

A current analysis of caregivers' approaches to fever and antipyretic usage

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Abstract

Introduction: The aim of this survey was to investigate the current knowledge, attitudes, and practices of febrile children's caregivers about fever, antipyretic usage, and temperature measurement methods in a tertiary care hospital.

Methodology: A 41-item questionnaire was administered to a convenience sample of febrile children's caregivers in face-to-face interviews by two research assistants from January 2012 through June 2012 in an urban region of Turkey.

Results: A total of 1,032 caregivers completed the interview. Approximately one-third of caregivers considered a temperature of less than 37.8°C (100°F) to be a fever, and 13% of all respondents would give antipyretics for a body temperature $\leq 37.8^\circ\text{C}$. Furthermore, 76% of parents would wake their children from sleep to administer antipyretics. Although a high proportion (89.5%) of respondents believed that fever had harmful effects, 10.5% considered fever to be beneficial. Alternating use of acetaminophen and ibuprofen (44%) and giving antipyretics routinely (71%) before and after immunizations were common parental practices and generally advised by pediatricians. Parents with higher levels of education were more likely to consider fever to be beneficial and to treat fever with antipyretics, and less likely to seek medical attention for mild fever. Most caregivers stated that they were unsure about the right site (90%) and thermometer type (95%) for temperature measurement.

Conclusions: Persistent fever anxiety and excessive antipyretic usage may be heightened by the lack of knowledge regarding accurate temperature measurement methods with digital thermometers in our population. Parental education may positively affect the approach to fever and antipyretic usage.

Key words: antipyretics; caregivers' approach; children; fever

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Introduction

Fever is one of the most common complaints of children managed by pediatricians and other health care providers, and is the cause of nearly 65% of ambulatory paediatric visits [1]. Although fever is a beneficial host response, it is an important cause of anxiety for parents and leads to undue and excessive use of antipyretics [2,3]. For more than three decades, beginning with a survey conducted by Schmitt in 1980, researchers have demonstrated significant degrees of "fever phobia" in caregivers from different countries [4-12].

There might be differences regarding knowledge, attitudes, concerns, and management of fever from country to country, and these differences may have been influenced by countries' health policies and socio-cultural differences. Until 2009, the mercury-in-glass thermometer was the most commonly used thermometer type in both hospitals and homes in Turkey. In 2009, the use of mercury-in-glass

thermometers was forbidden by the Turkish Ministry of Health because of reported cases of mercury poisoning due to broken or discarded thermometers, and this led to confusion for not only families, but also health care providers regarding temperature measurement and fever definition. Since accurate measurement of temperature is important for detection of fever and hypothermia in pediatric patients, an ideal temperature-measurement technique should be safe, easy, noninvasive, and should precisely reflect core body temperature [13]. Although various noninvasive thermometry methods are available today, there is no consensus on the most accurate method of thermometry and the best measurement site [14].

It is important to define current parental knowledge, practices, and causes leading to confusion in parents to reduce parental anxiety and the incorrect use of antipyretics, and to improve parents' ability to care for their febrile children. This study examined

current approaches to fever and antipyretic usage in Turkish parents.

Methodology

A cross-sectional survey was conducted in face-to-face interviews by two research assistants from January 2012 through June 2012 in an urban region of Turkey. A 41-item questionnaire (28 questions were multiple choice and 13 were open ended) was administered to a convenience sample of parents bringing their febrile children between 1 month and 16 years of age to the pediatric infectious diseases department, pediatric outpatient clinics, and pediatric emergency department (PED) for medical care. Some items in the survey were formulated on the basis of similar previous published surveys to allow comparison [4,6,7]. In addition to general demographic information (gender, age, level of education, and number of children), the survey included questions regarding definition of fever, concerns about fever, preferred temperature-taking method, and fever management (antipyretic usage and external cooling methods). Additionally, demographic factors influencing parental definition, concerns, and behaviors about fever such as parental age, educational level, child's age, and number of siblings were evaluated. The local ethics committee approved the study, and informed consent was obtained from participants.

Statistical analysis

Data analysis was performed using IBM Statistical Package for Social Sciences (SPSS) version 20, and $p < 0.05$ was considered to be statistically significant. Results were given as absolute numbers and percentages. The percentage of responses to the questions was calculated based on the total number of participants. Normally distributed descriptive variables were expressed as the mean \pm standard deviation (SD); variables with non-normal distribution were expressed as the median and range (minimum and maximum). The χ^2 and Fisher's exact tests were used for categorical variables. Spearman's correlation was used to test possible relationship between continuous variables, and a linear-by-linear test and Jonkheere-Terpstra tests were used for ordinal variables.

Results

Demographics

A total of 1,032 parents (median age, 32 years; range, 20 to 52 years) of febrile children were surveyed; 72% ($n = 743$) of the respondents were mothers. Demographic information of the index children and their parents is shown in Table 1.

Parental definition and concerns about fever

The median temperature defined by parents to be fever was 38°C (100.4°F), with a range of 35°C (95°F) to 40°C (104°F), and 36% ($n = 371$) of parents

Table 1. Demographic information

	Number	Percentage (%)
Gender of index children		
Male/female	564/468	54.7/45.3
Age of index children		
< 3 months	14	1.4
3-36 months	445	43
> 36 months	573	55.5
Parental age		
< 20 years	12	1.1
20-30 years	364	35.2
31-40 years	549	53.2
> 40 years	107	10.3
Educational level of parents		
Elementary school	518	50
Intermediate school	99	9.5
High school	161	15.6
University or college	254	24.6
Number of siblings		
0	217	21
1	494	47.9
2	263	25.4
> 3	58	5.6

considered a temperature of $\leq 37.8^{\circ}\text{C}$ (100°F) to be a fever. There were no significant correlations between the caregivers' definition of fever as $\leq 37.8^{\circ}\text{C}$ and parental age (Spearman's correlation, $r = -0.050$; $p = 0.138$), education level (Jonkheere-Terpstra test, $T = 1.85$; $p = 0.063$), number of siblings ($T = -0.572$; $p = 0.568$), and child's age ($r = -0.039$; $p = 0.250$). Infection (68.4%) was the most common indicated cause of fever. Eleven percent ($n = 113$) of families stated that they had another child with a history of febrile seizure.

A high proportion (89.5%, $n = 923$) of respondents believed that fever had harmful effects; the median temperature considered to be the lower threshold for danger was 39°C (102.2°F), with a range of 36°C (96.8°F) to 45°C (113°F). The most commonly reported harmful effects were seizure (67%, $n = 618$), brain damage (13%, $n = 120$), seizure and brain damage (6%, $n = 55$), and death (4%, $n = 36$). Only 108 (10.5%) of respondents considered fever to be beneficial in assisting the immune system to fight infection. There was a significant relationship between parental level of education and considering fever to be beneficial (linear-by-linear test, $\chi^2 = 33.274$; $p < 0.001$). Parents with higher levels of education were more likely to consider this ($\chi^2 = 1.85$; $p < 0.001$). However, parents with more children were less likely to consider fever to be beneficial ($\chi^2 = 5.00$; $p = 0.025$).

Distinctively, 12% ($n = 123$) of caregivers stated that hypothermia (asked parents directly and defined as the body temperature being below normal) was more dangerous than high fever because it could cause severe disease (37%, $n = 45$), death (33%, $n = 40$), seizure (10%, $n = 12$), brain damage (4%, $n = 5$), and shock (4%, $n = 5$). Parents with higher levels of education were more likely to respond that

hypothermia was more dangerous than high fever ($\chi^2 = 56.32$; $p < 0.001$).

The median temperature at which a parent would take a child to the hospital was 38.5°C (101.3°F), with a range of 36°C (96.8°F) to 40°C (104°F), and 5.2% ($n = 53$) of caregivers said that they would take a child to the hospital for a temperature of $< 38^{\circ}\text{C}$ (100.4°F). Further analysis showed that parents who had more children ($\chi^2 = 10.237$; $p = 0.001$), and who had a child with a history of febrile seizures ($\chi^2 = 11.6$; $p = 0.001$) were more likely to take their child to the hospital for a temperature of $< 38^{\circ}\text{C}$ (100.4°F), whereas parents with higher levels of education ($\chi^2 = 7.349$; $p = 0.007$) and parents with older children ($\chi^2 = 5.030$; $p = 0.025$) were less likely to do so.

Also, 67.5% ($n = 696$) of parents declared that they immediately refer to the PED when their child had a fever. Parents with higher levels of education ($\chi^2 = 25.095$; $p < 0.001$), and older parents ($\chi^2 = 22.669$; $p < 0.001$) were less likely to refer to the PED immediately.

Temperature measurement method

Eighty-five percent ($n = 877$) of parents had a thermometer and measured temperature at home. Results regarding temperature monitoring methods are given in Table 2. When asked directly, the majority of caregivers stated that they were unsure about the right site (90%, $n = 928$) and thermometer type (95%, $n = 980$) for temperature taking irrespective of parental education ($p > 0.05$) and age ($p > 0.05$). Therefore, deciding whether their child had a fever was the most important cited problem for them, and they indicated that they would like to receive more information about the most accurate temperature measurement method.

Table 2. Preferred thermometer type and measurement site for temperature taking by parents

	Number	Percentage (%)
Site of measurement		
Axillary	591	57.3
Auricular	198	19.1
Forehead	160	15.5
Oral	79	7.6
Rectal	4	0.4
Thermometer type		
Digital thermometer	825	79.9
Touching forehead	160	15.5
Mercury-in-glass thermometer	47	4.6
Total	1,032	100

Fever management

Antipyretic usage

The vast majority of parents (95.3%, $n = 983$) stated that they started antipyretics at home before seeing a physician. Seventy-seven percent ($n = 794$) of respondents thought that antipyretics should certainly be administered when their child had a fever. Although younger parents ($\chi^2 = 39.819$; $p < 0.001$) were more likely to think so, parents with higher levels of education were less likely to ($\chi^2 = 14.739$, $p < 0.001$). The median temperature at which antipyretics would be administered was 38°C (100.4°F) (range: 35°C [95°F] to 40°C [104°F]), and 13% ($n = 134$) of respondents declared that they would give antipyretics for a body temperature $\leq 37.8^\circ\text{C}$ (100°F). Ten percent ($n = 103$) of parents stated that they would continue to give antipyretics even if the fever subsided, with the aim of reducing the recurrence of fever (60%, $n = 61$), completing the treatment (32%, $n = 33$), and to prevent febrile convulsion (8%, $n = 8$). Furthermore, 76% ($n = 784$) of parents would wake their children from sleep to administer antipyretics.

Parents reported using both acetaminophen and ibuprofen (40%, $n = 412$), only ibuprofen (28%, $n = 288$), and only acetaminophen (19.6%, $n = 202$) to lower body temperature. Additionally, some parents reported using metamizole (7.4%, $n = 77$) and aspirin (4%, $n = 41$) to lower body temperature, and 5% ($n = 51$) of caregivers stated that they used ibuprofen for their child under six months of age. Eighty-five percent ($n = 877$) of caregivers said that they read the package insert, and the dose of antipyretics was reported to be given according to weight (37.6%, $n = 388$), package insert (25.3%, $n = 261$), physicians' advice (21%, $n = 216$), and age (16%, $n = 165$). Although 50% of parents ($n = 516$) were unaware of the toxic effects of antipyretics when used high doses, the most reported toxic effects were liver failure (23%, $n = 237$), kidney failure (22%, $n = 227$), allergy (3%, $n = 30$), and death (2%, $n = 20$).

While ibuprofen was considered to be the more effective antipyretic by 55% ($n = 567$) of parents, 32% ($n = 330$) considered acetaminophen to be the more effective antipyretic. Alternating acetaminophen and ibuprofen was declared by 44% ($n = 454$) of parents, 83% ($n = 376$) of whom stated that they had followed the advice of their pediatricians; most of them (85%, $n = 385$) found this practice useful. Parents were also asked whether antibiotics should be administered to every child with a fever; only 12.5% ($n = 129$) answered yes. Six percent ($n = 61$) of parents stated that they used antibiotics instead of antipyretics.

Seventy-one percent ($n = 732$) of parents said that they would give antipyretics routinely before (33%, $n = 242$) and after (67%, $n = 490$) immunizations to decrease the fever response, and this practice was recommended to 87% ($n = 636$) of parents by pediatricians. Furthermore, 17% ($n = 175$) of parents declared that they used antipyretics not only for fever, but also for pain (90%, $n = 157$) and discomfort (10%, $n = 18$).

External cooling methods

Seventy-two percent ($n = 743$) of respondents reported using external cooling methods to treat fever at home. These methods included use of a warm water bath (68%, $n = 505$) and removing clothes (12%, $n = 90$). Of those who used external cooling methods, 20% ($n = 148$) performed the technique incorrectly, using vinegar (12%, $n = 89$), a cold water bath (7%, $n = 52$), or alcohol (1%, $n = 7$).

Discussion

The present study is an analysis of current approaches to fever, antipyretic usage, and temperature-taking methods in Turkish parents. Results were analyzed using the American Academy of Pediatrics (AAP) and National Institute for Health and Clinical Excellence (NICE) recommendations [2,15]. A substantial proportion of parents in our study held unrealistic concerns about fever and its consequences, and most used antipyretics excessively, both of which were common findings in other studies as well [4-12]. Increased use of antipyretics and wrong external cooling methods to reduce fever, waking sleeping febrile children to administer antipyretics, and routine use of antipyretics before and after vaccination reflects heightened concern about the harmful effects of fever.

Standard pediatric textbooks define fever as a rectal temperature over 38°C (100.4°F) and an oral temperature of 37.8°C (100°F) [16,17]. In the 19th century, Wunderlich identified 38°C (100.4°F) as the upper limit of normal body temperature in his patient population and therefore regarded any temperature higher than 38.0°C (100.4°F) as fever [18]. Although Wunderlich's studies relied on axillary temperatures, subsequent studies were based on oral or rectal temperatures [19,20]. Body temperature varies among individuals by the time of day, measurement site, and type of thermometer. Because of such variability, no single temperature can be designated as the upper limit of normal [21].

In the present study, a digital thermometer was the most preferred device to measure children's fever, and the most preferred route of temperature measurement was the axillary site. It was found that the vast majority of caregivers had widespread confusion regarding temperature measurement site and method. We conclude that the origin of this confusion is related to the prohibition of the mercury-in-glass thermometer that was the standard measurement method in both hospitals and homes in our country until 2009. In our study, nearly 5% of parents were unaware of the prohibition of the mercury-in-glass thermometer. The use of the mercury-in-glass thermometer was phased out because of potential health problems associated with mercury, and in August 2001, the AAP encouraged parents to remove mercury thermometers from their homes [22,23]. Although mercury-in-glass thermometers have been replaced by digital thermometers, there are ongoing problems about standardization of digital thermometers, and considerable controversy regarding the most appropriate thermometer and the best anatomical site for temperature measurement [24]. In a systematic review of studies [25], temperature readings at the axilla and rectum using either mercury or electronic thermometers showed wide variation across studies, and it was concluded that axillary thermometry is not a good method for accurately measuring temperature [25,26]. The detection of fever by palpation is an age-old method that is insensitive and less accurate; 15% of caregivers in our study population reported still using this method. A large study by Whybrew *et al.* assessed whether mothers and medical students could use touch to determine if children had fever and found touch to overestimate skin temperature and thus falsely label children as having fever [27]. Since the use of a thermometer is the only way to determine whether a child has a fever and all other tactile and visual assessments are inaccurate, there is a great need for future large population studies to identify more standardized, age-appropriate, noninvasive, and cost-effective temperature measurement methods for children. Afterwards, parents should be educated about the accurate use of these modern thermometers; in this way, we conclude that parental anxiety about fever and incorrect use of antipyretics may be lessened.

Attempts to treat fever frequently are based on the assumption that fever has harmful effects and reduction of body temperature abolishes such harm [21]. Although some parents acknowledge the benefits of fever, concerns about seizure, brain damage, and death related to fever widely persisted in our study

population. Parents should be advised that febrile seizures do not cause brain injury and are not associated with subsequent intellectual or neurologic deficits, and that fever is a beneficial host response rather than a primary illness [2,3].

Contrary to popular perception, which was also seen in our study population, ibuprofen has not been demonstrated to be superior to acetaminophen by any parameter of fever control, except in a slightly longer duration of the antipyretic effect (between six and eight hours for ibuprofen, compared with between four and six hours for acetaminophen). Current evidence suggests that both are effective and safe antipyretic agents [2,3]. As seen in this study, acetaminophen and ibuprofen are frequently used in combination, and alternating doses often is advocated by physicians. Although there is some limited evidence that alternating or combining acetaminophen and ibuprofen may be more effective at lowering body temperature, questions remain about the safety and effectiveness in terms of improving discomfort. Moreover, combination therapy may also increase the chance of dosing errors and contribute to the fever phobia that already exists in parents [2,3].

Preventive usage of antipyretic before and after vaccine application is a common practice in primary health care in Turkey and is generally recommended by physicians. Antipyretics should not be prescribed as a preventive during a vaccination visit [3]. Prevacination antipyretics have been shown to diminish the antibody response to vaccines in children treated early with antipyretics [2,3]. According to a randomized, controlled, open-label vaccination study, prophylactic administration of paracetamol at the time of vaccination was shown to diminish the antibody response to several common vaccines [28]. Antipyretics may be used as necessary to treat fever after vaccination [3].

It was found that incorrect practices such as using acetylsalicylic acid and metamizole, cold application, and rubbing the body with alcohol and vinegar still persisted in our study population. Because of the risk of Reye's syndrome, particularly in children with varicella or influenza, use of acetylsalicylic acid is not recommended [21]. Metamizole is commonly preferred by many physicians in Turkey for fever unresponsive to paracetamol and ibuprofen. Although its use is banned in the United States and in several European countries because of the severe hematologic side effects, prescription is not officially restricted for children in some developing countries, including Turkey [29,30]. Rubbing children with cologne or

vinegar to treat their fever are traditional home remedies in our population. Physical temperature reducing methods are widely used in treating fever in children, but only a few small trials have evaluated the effects [31]. There is no evidence to recommend physical methods safely, as their usage may be associated with adverse effects such as shivering, crying, discomfort, and a paradoxical increase in fever [21,31]. Severe complications such as hypoglycaemia, coma, or even death may be seen in a febrile child due to rubbing with alcohol [32].

Our study did suggest that parents with higher levels of education were more likely to consider fever to be beneficial and to treat fever with antipyretics, and less likely to seek medical attention for mild fever. These results suggest that parental education may have a positive influencing factor on the approach to fever and antipyretic usage, as shown in previous studies [12,33]. However, parents with more children were less likely to consider fever to be beneficial, and more likely to take a child to the hospital for a temperature of $< 38^{\circ}\text{C}$ (100.4°F). This may be explained by the acquired worrying experiences of the parents.

Conclusions

The most accurate and appropriate fever measurement method in children was a topic of concern for many parents. The problem that needs to be addressed is related to the lack of established normal body-temperature values and standardized fever thresholds at each site with modern thermometers. We conclude that the lack of knowledge about accurate temperature taking contributed to parents' fever phobia. Our suggestion is that parents should be educated about not only fever definition and treatment, but also about accurate temperature taking and assessment methods. Parental education may have a positive influencing factor on the approach to fever and antipyretic usage.

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