

JBI Systematic Review Protocol

Review title: Non-pharmacological Management of
Fever in Children

Reviewers

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Background

Fever is a common childhood problem faced by medical practitioners, nurses, parents and caregivers in both hospital and community settings. Fever in children is frequently the reason for parents presenting to hospital emergency departments, general practitioners and paediatricians with their child. In their 2007 investigation of parental knowledge about fever in Metz, France, Boivin, et al¹ reported that children with fever represented 30% of paediatric consultations. The current National Institute for Health and Clinical Excellence (NICE) Guideline² states that fever in children under 5 years is the second most common reason for parents going to a doctor in the United Kingdom. Parental concerns can be traced, at least in part, to the deeply held “belief that fever is a disease rather than a symptom or sign of illness”.³

The febrile response as an adaptive physiologic mechanism with beneficial effects has been established for some considerable time.⁴⁻⁵ Fever is part of the body's defensive response to the entry of micro organisms or other antigens. A number of studies have demonstrated its impact on micro organism replication, enhancement of initial antigen recognition, increase in defence cell activity and other immune potentiating capabilities.⁶⁻⁷ However, the management of the febrile response in children is often not based on this knowledge and/or currently available evidence on what supports or inhibits this physiological response. Care by both parents/caregivers and health professionals remains inconsistent⁸ and sometimes even places the child at risk⁹. Both the temperature at which an intervention is implemented and the rationale(s) given for common practices vary considerably.

Management of a child with fever prescribed or provided by health care staff can be separated into two categories: antipyretics and non-pharmacological¹⁰. This systematic review will focus on the latter category. Into the non-pharmacological category fall maintenance of the child's hydration, rest and external cooling measures. External cooling measures can be classified into two sub groups: direct and environmental. Direct cooling measures encompass variations of sponging or bathing and minimising clothing or wrapping, while environmental measures include means of circulating and/or cooling the ambient temperature¹⁰. The literature on

fever management indicates that the outcomes of this management aimed for are reduction and/or clearance of the fever ¹¹, improved comfort of the child, reduction of parental anxiety, including concerns related to febrile convulsions, and reduction of unnecessary use of health services ¹².

Determining the clinical usefulness of interventions other than antipyretics in caring for the febrile child remains important, particularly given the significant increase in use of antipyretics as parents' preferred method of managing fever since the development of acetaminophen. In a study of Australian parents, for example, Walsh et al¹³ found that 91% reported using antipyretics to reduce their child's fever, with 94% using paracetamol (acetaminophen) and 77% ibuprofen. The use of antipyretics is not without risk and alternative interventions which are demonstrated to be effective and safe can either reduce the amount of antipyretics given to the child or possibly eliminate the need for them. Until recently, serious side effects from the use of acetaminophen and/or ibuprofen were considered to be uncommon although serious in nature: paracetamol has been linked hepatotoxicity¹⁴ and ibuprofen with renal failure in dehydrated children¹⁵ However, recent large international cross sectional studies¹⁶⁻¹⁸ have raised the possibility that exposure to even moderate amounts of acetaminophen *in utero*, infancy and/or childhood may be linked to asthma and allergies.

Studies have shown that both health professionals and parents/caregivers are responsible for excessive use of antipyretics, in some cases for reasons not supported by current knowledge and evidence. In a survey (n=419) of pediatricians, family practice physicians, emergency medicine physicians and general practitioners working in Saudi Arabia⁹, 85% of whom were expatriates, close to 84% of the respondents indicated that they would order antipyretics for children with temperatures of $\leq 38.5^{\circ}\text{C}$. Approximately 25% advised inappropriate dosage or administration intervals of acetaminophen. A study¹⁹ conducted in Australia of the management of fever in hospitalised children by paediatric nurses identified that the lowest temperature at which an antipyretic was administered was 35.9°C . Nearly half (45%) the antipyretics given were to children with a temperature below 38.3°C .

A number of studies of health professional practice illustrate the failure to base care on current knowledge and evidence. For example in Al-Eissa's⁹ study of the knowledge and beliefs of medical staff, only 5% believed that fever was not dangerous, while the remaining cited the principal danger of fever to be convulsions (69%), brain damage (35%), or death (8%). Responses indicated that the main purpose of antipyretic treatment was to prevent convulsions (70%), to make the child comfortable (55%) and to prevent brain damage (29%). Only 26% of physicians agreed that a sleeping child with fever should be left undisturbed. Edward et al's²⁰ and Walsh's et al²¹ studies of Australian paediatric nurses revealed ritualised actions, varying decision-making criteria and inconsistent practices that were influenced by many external variables. Factors that influenced their practice included medical orders, paucity of knowledge, negative personal beliefs and attitudes, the child's temperament, a history of febrile convulsions, parental requests, colleagues and ward norms.

The views and practices of health professionals influence those of parents and other caregivers. Studies of parental knowledge of fever have exposed unfounded fears and misconceptions, leading in many cases to unnecessary visits to hospital or medical practitioners and/or inappropriate treatments. A review of the literature by Schmitt²² in 1980 indicated that the only serious complications of fever were status epilepticus and heat stroke (both of which are uncommon). He concluded that marked parental concern about fever was not justified and believed that education to address "fever phobia" should be a part of routine paediatric care. The authors³ of a similar study in 2001 found that parental concerns showed little change since Schmitt's review and concluded that "fever phobia" persists. In fact, if judged by the 'over treatment' given to febrile children by caregivers in this latter study, the level of phobia could well be considered to have increased since Schmitt's data collection. When compared with the 1980 study, more caregivers listed seizure as a potentially harmful consequence of fever, woke their children to check temperatures and checked temperatures more often during febrile illnesses. They also gave antipyretics or initiated sponging more frequently for possibly normal temperatures, with 24% sponging at temperatures $\leq 37.8^{\circ}\text{C}$. The reasons for this behaviour can be explained by 91% of caregivers believing that a fever could cause harmful effects, including 21% who listed brain damage and 14% who listed death.

This excessive treatment of febrile children by caregivers can in itself put the child at risk, particularly by overdosing with antipyretics. In 1997 Rivera-Penera et al²³ reviewed the medical records of 73 paediatric patients admitted to a liver transplantation centre for acetaminophen overdose. Of these 28 (39%) had severe liver toxicity and six of these (21%) underwent liver transplantation. Another 30 (41%) had toxic serum levels but responded positively to the antidote. In the younger age group i.e. 10 years and under multiple (three or more doses), unintentional overdosing by caregivers was identified in 10 of the 14 children (71%) in this group with severe liver toxicity. This overdosing had resulted from the caregiver failing to read or understand label instructions regarding dosages and/or measuring device to be used. Huebi, Barbacci and Zimmerman¹⁴ identified six out of a total of 47 cases of hepatotoxicity where the child had received 100mg/kg/day or less of acetaminophen. Another study²⁴ which surveyed 100 caregivers about their use of over-the-counter medicines using a scenario to determine how much acetaminophen should be administered to their child, found that only 40% of the caregivers stated an appropriate dose for their child and only 67% accurately measured the amount of acetaminophen they intended to give. Despite concerns about the association between aspirin and Reye's syndrome in children, a number of studies have identified that caregivers, albeit in small numbers, are still using this drug¹. Crocetti et al³ reported that many of their participants indicated that they gave antipyretics at closer intervals than prescribed. This study also highlighted that alcohol sponges are still being used as a fever reduction strategy, with 18% of the 73% of the caregivers who initiated sponging using this method.

This systematic review will update the initial JBI review²⁵ published in 2001. The need for up to date evidence on effective and safe care of children with fever utilising non- pharmacological interventions to minimise the use of antipyretics is highlighted by the information summarised above.

Review Objectives

The objective of this systematic review is to establish what non-pharmacological practices are effective in managing fever in children, three months to 12 years of age, who are otherwise healthy.

More specifically, the review question(s) are:

- What non-pharmacological methods are effective and safe in reducing fever in children?
- What non-pharmacological methods in children are effective in relieving discomfort in children with fever?
- Does the use of these types of interventions reduce parental anxiety?
- Does the use of these types of interventions reduce unnecessary visits to health services?
- What implications do these interventions have for the care of feverish children who are otherwise well, by health professionals and parents or other care givers?

Criteria for considering studies for this review

Types of Studies

This review will consider any randomised or quasi randomised trials that examine the effectiveness of non-pharmacological interventions which are used to manage fever in children who are otherwise healthy.

Types of participants

This review will consider studies that include children who are not critically ill and are aged between three months and 12 years of age and have a fever i.e. a temperature ranging from 37.5°C (tympanic or oral)/38°C (rectal) to 41°C.

Exclusions:

Children who are critically ill or have hyperthermia, head injuries, malaria, severe anaemia, compromised cardiopulmonary function, gram negative sepsis with septic shock, meningitis, or mycobacteriosis.²⁶

Infants less than three months of age.

Types of interventions

This review will consider studies that include but are not restricted to the following interventions:

- Physiological e.g. maintenance of hydration, rest, and
- External cooling measures:
 - direct e.g. sponging, clothing
 - environmental e.g. fans, ambient temperature

Studies involving medical diagnosis and treatment of underlying conditions e.g. infection, will not be included.

Studies including antipyretics as a comparator will be included.

Types of outcome measures

This review will consider studies that include but are not confined to the following outcomes:

- Effect on fever
- Increased comfort e.g. decreased irritability, increased sleep
- Decreased parental anxiety
- Reduction in unnecessary use of health services

Search Strategy for identification of studies

The search strategy aims to find both published and unpublished studies and papers. The search will be limited to English language reports and other languages for which translation are available. A three-step search strategy will be utilised in this

review. An initial limited search of MEDLINE and CINAHL will be undertaken followed by an analysis of the text words contained in the title and abstract, and of the index terms used to describe the article. A second search using all identified keywords and index terms will then be undertaken. Thirdly, the reference list of all identified reports and articles will be searched for additional studies.

The databases to be searched include: Aushealth, CINAHL, Cochrane Library, Current Contents, Embase, Expanded Academic Index, Google Scholar, MEDLINE, Uncover, NursingNet, TRIP, DARE.

Reference lists of eligible studies will also be checked.

The search for unpublished studies will include: Cambridge Scientific Abstracts – Conference Papers Index, Dissertation Abstracts.

A handsearch will be undertaken of relevant 2011 journals which may not yet be indexed. Also paediatric nursing networks and authors with previous publications will be contacted.

The search strategy will be limited to the following years 2001 to 2011 i.e. the search will be confined to identifying eligible studies that have been published since the completion of the original systematic review²⁵, so as to prevent duplication. An abbreviated search was conducted in 2003 but no additional studies that met the eligibility criteria were identified at that time.

Initial keywords to be used for the review will be:
manage*, fever, child*, febrile, temperature.

Methods of review

Critical Appraisal

Papers selected for retrieval will be assessed by two independent reviewers for methodological validity prior to inclusion in the review using the standardised critical appraisal instruments from the Joanna Briggs Institute Meta Analysis of Statistics Assessment and Review Instrument (JBI-MAStARI)²⁷ (Appendix I). Any disagreements that arise between the reviewers will be resolved through discussion with a third reviewer.

Data Extraction

Data will be extracted from papers included in the review using standardised data extraction tools from the Joanna Briggs Institute Meta Analysis of Statistics Assessment and Review Instrument (JBI-MAStARI)²⁷ (Appendix II). Any disagreements that arise between the reviewers will be resolved through discussion with a third reviewer.

Data Synthesis

Where possible, quantitative research study results will be pooled for statistical meta-analysis using the data synthesis tool from the Joanna Briggs Institute Meta Analysis of Statistics Assessment and Review Instrument (JBI-MAStARI).²⁷ All results will be double entered. Odds ratio (for categorical data) and weighted mean differences (for continuous data) and their 95% confidence intervals will be calculated for analysis. Heterogeneity will be assessed using the standard Chi-square. Where statistical pooling is not possible the findings will be presented in narrative form.

Conflicts of Interest

There are no conflicts of interest to report.

Acknowledgements

In this update of the original systematic review published in 2001, significant contributions of one of the authors, Gail Thomas, and the following members of the initial Review Panel is gratefully acknowledged: Geraldine Carlton, Dr Paul Carman, Rebecca Coghlan, Alan Kuipers-Chan, P. McGonigle, Elaine Pavlos, Liz Prime, Lorraine Shepherd, Brenda Simmons and Shirley Woodger.

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Appendix I JBI Critical Appraisal Checklist for Experimental Studies

Reviewer _____ Date _____

Author _____ Year _____ Record Number _____

	Yes	No	Unclear
1. Was the assignment to treatment groups truly random?	☐	☐	☐
2. Were participants blinded to treatment allocation?	☐	☐	☐
3. Was allocation to treatment groups concealed from the allocator?	☐	☐	☐
4. Were the outcomes of people who withdrew described and included in the analysis?	☐	☐	☐
5. Were those assessing outcomes blind to the treatment allocation?	☐	☐	☐
6. Were the control and treatment groups comparable at entry?	☐	☐	☐
7. Were groups treated identically other than for the named interventions?	☐	☐	☐
8. Were outcomes measured in the same way for all groups?	☐	☐	☐
9. Were outcomes measured in a reliable way?	☐	☐	☐
10. Was appropriate statistical analysis used?	☐	☐	☐

Overall appraisal: Include ☐ Exclude ☐ Seek further info. ☐

Comments (Including reasons for exclusion)

Appendix II JBI Data Extraction Form for Experimental/Observational Studies

Reviewer _____ Date _____

Author _____ Year _____

Journal _____ Record Number _____

Study Method

RCT

Retrospective

Quasi-RCT

Observational

Longitudinal

Other

Participants

Setting

Population

Sample size

Intervention 1 _____ Intervention 2 _____ Intervention 3 _____

Interventions

Intervention 1

Intervention 2

Intervention 3

Clinical outcome measures

Outcome Description	Scale/measure

Study results

Dichotomous data

Outcome	Intervention () number / total number	Intervention () number / total number

Continuous data

Outcome	Intervention () number / total number	Intervention () number / total number

Authors conclusions

Comments