

Physicians', nurses', and parents' attitudes to and knowledge about fever in early childhood

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Abstract

This study investigated physicians', nurses' and parents' approach to fever in early childhood. A total of 2059 questionnaires was completed by the three groups. Though most of the responders (59.8%) believed that fever is a helpful bodily mechanism of the body, there was a significant difference between physicians (85.8%) and nurses and parents (63.9 and 43.1%, respectively) ($P < 0.001$). The majority of parents (62.7%) believed it necessary to treat children with low-grade fever ($<38^{\circ}\text{C}$) without any other sign of illness, whereas the physicians and nurses did not (10.8 and 30.2%, respectively). Regarding antipyretic medication, 92.3% of the physicians and 84% of the nurses would start treatment for a fever $38\text{--}40^{\circ}\text{C}$, whereas 38.8% of parents would do so for a fever of $37\text{--}38^{\circ}\text{C}$. Febrile seizure served as a reason for antipyretic treatment for 34.3% of the nurses and 20% of the parents, compared to 8.7% of the physicians. Finally, fear of brain damage due to fever was noted in almost twice as many nurses as physicians (11.8% versus 7.2%) and in three times as many parents (24.0%) as physicians. Parents and some nurses consider fever a risk factor for serious morbidity, mostly febrile convulsions and brain damage, even though these associations have long since been disproven. © 2002 Elsevier Science Ireland Ltd. All rights reserved.

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1. Introduction

Fever is defined in the literature as the "state of elevated core temperature, which is often, but not necessarily, part of the defensive responses of multicellular organisms to the invasion of pathogenic or inanimate matter recognized as alien to the host" [1]. Fever is part of the body's defensive response to infection. It helps curtail the replication of invasive microorganisms and enhances natural killer cell activity and killing of natural killer-resistant malignant cells [2–4]. Physiologically, the febrile response consists of a series of complex physiologic reactions, namely, a cytokine-mediated rise in core temperature, generation of acute phase reactants, and activation of numerous physiologic, endocrinologic and immunologic systems. The whole process is regulated by the rostral hypothalamic or "preoptic" region [5,6], which receives and sends signals via a continuum of neural structures and connections extending from the

hypothalamus and limbic system, through the lower brainstem and reticular formation, to the spinal cord and sympathetic ganglia [7].

Clinically, fever is defined as an increase in body temperature of 1°C or more above the mean standard: a rectal temperature of 1°C above 38.0°C or an axillary temperature of 1°C above 37.2°C (99°F) [8] and indicates the need to put the child under observation.

Though fever was considered a protective response for thousands of years, and was even induced by physicians to combat certain infections, the advent of antipyretic drugs, has led to the common belief that fever is maladaptive and harmful [9,10].

The risk-benefit ratio of fever has generated considerable controversy in recent years [11]. There are few available studies on contemporary parental knowledge and management of fever in children compared to medical personnel. Kramer et al. [12] reported that "... parents and physicians show fundamental value differences concerning diagnostic testing, diagnostic error, and short- and long-term morbidity. These differences have important implications for diagnostic decision-making in the young febrile child". This report suggests that a better understanding of this issue may point

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up areas requiring improved education. With this purpose in mind, we designed the present study to investigate and compare the approach of physicians, nurses and parents to fever in early childhood.

2. Methods

The study population consisted of three groups: (A) 1000 parents of children attending pediatric community (urban) clinics of the major HMO in Israel which serves >60% of the population; (B) 1000 primary care physicians, pediatricians, general practitioners and family medicine specialists working for the three major HMOs in Israel; and (C) 500 nurses working in pediatric community centers and well-baby clinics, a major pediatric hospital, and hospital pediatric emergency rooms.

An analysis of the sociodemographic data of the patients of these urban clinics, taken from another, study with the same population-basis, yielded the following: mean age 35 years, 2.4 children per family, 62% primary or secondary education, 33% tertiary education, and 3% vocational schooling.

The parent group was composed of every third parent who visited a pediatrician or family physician at the specified clinics for any reason during 1999 (only autumn months, to avoid bias of winter-associated illnesses), on Sundays, Tuesdays and Thursdays (days on which attending physicians alternate). In order to limit the study to fever in early childhood, all children <3 months of age were excluded, because fever in neonates is a different entity. A clinic staff member explained the purpose of the study to the parents in the waiting area and asked them to fill out the questionnaire. No assistance was provided during the actual completion of the questions.

The study groups of physicians and nurses were formed by selecting random numbers from 1 to 1000 from the directories of the HMOs and from the personnel registries of the institutions involved in the study, respectively. Half of the nurses' group was taken from hospitals and half from outpatient clinics. These groups received the questionnaire and an explanation of the study by mail.

2.1. Questionnaire

The questionnaire used in the present study was based on a published and validated questionnaire on knowledge, attitudes and fears concerning fever in children [13]. Our version was written in simple Hebrew. The content of the questions was similar for parents, physicians and nurses, but the terminology was adapted to each of the study groups. Parental comprehension of the content of the questionnaire was tested in a pilot study. All questions pertained only to children older than three months, to avoid bias of possible perinatal events associated with serious bacterial infection.

The following issues were addressed.

1. Knowledge

- 1.1. Benefit/danger of low-grade fever (37–38 °C).
- 1.2. Need to treat children with a fever below 38 °C, without any other symptoms of illness, such as change in behavior, poor appetite, decreased activity and irritability.
- 1.3. Need to awaken a febrile child with no other sign of illness in order to administer treatment.
- 1.4. Need for a thermometer to confirm suspected fever.
- 1.5. Temperature level at which children over 3 months old need to receive antipyretic medication (paracetamol).
- 1.6. Main risk that untreated fever poses to the child: poor overall well-being, febrile seizure, brain damage, other.

2. Attitudes

- 2.1. Method used to calculate the dose of antipyretic medication (paracetamol).

Physicians also completed items on work status (salaried/independent), age and years since graduation.

2.2. Sample size

The calculation of sample size was based on two questions: the temperature at which the child is considered to have fever and the temperature at which antipyretic treatment should be initiated. According to studies in 75% [10] to 48.9% [9] of parents consider a temperature of 37.0–38 °C as fever, whereas only 21% would start treatment for a fever under 38 °C. Thus, if the true rate of people who believe that treatment should start under 38 °C is 20%, with a relative precision of 15% at the 5% level of significance and power of 90%, a minimum of 485 subjects is needed [14]. This number is more than twice the minimum needed to answer the question "What proportion of people consider a temperature of <38 °C as fever" with the same α error and power, if P ranges from 48 to 40%. However, since a sample size of 500 is too small for stratification by socioeconomic status we multiplied the number by two. The sample of physicians was also elevated to 1000 to assure enough power for work status and years since graduation to be included in the statistical analysis.

2.3. Statistical analysis

Survey responses were analyzed using SPSSWIN, version 9.01b, and the data analyzed with the Chi-square or Fisher's exact test. Comparisons for continuous data with a non-normal distribution were assessed with the paired t -test repeated measure. A two-tailed P -value of 0.05 was used to define statistical significance for differences between groups and to calculate confidence intervals around differences in sample means and odds ratios.

3. Results

A total of 2059 completed questionnaires were evaluated. Compliance rates were 64.6% for physicians (93 questionnaires to physicians were returned unopened because of a change of address) and 93.4% for nurses. Although none of the 1003 parents who received the questionnaire refused to fill it out (100% compliance) they missed some of the answers. The responses of the parents, physicians and nurses to the main study questions are compared in Table 1.

Low-grade fever was considered harmful by 56.9% of parents and 36.1% of nurses, but only 14.2% of physicians ($P < 0.0001$ between parents/nurses and physicians). It was thought to require treatment by 62.7% of parents compared to only 32.2% of nurses and 10.8% of physicians; the differences between physicians and parents, nurses and parents, and physicians and nurses were statistically significant ($P < 0.0001$).

Regarding awakening febrile children in order to administer antipyretics, 65.5% of parents would do so compared with 52% of nurses, but only 26.9% of physicians; the differences between parents and physicians, parents and nurses, and nurses and physicians were all statistically significant ($P < 0.0001$).

Though the majority of parents (72.1%), and nurses (76.4%) thought it important to measure body temperature with a thermometer, physicians were ambivalent; 58.7% responded positively and 41.3% negatively. The differences between physicians and nurses, physicians and parents, and

nurses and patients were statistically significant ($P < 0.001$). Responses regarding treatment also differed between the groups (Table 2).

Regarding the temperature at which treatment with antipyretics should be initiated, 92.3% of physicians, 84% of nurses, and 38.8% of parents would start at 38–40 °C which is the recommended policy ($P < 0.001$ between all three groups).

According to 51% of physicians, 31.3% of nurses and 45.5% of parents, the main reason for giving antipyretics to a febrile child was to improve well being. Interestingly, 20% of parents, 34.3% of nurses, and only 8.7% of physicians considered avoidance of febrile seizure as the primary function of antipyretics ($P < 0.0001$). Brain damage alone was indicated by 5.6% of parents, 1.7% of nurses and 1.5% of physicians ($P < 0.0001$).

Table 3 shows the methods used to calculate the dosage of antipyretic drugs. Body weight alone was used to calculate dosage by 71.4% of physicians and 58.8% of nurses. These rates rose to 85.3 and 71.2% when age was added to the weight variable. By contrast, 30.1% of parents used only weight, 31.5% the manufacturer's instructions, and 18.2% the child's age.

In a separate analysis, physicians were stratified by work status and years since graduation. Two-hundred and one physicians were salaried (34.5%), 188 (32.3%) were independent, and 194 (33.3%) were both salaried and independent. No significant association was found between these variables and the questionnaire responses.

Table 1
Parents, physicians and nurses knowledge to fever in children^a

Question	Parents			Physicians			Nurses			<i>P</i>
	<i>N</i>	Yes	No	<i>N</i>	Yes	No	<i>N</i>	Yes	No	
Fever (37–38 °C) during infection is beneficial	1000	431 (43.1)	569 (56.9)	565	485 (85.8)	80 (14.2)	466	298 (63.9)	168 (36.1)	<0.0001
Fever below 38 °C without other symptoms needs treatment	1003	629 (62.7)	374 (37.3)	583	63 (10.8)	520 (89.2)	463	140 (30.2)	323 (69.8)	<0.0001
Children with fever without other symptoms need to be awakened for treatment	995	652 (65.5)	343 (34.5)	584	157 (26.9)	427 (73.1)	467	243 (52.0)	224 (48.0)	<0.0001
It is necessary to confirm fever with a thermometer prior to starting treatment	984	709 (72.1)	275 (27.9)	583	342 (58.7)	241 (41.3)	461	352 (76.4)	109 (23.6)	<0.0001

^a The values in parenthesis are in percent.

Table 2
Knowledge about main indication for administration of antipyretics to children with fever^a

Indication	Parents	Physicians	Nurses	Total	<i>P</i>
To improve well-being only	455 (45.5)	299 (51.0)	146 (31.3)	900 (43.8)	<0.0001
To avoid febrile seizure only	200 (20.0)	51 (8.7)	160 (34.3)	411 (20.0)	<0.0001
To avoid brain damage only	56 (5.6)	9 (1.5)	8 (1.7)	73 (3.6)	<0.0001
Combinations of brain damage and seizure	289 (28.9)	227 (38.7)	153 (32.8)	669 (32.6)	<0.0001
Total	1000 (100)	586 (100)	467 (100)	2053 (100)	<0.0001

^a The values in parenthesis are in percent.

Table 3

Attitudes: basis for calculation of dose of antipyretic (paracetamol)^a

Basis	Parents	Physicians	Nurses	Total	P
Manufacturer's instructions	315 (31.5)	19 (3.3)	56 (12.0)	390 (19.0)	<0.0001
Child's weight alone	301 (30.1)	417 (71.4)	274 (58.8)	992 (48.4)	<0.0001
Child's age	182 (18.2)	31 (5.3)	17 (3.6)	230 (11.2)	<0.0001
Manufacturer's instructions + child's weight	34 (3.4)	21 (3.6)	26 (5.6)	81 (3.9)	NS
Manufacturer's instructions + child's age	36 (3.6)	8 (1.4)	7 (1.5)	51 (2.5)	0.007
Child's weight + child's age	66 (6.6)	50 (8.6)	41 (8.8)	157 (7.7)	NS
Three factors	67 (6.7)	38 (6.5)	45 (9.7)	150 (7.3)	NS
Total	1001 (100)	582 (100)	466 (100)	2051 (100)	<0.0001

^a The values in parenthesis are in percent.

4. Discussion and conclusion

To the best of our knowledge, this is the first comparison of the approach to fever in children between parents and medical personnel. Parental opinions on health-related issues are shaped by information provided by physicians and nurses [15], in addition to the media, family members, neighbors, friends, etc. Obviously, physicians and nurses obtain their knowledge mainly from more established sources, such as textbooks, journals, lectures, and the Internet. Nevertheless, they are not free of cultural and other influences. Our study showed that whilst most physicians (85.8%) were aware that fever is usually beneficial to the body's defense system [16–18], many nurses (36%) were not. Furthermore, many parents have misconceptions about the reason for fever and its consequences. This can lead to unnecessary or overaggressive management of even low-grade fever (<38 °C) in the absence of signs of infection [10,16]. These findings suggest that little has changed since 1980, when other investigators noted that most parents (>56%) start antipyretic therapy for a fever of <38 °C [17].

Although non-response bias is a limitation in survey studies, our response rate of 64.6% for physicians can be considered good for studies involving physicians in mail surveys [19].

The great majority of parents treat even low-grade fever of <38 °C, whereas the great majority of physicians and nurses do not. Parents also place too great an emphasis on the presence of low-grade fever, as evidenced by the finding that most use a thermometer every time low-grade fever is suspected, even in the absence of other signs or symptoms, and they wake children to take medication, though the majority of physicians advise against this policy. Both the rectal temperature evaluation and the night-time awakening cause unnecessary discomfort and distress to the child.

Pediatricians often recommend natural and pharmacological agents to lower fever. This is intended not to hasten recovery but merely to reduce the child's discomfort [20]. Obviously, antipyretics which are also analgesic, are commonly used for the relief of agitation and restlessness, even with low-grade fever. Interestingly, close to 30% of the

parents in our study believed that the principal reason for prescribing antipyretics is to prevent brain damage and/or seizure. This rate is consistent with the 43% of parents noted in an earlier study who believe that fever produces brain damage and that fever <40 °C could be dangerous [21]. Furthermore, our results show that nurses remain unaware of recent findings that children with simple and complex febrile convulsions have the same benign outcome and long term prognosis in terms of subsequent epilepsy, neurologic, motor, intellectual, cognitive and scholastic ability [22]. In a 10-year follow-up, children with febrile convulsions were reported to display similar academic and intellectual behaviors as control children [23,24].

Parents are very unclear about the appropriate dosage of antipyretics. Some use the manufacturer's instructions, others use body weight or age, and some use a combination of these. A recent investigation reported that 57% of parents treated children with incorrect doses of antipyretic drugs [25]. Attention would be directed better at the cause of the fever itself. Most parents are unaware that paracetamol, when used as an antipyretic, has deleterious effects on the disease process and overdose can cause hepatic toxicity [15]. From a medical point of view, there are few reasons for antipyretic therapy in toddlers and children if the duration of fever is <5 days and serious disease has been excluded [26,27].

It should be noted, however, that in Israel, we still use dipyrone for fever reduction, whereas ibuprofen is unavailable in syrup form.

4.1. Conclusion

In conclusion, most pediatricians in Israel are well aware of the role of fever in the immunological cascade, whereas nurses are less so, and their approach to certain issues is closer to the parents' than to the physicians'. A great number of nurses in the community do not spend enough time in continuing medical education once they have completed their hospital training. Their close daily association with illnesses, combined with the parents' "fever phobia", can lead them to treat fever too aggressively [28]. Parental misconceptions may also lead to excessive utilization of

health care services and to institution of treatment that may be doing more harm than good.

4.2. Practical implications

Our study suggests that medical personnel have to increase their efforts to improve the knowledge about fever, and to educate parents about the causes of fever, its effect on the body, the appropriate treatment for fever and the consequences of antipyretic abuse. We believe standardized guidelines for the management of fever should be developed for both medical and nursing associations. In Israel, nurses and physicians work in close collaboration, and nurses are often placed in charge of patient health education. We also suggest that the health authorities should initiate an educational campaign for the public on the subject.

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References

- [1] IUPS Thermal Commission. Glossary of terms for thermal physiology. 2nd edition. *Pflugers Arch* 1987;410:567–87.
- [2] Mackowiak PA. Concept of fever. *Arch Int Med* 1998;158:1870–81.
- [3] Rowesey PJ. Pathophysiology of fever. *Dimen Crit Care Nurs* 1997;16:251–6.
- [4] Kluger MJ, Kozak W, Conn CA, Leon LR, Soszynski D. Role of fever in disease. *Ann NY Acad Sci* 1998;856:224–33.
- [5] Boulant JA. Hypothalamic control of thermoregulation: neurophysiological basis. In: Morgan PJ, Pankepp J, editors. *Handbook of the hypothalamus*. vol. 3, part A. New York: Marcel Dekker, 1980. p. 1–82.
- [6] Hammel HT. Temperature regulation by hypothalamic proportion control with an adjustable set point. *J Appl Physiol* 1963;18:1146–54.
- [7] Mackowiak PA, Boulant JA. Fever's glass ceiling. *Clin Infect Dis* 1996;22:525–36.
- [8] El-Rahi AS, Carroll J. Fever in pediatric practice. Oxford: Blackwell Science, 1994. p. 15–49.
- [9] Impicciatore P, Nannini S, Pharm D, Pandolfini BA, Bonati M. Mothers' knowledge of, attitudes toward, and management of fever in preschool children in Italy. *Prev Med* 1998;27:268–73.
- [10] Schmitt BD. Fever phobia: misconception of parents about fever. *Am J Dis Child* 1980;134:176–81.
- [11] Mackowiak PA. Fever: blessing or curse? Unifying hypothesis. *Ann Int Med* 1994;120:1037–40.
- [12] Kramer MS, Etezadi-Amoli J, Ciampi A, Tange SM, Drummond KN, Mills EL, Bernstein ML, Leduc DG. Parents' versus physicians' values for clinical outcomes in young febrile children. *Pediatrics* 1994;93:697–702.
- [13] Kramer MS, Naimark I, Leduc DG. Parental fever phobia and its correlates. *Pediatrics* 1985;75:1110–3.
- [14] Lwanga SK, Lemeshow S. Sample size determination in health studies. A practical manual. World Health Organization, Geneva, 1991.
- [15] Heubi JE, Barbacci MB, Zimmerman JH. Therapeutic misadventures with acetaminophen: hepatotoxicity after multiple dose in children. *J Pediatr* 1998;132:22–7.
- [16] Schmitt BD. Fever in childhood. *Pediatrics* 1984;74:929–36.
- [17] Bernheim HA, Kluger MJ. Fever: effect of drug-induced antipyresis on survival. *Science* 1976;267:43–5.
- [18] Toms GL, Davies JA, Woodward CG, Sweet C, Smith H. The relation of pyrexia and nasal inflammatory response to virus levels in nasal washings of ferrets infected with influenza viruses of differing virulence. *Br J Exp Pathol* 1977;58:444–58.
- [19] Asch DA, Jedrziewski MK, Christakis NA. Response rate to mail surveys in medical journals. *J Clin Epidemiol* 1997;50:1125–36.
- [20] Fox R. Management of childhood fever. *Lancet* 1991;339:1049–50.
- [21] Anderson AR. Parental perception and management of school-age children's fevers. *Nurs Pract* 1988;13:12–8.
- [22] Knudsen FU, Paerregaard A, Andersen R, Andersen J. Long term outcome of prophylaxis for febrile convulsions. *Arch Dis Child* 1996;74:13–8.
- [23] Verity C, Greenwood R, Golding J. Long term intellectual and behavioral outcome of children with febrile convulsion. *N Engl J Med* 1998;338:1723–8.
- [24] Kolfen W, Pehel K, Konig S. Is long term outcome of children following febrile convulsion favorable? *Dev Med Child Neurol* 1998;40:667–71.
- [25] Linder N, Sirota L, Snapir A, Eisen I, Davidovich N, Kaplan G, Barzilai A. Parental knowledge of the treatment of fever in children. *Isr Med Assoc J* 1999;1:158–60.
- [26] Hull D. Fever, the fire of life. *Arch Dis Child* 1989;64:1741–7.
- [27] Kluger MJ. Fever revisited. *Pediatrics* 1992;90:846–50.
- [28] May A, Bauchner H. Fever phobia: the pediatrician's contribution. *Pediatrics* 1992;90:851–4.