Effect of Body Temperature on Mortality of Acute Stroke

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Abstract
Objectives: The exact relation between body temperature and mortality of acute stroke victims is poorly understood. However, body temperature can affect the outcome of stroke cases in relation to mortality. In the initial (4-12 hrs) hours of stroke, the temperature rise is often neurogenic in origin and mortality is also higher with raised body temperature. Though the anatomical lesion or nature of lesion along with other established risk factors influence the mortality of stroke cases, change in temperature does affect the outcome of stroke cases.

We sought to find out the significance of stroke victim’s body temperature (within 4-12 hrs) with respect to short-term mortality rate in our study.

Methods: We selected 100 ischemic and 100 hemorrhagic stroke patients proved by CT scan of brain and 2-hrly oral temperature was strictly recorded for the initial 4-12 hrs of admission.

Results: It was evident from the study that hyperthermia (>37.5°C) was associated with highest mortality rate in both hemorrhagic (51.78%) and ischemic (56.66%) cases. In normothermic group, mortality was 13.5% and 8.8% in hemorrhagic and ischemic group respectively, whereas hypothermia (<36.5°C) was associated with 0% mortality.

Conclusion: Hyperthermia in acute stroke victim carries a bad prognostic parameter in short term basis.

INTRODUCTION
Various factors likely to be associated with high risk of death and poor functional outcome after stroke have been studied and identified by many authors. Demographic and clinical features, simple laboratory tests and complex tests like CT scanning or MRI of brain are all taken into consideration to predict the outcome of stroke cases.1 In spite of all these, there is scanty data to predict an individual outcome early after stroke onset with enough accuracy to be of much value in clinical practice.

Though the exact relationship of body temperature and mortality of stroke victims is poorly understood, the body temperature can undoubtedly affect the outcome of stroke cases in relation to mortality.2

In some cases within 4-12 hours of acute stroke there is a neurogenic rise in temperature which is non-infectious in origin and is probably due to hypothalamic disturbance.3 Since mortality and morbidity are higher with raised temperature,4 it is necessary to maintain strict temperature chart during the acute phase of cerebrovascular accident (CVA).

With this idea in mind, we tried to find out the significance of stroke victims’ admission body temperature (within first 4-12 hours of onset of stroke) with respect to short-term mortality rate.

METHODS
The study was carried out in the indoor Department of Medicine, RG Kar Medical College, Kolkata from February 2000 to February 2002. The study population comprised 200 patients during the said period (Table 1).

As a routine procedure, we carried out CT scanning of brain in all cases of CVA admitted in our department. We selected CT proved cases of 100 ischemic and 100 haemorrhagic stroke cases in our study out of total 681 cases of CVA admitted in our units during February 2000 to February

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Criteria for selection of patients were kept uniform as far as possible in relation to various established clinical predictors of stroke outcome (viz. various risk factors). No case with pontine haemorrhage was included in the study. We excluded patients who gave history of fever immediately prior to stroke. Admission oral temperature was classified as hypothermia, normothermia and hyperthermia (Table 2).

Two-hourly temperature charts were strictly maintained during the first 4-12 hours of admission. Range of temperature in two groups has been depicted in Table 3.

We also tried to find out mortality correlation between anatomical lesion (as defined by CT) or the nature of lesion (e.g., lacune vs. large infarct) and body temperature in our study population.

## RESULTS

It is evident from Table 4 that in both the groups (ischemic and haemorrhagic) the overall outcome of the patients with hypothermia was the best (mortality 0%) while in-patients with normothermia there was a mortality of 13.6% and 9.67% in haemorrhagic and ischemic groups, respectively. Hyperthermia was associated with highest mortality rate in both hemorrhagic (51.78%) as well as ischemic (56.66%) groups.

From Table 5 it is evident that in ischemic group (N=100) mortality was higher in large vessel subset (48.7%) as compared to lacunar subset (6.5%). In both the subsets of ischemic groups patient with hyperthermia had the highest mortality. From Table 6 it is found that in ischemic group mortality was 20.45% in cortical (N=44) subset and 25% in subcortical (N=56) subset. In both the subsets mortality was highest in patients having hyperthermia.

From Table 7 it is evident that patients with basal ganglia hemorrhage, mortality was 40.98% and with lobar hemorrhage mortality was 25.64%.

In both the subsets of hemorrhagic group, mortality was higher in patients with hyperthermia (70% in lobar hemorrhage and 88% in basal ganglia hemorrhage). Again from Table 8 it is found that patients with small hematoma had the mortality of 19.35% whereas patients with large hematoma had 60.52% mortality. In both the subsets highest mortality was found in those patients with hyperthermia (34.37% in small hematoma).
subset and 79.16% in large hematoma subset).

**DISCUSSION**

The survival, recovery and ultimate outcome of an individual who has sustained an acute stroke may be influenced by many variables which include demographic variables (e.g. age, gender and race), general medical characteristics (e.g. hypertension, heart diseases, diabetes etc), lesion-related variables (e.g. pathology, lesion site and size, impairment characteristics, coma at onset, bladder and bowel incontinence), specific therapeutic interventions (e.g. nature of therapy, time of initiating therapy, intensity of therapy), psychosocial variables (e.g. socio-economic status, pre-morbid personality, patient family role etc). Some studies have also shown the influence of body temperature in the early hours of CVA to be an important parameter in final outcome of stroke victims. Wang Y et al evaluated a study population comprising 509 patients of CVA (ischemic strokes N=437 and hemorrhagic strokes N=72) in relation to influence of admission body temperature on stroke mortality and they found that hypothermia was associated with a much better outcome than hyperthermia, both in short-term and long-term among patients with ischemic stroke. The mortality rate was also found to be higher among hyperthermic patients with hemorrhagic stroke. Reith et al showed that for each degree centgrade rise in body temperature, the relative risk of death increased by 1.8 fold. Mohan V et al analysed important critical care aspects which can alter the morbidity and mortality after acute stroke and they found that for every two degrees centgrade rise in the body temperature the infarct size was increased by three times. In our study we also found a definite correlation of stroke patients’ body temperature (during 4 to 12 hours of acute insult) with short-term mortality.

**CONCLUSION**

Hyperthermia as evidenced from our study in stroke victims carries a bad prognostic parameter in relation to short-term mortality. Temperature recording in early hours of CVA is therefore an important step in managing stroke cases. Temperature recording is a simple bedside method that can be utilised in every case of CVA in any centre and it can predict the outcome of stroke victims to a great extent. More studies with larger number of patients may be undertaken in future to further substantiate our observation.

**REFERENCES**


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**Announcement**

**ITP Study Group**

At the recently held First National Conference on Idiopathic Thrombocytopenic Purpura, it was decided to form ITP Study Group with a view to study the natural history of the disease in India and also to see the commonly prevailing practice in treating this disease. Based on the information collected in such study, recommendations can be made about the management of ITP in India including a possible role of alternative forms of therapy.

Those who are interested in joining the study group should contact: Dr B C Mehta at (labmed@ghrc-bk.org). It is necessary that those who wish to join the group have easy access to internet. All communications of the study group will be through e-mail and web. Members will have access to the data/information on web.