
Antipyretic prehospital therapy for febrile convulsions: Does the treatment fit? A literature review

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Abstract

Objective The objective of this literature search was to find evidence to support (or refute) the prehospital emergency use of antipyretic therapies, such as tepid sponging and paracetamol, to prevent the recurrence of febrile convulsions.

Methods An on-line literature search was made of Medline. The key text words utilised were febrile convulsion(s); febrile seizure(s); infantile convulsion(s); paracetamol; acetaminophen; rectal administration; treatment; prevention; pathophysiology, (a)etiology; recurrence; tepid; sponging; bathing; antipyretic; temperature reduction; fever. References from retrieved papers were also sought and reviewed where available. Each paper was critically appraised for relevance and content.

Results Forty-eight papers were identified. Twenty-nine were irrelevant.

Conclusions The available evidence suggests that neither antipyretic medication (including paracetamol) nor tepid sponging prevent the recurrence of febrile convulsions following a simple initial fit, and both are associated with risk to the patient. We recommend that neither intervention be used in the prehospital phase of treatment.

Key words: febrile convulsion, febrile seizure, antipyretic, tepid sponging, prehospital

Introduction

This paper seeks to evaluate the evidence for the effectiveness of current antipyretic prehospital interventions in preventing the short-term recurrence of fits following an initial febrile convulsion.

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Epidemiology

Febrile convulsions affect 3–4 per cent of children and are most likely to occur between the ages of six months to five years^{1,2,3}. The peak age of onset is approximately 14 to 18 months¹. It is generally well known that the likely incidence of a convulsion occurring during a febrile episode is related to the height of the temperature, and is most likely to occur when the core temperature reaches or exceeds 39°C^{1,4}. What appears to be less well known is that a *rapid* rise in temperature is also a key component in triggering a convulsion, and that fits occur most frequently during the temperature rise itself, rather than when it has reached its peak^{1,5}. Also of significance is that, by definition, children suffering from *simple* febrile convulsions will only have one fit within a twenty-four hour period during a fever⁶. Repeated seizures indicate the presence of additional pathology, such as central nervous system abnormality. The great majority of children suffering febrile convulsions have a normal long-term outcome^{7,8}. Despite this there is a general concern that febrile convulsions can lead to additional subsequent febrile seizures, epilepsy, and brain injury. There is, therefore, an unwritten imperative to treat this condition and to attempt to reduce high temperatures urgently.

Antipyretic therapies currently used in prehospital care include tepid sponging and rectal paracetamol (acetaminophen). Rectal diazepam is commonly available for the control of prolonged fits. Its use will not be discussed further in this paper.

Methods

We conducted a Medline search using combinations of the keywords febrile convulsion(s); febrile seizure(s); infantile convulsion(s); paracetamol; acetaminophen; rectal administration; treatment; prevention; pathophysiology, (a)etiology; recurrence; tepid; sponging; bathing; antipyretic; temperature reduction; fever.

Results

Forty-eight papers were identified. Twenty-nine papers did not address the prevention of recurrent febrile convulsions using antipyretic therapy and were therefore deemed to be irrelevant. Due to the limited number of papers retrieved, all remaining articles have been included in this review.

One paper from 1978 identified 17 patients (from a sample of 100) who had recurrence of a febrile convulsion. However, the authors reported that no patient had a further fit following simple antipyretic treatment⁹.

Pharmacological antipyretics

Acetaminophen has been recommended as the preferred antipyretic agent for use in children¹⁰. However, a number of studies have compared the relative efficacy of paracetamol and ibuprofen. A double-dummy, double-blind, randomised, placebo controlled trial comparing the antipyretic efficacy of acetaminophen and ibuprofen involving 37 children found that both drugs were effective antipyretic agents but that

ibuprofen yielded a significantly greater fever reduction¹¹. This was substantiated in a further randomised controlled trial of seventy post febrile seizure children seen as outpatients¹².

Concurrent administration of rectal diazepam and paracetamol has been shown to be safe and without undesirable interactions or potentiation¹³. However, Uhari et al concluded in a placebo-controlled randomised double blind trial of 180 patients that the combination of acetaminophen with anticonvulsant medication did not reduce the recurrence of febrile seizures when administered at the start of each new febrile episode¹⁴. Furthermore, following a controlled study, Schnaiderman et al concluded that the prophylactic administration of acetaminophen is not effective in the prevention of fever, the reduction of its degree, or in preventing the early recurrence of febrile seizures¹⁵. Similarly, in a randomised controlled trial which recruited 349 children with a history of febrile convulsions, no significant reduction in the incidence of febrile seizure recurrence was shown when prophylactic ibuprofen was administered at the start of subsequent febrile episodes¹⁶. And in an overview of the treatment of febrile seizures, Baumann concluded that antipyretic therapy did not prevent further simple febrile convulsions⁶.

Tepid sponging as an antipyretic

A randomised trial of 75 febrile children found that a greater and more rapid fall in mean rectal temperature occurred following tepid sponging combined with paracetamol than with the administration of paracetamol alone¹⁷. Another randomised controlled trial (RCT), comparing 224 children allocated to either tepid sponging alone or treatment with aspirin, ibuprofen, or paracetamol, found that sponging was more effective in reducing body temperature in the first 30 minutes¹⁸. But this finding is contradicted by an RCT of 80 children which concluded that paracetamol was more effective in reducing body temperature rapidly¹⁹. This echoed the findings of a trial involving 130 children which reported no difference in temperature reduction between those patients given antipyretic medication or those given sponging and medication, and whose authors recommended that sponging be abandoned²⁰.

Concerns about the distress caused by tepid sponging have been expressed. Mahar et al reported crying as being associated with sponging¹⁷. Following a randomised trial comparing sponging with acetaminophen or acetaminophen alone, Sharber concluded that whilst sponge-bathed subjects cooled faster during the first hour of treatment, they had significantly higher discomfort scores (crying, shivering, and goose bumps)²¹.

We were unable to find any papers that examined the efficacy of tepid sponging in reducing the recurrence of febrile convulsions.

Discussion

There is strong evidence to suggest that antipyretic medication does *not* result in a reduction in the incidence of recurrent fits in febrile children. Although the paper by

Daneman et al⁹ appears to contradict this, it was not an RCT and its design makes it impossible to determine whether or not the patients it describes would have had a second fit even if antipyretic treatment had not been given.

Although it is clear that antipyretic medication is effective in reducing *fever* in children, this of itself does not support the use of this therapy in the prehospital environment. There is no evidence that pyrexia requires *emergency* treatment. It has been recommended that paracetamol be given via the rectal route following a febrile seizure²², but this is an invasive procedure with associated risks and should therefore only be utilised if there is clear evidence of patient benefit. To reiterate, there is no evidence that antipyretic medication provides any patient benefit in respect of preventing recurrent febrile seizures.

Whilst some studies have shown that a rapid reduction from a high temperature can be achieved with tepid sponging, others have shown this to be associated with significant distress for the child concerned. The reported signs of distress include shivering; a reflex reaction to cold which has the effect of increasing body temperature. Consequently, sponging may have the opposite of the desired effect, particularly if not carefully controlled, as shivering may result in a further rapid temperature rise provoking a subsequent febrile fit.

Importantly, we were unable to find any studies that showed that tepid sponging prevented the recurrence of febrile convulsions.

Actively reducing a high temperature does not seem to prevent recurrent febrile convulsions. Rather, it appears that secondary fits subsequent to simple febrile seizures are rare events and so are unlikely to occur regardless of whether any intervention is made or not.

Limitations

Searches of electronic databases are unlikely to result in the retrieval of all relevant papers relating to a particular subject area. Consequently we may have missed research which contradicts our conclusions. Publication bias may also be a problem. However, this commonly results in the failure to publish (or to submit for publication) studies which report interventions which have been shown to be ineffective. Consequently, we believe that in the context of this particular research question, publication bias may only have resulted in a failure to find additional evidence that would have supported our conclusion that antipyretic therapies are ineffective in preventing recurrent febrile convulsions. A systematic review addressing this issue may, however, provide a more definitive conclusion than our relatively limited review can offer.

Conclusion and Recommendations

The assumption that it is important to reduce fever to prevent further fits subsequent to an initial febrile convulsion is understandable but erroneous, and appears to be founded on a lack of awareness of the mechanisms that lead to febrile seizures. As

discussed in our introduction, febrile seizures occur as a result of a rapid rise in temperature, rather than just as a result of the temperature being high. Furthermore, children with a simple uncomplicated febrile seizure are very unlikely to have a second fit within the subsequent twenty-four hour period. With this in mind, conclusions that imply that the delivery of an intervention during the post seizure period is responsible for a reduction in recurrence must be viewed with suspicion. In reality, those children who do not have a second fit following the administration of paracetamol or tepid sponging *would not have had a second fit even if these treatments had been withheld.*

We recommend that neither antipyretic medication (including paracetamol) nor tepid sponging be used in the prehospital phase of treatment. The available evidence suggests that neither of these antipyretic interventions prevents the recurrence of febrile convulsions and both are associated with risk to the patient.

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