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Abstract

Objective. To identify the percentage of parents who define the threshold for fever between 38.0°C and 38.3°C, which has not been reported previously, and to describe parental attitudes toward fever and antipyretic use. **Study Design.** Thirteen-question survey study of caregivers. **Results.** Overall, 81% of participants defined the threshold for fever as <38.0°C, 0% correctly defined fever between 38.0°C and 38.3°C, and 19% defined fever as >38.3°C. Twenty percent of children brought to clinic for a chief complaint of fever were never truly febrile. Ninety-three percent of participants believed that high fever can cause brain damage. For a comfortable-appearing child with fever, 89% of caregivers reported that they would give antipyretics and 86% would schedule a clinic visit. **Conclusion.** Our finding that 0% of parents correctly defined fever is both surprising and unsettling, and it should inform future discussions of fever between parents and clinicians.

Keywords

fever, fever phobia, fever literacy, fever definition, fever illiteracy, health literacy, antipyretic, fever knowledge, parental knowledge

Introduction

Fever is the most common chief complaint in pediatrics, accounting for almost one third of all urgent care and emergency department visits among children.¹⁻⁷ Each year in the United States, children presenting with fever account for approximately 60 million clinic visits and 8 million emergency department visits, costing an estimated \$10 billion annually.¹⁻⁹

Dr Barton Schmitt coined the term *fever phobia* in 1980.¹⁰ Schmitt found that almost all parents believe that fever can cause physical harm to their children, despite the reality that fever is a physiologic process and not a primary illness in itself.¹⁰⁻¹⁴

Fever phobia likely explains why the vast majority of fevers are treated with antipyretics, both at home and in hospital settings.¹ Despite the widespread use of antipyretics, there is no evidence that treating fever reduces morbidity or mortality,¹⁵ with one exception for critically ill children with low metabolic reserve. In fact, available evidence suggests that *not* treating fever may improve outcomes, as viruses and bacteria have more difficulty replicating in febrile hosts.¹⁶⁻²⁴ The American Academy of Pediatrics (AAP) recently published a policy statement and concluded that there is no evidence to recommend the

use of antipyretics to reduce temperature in a febrile child.¹⁵ The primary goal of antipyretic use, according to the AAP, should be to improve overall comfort.

In 1980, Schmitt created a list of 10 suggestions to help combat fever phobia. His number one suggestion was to educate parents about the definition of fever.^{10,25} *Nelson Textbook of Pediatrics* defines normal human body temperature as 36.6°C to 37.9°C and fever as any temperature $\geq 38.0^\circ\text{C}$.²⁶ There is no universal consensus, but most practitioners at our institutions use 38.0°C as the definition of fever in their practices.

Fever is the subject of discussion between physicians and parents on a daily basis. These discussions are rendered meaningless, or even dangerous, if parents

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and physicians do not have a common understanding of the definition of fever. The primary aim of the present study was to identify the percentage of parents who define the threshold for fever between 38.0°C and 38.3°C, which has not been reported previously. Several studies have asked parents to define fever,²⁷⁻³² but they did not report precise ranges of parental definitions. Assessment of parental ability to define fever threshold within a clinically meaningful temperature range may facilitate a better understanding of the knowledge gap between clinicians and parents regarding fever.

Methods

Participants were recruited from 2 pediatric urgent care clinics in San Jose, California: (a) a county hospital clinic with a large medically underserved population (Santa Clara Valley Medical Center) and (b) a private clinic affiliated with Kaiser Permanente. The 2 clinics were chosen to ensure that the study had diverse racial/ethnic, educational, socioeconomic, and cultural representation. A convenience sample of caregivers of children brought to pediatric urgent care clinic for evaluation during July and August 2012 were eligible for inclusion in the study. Researchers spent a total of five days distributing and collecting surveys. On those days when researchers were present in clinic, all eligible caregivers who entered the waiting area were asked to participate. Caregivers who agreed to participate completed a 1-page, 13-question survey. The surveys were available in English and Spanish.

Survey questions were related to demographics, reason for the present visit, parental knowledge of fever, and home use of antipyretics. Most of the questions were multiple choice. However, the primary outcome was elicited by asking, "What is a fever? A fever is any temperature above [fill in the blank]." Answers in degrees Fahrenheit were converted to degrees Celsius prior to analysis. We also asked parents to rate the importance of giving antipyretics for a variety of conditions, using a Likert-type scale where 1 represented *not at all important* and 5 represented *extremely important*. Parents were not given any assistance in answering the questions provided. We considered 38.0°C to 38.3°C to be the reference range of threshold for fever. Although there is no universal consensus, we believe that this represents the range of definitions of fever most commonly used in medical practice.

Statistical analysis was performed using Statistical Analysis Software, version 4.1 (SAS Institute Inc, Cary, NC, 2003). Appropriate measures of central tendency were used to describe the data, including mean and standard deviation for continuous variables. Binary and categorical variables were described with

frequencies, percentages, and proportions. Survey answers from the private clinic were compared with those from the county clinic using Student's *t* test, χ^2 , and Fisher's exact test as appropriate. We stratified the data by clinic location in an effort to evaluate the effect of socioeconomic status on survey answers. Statistical significance was set as a *P* value of <.05. This study was approved by the institutional review boards at Santa Clara Valley Medical Center, Kaiser Permanente, and Stanford University. All research components adhered to Stanford University ethical human research guidelines.

Results

A total of 105 caregivers completed the survey out of 107 who were asked to participate (98%). Five surveys were excluded from analysis for illegible handwriting or outlier answers (eg, defining fever as "20.43°C"), leaving a total of 100 surveys (93%) that were included in the final analysis. The 2 sites differed demographically by race/ethnicity, language, and education (Table 1). The mean (\pm standard deviation) ages of the participants and their children were 35.3 \pm 8.5 and 4.7 \pm 4.3 years, respectively.

Fever accounted for 31% of chief complaints (Table 2). Fever was reported to be present among 39% of all children, of which 88% reported using a home thermometer. Among those with a chief complaint of fever and a documented home temperature, 20% reported the maximum home temperature to be less than 38.0°C. This occurred more frequently among participants from the private clinic compared with those from the county clinic, although this difference was not statistically significant (29% vs 9%, *P* = .13).

The mean temperature definition of fever was 37.6°C \pm 0.7°C, with a range of 35.9°C to 39.6°C. Overall, 81% of participants defined the threshold for fever as <38.0°C, 0% correctly defined fever between 38.0°C and 38.3°C, and 19% defined fever as >38.3°C, or the equivalent temperatures in degrees Fahrenheit (Table 3). The mean definition of fever was significantly lower among college graduates (37.3°C \pm 0.5°C vs 37.9°C \pm 0.8°C, *P* < .001), English speakers (37.4°C \pm 0.6°C vs 38.1°C \pm 0.8°C, *P* < .001), and participants from the private clinic compared with the county clinic (37.4°C \pm 0.6°C vs 37.8°C \pm 0.8°C, *P* < .01). The most common fever threshold was 37.8°C (100.0°F), reported by 28%; 37.2°C (99.0°F) and 37.0°C (98.6°F) were also common answers, reported by 19% and 12% of caregivers, respectively.

The survey also revealed that 93% of participants believe that high fever can cause brain damage, which did not differ significantly when stratified by site, race/ethnicity, language, or education (*P* > .05). Overall,

Table 1. Demographics of Participants

Variables	Total (n = 100)	Private Clinic (n = 54)	County Clinic (n = 46)	P ^a
Age of child in years (mean ± SD)	4.7 ± 4.3	5.1 ± 4.8	4.2 ± 3.6	.36
Age of parent/guardian in years (mean ± SD)	35.3 ± 8.5	35.4 ± 7.4	35.1 ± 9.6	.86
Parental race/ethnicity (%)				
Hispanic	42	26	61	
Caucasian	21	28	13	
Black	6	0	13	
Asian	22	31	11	
Other	9	15	2	<.001
Completed survey in Spanish (%)	22	4	43	<.001
Relationship of participant to child (%)				
Mother	65	69	61	
Father	31	31	30	
Other	4	0	9	1.0
Education (%)				
High school graduate	89	96	76	
College graduate	61	72	28	<.001

^aFor *t* test or χ^2 comparison of private versus county clinic.

Table 2. Reason for Visit

Variables	Total (n = 100)	Private Clinic (n = 54)	County Clinic (n = 46)	P ^a
Chief complaint (%)				
Fever	31	30	31	
Pain or injury	20	24	17	
Earache	10	11	10	
Vomiting/diarrhea	5	0	10	
Cough/runny nose	9	9	10	
Rash	8	11	5	
Other	17	15	19	.40
Fever present ^b (%)	39	39	38	.73
Used thermometer	88	94	81	.47
Reported maximum temp <38.0°C when chief complaint is fever (%)	20	29	9	.13

^aFor χ^2 comparison of private versus county clinic.

^bIncludes all reported fevers, both chief complaints and secondary symptoms.

89% of participants said they would give antipyretics to a comfortable-appearing child with a temperature greater than 38.0°C, and 59% would give antipyretics to a comfortable-appearing child with a temperature between 37.4°C and 37.8°C (Table 4). Likewise, participants believe that it is more important to give antipyretics for fever than for pain or irritability, using a 5-point Likert scale (4.2 ± 1.0 vs 3.6 ± 1.1, *P* < .001). Most participants (86%) would schedule a clinic visit for a comfortable-appearing child with a temperature greater than 38.0°C, and 38% would schedule a clinic visit for a comfortable-appearing child with a temperature between 37.4°C and 37.8°C.

Table 3. Definition of Fever Reported by Caregivers

Variables	Percentage			P ^a
	Total (n = 100)	Private Clinic (n = 54)	County Clinic (n = 46)	
Definition of fever (°C)				
≤37.0	24	31	15	
37.0-37.5	28	37	17	
37.5-38.0	29	17	43	
38.0-38.3	0	0	0	
38.3-38.5	7	7	7	
38.5-39.0	7	5	9	
≥39.0	5	3	9	.01

^aFor χ^2 comparison of private versus county clinic.

Discussion

This investigation demonstrates a profound misunderstanding of fever among participants included in our analysis. Our results were mostly consistent with prior literature.^{1,10,29-30,33} However, our finding that 0% of parents defined the threshold for fever between 38.0°C and 38.3°C has not been reported previously. This result is both surprising and unsettling, and it should inform future discussions of fever between parents and clinicians.

Unlike previous studies that have asked parents to define fever,²⁷⁻³¹ we assessed parental ability to define fever threshold within a clinically meaningful and precise

Table 4. Fever-Related Beliefs and Behaviors

Variables	Percentage			P ^a
	Total (n = 100)	Private Clinic (n = 54)	County Clinic (n = 46)	
High fever causes brain damage	93	94	88	.14
Would give antipyretics to comfortable child with temp >38.0°C	89	89	89	1.0
Would give antipyretics to comfortable child with temperature 37.4°C to 37.8°C	59	63	54	.38
Would schedule clinic visit for comfortable child with temp >38.0°C	86	83	89	.64
Schedule clinic visit for comfortable child with temperature 37.4°C to 37.8°C	38	33	43	.75

^aFor χ^2 comparison of private versus county clinic.

range. Previous studies have reported broad ranges of fever definitions that are not applicable to clinical practice, for example, Kramer et al³⁰ reported that 51% of parents defined fever between 38.0°C and 39.9°C without providing further analysis. In other words, these previous studies miss the true knowledge gap that exists between parents and clinicians regarding fever. Only one previous study has reported the percentage of parents who defined fever within a meaningful temperature range, but their data were extracted from one multiple-choice question.³² In their survey, the percentage of participants who selected 38.0°C (15%) was less than expected by chance alone among the 6 answer choices, calling into question the external validity of their results. The true percentage of parents that can accurately define fever is probably closer to 0%, as reported in the present study.

For more than 30 years since Schmitt first published his study on fever phobia, medical professionals have tried to educate patients and their families about fever.¹ Interestingly, the present study found that participants with the highest socioeconomic backgrounds (and presumably the best access to medical education) provided the least accurate definitions of fever. New approaches must be considered to educate caregivers, and perhaps health care providers, about fever. Physicians could avoid confusion altogether by using specific temperatures rather than the term *fever* when interacting with parents. In other words, the question, “Has your child had a temperature above 100.4°F?” has a much clearer meaning to parents than “Has your child had a fever?”

This study also demonstrates that most caregivers (89%) reported that they would give antipyretics to a comfortable-appearing child with a fever, and that parents believe the most important use of antipyretics is for fever, not for pain or irritability. These additional findings demonstrate that, despite the laudable attempts of

Dr Schmitt, the AAP, and others to combat fever phobia, we have made little progress over the past 3 decades in educating caregivers regarding the implications of fever, which may be driving antipyretic overuse and inappropriate health care utilization.

Our lack of progress may be iatrogenic. One survey from 1992 found that 65% of pediatricians believe that fever can be dangerous and that 72% always or often recommend antipyretics to treat elevated temperatures.³⁴ However, there is no evidence that fever, which should be distinguished from hyperthermia, can cause brain damage.¹³ Human body temperature does not cause physical harm until it reaches 41°C to 42°C for a prolonged period of time, which is extremely rare in infectious conditions.^{11,13,35-39}

Recommending antipyretics to treat elevated temperature is not a benign intervention for children, particularly when one half of parents give incorrect doses.⁴⁰ Antipyretics can cause rare but severe side effects, including liver failure, renal failure, and gastrointestinal ulceration, and have been associated with Stevens–Johnson syndrome⁴¹ and asthma.^{13,42} In spite of the evidence, antipyretic use for febrile children has increased over the last several decades, from 67% to more than 90%.^{40,43} In fact, 85% of parents report that they would wake a sleeping child to deliver antipyretics,¹ and 33% to 65% of parents report giving acetaminophen for temperatures less than 38.0°C in previous surveys.^{29,33} Our results are also consistent with a recent study by Enarson et al,⁴⁴ who found that 74% of parents felt that fever was dangerous and that 90% always attempt to treat fever.

We also found that almost one third of children brought to the private clinic for a chief complaint of “fever” were never truly febrile, which is consistent with prior literature.^{31,45,46} This should not come as a surprise given that 81% of caregivers in our study defined fever as <38.0°C,

and 38% would schedule a clinic visit for a well-appearing, afebrile child.

The present study offers several strengths. We collected data from participants at 2 different clinics in the San Jose area with a wide range of socioeconomic, racial/ethnic, and educational backgrounds. Furthermore, 98% of caregivers who were initially approached chose to participate in the survey. Several limitations should be considered. First, our survey was distributed during the summer and did not account for the seasonal variation in chief complaints. Second, our sample size was relatively small ($n = 100$) and was not powered to detect differences between the 2 sites; however, our sample size was comparable to Schmitt's initial survey study of fever phobia.¹⁰ Third, the generalizability of our results is uncertain, given that we sampled participants from only 2 clinics, which were both urgent care. This group may be more vigilant about fever, and their knowledge of fever may differ from those seen in nonurgent settings. Fourth, caregiver responses may have been influenced by the inclusion of example temperatures in the multiple-choice section of the survey. Although 28% of caregivers listed 37.8°C as the threshold for fever, 37.8°C happened to be 1 of 3 example temperatures used in the survey. Fifth, we did not account for variations in caregiver definitions by anatomic site of temperature measurement. However, very few clinicians at our institutions adjust fever threshold by site, so we felt that further questions regarding method of measurement might lead to more confusion for survey takers.

In conclusion, aggressive educational campaigns for appropriate antipyretic use should be targeted toward physicians and nurses. The "Choosing Wisely" campaign is a great example of an educational initiative that is designed to combat overuse in healthcare.⁴⁷ The campaign has generated a list of "Five things physicians and patients should question" from a total of 9 specialty societies thus far. No pediatric list has been published at the time this article was drafted. Given the high incidence of fever in children and the impact fever phobia has on our health care system, inclusion of fever and antipyretics on such a list would be an important step toward changing behavior.

Declaration of Conflicting Interests

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