. **Temperature management in strokean unsolved, but important topic.** Cerebrovasc Dis 2011; 31:532–43. DOI: 10.1159/000324621

4. Tahir RA, Pabaney AH. **Therapeutic hypothermia and ischemic stroke: A literature review.** Surg Neurol Int 2016; 7. DOI: 10.4103/2152-7806.183492

5. Kim JY, Yenari MA. **Hypothermia for treatment of stroke.** Brain Cir 2015; 1:1425. DOI: 10.4103/2394-8108.164997

6. Maheshwari AK, Kumar P, Alam MT. J Coll Physicians Surg Pak. 2016 Jun; 26(6):4903.

7. Yuan J, Yankner BA. **Apoptosis in the nervous system.** Nature. 2000 Oct 12.407(6805):8029. DOI: 10.1038/35037739

8. Latchaw RE, Yonas H, Hunter GJ, Yuh WT, Ueda T, Sorensen AG, et al. **Guidelines and recommendations for perfusion imaging in cerebral ischemia: A scientific statement for healthcare professionals by the writing group on perfusion imaging, from the Council on Cardiovascular Radiology of the American Heart Association.** Stroke. 2003 Apr. 34(4):1084104. DOI: 10.1161/01.STR.0000064840.99271.9E

9. Sacco RL, Shi T, Zamanillo MC, Kargman DE. **Predictors of mortality and recurrenceafter hospitalized cerebral infarction in an urban community: The Northern Manhattan Stroke Study.** Neurology. 1994 Apr. 44(4):62634. DOI: 10.1212/wnl.44.4.626

10. Wang JC, Chien WC, Chu P, Chung CH, Lin CY, Tsai SH. **The association between heat stroke and subsequent cardiovascular diseases.** PloS one. 2019 Feb 13; 14(2):e0211386. DOI: 10.1371/journal.pone.0211386

11. Castillo J, Dávalos A, Noya M. **Aggravation of acute ischemic stroke by hyperthermia is related to an excitotoxic mechanism.** Cerebrovasc Dis. 1999 Jan-Feb; 9(1):22-7. doi: 10.1159/000015891. PMID: 9873159. DOI: 10.1159/000015891

12. Szczudlik A, Turaj W, Słowik A, Strojny J. **Microalbuminuria and hyperthermia independently predict long-term mortality in acute ischemic stroke patients.** Acta Neurol Scand. 2003 Feb; 107(2):96-101. doi: 10.1034/j.1600-0404.2003.01363.x. PMID: 12580857. DOI: 10.1034/j.1600-0404.2003.01363.x

13. Maheshwari AK, Kumar P, Alam MT, Aurangzeb M, Parkash J, Imran K, Masroor M. **Frequency of hyperthermia in acute ischemic stroke patients visiting a tertiary care hospital.** J Coll Physicians Surg Pak. 2016 Jun; 26(6):490-3. PMID: 27353986.

14. Ueno T, Nishijima H, Hikichi H, Haga R, Arai A, Suzuki C, Nunomura JI, Tomiyama M. **Association of survival and hyperthermia after rt□PA for ischemic stroke.** Acta Neurologica Scandinavica. 2018 Dec; 138(6):574-8. https://doi.org/10.1111/ane.13011. DOI: 10.1111/ane.13011

15. Dabilgou AA, Dravé A, Kyelem JMA, Ouedraogo S, Napon C, Kaboré J. **Frequency and mortality risk factors of acute ischemic stroke in emergency department in burkina faso.** Stroke Res Treat. 2020 Jun 11; 2020:9745206. doi: 10.1155/2020/9745206. PMID: 32577197; PMCID: PMC7305528. DOI: 10.1155/2020/9745206. doi: 10.1155/2020/9745206.

AUTHORSHIP AND CONTRIBUTION DECLARATION

No.	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Farhan Zeb	Concep of study, Study design + Study conduction.	
2	Imran Qadir	Data analysis, Manuscript writing.	
3	Sheraz Zafar	Study design+data analysis and result interpretation.	
4	Sobia Ahmed Qureshi	Manuscript writing + data collection.	
5	Asif Khan	Data analysis + Manuscript writing.	
6	Saqib Parveiz	Discussion writing + Data collection.