Fever in Children: The misconceptions, myths and facts

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9 April 2017
Fever

• The commonest reason for children to be taken to the doctor

• A concern for parents and carers
Fever has always been one of the most common reasons for parents to contact their children’s doctor. Unfortunately, there are many misconceptions regarding fever, causing parents anxiety as well as unnecessary concern. Many parents have heard that fever is a sign of serious illness; however, fever is actually a normal and healthy response to an infection. In fact, if we aggressively treat fever, we may be prolonging the course of an illness.

Why then do we have such a concern to treat fever? Many have heard and believe that fever in and of itself can cause serious harm. Many believe that fever will cause seizures, brain damage and even death. It is true, fever may lower the seizure threshold in children with a history of convulsive disorders. However, temperature alone is not a significant cause of brain damage, organ damage and death in less than three percent of children. It should be reassuring to know these febrile convulsions are almost always completely harmless. Brain damage, organ damage and death are extremely unlikely to occur in a child with fever. Some parents believe that dehydration can easily occur during periods of fever; however, this is extremely unlikely, except when coupled with vomiting and diarrhea.

The normal body temperature has been defined as 98.6 degrees Fahrenheit, but can range from 97-100 degrees F and still be normal in children. Infants tend to have a slightly higher body temperature than older children. Most physicians consider fever as 100 degrees F or higher. Of course, the slight increase in body temperature helps to fight off the infection.

Many parents are concerned about the proper way to measure their child’s temperature. The most accurate home measurement of body temperature is the use of the rectal thermometer. However, if the child is able to cooperate, oral measurement is adequate in most children over the age of four. Other thermometers have been developed to measure temperature using a variety of innovative methods such as the ear and under the arm. The accuracy of these devices is still not verified to the same degree as the rectal thermometer.

An oral thermometer placed under a baby’s tongue has a high degree of inaccurate measurements especially in children under the age of one. Pediatric thermometers, on average, need to be held within the mouth for a minimum of four minutes and are not recommended for use. The common drugstore digital thermometer is very adequate for measuring the temperature of a child at home.
Fever Phobia

• An *irrational fear or overconcern* about fever
• A common disease among the parents and medical professionals
• Parental fever phobia is strongly reinforced by the actions of medical professionals
Fever Phobia...

• Fever phobia among the medical professionals leads to unnecessary
  – hospital admission
  – laboratory tests
  – imaging studies
  – Doses of broad spectrum antibiotics

• Caused by misconceptions that fever alone is dangerous or represents a potentially dangerous disease
Fever phobia: misconceptions of parents about fever

Schmitt, B D

• Eighty-one parents bringing their children to a hospital-based pediatric clinic (USA) were surveyed about their understanding of fever
  – Most parents were unduly worried about low-grade fever, with temperatures of 38.9°C or less
  – Most parents (52%) believed that moderate fever with a temperature of 40°C or less can cause serious neurological side-effects.
  – Most parents treated fever aggressively:
    • 85% gave antipyretic medication before the temperature reached 38.9°C
    • 68% sponged the child before the temperature reached 39.5°C
Fever Phobia Revisited: Have Parental Misconceptions About Fever Changed in 20 Years?

Michael Crocetti, Nooshi Moghbeli, Janet Serwint
Pediatrics June 2001

• A total of 340 caregivers in 2 hospital-based paediatric clinics (USA) were interviewed.
  – 56% of caregivers were very worried about the potential harm of fever in their children
  – 44% considered a temperature of 38.9°C (102°F) to be a “high” fever
  – 7% thought that a temperature could rise to ≥43.4°C (≥110°F) if left untreated
  – 91% of caregivers believed that a fever could cause harmful effects (21% listed brain damage, and 14% listed death)
  – 52% of caregivers checked their child's temperature ≤1 hour when their children had a fever
  – 25% gave antipyretics for temperatures <37.8°C (<100°F)
  – 85% awakened their children to give antipyretics
• Today, fever phobia is still widespread
What are the myths going on in the community and medical professionals?
Myth 1

• My child is warm, so she has fever

Myth: A warm nose means the dog is ill.
Truth: The temperature of a dog's nose does NOT indicate illness.

Beechmont Pet Hospital
Fever

- Warm body ≠ fever
- Warm body
  - Fever
  - hyperthermia (heat illness, medication related)
  - Just a normal child
- Fever = regulated rise in body temperature due to elevated hypothalamic set-point
- Hyperthermia—no change in hypothalamic set-point
Relationship of hypothalamic set-point to body temperature

Euthermia: hypothalamic set-point is normal, and body temperature approximates set-point and is also normal.
Fever: hypothalamic set-point is elevated, and body temperature follows set-point and is also elevated.
Heat illness: hypothalamic set-point is normal, and body temperature is elevated despite normal set-point.
Myth 1

• My child is warm, so she has fever

Myth: A warm nose means the dog is ill.
Truth: The temperature of a dog's nose does NOT indicate illness.

Beechmont Pet Hospital
Myth 2

• All fevers are bad for children
Pathways of fever production

Starting from the top left, infectious agents and/or microbial products, as well as cytokines and other inflammatory processes, induce macrophages, endothelial cells, and the reticuloendothelial system to produce and secrete pyrogenic cytokines into the circulation. These pyrogenic cytokines induce the synthesis of prostaglandin E2 (PGE2) in the hypothalamus. In addition, microbial toxins, acting as ligands to the toll-like receptors in the hypothalamus, stimulate the synthesis of PGE2 by the hypothalamus. PGE2 raises the thermostatic set point in the hypothalamus to febrile levels. The vasomotor center sends signals for heat conservation (vasoconstriction) and heat production (shivering). Corticosteroids reduce the peripheral synthesis of pyrogenic cytokines, whereas antipyretics reduce PGE2 levels in the brain.

TLR: toll-like receptor; IL-1: interleukin-1; IL-6: interleukin-6; TNF: tumor necrosis factor; IFN: interferon; PGE2: prostaglandin E2.

Courtesy of Reuven Porat, MD and Charles A Dinarello, MD.
Benefits of Fever

• Retardation of the growth and reproduction of some bacteria and viruses (perhaps related to decreased serum iron)
• Enhanced immunologic function at moderately elevated temperatures
“Fever is a mighty engine which Nature brings into the world for conquest of her enemies.”

Lizards have been observed staying in the sun longer and fish seeking out warmer water when ill.
Is there any evidence that trying to prevent fever will result in a worse outcome?

- The regular use of paracetamol in children with chickenpox delays the healing of vesicles\(^1\)
- The use of antipyretics is associated with increased mortality in critically ill adults\(^2\)
- It has been shown that the prophylactic use of paracetamol results in reduced antibody titres against childhood vaccines\(^3\)

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Harms of Fever

• Discomfort
• Increased metabolic rate, oxygen consumption, carbon dioxide production, and demands on the cardiovascular and pulmonary systems
• No mortality!
Myth 2

- All fevers are bad for children
Myth 3

- The higher the fever, the more serious is the infection
Is a child with a high fever more likely to have a serious underlying cause?

- A systematic review was conducted by developers of NICE guidelines on “feverish illness in young children” to study on the relationship between the height of fever and the incidence of serious illness.
- Nine prospective cohort studies were included in the review.
- Six of the studies reported that the incidence of serious illness increased with body temperature and three did not.
- In general, the studies that did report an association found the predictive value of a high temperature to be poor.
- Many children with a serious illness did not have a particularly high temperature.
- However, some of the studies looked at children of different ages and there did appear to be a higher predictive value of a body temperature >39°C in children under the age of 6 months, and even more so in infants under the age of 3 months.

Ref: Martin Richardson, Ed Purssell. Who’s afraid of fever? Arch Dis Child September 2015 Vol 100 No 9
Fever in under 5s: Assessment and Initial Management\textsuperscript{5}

- In children older than 6 months \textbf{do not use height of body temperature alone} to identify those with serious illness.
- Recognise that children \textbf{younger than 3 months} with a temperature of 38°C or higher are in a high-risk group for serious illness.
- Recognise that children aged 3–6 months with a temperature of 39°C or higher are in at least an intermediate-risk group for serious illness.

\textsuperscript{5}NICE Clinical Guideline 2013
Myth 3

• The higher the fever, the more serious is the infection
Myth 4

• Fever leads to seizure.
Febrile Seizure

• Age-dependent phenomenon
• Benign nature
• Occurs in 2-4% of children < 5 years
• Occurs within 24-36 hours of onset of fever
• Risk factors:
  – Infection (Viral > bacteria)
  – Family history of febrile seizure
  – h/o febrile seizure
  – Immunization
  – High fever??? Rate of rise in body temperature
• Every child has different seizure threshold
Complex Febrile fit 2° AGE

• 1 yr 2 mth old boy, from Sibu
• Exprem 32/52
• HOPI
  – Fever, vomiting and loose stool for 2 days
  – Fitted 4X on the day of admission
  – Unsure of last urine output
  – Twin brother also had V & D
  – Just discharged from Bintulu Hosp 1 week ago for complex febrile seizure 2° AGE, given 4 days of ampicillin
• On Exam
  – Well, active, normal hydration

• Ix
  – TWBC 14.1
  – BUSE, Ca, PO4, Mg normal

• Rx
  – Hydration
  – Child was well, discharged 2 days later
Recurrent Febrile Seizure

• Risk of recurrence\(^4\)
  – Young age at onset
  – History of febrile seizures in a first-degree relative
  – Low degree of fever while in the emergency department
  – Brief duration between the onset of fever and the initial seizure

• Risk of recurrence \(\approx 30\%\)

Myth 4

- Fever leads to seizure
- ✓ in at risk children
Myth 5

- Antipyretics prevent febrile seizure
Febrile fit $2^{\circ}$ Acute Rhinopharyngitis

• 1 yr 6 mth old boy
• HOPI
  – Cough & running nose, followed by fever 1 day
  – 1 episode of GTC on the day of admission
  – Fever started at 3 am the previous night
  – PCM served 4 hourly by mum, last served at 11am, fitted soon after that
• Well, discharged the next day
• OBJECTIVES
  – To evaluate primarily the effectiveness and safety of antiepileptic and antipyretic drugs used prophylactically to treat children with febrile seizures; but also to evaluate any other drug intervention where there was a sound biological rationale for its use

• SELECTION CRITERIA
  – Trials using randomised or quasi-randomised participant allocation that compared the use of antiepileptic, antipyretic or other plausible agents with each other, placebo or no treatment
MAIN RESULTS

We included 40 articles describing 30 randomised trials with 4256 randomised participants. We analysed 13 interventions of continuous or intermittent prophylaxis and their control treatments. Methodological quality was moderate to poor in most studies. We found no significant benefit for intermittent phenobarbitone, phenytoin, valproate, pyridoxine, ibuprofen or zinc sulfate versus placebo or no treatment; nor for diclofenac versus placebo followed by ibuprofen, acetaminophen or placebo; nor for continuous phenobarbitone versus diazepam, intermittent rectal diazepam versus intermittent valproate, or oral diazepam versus clobazam. There was a significant reduction of recurrent febrile seizures with intermittent diazepam versus placebo or no treatment, with a risk ratio (RR) of 0.64 (95% confidence interval (CI) 0.48 to 0.85 at six months), RR of 0.69 (95% CI 0.56 to 0.84) at 12 months, RR 0.37 (95% CI 0.23 to 0.60) at 18 months, RR 0.73 (95% CI 0.56 to 0.95) at 24 months, RR 0.58 (95% CI 0.40 to 0.85) at 36 months, RR 0.36 (95% CI 0.15 to 0.89) at 48 months, with no benefit at 60 to 72 months. Phenobarbitone versus placebo or no treatment reduced seizures at 6, 12 and 24 months but not at 18 or 72 month follow-up (RR 0.59 (95% CI 0.42 to 0.83) at 6 months; RR 0.54 (95% CI 0.42 to 0.70) at 12 months; and RR 0.69 (95% CI 0.53 to 0.89) at 24 months). Intermittent clobazam compared to placebo at six months resulted in a RR of 0.36 (95% CI 0.20 to 0.64), an effect found against an extremely high (83.3%) recurrence rate in the controls, which is a result that needs replication. The recording of adverse effects was variable. Lower comprehension scores in phenobarbitone-treated children were found in two studies. In general, adverse effects were recorded in up to 30% of children in the phenobarbitone-treated group and in up to 36% in benzodiazepine-treated groups. We found evidence of publication bias in the meta-analyses of comparisons for phenobarbitone versus placebo (eight studies) at 12 months but not at six months (six studies); and valproate versus placebo (four studies) at 12 months, with too few studies to identify publication bias for the other comparisons. Most of the reviewed antiepileptic drug trials are of a methodological quality graded as low or very low. Methods of randomisation and allocation concealment often do not meet current standards; and treatment versus no treatment is more commonly seen than treatment versus placebo, leading to obvious risks of bias. Trials of antipyretics and zinc were of higher quality.
Myth 5

- Antipyretics prevent febrile seizure
Myth 6

• High fever due to infection causes brain damage
Fever due to infection never more than 41°C
Myth 6

• High fever due to infection causes brain damage
Myth 7

- Fever should not recur after the child becoming afebrile with antipyretic
Viral fever

• 6 months old girl admitted at 2320 H
  – Fever since 3pm of the day of admission
  – Otherwise well
  – No other symptom
  – From Sibu (Pahlawan area)
  – Elder sister also had febrile illness

• lx
  – Urine dipsick negative
  – TWBC 13.9

• Rx
  – Observation
  – Discharged 2 days later
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Name: Julela Jesse Ak Tera | Age: 5/10 | Ward: PMW 56 | Bed No.: 13
• Duration of viral illness
  – 4-5 days
  – Fever peaks on day 2 of illness
• Take note of
  – Duration
  – Trend of the fever
• Reassess the child after 72 hours of fever
Myth 7

• Fever should not recur after the child becoming afebrile with antipyretic
Myth 8

• Tepid sponging should continue
Physical methods versus drug placebo or no treatment for managing fever in children

Martin M Meremikwu, Angela Oyo-Ita

First published: 22 April 2003
Cochrane Cochrane Database Syst Rev updated Oct 2005

• Selection criteria
  – Randomized and quasi-randomized controlled trials comparing physical methods with a drug placebo or no treatment in children with fever of presumed infectious origin. We included studies where children in both groups were given an antipyretic drug.

• Main results
  • Seven trials, involving 467 participants, met the inclusion criteria. One small trial (n = 30), comparing physical methods with drug placebo, did not demonstrate a difference in the proportion of children without fever by one hour after treatment in a comparison between physical methods alone and drug placebo. In two studies, where all children received an antipyretic drug, physical methods resulted in a higher proportion of children without fever at one hour (n = 125; risk ratio 11.76; 95% confidence interval 3.39 to 40.79). In a third study (n = 130), which only reported mean change in temperature, no difference was detected. Mild adverse events (shivering and goose pimples) were more common in the physical methods group (3 trials; risk ratio 5.09; 95% confidence interval 1.56 to 16.60).
OBJECTIVE: To compare the effectiveness of tepid sponging and antipyretic drug versus only antipyretic drug among febrile children.

DESIGN: Randomized controlled trial.

SETTING: Tertiary care hospital.

PARTICIPANTS: 150 children 6 mo - 12 yr age with axillary temperature 101F.

INTERVENTION: Tepid sponging and antipyretic drug (Paracetamol) (n=73) or only antipyretic drug (Paracetamol) (n=77).

MAIN OUTCOME MEASURES: Reduction of body temperature and level of comfort.

RESULTS: The reduction of body temperature in the tepid sponging and antipyretic drug group was significantly faster than only antipyretic group; however, by the end of 2 hours both groups had reached the same degree of temperature. The children in tepid sponging and antipyretic drug had significantly higher discomfort than only antipyretic group, but the discomfort was mostly mild.
Fever in under 5s: Assessment and Initial Management\textsuperscript{6}

- Antipyretic interventions
  - Antipyretic agents do not prevent febrile convulsions and should not be used specifically for this purpose.
  - Tepid sponging is not recommended for the treatment of fever
  - Children with fever should not be underdressed or overwrapped
  - Do not use antipyretic agents with the sole aim of reducing body temperature in children with fever
  - Consider using either paracetamol or ibuprofen in children with fever who appear distressed

\textsuperscript{6}NICE Clinical Guideline 2013
Myth 8

- Tepid sponging should continue
Myth 9

• Fever = antibiotic
• Most of the febrile illnesses in children are due to viral illness

• >60% pneumonia in children are viral in origin\(^7\)

• Antibiotic only kills bacteria!

Myth 9

- Fever = antibiotic
Myth 10

• Fever = hospital admission
When to admit a febrile child?

- **Compulsory admission**
  - Neonates
  - Infants 29-90 days if no obvious source of infection
  - Any child with bronchiolitis < 3 months old
  - Any child with pneumonia < 3 months old
  - Any child with HFMD < 1 year old
  - Any child with warning symptoms/look sick
Warning Symptoms

- Unable to tolerate orally (60% of usual oral intake is adequate)
- Persistent vomiting or diarrhoea
- Reduced urine output
- Fast breathing
- Less active
- Irritable
- Sleepy or drowsy
- Convulsion
- Non-blanching rashes
- Worsening of symptoms
Children with risk factor for severe illness

- Age < 3 months old
- NICU graduates
- Congenital Heart Disease
- Immunodeficiency or immunosuppressed condition
- Indwelling catheters
- Risk of specific infectious diseases based on local epidemiology and overseas travel
• Hospital admission
  – Overload the ward
  – Increase health care cost
  – Nosocomial infection
  – Disrupting family routine
  – Contribute to fever phobia
  – etc
Myth 10

• Fever = hospital admission

How your child acts is more important than the number!
Please don’t get me wrong,

- Carter Nick (I Just Wanna Take You Home)
Thank You
From heart
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