

Literature review: Hyperthermia outcome on intracerebral hemorrhage

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ABSTRACT

Hyperthermia occurs in up to 30–40% of patients with ICH and is associated with the highest morbidity and mortality rates. Primary ICH accounts for 85% of all ICH cases and is associated with high morbidity and mortality rates. ICH can lead to primary or secondary brain injury. The purpose of the study was to identify outcome related to hyperthermia on intracerebral haemorrhage. This literature review described four peer-reviewed journals based on inclusion criteria. The results of the analysis of the literature review found that outcome of hyperthermia are mortality and morbidity. Fever can contribute to subsequent brain damage following ICH, hyperthermia to worse outcomes in both ischemic and hemorrhagic stroke patients at 3 months, but the underlying mechanism may differ. Fever is prevalent in people with ICH and is seldom linked with a definite infectious cause

Keywords: *Hypertermia, Fever, Intracerebral Haemorrhage (ICH), Intracerebral Parenchymal*

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INTRODUCTION

Non-traumatic intracerebral hemorrhage (ICH) is responsible for around 15% of all strokes and is one of the most destructive with a bad result. To reduce brain damage after ICH, supportive therapies such as airway protection, hemodynamic stabilization, and intracranial pressure management are recommended. Hyperthermia can be harmful in all sorts of brain injury. Hyperthermia affects 30-40% of individuals with ICH and is linked to higher morbidity and death rates. (Lavinio et al., 2023)

Intracerebral hemorrhage (ICH), which causes cerebral vascular rupture and parenchymal bleeding, is a medical emergency with significant mortality and disability rates. Primary brain injury occurs when a blood clot causes damage to the parenchyma. Secondary brain injury occurs when blood vessels are damaged. Oxidative stress, excitotoxicity, inflammatory response, mitochondrial malfunction, and cell death are among the factors that contribute to this condition. Excessive formation of reactive oxygen species (ROS) causes oxidative stress, worsening subsequent brain damage. Hypertension, current smoking, excessive alcohol use, hypocholesterolemia, and use of narcotics are all

risk factors for ICH. Old age, male sex, Asian ancestry, chronic renal illness, cerebral amyloid angiopathy (CAA), and cerebral microbleeds all enhance the risk of ICH. (Tseng et al., 2023)

METHOD

Data searched from PubMed for English-language articles on fever and ICH using the following terms: (fever OR hyperthermia) AND (intracerebral hemorrhage OR intraparenchymal hemorrhage OR intracerebral haemorrhage OR intraparenchymal haemorrhage). We evaluated all abstracts and created a literature database on fever and ICH. Full-text analysis and data extraction focused solely on original literature about fever and ICH. All study kinds were examined. We excluded studies that assessed outcome hypothermia on patient with intracerebral Haemorrhage.

FINDING AND DISCUSSION

Table 1 : Summary of study

No.	Title	Methods (design,sample,variable)	Results
1	Hyperthermia in Human Ischemic and Hemorrhagic Stroke: Similar Outcome, Different Mechanisms (Vieites-prado et al., 2013)	Design : case control study Sample : 50 Intracerebral Hemorrhagic and 50 Ischemic stroke Variable : Hyperthermia, Ischemic and hemorrhagic stroke	Results showed that Tmax > 37.5C within the first 24 hours was independently associated with poor outcome in ICH after adjusting for variables with a proven biological relevance for outcome.
2	Central fever in patients with spontaneous intracerebral hemorrhage: predicting factors and impact on outcome(Honig et al., 2015)	Design : prospective study Sample : 95 patient with intracerebral hemmoraghic Variable : Intracerebral Hemmoragic, central fever	Central Fever was identified in 30 patients (32%), infectious etiology was found in 9 patients (9%) and the remaining patients did not develop fever. Outcome analysis showed higher mortality rates and lower

			rates of favorable functional outcome
3	Inflammation, edema and poor outcome are associated with hyperthermia in hypertensive intracerebral hemorrhages (Iglesias, 2018)	Design : retrospective study Sample : 887 patient with intracerebral hemmoraghic Variable : inflammation, edema, hyperthermia hypertensive intracerebral hemorrhages	Patients with hypertensive ICH showed the highest body temperature hypertensive
4	An Ambiguous Role for Fever in Worsening Outcome After Intracerebral Hemorrhage(Liddle et al., 2023)	Design : Meta-Analysis Sample : 727 studies Variable : fever, post Intracerebral Hemorrhage	Fever causes an increased risk of mortality but poor outcomes among survivors

The results of the analysis of the literature review found that aspects of findings related to hyperthermia and functional affect post intracerebral Haemorrhage,

The result of intracerebral hemorrhage is morbidity and mortality. Table 1 shows that one of the causes of morbidity is increasing blood pressure, which will be caused by hyperthermia. Furthermore, Tseng et al. (2023) state that the first year after intracerebral hemorrhage with hyperthermia will result in substantial functional reliance. Furthermore, Lavinio et al.(2023) discovered that each degree celsius increase in body temperature is related with a 30% higher risk of dying or becoming dependant after three months. Intracerebral hemorrhage (ICH) is the second most frequent kind of stroke and a crucial condition that often results in severe impairment or death. ICH is more frequent in Asians, older people, men, and low- and middle-income nations. The case mortality rate for ICH is significant (40% at one month and 54% at one year), with just 12% to 39% of survivors achieving long-term functional independence. (An et al., 2017)

ICH is mainly caused by burst arteries that have deteriorated as a result of chronic hypertension. The media and smooth muscles of the responsible arteries are significantly degenerated. Some individuals may have fibrinous necrosis of the subendothelium, as well as microaneurysms and localized dilatations. Lipohyalinoses, which are strongly linked to long-term hypertension, are more commonly detected in non-lobar ICH, whereas cerebral amyloid angiopathy (CAA) is more prevalent in lobar ICH.(Andrews et al., 2018) In addition, patients with intracerebral hemorrhage who suffer from hypertension may experience increased body temperature, or hyperthermia. This is consistent with the research

conducted by Iglesias (2018), who discovered that hyperthermia is associated with increased blood flow in the intracerebral haemorrhage, a condition that is linked to the presence of edema cerebry. According to Vieites-prado et al. (2013), hyperthermia in intracerebral haemorrhage patients is also caused by changes in laboratory results, which result in increased leuchocyte.

CONCLUSION

Hyperthermia is a common early symptom of intracerebral haemorrhage. If hyperthermia is not identified and treated, it can lead to morbidity and mortality, as well as long-term effects from intracerebral hemorrhage. Fever can contribute to subsequent brain damage following ICH. A previous research linked hyperthermia to worse outcomes in both ischemic and hemorrhagic stroke patients at 3 months, but the underlying mechanism may differ. Fever is prevalent in people with ICH and is seldom linked with a definite infectious cause. A research found that around 40% of spontaneous ICH patients experienced fever, while only 9% had an infectious cause. research have found that individuals with ICH with early fever had greater short-term death rates than other patients. However, such research have revealed inconsistent results regarding the effects of fever on functional outcomes following ICH.

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