


Perception, knowledge and attitude towards childhood fever: A survey among final-year medical students

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Funding information

Italian Ministry of Health, Grant/Award Number: Ricerca Corrente

Aims: Undue concerns about the consequences of fever and its inappropriate management have been documented worldwide among physicians. However, no data exist on medical students. We investigated the perception, knowledge and attitude towards childhood fever among final-year medical students.

Methods: Between June and September 2021, final-year medical students of six Italian universities were invited to complete an online survey on their conceptions and attitude towards pharmacological and non-pharmacological management of childhood fever. History of relevant personal or second-hand experience with childhood fever was also addressed. Both quantitative and qualitative approaches were used.

Results: Of 1095 (69%) final-year medical students, 756 completed the survey. Many students believe that high fever might cause brain damage, would recommend physical methods and alternate two drugs for fever. Most students do not think that fever has mainly beneficial effects. In Northern Italy, students are less likely to believe that

The authors confirm that the Principal Investigator for this paper is Gregorio P. Milani and that he had direct responsibility for enrolled subjects.

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fever might lead to brain damage (OR 0.55, 95% CI 0.33–0.94), and in Southern Italy students are more likely to advise physical methods (OR 1.77, 95% CI 1.22–2.57) and less likely to believe that fever has mainly beneficial effects (OR 0.55, 95% CI 0.39–0.77). History of a relevant personal episode of fever during childhood was not associated with these outcomes.

Conclusions: Misconceptions about fever are common among final-year medical students in Italy. Cultural factors rather than individually learned traits might underlie these beliefs. Medical students are a promising target for educational interventions to improve childhood fever management.

KEYWORDS

children, education, fever, fever phobia, management, overtreatment

1 | INTRODUCTION

The management of fever in children is a frequent task for healthcare providers, including paediatricians.¹ Although current recommendations focus less on the body temperature itself than the child discomfort, an improper approach to fever is common among caregivers worldwide.^{2,3} Undue concerns about the consequences of fever (e.g., febrile seizure) and an excessively aggressive treatment of this sign have been observed among nurses and physicians.^{4,5} The inappropriate management of fever might impact the immune response and is associated with the risk of drug toxicity.^{6–8}

To improve the management of fever in children, educational interventions (e.g., lectures or tutorials) and guidelines have been developed for both caregivers and healthcare providers in the last decades,^{9,10} but recent systematic reviews show that a gap between available recommendations and everyday clinical practice is still present in many countries.^{7,11–13}

Educational interventions promoting evidence-based fever knowledge might well be directed at medical students, who might eventually have their future work be informed by the views acquired during their medical training.¹⁴ However, no data exist on beliefs and attitudes towards paediatric fever among students. To fill this gap, we conducted a nationwide survey among medical students in Italy, with the primary aim of investigating their perception, knowledge and attitude towards fever in children. The secondary aim was to explore the role of possible moderators on knowledge and attitudes on children fever in this group of subjects and in particular the role of individual experience on fever.

2 | METHODS

This prospective cross-sectional study included both quantitative and qualitative approaches. Between June and September 2021, all final-year medical students enrolled at the University of Milan and University of Pavia (Northern Italy), University of Florence and University of Pisa (Central Italy), University of Naples and University of Messina

What is already known about this subject

- The management of fever is a frequent task for healthcare providers.
- Undue concerns about the consequences of paediatric fever leads to overtreatment worldwide.

What this study adds

- Misconceptions about fever are common among final-year medical students.
- Medical students are a promising target for educational interventions to improve fever management in children.

(Southern Italy) were considered eligible to take part in this study. These universities were chosen as they enrol students from the three different regional areas of Italy (North, Centre and South). Eligible students received an invitation to participate in the study through institutional email with an explanation of the study and a link to answer an anonymous questionnaire. In the invitation, it was explained that questions on fever knowledge and attitudes referred to otherwise healthy children. The questionnaire comprised both closed-ended and open-ended questions and was available on Google Forms platform. After the first invitation, three further email reminders were sent. All invitations were sent by the student office in the medical faculty of the respective university. The respondents did not receive any compensation or incentive.

2.1 | Survey instrument

We developed the survey employing existing questions largely used in the literature,^{15,16} which we adapted to the target population

(i.e., medical students). Then, the questionnaire was pilot tested among five researchers (three paediatricians and two science communicators) with an expertise on questionnaires on fever, five paediatric residents and five final-year medical students. The survey was changed based on their comments. Subsequently, two students answered the survey twice with a 10-day interval. The responses to the closed-ended questions were identical in the first and in the second round. The response to one of the open-ended questions by one student slightly differed with respect to some not relevant details. The final survey was composed of four main sections to gather the following information: (1) demographics and the university attended by the students; (2) training on fever during the medical course; (3) perception, knowledge and attitude towards pharmacological and non-pharmacological management of childhood fever; and (4) history of relevant personal or second-hand experience with childhood fever.

The first three sections included only single-choice closed-ended questions. The answer option to five of these questions comprised scale responses (“Very likely”, “Likely”, “Unlikely”, “Very unlikely” or “Strongly agree”, “Agree”, “Disagree”, “Strongly disagree”).

In the fourth section, if the students answered “yes” to one of the two questions, they were asked to describe the episode. The full questionnaire is reported in the supplementary material (File 1). The study was approved by the Institutional Review Board of the University of Milan (PARERE CE–18.05.21). All subjects gave their written informed consent to participation in the study.

2.2 | Data analysis and statistics

All answers were automatically collected into an online database and then transferred to an Excel spreadsheet. Quantitative data are presented as median and interquartile range or absolute frequency and percentage, as appropriate. The details of the analysis and synthesis of the open-ended questions are reported in the supplementary material. Briefly, we performed an inductive-deductive analysis of all reports to identify experiential patterns. The analysis was performed by two coders with extensive experience in qualitative analysis (I.F. and M.F.) and agreement was sought on the results among all team members by constantly referring to the corpus of data (Supplementary File 2—Qualitative analysis).

For the quantitative analysis, the Fisher exact test with Bonferroni adjustment was used to compare dichotomous variables. Pairwise deletion was used to manage missing data. To explore the role of possible moderators on fever beliefs (brain damage and beneficial effects) and management (advice for physical methods), the 5-digit scales were turned into 3-digit measures by collapsing the two scale points on either side. Histograms were created to compare the differences among the three main Italian regions (North, Centre and South). Then, logistic regression models were used to evaluate the associations between the belief that high fever might cause brain damage, the advice to use physical methods and the assumption that fever has mainly beneficial effects (dependent variables) and age, sex, regional

area of the student's university, the teaching time dedicated to paediatric fever during the medical course, personal or referred relevant experience of childhood fever (independent variables). The Akaike information criterion was used to select the best model for each dependent variable. Significance was assumed at a level of $P < .05$. Analyses were conducted using the “R” program (version 3.5.3, R Foundation for Statistical Computing, Vienna).

3 | RESULTS

A total of 756 out of 1095 (69%) final-year medical students participated and completed the questionnaire (Table 1). The majority of respondents were female ($n = 461$, 61%) with a median age of 26 (IQR 25–28) years. A total of 219 (29% of students) studied in Northern Italy, 261 (35%) in Central Italy and the remaining 276 (37%) in Southern Italy. The response rate was >60% in all these three regional areas (Supplementary File 4, Table S2).

3.1 | Closed-ended questions

Approximately half of the respondents ($n = 356$, 47%) had received 2 hours or less of lessons on “child's fever” during the medical course and 424 (56%) found their knowledge on fever adequate or very adequate for their future medical work. Table 2 sums up students' answers about questions on management of childhood fever.

The criteria for treating fever in children varied a lot among respondents with most ($n = 352$, 47%) considering a body temperature of $>37.9^{\circ}\text{C}$ to indicate fever. Only a minority of final-year medical students ($n = 18$, 2.4%) would consider pharmacological prescription for discomfort rather than temperature. Almost all respondents would administer acetaminophen ($n = 714$, 94%) as first-line drug to manage the fever, they would not administer a further dose of antipyretic if the fever did not decrease quickly ($n = 730$, 96%), nor would they administer another antipyretic ($n = 710$, 94%) if the fever did not decrease quickly after a dose of antipyretic.

Results regarding participants' belief that high fever might lead to brain damage, their attitude towards advising in favour of physical methods for treating fever, and their belief that fever has mainly beneficial effects on children are shown in Figure 1. The results of these questions compared across different regional areas are shown in Figure 2.

3.2 | Open-ended questions

A total of 131 (17%) students had a relevant personal episode of fever from their childhood whereas 142 (19%) reported a relevant fever episode of another child (Supplementary File 3, Table S1). The qualitative analyses of the open answers showed that participants reported experiences related to (1) complications of fever, (2) treatment of fever, (3) aetiology of fever and (4) elevated body temperature. Clinical

TABLE 1 Characteristics of the study participants in Northern, Central and Southern Italy. Data are given as median and interquartile range or absolute frequency and percentage

	All	North	Centre	South
<i>n</i>	756	219	261	276
Sex ^a				
Male	291 (38)	86 (39)	75 (29)	130 (47)
Female	461 (61)	133 (61)	182 (70)	146 (53)
Missing data	4 (0.5)	0	4 (1.5)	0
Age, years ^b	26 [25–28]	25 [25–27]	27 [25–29]	26 [25–28]
Teaching time dedicated to fever ^a				
>5 hours	21 (2.7)	0	9 (3.4)	12 (4.3)
>2–5 hours	242 (32)	59 (27)	71 (27)	112 (41)
1–2 hours	256 (34)	75 (34)	93 (36)	88 (32)
<1 hour	100 (13)	39 (19)	35 (13)	26 (9.4)
No time	137 (18)	46 (21)	53 (20)	38 (14)
Topic fever deepened by means of a textbook, yes ^a	442 (58)	109 (50)	136 (52)	197 (71)
Own know-how adequacy on fever ^{a,c}				
Very adequate	47 (6.2)	12 (5.4)	19 (7.3)	16 (5.8)
Adequate	377 (50)	85 (39)	132 (51)	160 (58)
Inadequate	284 (38)	112 (51)	81 (31)	91 (33)
Very inadequate	48 (6.3)	10 (4.6)	29 (11)	9 (3.3)

^a*P* < .001.

^b*P* < .01.

^cStudents disclosing an inadequate or very inadequate own know-how more frequently reported <1 hour or no teaching time on fever as compared to students disclosing an adequate or very adequate know-how (51% vs 16%, respectively, *P* < .0001).

complications of fever and the elevated body temperature associated with it consistently ranked as the most frequently reported types of both personal and second-hand relevant experiences.

3.3 | Multiple regression models

The results of the multiple regression models showed that the region where students undergo their training (reference category: Central Italy) was associated with all the outcomes considered: the belief that high fever might lead to brain damage (Northern Italy, OR 0.55, 95% CI 0.33–0.94, Supplementary File 4, Table S3), attitude towards advising in favour of physical methods for treating fever (Southern Italy OR 1.77, 95% CI 1.22–2.57, Supplementary File 4, Table S4), and the belief that fever has mainly beneficial effects on children (South, OR 0.55, 95% CI 0.39–0.77, Supplementary File 4, Table S5). History of a relevant personal episode of fever during childhood was not associated with any of the outcomes. The male sex was positively associated with the belief that high fever might cause brain damage (OR 1.74, 95% CI 1.19–2.55). Reporting the inappropriate treatment of other feverish children was inversely associated with the use of physical methods to reduce fever (OR 0.24, 95% CI 0.06–0.92). No other significant association was observed.

4 | DISCUSSION

This is the first survey investigating perception, knowledge and attitude towards fever in children among final-year medical students. It shows that the misconceptions about fever are widely present among students in Italy and are associated more to the regional area, a well-known proxy for cultural variations in attitudes and behaviours,¹⁷ rather than to personal or second-hand history of major fever episodes.

Although it is well recognized that fever should be treated only if discomfort is present, without physical methods or alternating antipyretics, several misconceptions on childhood fever management are widespread among physicians.¹⁸ Surveys conducted in the United States, France and Switzerland showed that only a minority of physicians consider discomfort as the main criterion to treat fever.^{19–22} Furthermore, previous studies found that most physicians recommend physical methods to decrease body temperature and advise alternating acetaminophen and ibuprofen to lower body temperature.^{15,21,22} The attitudes observed among medical students participating in this study were very similar. They likely reflect an undue concern about the possible consequences of fever that lead to an exaggerated treatment of this symptom and is commonly called “fever phobia”.²³ This study shows for the first time that “fever phobia” is widespread already among medical students.

TABLE 2 Students' answers about questions on management of children fever. Data are given as absolute frequency and percentage

n	756
Criterion for treating fever in children	
Body temperature	
>36.7 °C	1 (0.1)
>37.4 °C	103 (14)
>37.9 °C	352 (47)
>38.4 °C	245 (32)
>38.9 °C	37 (4.9)
Other (I would consider discomfort rather than the temperature)	18 (2.4)
Most-prescribed antipyretic drug	
Acetaminophen	714 (94)
Ibuprofen	39 (5.1)
Salicylates	3 (0.4)
Second antipyretic dose in nonresponsive cases	
Very likely	0 (0.0)
Likely	26 (3.4)
Unlikely	327 (43)
Very unlikely	403 (53)
Alternating antipyretic regimen	
Very likely	0 (0.0)
Likely	42 (5.6)
Unlikely	365 (48)
Very unlikely	349 (46)

Purssell and Collin have speculated that misconceptions about fever are culturally, rather than individually learned traits.¹³ Our results corroborate such assumption. Furthermore, these findings are in line with observations conducted in Switzerland disclosing regional differences among physicians on the symptomatic management of fever.²⁴ Of note, also the prescription of antimicrobials differs among the three regional areas of Italy.²⁵ Further research is required to identify the underlying cultural factors.

We speculate that students might be more prone to improve their attitudes and beliefs than board-certified physicians and, therefore, represent ideal candidates for future educational interventions. In this study, many final-year medical students reported a teaching time dedicated to fever of less than 1 hour. On the other hand, most students perceived themselves to be competent on this issue. These data suggest that some students underestimate the topic “fever” or might be unconsciously incompetent. These phenomena might, in turn, contribute to the persistence of fever phobia among healthcare providers. Although the study of specific paediatric diseases is crucial in the medical curriculum, the knowledge and attitudes on fever represent an equally important subject. It is well recognized that misconceptions about fever are associated not only with the overuse of antipyretics, but also with the overuse of antimicrobials and overengagement with health

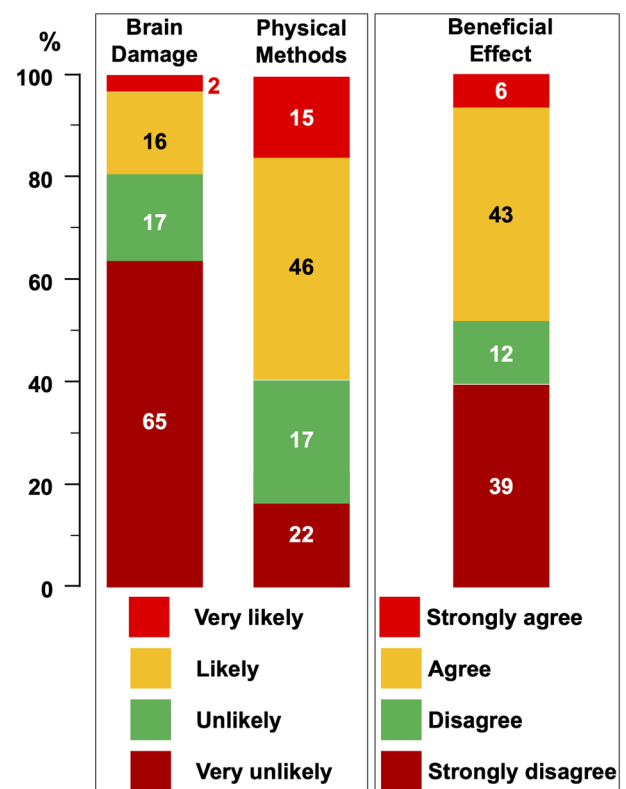


FIGURE 1 Frequency of final-year medical students who believe that high fever might lead to brain damage, who would advise physical methods for treating fever, and who believe that fever has mainly beneficial effects on children

services, endangering the health of patients and generating unnecessary costs.^{18,26,27}

In recent years, many countries have been developing new competency-based medical education programmes.^{28,29} The results of this survey, combined with data on the persistence of fever misconceptions among physicians worldwide, confirm the great challenge of implementing guidelines and point out that the physiopathology and the management of fever should receive more attention in teaching. This is relevant because students' knowledge and attitudes often do not improve after graduation.³⁰

This study has several limitations that are worth mentioning. First, we used previously published questionnaire items to develop this survey, which were not psychometrically validated (though the final version was pilot-tested). Second, the study was restricted to Italy, limiting the generalizability of the findings to other geographical areas. Finally, the results of the survey might not fully reflect the actual practice of the final-year students, who might have replied in a socially desirable way. Yet, the study has several strengths. This is the first study conducted among medical students on symptomatic fever management and included several universities throughout Italy with a good response rate. Furthermore, we conducted both a quantitative and qualitative investigation that allowed us to concurrently explore the potential role of regional

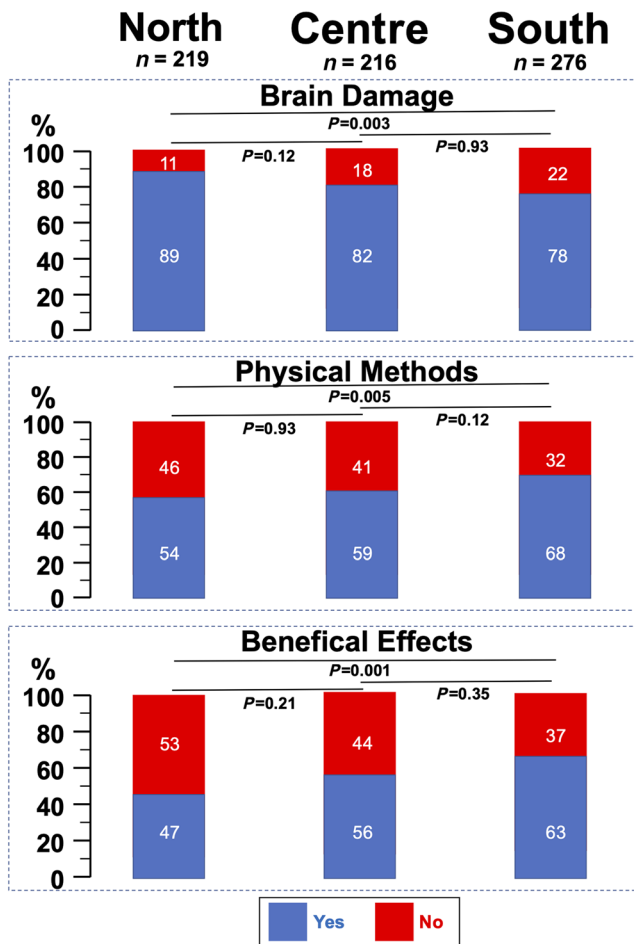


FIGURE 2 Regional area of training and beliefs on high fever and brain damage, advising for physical methods to treat fever, and beliefs on beneficial effect of fever

location, training and personal/second-hand relevant experience with fever.

5 | CONCLUSIONS

This study shows that inappropriate perceptions, attitudes and knowledge on children fever are widely present among final-year medical students in Italy. These misconceptions are mainly associated to the regions where students are trained rather than to previous relevant experience with fever. Final-year medical students might be a promising target for educational interventions to improve paediatric fever management.

ACKNOWLEDGEMENTS

The study was partially supported by a grant from the Italian Ministry of Health (Ricerca Corrente). Open Access Funding provided by Università degli Studi di Milano within the CRUI-CARE Agreement.

COMPETING INTERESTS

The authors have no conflicts of interest relevant to this article to disclose.

CONTRIBUTORS

G.P.M. conceptualized and designed the study, conducted the statistical analyses, drafted the initial manuscript. M.G.B., P.J.S., D.P., P.M. and E.C. contributed to study conceptualization, designed the study, contributed to data interpretation, drafted the initial manuscript, and revised the manuscript. M.F. and I.F. contributed to the design of the study, conducted the qualitative analysis, and reviewed and revised the manuscript. A.C., M.L.G., G.L.M., C.C. and E.B. contributed to the study design, collected the data, contributed to data interpretation, and reviewed and revised the manuscript. All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

DATA AVAILABILITY STATEMENT

The approval granted by the ethical committee of the University of Milan, Italy for the study does not allow the publication of the raw data online. If readers would like to re-analyse the dataset for other purposes, additional ethical approval will be required for each individual user and purpose.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

How to cite this article: Milani GP, Corsello A, Fadda M, et al. Perception, knowledge and attitude towards childhood fever: A survey among final-year medical students. *Br J Clin Pharmacol*. 2022;1-7. doi:[10.1111/bcp.15493](https://doi.org/10.1111/bcp.15493)