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Parental knowledge, attitudes and beliefs on fever; opportunities for public health initiatives – a questionnaire study

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Abstract

Objectives

Fever is both common and mostly benign in young children, yet concerning for parents. The aim of this study was to describe parental knowledge, attitudes and beliefs regarding fever in children aged ≤five years of age.

Design

A cross-sectional study using a previously validated questionnaire. Analysis was conducted using SPSS version 22.0 (SPSS, Inc., Chicago IL) and R version 3.3.1.

Setting

Purposively selected primary schools (n=8) in Cork, Ireland using a paper-based questionnaire. Data were collected from a cross-sectional internet-based questionnaire with a convenience sample of parents via webpages (n=10) previously identified in an interview study.

Participants

Parents with at least one child aged ≤five years were invited to participate in the study.

Main outcome measures

Parental knowledge, attitudes and beliefs when managing fever in children.

Results

1104 parents contributed to this research (121 parents from schools and 983 parents through an online questionnaire). Almost two-thirds of parents (63.1%) identified temperatures at which they define fever that were either below or above the recognised definition of temperature (38^{O}C). Nearly two of every three parents (64.6%) alternate between two fever-reducing medications when managing a child's fever. Amongst parents, years of parenting experience, age, sex, educational status, or marital status did not predict being able to correctly identify a fever, neither did they predict if the parent alternated between fever-reducing medications.

Conclusions

Parental knowledge of fever and fever management was found to be deficient which concurs with existing literature. Parental experience and other socio-demographic factors were generally not helpful in identifying knowledgeable parents. Resources to help parents when managing a febrile illness need to be introduced to help all parents provide effective care.

Key Words: child, fever, temperature, parents, knowledge, attitude

Article Summary

Strengths and Limitations

- A large number of parents were recruited for this study which is one of the major strengths of this study.
- Beliefs and opinions were captured in a non-clinical setting which may portray more realistic attitudes and concerns than those captured at the point of care or in acute care settings.
- The questionnaire used in this study was previously validated.
- A limitation of the study is that we cannot estimate response rate from the web-based study.
- Participants were mainly mothers or had third level education which limits generalisability of findings.

Introduction

Fever, defined as a regulated rise in temperature, is common in childhood,[1-4] however fever episodes are rarely a symptom of serious illness.[1 5 6]

Fever is commonly defined as a temperature of 38^{O}C or above.[7 8] Fever on its own does not require treatment,[9] and guidelines recommend that antipyretics should only be used when the child is also distressed or in pain.[4] However, research suggests that parents often misuse antipyretics by over- or under-dosing,[10 11] or by routinely alternating between antipyretics when managing a fever,[12] despite guidance to the contrary.[4]

Studies examining parents' attitudes and beliefs around fever are limited.[13] The majority of published studies were conducted in secondary care where perceptions may be biased as children may be acutely unwell, placing stress on the parents and possibly influencing responses.[13] Consequently, the National Institute of Health and Care Excellence (NICE) has suggested that studies examining home antipyretic use be done. Furthermore, the NICE Guideline Development Group has called for studies of: parental help-seeking behaviour; triggers for presentation to a healthcare professional; triggers for the decision to give an antipyretic; and triggers for the decision to change from one antipyretic to another.[6] To help address these gaps, we surveyed parental knowledge, attitudes and beliefs around childhood fever and febrile illness.

Methods

Cross-sectional data for this study were collected from parents with at least one child aged five years of age or younger, and were recruited from one of two sources: purposively selected primary schools (n=8) in Cork, Ireland and via the internet (websites and webpages n=10). The schools were selected to maximise sample variation, and included urban and rural settings; large and small schools; and schools that were, and were not designated as delivering education to children and young people who are experiencing, or are at risk of experiencing, educational disadvantage. The websites and webpages used to recruit parents for the internet questionnaire were selected from previous qualitative work with parents.[14] A review of existing literature suggested a sample size of ≥ 600 parents would be adequate to ensure generalisability of responses.[7 12 15-23] Data collection in the schools took place over one week in December 2015, while responses from the internet questionnaire were obtained in January 2016. There were no incentives for participation. School based parents provided written informed consent, whereas consent was implied from online participation.

The questionnaire administered in this study was developed and used in previous research.[7 24-26] The questionnaire was modified to reflect custom and practice in Ireland and piloted with a sample of five parents. It consisted of 38 questions with sub-themes. Response options, including yes/no, agree/disagree, and Likert scales were used. The questionnaire assessed parental knowledge, help-seeking behaviours and expectations, needs for additional resources, fever management practices, use of pharmaceutical products, and concerns, attitudes and beliefs.

Respondents' answers were entered into a Microsoft Excel (2013) data file. Available cases were analysed. Paper-based responses were entered by RH (a researcher not involved in the care of participants). A random sample of 20% of paper-based responses were checked for accuracy by MK. Where data were missing, available cases were analysed. Data were analysed using SPSS version 22.0 (SPSS, Inc., Chicago IL) and R version 3.3.1.[27] Categorical variables were described by the count and proportion in each category. Continuous variables were described by their means and standard deviations (SD), or by their medians and inter-quartile ranges (IQR), depending on whether they were normally distributed or not.

Crude associations between categorical variables were assessed using Pearson's Chi-square test. P values <0.05 were considered to be statistically significant, given a null hypothesis of independence. Multivariable logistic regression was used to estimate covariate adjusted associations, reported as odds ratios (ORs) and 95% confidence intervals (CIs), between key socio-demographic predictors (years of parental experience, respondent age, sex, educational level, and marital/partner status) and each the following dependent variables: whether the parent identified the correct temperature indicative of a fever, and whether they reported alternating fever-reducing medications.

Participant involvement

A previous qualitative study on this topic conducted by the research team,(9) found that parents identified fever as a priority when caring for young children, however parents perceived that they lacked knowledge. Following on from this study, a small number of parents were asked to participate in the design of this study. Parents were not involved in recruiting other parents. Study participants who indicated that they would like to receive a copy of the final report were provided with the report.

Results

Parents' characteristics

A total of 121 parents recruited from schools completed the paper-based questionnaire (response rate 42%), while 983 parents contributed using the online questionnaire. Overall, 1104 parents contributed to this research.

Of those parents who indicated their gender (n=817), 95.5% were female. The age of parents ranged from 20 to 55 years of age, with a mean age of 35.3 years (n=805, SD 4.8).

Although the majority of parents were white Irish (91.8%, n=746), parents representing 34 nationalities participated in the study. Parents (n=817) indicated that they had between 1 and

7 children; the median number of children was 2 (IQR 2). Additional demographic information is listed in Table 1

Table 1. Additional demographic information

Education level (n=816)	Primary level	0.2% (n=1)
	Secondary level	11.6% (n=95)
	Third level	88.2% (n=720)
Marital status/living situation (n=1029)	Married	79.3% (n=816)
	Co-habiting	15.6% (n=161)
	Single	3.3% (n=34)
	Divorced	1% (n=10)
	Widowed	0.6% (n=6)
	Civil partnership	0.2% (n=2)

Knowledge

Parents (n=1104) indicated that they considered temperatures between 36^{O}C and over 40^{O}C indicative of fever. Almost two-thirds of parents (63.1%) identified temperatures at which they define fever that were either below (44%) or above (19.1%) the recognised definition of temperature (38^{O}C).[7 8] Logistic regression analysis showed no apparent associations between reporting the correct definition of fever temperature and years of parenting experience or key socio-demographic factors (Supplemental Table 1).

Parents illustrated a good level of knowledge regarding infections and medication. Most parents (94.9% n=971) believed that the majority of children with a fever did not need an antibiotic, while 89.4% (n=915) were aware that antibiotics are used to cure infections caused by bacteria. Logistic regression analysis with parents' knowledge of antibiotics as the dependent variable found no statistically significant associations between this and years of parenting experience or key socio-demographic factors (Supplemental Table 2). The majority of parents, 89.7% (n=917), knew that antibiotics are not used to cure viral infections. Female sex and having a third level education were independently associated with correctly

answering that antibiotics are not used to cure infections caused by viruses (Supplemental Table 2).

Help seeking and expectations

A large proportion of parents (69.8% n=709) would visit the GP because of fever in their child. Amongst the most common reasons to visit a GP when a child had fever were; fever lasting more than three days and, fever accompanied by a skin rash.

More than half of parents (51.6%) had visited a GP at an out of hours practice with their child because of fever. Level of satisfaction with GP services during both office and out of hours was high as shown in Table 2. Greater than one-third of parents (39.4% n=385) had seen different doctors with their child due to fever. Of these parents, 31.3% (n=111) indicated that they had received different information from these doctors regarding fever in their child e.g. "Some say treat others say if not high let it run its course", "Some say 37.5^{O}C is fever and some say 38^{O}C is a fever".

Table 2. Level of satisfaction with GP services provided

	Office hours/outside office hours	Strongly disagree/ disagree	Neutral	Agree/strongly agree
I was satisfied after the visit	Office hours (n=753)	10.1% (n=76)	9.4% (n=71)	80.5% (n=606)
	Outside of office hours (n=508)	19.9% (n=101)	15% (n=76)	65.1% (n=331)
I felt appeased after the visit	Office hours (n=752)	10.4% (n=78)	11.4% (n=86)	78.2% (n=588)
	Outside of office hours (n=506)	19.6% (n=99)	19.8% (n=100)	60.6% (n=307)
The GP took into account my reasons for consulting at that moment	Office hours (n=752)	7.4% (n=56)	7.2% (n=54)	85.4% (n=642)
	Outside of office hours (n=508)	13.2% (n=67)	14.8% (n=75)	72% (n=366)
The GP had enough attention for my questions	Office hours (n=751)	9.8% (n=74)	11.1% (n=83)	79.1% (n=594)
	Outside of office hours (n=506)	17.6% (n=89)	17.6% (n=89)	64.8% (n=328)
I got enough information about fever in the case of my child	Office hours (n=749)	11.5% (n=86)	15.5% (n=116)	73% (n=547)
	Outside of office hours (n=506)	21.4% (n=108)	17.3% (n=87)	61.3% (n=311)
I got enough information about alarm symptoms	Office hours (n=749)	15% (n=112)	13.6% (n=102)	71.4% (n=535)
	Outside of office hours (n=506)	22.9% (n=116)	16.6% (n=84)	60.5% (n=306)
I got enough information on the expected duration of illness of my child	Office hours (n=750)	14.8% (n=111)	17.5% (n=131)	67.7% (n=508)
	Outside of office hours (n=505)	25.7% (n=130)	20.4% (n=103)	53.9% (n=272)

Parents' primary reason for visiting the GP was to obtain a physical exam for their child (72.2% n=598). The next most important reason was to get advice on alarm symptoms

(9.4%), followed by reassurance (5.7%). Parents rarely visited the GP to obtain medication such as antibiotics (2.9%) or paracetamol (2.3%).

Use of GP services with introduction of free GP care for children

The majority of parents (87.5% n=734) indicated that the introduction of free GP care in Ireland (July 2015[28]) had not impacted on how often they have or will consult the GP in future regarding fever.

Information sources

Figure 1 below illustrates sources of information used by parents.

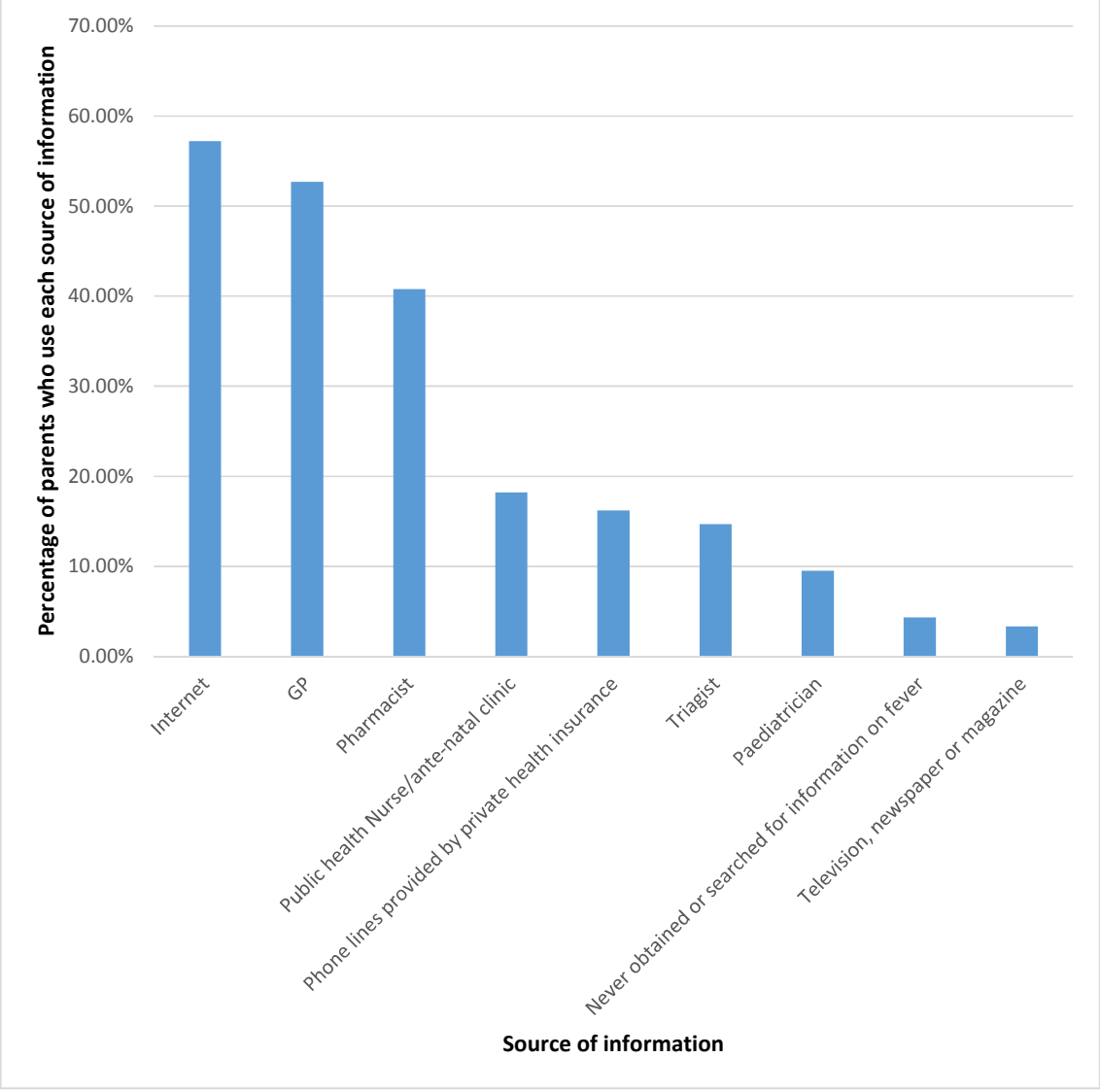

Figure 1. Sources of information used. Respondents could indicate more than one source.

A large proportion of parents (40.7% n=341) always seek information about alarm symptoms (e.g. drowsiness, fatigue) when their child has a fever.

The data indicate that the majority of parents (79.5% n=660) would prefer to receive information about fever before their child gets sick. When their child is sick, almost three-quarters of parents (74.2% n=617) would prefer to receive information about fever from a GP. A further 12.3% (n=102) would be happy to receive information from a pharmacist. When their child is not sick, parents indicated that they prefer to receive information by searching for the information on the internet (28.1% n=233). A further 27% (n=224) would prefer to receive information from a nurse, 25.5% (n=211) from a pharmacist and 19.4% (n=161) from a GP.

The data indicates that parents (39.1%) would like to receive information about fever in a number of ways (verbally, on paper and through an internet site). A further 34.5% would prefer to receive information verbally and on paper.

Fever management practices

Greater than one-third of parents (37.4% n=413) give medication when fever is higher than 38^{O}C. A minority of parents (1.2% n=13) do not give medication when their child has a fever.

The majority of parents (98.4% n=999) would give medication to their children such as paracetamol before first consulting a doctor. Similarly 94.5% (n=959) would give medication such as paracetamol to their children before first consulting a pharmacist.

More than three-quarters of parents (84.4% n=854) would not use fever-reducing medication to together, however almost two-thirds of parents (64.6% n=714) alternate between fever-reducing medications. There were no apparent associations between whether the parent reported alternating fever-reducing medications and years of parenting experience or key socio-demographic factors (Supplemental Table 1). The majority of parents (81.8% n=830) indicated that they use liquid or oral forms of medication. Suppository or rectal forms of medication were favoured by 10% (n=102) of parents. A small number of parents (1.1% n=11) preferred not to use medication while 3.8% (n=39) use methods other than medication to reduce fever (e.g. tepid sponging).

Concerns, attitudes and beliefs

Almost two-thirds of parents (60.4% n=667) were worried about the consequences of fever in general, while only 27.2% (n=301) of parents were of the opinion that fever may be beneficial to their child's health. Fear of fever was also related to a fear of dehydration (47.7% n=526), fear of febrile convulsions (74.5% n=822), and a fear of fever leading to brain damage (31.3% n=345). Greater than three-quarters of parents (80.5% n=890) agreed that fever causes discomfort. A statistically significant association was observed between parental worry about the consequences of fever and age of the parent χ^2 (4) =9.531, p=0.049. Older parents (41 years of age and older) were more likely to disagree that they worry about the consequences of fever, while younger parents (20-30 years of age) were less likely to disagree that they worry about the consequences of fever.

The majority of parents (53.5% n=590) believe that they can determine whether or not their child has a fever by touching his/her forehead or skin. A statistically significant association was observed between whether or not parents believe that they can determine if their child has a fever by touching his/her forehead or skin and the number of children χ^2 (2)=10.964, p=0.004. Parents with more than one child were more likely to believe that they could determine if their child has a fever by touching his/her forehead or skin than parents with only one child.

Discussion

The study shows that parental knowledge regarding correct definition of febrile temperature is deficient, with many parents identifying fever when temperatures are either above or below the accepted level. Parental knowledge concerning the purpose and appropriate uses of antibiotics was found to be good. Parents regularly consulted the GP when their child had a fever, however if parents consulted more than one doctor when their child had a fever (e.g. GP, out-of-hours doctor, specialist) they often received conflicting information from each doctor. Parents' main source of information was via the internet or from a GP. The majority of parents would give medication when their child has a fever (with or without accompanying symptoms). Most parents do not give antipyretic medication together, however almost two-thirds of parents alternate between antipyretic medications to reduce fever symptoms. The majority of parents revealed that they are worried about the consequences of fever. Contrary

to expectations, neither parental experience, nor key socio-demographic characteristics, were generally predictive of parental knowledge or reported behaviours.

A substantial proportion of parents involved in this research selected incorrect temperatures to define fever which is similar to existing literature.[7 29-34] This study confirms that parents are still detecting and managing fevers at temperatures which are below the recommended temperature for fever ($38^{O}C$).[7] It also shows that parents are not identifying fevers when their child's temperature is above normal fever temperature definition. However, considerably more of the population included in this research (63.1%) selected incorrect temperatures at which to define fever when contrasted with existing research (22%-56%).[7 29-32] The higher level of incorrect answers shown in this study may reflect a more accurate representation of the prevalence of misinformation as a larger sample size increases precision of estimates. Nevertheless, the inclusion of a greater proportion of highly educated individuals when compared with previous research should have decreased the number of incorrect answers as education and health literacy are intrinsically linked.[35] This study demonstrates that evidence-based information resources need to be directed at all parents as demographic factors (e.g. level of education) have no impact on parents' knowledge of fever definition. Similar to previous research, the majority of parents were worried about the consequences of fever.[1 3 7 19 21-23 31 34 36-40] This may have contributed to their frequent use of antipyretics which concurs with existing literature.[3 7 11 14-16 23] Similar to previous research, parents also indicated that they prefer liquid to suppository forms of medication.[14] Furthermore, parents indicated that they often alternate between fever-reducing medications but rarely use them together. Guidelines recommend that antipyretics are not used alternately to decrease the risk of dosing errors and toxicity,[4 41] nonetheless previous research has indicated that parents do alternate between fever-reducing medications.[3 12 40] The inclusion of a large proportion of highly educated parents may have influenced this result as previous research has shown that highly educated parents tend to medicate more regularly than less well educated individuals.[11] Parents demonstrated a good level of knowledge regarding infections and antibiotic use which is similar to previous research.[7] This result may reflect the education level of the included sample. However, it may also reflect improvements based on a European campaign aimed at reducing unnecessary prescriptions for antibiotics and decreasing antibiotic resistance.[42]

The natural and favourable biologic nature of fever should be communicated to parents,[43] both before the child gets sick and when the child is sick. Furthermore, specific information regarding alternating between fever-reducing medications should be conveyed to parents in user friendly and accessible language. As pharmacists are one of the most accessible healthcare professionals, they are in a prime position to offer this advice to parents purchasing antipyretics. Previous research has also suggested that nurses are in a prime position to offer this advice.[44] It is clear, therefore, that in order to provide information which may decrease pressure on GPs to examine children with benign fever, information resources need to be designed, produced and made available to parents, which concurs with existing research.[14] Providing parents with evidence-based information in a form which is accessible, understandable and concise should increase awareness and thus decrease over-use of antipyretics where administration disagrees with guidelines. It may alleviate unnecessary presentations at healthcare facilities for assessment and treatment. Tackling the issue of inappropriate detection and management of fever does not have a single solution but requires a suite of initiatives similar to those used to increase awareness regarding antibiotic prescribing.[42 45] Information and media campaigns have proven to effectively reduce patient desire for antibiotics where there is insignificant need.[42] Furthermore, advertising, marketing and sponsorship of antipyretics should be reviewed by governments in line with standards for advertising of prescription medication. The media have a large role to play in communicating with parents and patients in general. Perhaps the media could play a role in communicating an effective message to parents of children regarding management of fever and febrile illness.

Future work should investigate the feasibility of an intervention to assist parents to manage fever and febrile illness in their children effectively. Empowering parents to take responsibility for effective care of their children should be a key public health issue. Furthermore, the knowledge and beliefs of healthcare professionals should be investigated to understand if parents' misinformation, attitudes and beliefs are as a result of healthcare professionals' misinformation, beliefs or out-dated information on the topic.

The large sample size is one of the major strengths of this study. Furthermore, beliefs and opinions were captured in a non-clinical setting. This may portray more realistic attitudes and concerns than those captured at the point of care or in acute care settings as the influence of stressful situations may be eliminated. A limitation of the study is that we cannot estimate response rate from the web-based study. The most prominent issue with cross-sectional studies is responder bias as non-participation in questionnaire-based studies is rarely random.[46] However, we do not believe this has altered the findings of this study as they are reasonably comparable with existing international studies. This study included a large proportion of highly educated parents, which may not be representative of the general population. This would, reduce the external validity as results may not be generalisable to the entire population. When interpreting these results, the reader needs to consider the demographic of the included population. We minimised the effect of response bias associated with internet users by incorporating a paper-based element to the questionnaire. We tested for associations between the source of information (school vs. web based), finding no evidence of differential responses. Additionally it is likely that there is a high percentage of internet users among the target population (parents of young children), therefore any response bias with regard to use of the internet is minimal. In the models we have reported, we measured parental experience by the total number of years they had been parents (i.e. the age of their oldest child). We estimated similar models where total number of children or total child-years of parenting were used to reflect experience, but there were no appreciable differences in the conclusions drawn from these models and those we have reported here.

Conclusion

Lack of knowledge and presence of misinformation regarding fever and febrile illness continues to be one of the most prevalent public health issues encountered by parents of young children. Despite increased efforts by guideline writers and national organisations, evidence-based fever management practices continue to be misunderstood or misinterpreted by a section of the population. These levels of misinformation and inappropriate management remain a primary concern to those attempting to improve child health and well-being and decrease unnecessary burden on healthcare services. The current research provides public policy makers with an up-to-date snapshot of current knowledge, attitudes and beliefs of parents concerning fever and febrile illness in children aged five years of age and younger.

As nations aim to decrease pressure on healthcare services, a spotlight on parental concerns showcases the need for initiatives and interventions to empower parents to take informed responsibility for the care and management of their child when they have a fever or febrile illness.

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Contributor details

Maria Kelly: Ms. Kelly conceptualized and designed the study, adjusted the questionnaire to reflect custom and practice in Ireland, applied for ethical approval, recruited parents, inputted data into excel, preformed statistical analysis, compiled the results, reviewed and revised the manuscript and approved the final manuscript as submitted.

Laura J Sahm: Dr Sahm conceptualized and designed the study, assisted with adjustment of the questionnaire to reflect custom and practice in Ireland, reviewed, revised and approved the manuscript the final manuscript, and submitted the manuscript.

Frances Shiely: Dr. Shiely conceptualized and designed the study, reviewed and revised the manuscript, and approved the final manuscript as submitted.

Ronan O'Sullivan: Professor O'Sullivan conceptualized and designed the study and approved the final manuscript as submitted.

Eefje de Bont: designed and validated the original questionnaire, approved adjustments to reflect custom and practice in Ireland, reviewed and revised the manuscript, and approved the final manuscript as submitted.

Aoife McGillicuddy: assisted with statistical analysis, reviewed and revised the manuscript and approved the final manuscript as submitted.

Roisin Herlihy: assisted with data entry and approved the final manuscript as submitted.

Darren Dahly: designed and preformed logistic regression modelling, reviewed and revised the manuscript and approved the final manuscript as submitted.

Suzanne McCarthy: Dr. McCarthy conceptualized and designed the study, assisted with adjustment of the questionnaire to reflect custom and practice in Ireland, assisted with statistical interpretations, reviewed and revised the manuscript and approved the final manuscript as submitted.

Data Sharing

Consent was not obtained from parents to share their data. The presented data are anonymised and risk of identification is negligible. A full dataset of results is available from the corresponding author.

Competing Interests

All authors have completed the ICMJE uniform disclosure form at www.icmje.org/coi_disclosure.pdf and declare: no support from any organisation for the submitted work; no financial relationships with any organisations that might have an interest in the submitted work in the previous three years; no other relationships or activities that could appear to have influenced the submitted work.

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Ethical Approval

Ethical approval for this study was obtained from the Clinical Research Ethics Committee of the Cork Teaching Hospitals prior to starting the study (reference ECM 4 (y)). Written

informed consent forms were not deemed necessary by the Ethics Committee as participation indicated consent to take part in the study.

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Supplemental Table 1. Estimated associations between (ORs and 95%CIs) parental experience and key socio-demographic variables with parental knowledge.

	Dependent variable:	
	Q1 Correct	Q7 Correct
	(1)	(2)
Years of parenting experience	0.99 (0.98, 1.01)	1.01 (0.99, 1.03)
Age (years)	0.98 (0.94, 1.01)	1.05 (1.02, 1.10)
Female (vs. male)	0.88 (0.42, 1.76)	1.40 (0.64, 2.88)
Any 3rd level education (vs none)	0.69 (0.42, 1.12)	1.49 (0.92, 2.40)
Has a partner (vs. none)	0.48 (0.20, 1.02)	0.94 (0.45, 1.88)
Constant	13.78 (2.77, 72.62)	0.20 (0.04, 1.04)
Observations	800	792
Log Likelihood	-518.03	-466.30
Akaike Inf. Crit.	1,048.05	944.60

Supplemental Table 2. Estimated associations between (ORs and 95%CIs) parental experience and key socio-demographic variables with parental knowledge.

	Dependent variable:				
	q10a_correct (1)	q10b_correct (2)	q10c_correct (3)	q10d_correct (4)	q10e_correct (5)
Years of parenting experience	0.99 (0.98, 1.01)	1.01 (0.99, 1.03)	0.97 (0.94, 1.01)	1.02 (0.99, 1.06)	1.01 (0.99, 1.03)
Age (years)	0.98 (0.94, 1.01)	1.05 (1.02, 1.10)	1.08 (1.01, 1.16)	0.94 (0.89, 0.99)	1.03 (0.99, 1.07)
Female (vs. male)	0.88 (0.42, 1.76)	1.40 (0.64, 2.88)	1.18 (0.19, 4.19)	0.18 (0.08, 0.42)	1.05 (0.52, 2.29)
Any 3rd level education (vs none)	0.69 (0.42, 1.12)	1.49 (0.92, 2.40)	1.74 (0.73, 3.74)	0.45 (0.24, 0.89)	0.61 (0.39, 0.99)
Has a partner (vs. none)	0.48 (0.20, 1.02)	0.94 (0.45, 1.88)	0.72 (0.11, 2.52)	0.60 (0.25, 1.65)	0.77 (0.39, 1.58)
Constant	13.78 (2.77, 72.62)	0.20 (0.04, 1.04)	1.00 (0.05, 27.60)	11.26 (1.06, 117.08)	0.24 (0.05, 1.23)
Observations	798	799	799	798	799
Log Likelihood	-550.70	-145.93	-172.06	-229.36	-474.98
Akaike Inf. Crit.	1,113.39	303.86	356.13	470.73	961.97

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1,2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	2,3
Objectives	3	State specific objectives, including any prespecified hypotheses	3
Methods			
Study design	4	Present key elements of study design early in the paper	3,4
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	3
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	3
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	3,4
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	3,4
Bias	9	Describe any efforts to address potential sources of bias	4
Study size	10	Explain how the study size was arrived at	3
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	4
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	4
		(*b*) Describe any methods used to examine subgroups and interactions	4
		(*c*) Explain how missing data were addressed	4
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	4
		(*e*) Describe any sensitivity analyses	N/A
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed	5-10

		eligible, included in the study, completing follow-up, and analysed	
		(b) Give reasons for non-participation at each stage	N/A
		(c) Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	5
		(b) Indicate number of participants with missing data for each variable of interest	5-10
Outcome data	15*	Report numbers of outcome events or summary measures	5-10
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	5-10
		(*b*) Report category boundaries when continuous variables were categorized	5-10
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	5-10
Discussion			
Key results	18	Summarise key results with reference to study objectives	10,11
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	12,13
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	11-14
Generalisability	21	Discuss the generalisability (external validity) of the study results	12,13
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	15

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Parental knowledge, attitudes and beliefs on fever - a cross-sectional study in Ireland

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Parental knowledge, attitudes and beliefs on fever – a cross-sectional study in Ireland

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Running Title: Parental knowledge of fever; a questionnaire study

Word count: 3143

Abstract

Objectives

Fever is a common symptom of mostly benign illness in young children, yet concerning for parents. The aim of this study was to describe parental knowledge, attitudes and beliefs regarding fever in children aged ≤five years of age.

Design

A cross-sectional study using a previously validated questionnaire. Results were analysed using descriptive statistics and multivariable logistic regression.

Setting

Purposively selected primary schools (n=8) in Cork, Ireland using a paper-based questionnaire. Data were collected from a cross-sectional internet-based questionnaire with a convenience sample of parents via webpages (n=10) previously identified in an interview study.

Participants

Parents with at least one child aged ≤five years were invited to participate in the study.

Main outcome measures

Parental knowledge, attitudes and beliefs when managing fever in children.

Results

1104 parents contributed to this research (121 parents from schools and 983 parents through an online questionnaire). Almost two-thirds of parents (63.1%) identified temperatures at which they define fever that were either below or above the recognised definition of temperature (38^{O}C). Nearly two of every three parents (64.6%) alternate between two fever-reducing medications when managing a child's fever. Amongst parents, years of parenting experience, age, sex, educational status, or marital status did not predict being able to correctly identify a fever, neither did they predict if the parent alternated between fever-reducing medications.

Conclusions

Parental knowledge of fever and fever management was found to be deficient which concurs with existing literature. Parental experience and other socio-demographic factors were generally not helpful in identifying parents with high or low levels of knowledge. Resources to help parents when managing a febrile illness need to be introduced to help all parents provide effective care.

Key Words: child, fever, temperature, parents, knowledge, attitude

Article Summary

Strengths and Limitations

- A large number of parents were recruited for this study which is one of the major strengths of this study.
- Beliefs and opinions were captured in a non-clinical setting which may portray more realistic attitudes and concerns than those captured at the point of care or in acute care settings.
- The questionnaire used in this study was previously validated.
- A limitation of the study is that we cannot estimate response rate from the web-based study.
- Participants were mainly mothers or had third level education which limits generalisability of findings.

Introduction

Fever, defined as a regulated rise in temperature, is common in childhood,[1-4] however fever episodes are rarely a symptom of serious illness.[1, 5, 6]

Fever is commonly defined as a temperature of 38^{O}C or above.[7, 8] Fever on its own does not require treatment,[9] and guidelines recommend that antipyretics should only be used when the child is also distressed or in pain.[4] However, research suggests that parents often misuse antipyretics by over- or under-dosing,[10, 11] or by routinely alternating between antipyretics when managing a fever,[12] despite guidance to the contrary.[4]

Studies examining parents' attitudes and beliefs around fever are limited.[13] The majority of published studies were conducted in secondary care where perceptions may be biased as children may be acutely unwell, placing stress on the parents and possibly influencing responses.[13] Consequently, the National Institute of Health and Care Excellence (NICE), together with their guideline development group have suggested that studies examining home antipyretic use andparental help-seeking behaviour be completed.[6] To help address these gaps, we surveyed parental knowledge, attitudes and beliefs around childhood fever and febrile illness.

Methods

Cross-sectional data for this study were collected from parents with at least one child aged five years of age or younger, and were recruited from one of two sources: purposively selected primary schools (n=8) in Cork, Ireland and via the internet (websites and webpages n=10 (Supplemental Table 1)) during December 2015 and January 2016. No major public health initiatives were initiated during that time. The schools were selected to maximise sample variation, and included urban and rural settings; large and small schools; and schools that were, and were not designated as delivering education to children and young people who are experiencing, or are at risk of experiencing, educational disadvantage. The websites and webpages used to recruit parents for the internet questionnaire were selected from previous qualitative work with parents (Supplemental Table 1).[14] A review of existing literature suggested a sample size of ≥ 600 parents would be adequate to ensure generalisability of responses.[7, 12, 15-23] Data collection in schools took place over one week in December 2015, while responses from the internet questionnaire were obtained in January 2016. There were no incentives for participation. School based parents provided written informed consent, whereas consent was implied from online participation.

The questionnaire administered in this study was developed and used in previous research.[7, 24-26] The questionnaire was modified to reflect custom and practice in Ireland and piloted with a sample of five parents. It consisted of 38 questions with sub-themes. Response options, including yes/no, agree/disagree, and Likert scales were used. The questionnaire assessed parental knowledge, help-seeking behaviours and expectations, needs for additional resources, fever management practices, use of pharmaceutical products, and concerns, attitudes (feelings about) and beliefs.

Respondents' answers were entered into a Microsoft Excel (2013) data file. Available cases were analysed. Paper-based responses were entered by RH (a researcher not involved in the care of participants). A random sample of 20% of paper-based responses were checked for accuracy by MK. Where data were missing, available cases were analysed. Data were analysed using SPSS version 22.0 (SPSS, Inc., Chicago IL) and R version 3.3.1. [27] Categorical variables were described by the count and proportion in each category. Continuous variables were described by their means and standard deviations (SD), or by their medians and inter-quartile ranges (IQR), depending on whether they were normally distributed or not.

Crude associations between categorical variables were assessed using Pearson's Chi-square test. P values <0.05 were considered to be statistically significant, given a null hypothesis of independence. Multivariable logistic regression was used to estimate covariate adjusted associations, reported as odds ratios (ORs) and 95% confidence intervals (CIs), between key socio-demographic predictors (years of parental experience, respondent age, sex, educational level, and marital/partner status) and each the following dependent variables: whether the parent identified the correct temperature indicative of a fever, and whether they reported alternating fever-reducing medications.

Participant involvement

A previous qualitative study on this topic conducted by the research team,[14] found that parents identified fever as a priority when caring for young children, however parents perceived that they lacked knowledge. Following on from this study, a small number of parents were asked to participate in the design of this study. Parents were not involved in recruiting other parents. Study participants who indicated that they would like to receive a copy of the final report were provided with the report.

Results

Parents' characteristics

A total of 121 parents recruited from schools completed the paper-based questionnaire (response rate 42%), while 983 parents contributed using the online questionnaire. Overall, 1104 parents contributed to this research. Although the majority of parents were white Irish (91.8%, n=746), parents representing 34 nationalities participated in the study.

Demographic information is listed in Table 1

Table 1. Demographic information

		Overall	Website/webpage sample	School sample
Gender	N	817	696	121
	Male	4.5%	3.7%	9.1%
	Female	95.5%	96.3%	90.9%
Age of parents	N	805	685	120
	Range (years)	20-55	20-51	26-55
	Mean (SD)	35.3 (4.8)	34.7 (4.5)	38.3 (4.7)
Number of children (n=817)	N	817	696	121
	Range	1-7	1-6	1-7
	Median (IQR)	2 (2)	2 (2)	2 (2)
Education level	N	816	696	120
	Primary level	0.2%	0.3%	0%
	Secondary level	11.6%	11.4%	13.3%
	Third level	88.2%	88.4%	86.7%
Marital status/living situation	N	816	696	120
	Married	79.3%	77.6%	89.2%
	Co-habiting	15.6%	17.1%	6.7%
	Single	3.3%	3.3%	3.3%
	Divorced	1%	1.1%	0%
	Widowed	0.6%	0.6%	0.8%
	Civil partnership	0.2%	0.3%	0%

Knowledge

Parents (n=1104) indicated that they considered temperatures between 36^{O}C and over 40^{O}C indicative of fever. Almost two-thirds of parents (63.1%) identified temperatures at which they define fever that were either below (44%) or above (19.1%) the recognised definition of temperature (38^{O}C).[7, 8] Logistic regression analysis showed no apparent associations between reporting the correct definition of fever temperature and years of parenting experience or key socio-demographic factors (Supplemental Table 2).

Parents illustrated a good level of knowledge regarding infections and medication. Most parents (94.9% n=971) believed that the majority of children with a fever did not need an antibiotic, while 89.4% (n=915) were aware that antibiotics are used to cure infections caused by bacteria. Logistic regression analysis with parents' knowledge of antibiotics as the dependent variable found no statistically significant associations between this and years of parenting experience or key socio-demographic factors (Supplemental Table 3). The majority of parents, 89.7% (n=917), knew that antibiotics are not used to cure viral infections. Female sex and having a third level education were independently associated with correctly answering that antibiotics are not used to cure infections caused by viruses (Supplemental Table 3).

Help seeking and expectations

A large proportion of parents (69.8% n=709) had visited the GP because of fever in their child. Amongst the most common reasons selected to visit a GP when a child had fever were; fever lasting more than three days and, fever accompanied by a skin rash.

More than half of parents (51.6%) had visited a GP at an out of hours practice with their child because of fever. The of parents when they consult GPs are shown Table 2 below. Greater than one-third of parents (39.4% n=385) had seen different doctors with their child due to fever. Of these parents, 31.3% (n=111) indicated that they had received conflciting information from these doctors regarding fever in their child e.g. "Some say treat others say if not high let it run its course", "Some say 37.5^{O}C is fever and some say 38^{O}C is a fever".

Table 2. Parental expectations when they consult a GP due to fever in a child

Obtain a physical examination	72.2% (n=598)
Get advice on alarm symptoms	9.4% (n=78)
Reassurance	5.7% (n=48)
To obtain antibiotics	2.9% (n=24)
To obtain paracetamol	2.3% (n=19)

Use of GP services with introduction of free GP care for children

The majority of parents (87.5% n=734) indicated that the introduction of free GP care in Ireland (July 2015 [28]) had not impacted on how often they have or will consult the GP in future regarding fever.

Information sources

Figure 1 below illustrates sources of information used by parents.

<<Insert Figure 1 here>>

The data indicate that the majority of parents (79.5% n=660) would prefer to receive information about fever before their child gets sick. When their child is sick, almost three-quarters of parents (74.2% n=617) would prefer to receive information about fever from a GP. A further 12.3% (n=102) would be happy to receive information from a pharmacist. When their child is not sick, parents indicated that they prefer to receive information by

searching for the information on the internet (28.1% n=233). A further 27% (n=224) would prefer to receive information from a nurse, 25.5% (n=211) from a pharmacist and 19.4% (n=161) from a GP.

The data indicates that parents (39.1%) would like to receive information about fever in a number of ways (verbally, on paper and through an internet site). A further 34.5% would prefer to receive information verbally and on paper.

Parents' methods for managing childhood fever

Greater than one-third of parents (37.4% n=413) give medication when fever is higher than 38^{O}C. A minority of parents (1.2% n=13) do not give medication when their child has a fever.

More than three-quarters of parents (84.4% n=854) would not use fever-reducing medication to together, however almost two-thirds of parents (64.6% n=714) alternate between fever-reducing medications. There were no apparent associations between whether the parent reported alternating fever-reducing medications and years of parenting experience or key socio-demographic factors (Supplemental Table 2). The majority of parents (81.8% n=830) indicated that they use liquid or oral forms of medication. Suppository or rectal forms of medication were favoured by 10% (n=102) of parents. A small number of parents (1.1% n=11) preferred not to use medication while 3.8% (n=39) use methods other than medication to reduce fever (e.g. tepid sponging).

Concerns, attitudes and beliefs

Almost two-thirds of parents (60.4% n=667) were worried about the consequences of fever in general, while only 27.2% (n=301) of parents were of the opinion that fever may be beneficial to their child's health. Reasons parents selected to fear fever are shown in Table 3 below.

Table 3. Parental reasons to fear fever

Fear of fever	Fear of dehydration (47.7% n=526) Fear of febrile convulsions (74.5% n=822) Fear of fever leading to brain damage (31.3% n=345)

Greater than three-quarters of parents (80.5% n=890) agreed that fever causes discomfort. A statistically significant association was observed between parental worry about the consequences of fever and age of the parent χ^2 (4) =9.531, p=0.049. Older parents (41 years of age and older) were more likely to disagree that they worry about the consequences of fever, while younger parents (20-30 years of age) were less likely to disagree that they worry about the consequences of fever.

Discussion

The study shows that parental knowledge regarding correct definition of febrile temperature is deficient, with many parents identifying fever when temperatures are either above or below the accepted level. Parental knowledge concerning the purpose and appropriate uses of antibiotics was found to be good. Parents regularly consulted the GP when their child had a fever, however if parents consulted more than one doctor when their child had a fever (e.g. GP, out-of-hours doctor, specialist) they often received conflicting information from each doctor. Parents' main source of information was via the internet or from a GP. The majority of parents would give medication when their child has a fever (with or without accompanying symptoms). Most parents do not give antipyretic medication together, however almost two-thirds of parents alternate between antipyretic medications to reduce fever symptoms. The majority of parents revealed that they are worried about the consequences of fever. Contrary to expectations, neither parental experience, nor key socio-demographic characteristics, were generally predictive of parental knowledge or reported behaviours.

A substantial proportion of parents involved in this research selected incorrect temperatures to define fever which is similar to existing literature.[7, 29-34] This study confirms that parents are still detecting and managing fevers at temperatures which are below the recommended temperature for fever (38^{O}C).[7] It also shows that parents are not identifying fevers when their child's temperature is above normal fever temperature definition. However, considerably more of the population included in this research (63.1%) selected incorrect

temperatures at which to define fever when contrasted with existing research (22%-56%).[7, 29-32] The higher level of incorrect answers shown in this study may reflect a more accurate representation of the prevalence of misinformation as a larger sample size increases precision of estimates. Nevertheless, the inclusion of a greater proportion of highly educated individuals when compared with previous research should have decreased the number of incorrect answers as education and health literacy are intrinsically linked.[35] This study demonstrates that evidence-based information resources need to be directed at all parents as demographic factors (e.g. level of education) have no impact on parents' knowledge of fever definition. Similar to previous research, the majority of parents were worried about the consequences of fever.[1, 3, 7, 19, 21-23, 31, 34, 36-40] This may have contributed to their frequent use of antipyretics which concurs with existing literature.[3, 7, 11, 14-16, 23] Similar to previous research, parents also indicated that they prefer liquid to suppository forms of medication.[14] Furthermore, parents indicated that they often alternate between fever-reducing medications but rarely use them together. Guidelines recommend that antipyretics are not used alternately to decrease the risk of dosing errors and toxicity,[4, 41] nonetheless previous research has indicated that parents do alternate between fever-reducing medications.[3, 12, 40] The inclusion of a large proportion of highly educated parents may have influenced this result as previous research has shown that highly educated parents tend to medicate more regularly than less well educated individuals.[11] Parents demonstrated a good level of knowledge regarding infections and antibiotic use which is similar to previous research.[7] This result may reflect the education level of the included sample. However, it may also reflect improvements based on a European campaign aimed at reducing unnecessary prescriptions for antibiotics and decreasing antibiotic resistance.[42]

The natural and favourable biologic nature of fever should be communicated to parents,[43] both before the child gets sick and when the child is sick. Furthermore, specific information regarding alternating between fever-reducing medications should be conveyed to parents in user friendly and accessible language. It is clear, therefore, that in order to provide information which may decrease pressure on GPs to examine children with benign fever, information resources need to be designed, produced and made available to parents, which concurs with existing research.[14] Providing parents with evidence-based information in a form which is accessible, understandable and concise should increase awareness and thus decrease over-use of antipyretics where administration disagrees with guidelines. It may

alleviate unnecessary presentations at healthcare facilities for assessment and treatment. Tackling the issue of inappropriate detection and management of fever does not have a single solution but requires a suite of initiatives similar to those used to increase awareness regarding antibiotic prescribing.[42, 44] Information and media campaigns have proven to effectively reduce patient desire for antibiotics where there is insignificant need.[42] Furthermore, advertising, marketing and sponsorship of antipyretics should be reviewed by governments in line with standards for advertising of prescription medication. The media have a large role to play in communicating with parents and patients in general. Perhaps the media could play a role in communicating an effective message to parents of children regarding management of fever and febrile illness.

Future work should investigate the feasibility of an intervention to assist parents to manage fever and febrile illness in their children effectively. Empowering parents to take responsibility for effective care of their children should be a key public health issue. Furthermore, the knowledge and beliefs of healthcare professionals should be investigated to understand if parents' misinformation, attitudes and beliefs are as a result of healthcare professionals' misinformation, beliefs or out-dated information on the topic.

The large sample size is one of the major strengths of this study. Furthermore, beliefs and opinions were captured in a non-clinical setting. This may portray more realistic attitudes and concerns than those captured at the point of care or in acute care settings as the influence of stressful situations may be eliminated. A limitation of the study is that we cannot estimate response rate from the web-based study. A further limitation is the low response rate from the school based study. The most prominent issue with cross-sectional studies is responder bias as non-participation in questionnaire-based studies is rarely random.[45] However, we do not believe this has altered the findings of this study as they are reasonably comparable with existing international studies. This study included a large proportion of highly educated parents, which may not be representative of the general population. Similarly, the included sample did not reflect diverse ethnic backgrounds. This would, reduce the external validity as results may not be generalisable to the entire population. When interpreting these results, the reader needs to consider the demographic of the included population. We minimised the effect of response bias associated with internet users by incorporating a paper-based element to the questionnaire. However, the response rate from the paper-based questionnaire was low

(42%). We tested for associations between the source of information (school vs. web based), finding no evidence of differential responses. Additionally, it is likely that there is a high percentage of internet users among the target population (parents of young children), therefore any response bias with regard to use of the internet is minimal. In the models we have reported, we measured parental experience by the total number of years they had been parents (i.e. the age of their oldest child). We estimated similar models where total number of children or total child-years of parenting were used to reflect experience, but there were no appreciable differences in the conclusions drawn from these models and those we have reported here.

Conclusion

Lack of knowledge and presence of conflicting information regarding fever and febrile illness continues to be one of the most prevalent public health issues encountered by parents of young children. Despite increased efforts by guideline writers and national organisations, evidence-based fever management practices continue to be misunderstood or misinterpreted by a section of the population. These levels of misinformation and inappropriate management remain a primary concern to those attempting to improve child health and well-being and decrease unnecessary burden on healthcare services. The current research provides public policy makers with an up-to-date snapshot of current knowledge, attitudes and beliefs of parents concerning fever and febrile illness in children aged five years of age and younger. As nations aim to decrease pressure on healthcare services, a spotlight on parental concerns showcases the need for initiatives and interventions to empower parents to take informed responsibility for the care and management of their child when they have a fever or febrile illness.

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Contributor details

Maria Kelly: Ms. Kelly conceptualized and designed the study, adjusted the questionnaire to reflect custom and practice in Ireland, applied for ethical approval, recruited parents, inputted data into excel, preformed statistical analysis, compiled the results, reviewed and revised the manuscript and approved the final manuscript as submitted.

Laura J Sahm: Dr Sahm conceptualized and designed the study, assisted with adjustment of the questionnaire to reflect custom and practice in Ireland, reviewed, revised and approved the manuscript the final manuscript, and submitted the manuscript.

Frances Shiely: Dr. Shiely conceptualized and designed the study, reviewed and revised the manuscript, and approved the final manuscript as submitted.

Ronan O'Sullivan: Professor O'Sullivan conceptualized and designed the study and approved the final manuscript as submitted.

Eefje de Bont: designed and validated the original questionnaire, approved adjustments to reflect custom and practice in Ireland, reviewed and revised the manuscript, and approved the final manuscript as submitted.

Aoife McGillicuddy: assisted with statistical analysis, reviewed and revised the manuscript and approved the final manuscript as submitted.

Roisin Herlihy: assisted with data entry and approved the final manuscript as submitted.

Darren Dahly: designed and preformed logistic regression modelling, reviewed and revised the manuscript and approved the final manuscript as submitted.

Suzanne McCarthy: Dr. McCarthy conceptualized and designed the study, assisted with adjustment of the questionnaire to reflect custom and practice in Ireland, assisted with statistical interpretations, reviewed and revised the manuscript and approved the final manuscript as submitted.

Data Sharing

Consent was not obtained from parents to share their data. The presented data are anonymised and risk of identification is negligible. A full dataset of results is available from the corresponding author.

Competing Interests

All authors have completed the ICMJE uniform disclosure form at www.icmje.org/coi_disclosure.pdf and declare: no support from any organisation for the submitted work; no financial relationships with any organisations that might have an interest in the submitted work in the previous three years; no other relationships or activities that could appear to have influenced the submitted work.

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Ethical Approval

Ethical approval for this study was obtained from the Clinical Research Ethics Committee of the Cork Teaching Hospitals prior to starting the study (reference ECM 4 (y)). Written informed consent forms were not deemed necessary by the Ethics Committee as participation indicated consent to take part in the study.

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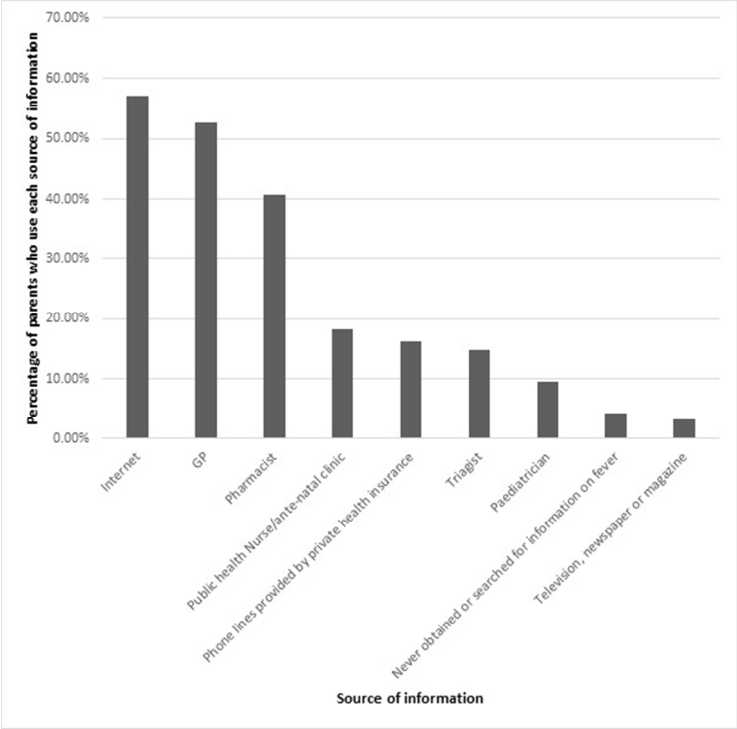

Figure 1. Sources of information used. Respondents could indicate more than one source.

69x50mm (300 x 300 DPI)

Supplemental Table 1. Websites and webpages used to host questionnaire

Eumom
Mummy Pages
Recession Busting Moms
Schooldays
Fulltimemum
HerFamily
Magicmum
Wonderbaba
Fiona O'Farrell Nurturing Child Development

Supplemental Table 2. Estimated associations between (ORs and 95%CIs) parental experience and key socio-demographic variables with parental knowledge.

	Dependent variable:	
	Knowledge of correct definition of fever temperature $38^{O}C$	Do you alternate between fever reducing medications (no)
	(1)	(2)
Years of parenting experience	0.99 (0.98, 1.01)	1.01 (0.99, 1.03)
Age (years)	0.98 (0.94, 1.01)	1.05 (1.02, 1.10)
Female (vs. male)	0.88 (0.42, 1.76)	1.40 (0.64, 2.88)
Any 3rd level education (vs none)	0.69 (0.42, 1.12)	1.49 (0.92, 2.40)
Has a partner (vs. none)	0.48 (0.20, 1.02)	0.94 (0.45, 1.88)
Constant	13.78 (2.77, 72.62)	0.20 (0.04, 1.04)
Observations	800	792
Log Likelihood	-518.03	-466.30
Akaike Inf. Crit.	1,048.05	944.60

Supplemental Table 3. Estimated associations between (ORs and 95%CIs) parental experience and key socio-demographic variables with parental knowledge.

	Dependent variable:				
	Every child with a fever needs fever reducing medications (false)	Every child with a fever needs antibiotics (false)	Antibiotics are used to treat infections caused by bacteria (true)	Antibiotics are used to treat infections caused by viruses (false)	In all cases of fever there is an infection (false)
	(1)	(2)	(3)	(4)	(5)
Years of parenting experience	0.99 (0.98, 1.01)	1.01 (0.99, 1.03)	0.97 (0.94, 1.01)	1.02 (0.99, 1.06)	1.01 (0.99, 1.03)
Age (years)	0.98 (0.94, 1.01)	1.05 (1.02, 1.10)	1.08 (1.01, 1.16)	0.94 (0.89, 0.99)	1.03 (0.99, 1.07)
Female (vs. male)	0.88 (0.42, 1.76)	1.40 (0.64, 2.88)	1.18 (0.19, 4.19)	0.18 (0.08, 0.42)	1.05 (0.52, 2.29)
Any 3rd level education (vs none)	0.69 (0.42, 1.12)	1.49 (0.92, 2.40)	1.74 (0.73, 3.74)	0.45 (0.24, 0.89)	0.61 (0.39, 0.99)
Has a partner (vs. none)	0.48 (0.20, 1.02)	0.94 (0.45, 1.88)	0.72 (0.11, 2.52)	0.60 (0.25, 1.65)	0.77 (0.39, 1.58)
Constant	13.78 (2.77, 72.62)	0.20 (0.04, 1.04)	1.00 (0.05, 27.60)	11.26 (1.06, 117.08)	0.24 (0.05, 1.23)
Observations	798	799	799	798	799
Log Likelihood	-550.70	-145.93	-172.06	-229.36	-474.98
Akaike Inf. Crit.	1,113.39	303.86	356.13	470.73	961.97

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1,2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3
Objectives	3	State specific objectives, including any prespecified hypotheses	3
Methods			
Study design	4	Present key elements of study design early in the paper	4,5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	4
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	4
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	4,5
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	4,5
Bias	9	Describe any efforts to address potential sources of bias	4,5
Study size	10	Explain how the study size was arrived at	4
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	4,5
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	4,5
		(*b*) Describe any methods used to examine subgroups and interactions	4,5
		(*c*) Explain how missing data were addressed	4,5
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	4,5
		(*e*) Describe any sensitivity analyses	N/A
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed	5-10

		eligible, included in the study, completing follow-up, and analysed	
		(b) Give reasons for non-participation at each stage	N/A
		(c) Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	5
		(b) Indicate number of participants with missing data for each variable of interest	5-11
Outcome data	15*	Report numbers of outcome events or summary measures	5-11
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	5-11
		(*b*) Report category boundaries when continuous variables were categorized	5-11
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	5-11
Discussion			
Key results	18	Summarise key results with reference to study objectives	11
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	11-14
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	11-14
Generalisability	21	Discuss the generalisability (external validity) of the study results	11-14
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	16

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.