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P. J. KOECH, F. E. ONYANGO and C. JOWI

ABSTRACT

***Background*: Fever is one of the most common complaints presented to the Paediatric Emergency Unit (PEU). It is a sign that there is an underlying pathologic process, the most common being infection. Many childhood illnesses are accompanied by fever, many of which are treated at home prior to presentation to hospital. Most febrile episodes are benign. Caregivers are the primary contacts to children with fever. Adequate caregivers' knowledge and proper management of fever at home leads to better management of febrile illnesses and reduces complications.**

***Objective*: To determine the caregivers' knowledge and practices regarding fever in children.**

***Design*: A cross-sectional study.**

***Setting*: Peadiatric Emergency Unit at Kenyatta National Hospital (KNH)**

***Subjects*: Two hundred and fifty caregivers of children under 12 years presenting with fever in August to October 2011 to the PEU.**

***Results*: Three quarters of the caregivers' defined fever correctly. Their knowledge on the normal body was at 47.6%. Infection was cited as the leading cause of fever (95.2%). Brain damage (77.6%) and dehydration (65.6%) were viewed as the most common complication. Fever was treated at home by 97.2% of caregivers, most of them used medication.**

***Conclusions*: Fever was defined correctly by 75.2% of the study participants and a majority of them used touch to detect fever. Fever was managed at home with medications. Public Health Education should be implemented in order to enlighten caregivers on fever and advocate for the use of a clinical thermometer to monitor fever at home.**

INTRODUCTION

Fever is controlled increase in body temperature over the normal values for an individual (core temperature above 38ºC). Rectal temperature closely approximates core temperature. Oral temperature is 0.5oC lower than the core temperature. Axillary (armpit) is 0.8ºC lower than core temperature. Fever is regulated in the same manner as normal temperature is maintained in a cool environment, the difference being that the body's thermostat has been reset at a higher temperature. It is caused by various inciting agents like infection, vaccines, tissue injury and other biologic agents (1, 2).

Fever is a common medical problem in children that often prompts parents to seek medical attention (3). It has been recognised as a sign of disease since the beginning of recorded history (4). Most febrile episodes are not dangerous and are a beneficial response to infection by potentiating immunological reaction. In children, these febrile episodes are usually due to self-limiting viral infections of the respiratory tract. Most of such fevers are benign and do not need out of home consultation. However, there are dangerous forms of fever which require prompt detection by the caregiver and referral to a health facility for further investigations and treatment in order to prevent complications. This include fever accompanied by symptoms such as change in mental status, convulsions, inability to feed, cardiopulmonary compromise, fever persisting for more than seven days, high core temperature (> 39ºC) and fever in an infant less than two months of age (5).

Management of fever in children: Management of fever includes treatment of the underlying cause, the use of

antipyretic and supportive measures. The antipyretic used to treat fever in children are paracetamol (acetaminophen) at 10-15mg/kg/dose every four to six hours and ibuprofen 5–10 mg/kg every six to eight hours. The supportive measures include the increase of fluid intake, reduction of clothing, tepid sponging with warm water and allowing the child to rest.

The WHO recommends that antipyretic treatment should be restricted to children with core temperature above 39oC (axillary temperature >38.2oC). A febrile child with core temperature less than 39oC who remains alert, playful and active should not cause anxiety and should not be given antipyretics. On the contrary parents should take the children to a health facility when fever is associated with other worrying symptoms like change in mental status, convulsions, inability to feed, cardiopulmonary compromise, fever persisting for more than seven days, and fever in an infant less than two months of age. These conditions indicate that there is an underlying pathologic process that requires more investigation and prompt management in a health facility (5).

Literature review: Studies on caregivers' knowledge on fever in children and their treatment practices have shown that many parents have limited knowledge regarding fever. The specific knowledge limitations identified by the studies included the lack of information on the normal body temperature, the correct temperature for fever, causes of fever and the symptoms associated with fever. Regarding the treatment practices, it was found that there was inappropriate use of medications such as antipyretics and antibiotics (3, 6, 7).

Other studies have demonstrated that interventions such as teaching parents about the definition of fever, accurate measurement of child's temperature and appropriate use of antipyretic can be effective in changing parents' knowledge and lead to proper management of fever at home. Good caregivers' knowledge was associated with increased appropriate management of febrile episodes at home, reduction in inappropriate physician visits and decreased misuse of resources such as medication, time and money (7, 8).

MATERIALS AND METHODS

A hospital based cross- sectional study was carried out among caregivers of children age 0- 12 years presenting with fever to the PEU at KNH for a period of four months-July to October 2011.

Sample size determination: The sample size of the study was 250 primary caregivers. This was based on the prevalence in a study in Nigeria done by Kazeem *et al* (10).

This was derived from Fisher's formula as shown below;

$$N = \frac{Z^2 p(1\text{-}p)}{d^2} = \frac{1.96^2 \times 0.8\ (1 - 0.8)}{0.05 \times 0.05} = 245\text{^}250$$

Where

N = Sample size

Z = The Normal Standard Deviation taken with a confidence level of 95%, Confidence Interval is set to 1.96

P = Proportion 0.8

d = The margin of error in this case 0.05 (Precision index).

Sampling Technique and the Patient Recruitment Procedure: Recruitment into the study was done through consecutive sampling. Any caregiver who accompanied a child with a complaint of fever was identified by checking through the clerkship notes in PEU. The purpose and methods of the study was explained to the caregiver who was then requested to provide voluntary written informed consent.

Data Collection: Data were collected from the study subjects using a pre-tested structured questionnaire. The questionnaire was divided into five Sections. Section A and B were the demographics of the caregiver and the child respectively, C and D were the caregivers' knowledge and their modes of detecting fever, while Section E was the home treatment of fever. The questionnaires were administered to caregivers who presented to the PEU at KNH with fever as one of their presenting complaints. For most questions, caregivers were asked to choose responses from a checklist. They were given the opportunity to add items not on the checklist.

Statistical analysis: Data were entered on Microsoft Access 2007 in a PC format and analysed on SPSS version 17.0. The socio-demographic characteristics were used to describe the study population. The data is presented as proportions and means/medians for categorical and continuous data respectively. Caregivers' knowledge on fever was assessed using the ability to define fever, and the normal body temperature. Treatment practices were determined by the proportion of caregivers' who treated fever at home. Tests of association between socio-demographic factors and treatment were performed using Chi-square test and Student's t test for categorical and continuous variables respectively. The factors independently associated with treatment at home were determined using logistic regression. Statistical tests were performed at 95% CI.

RESULTS

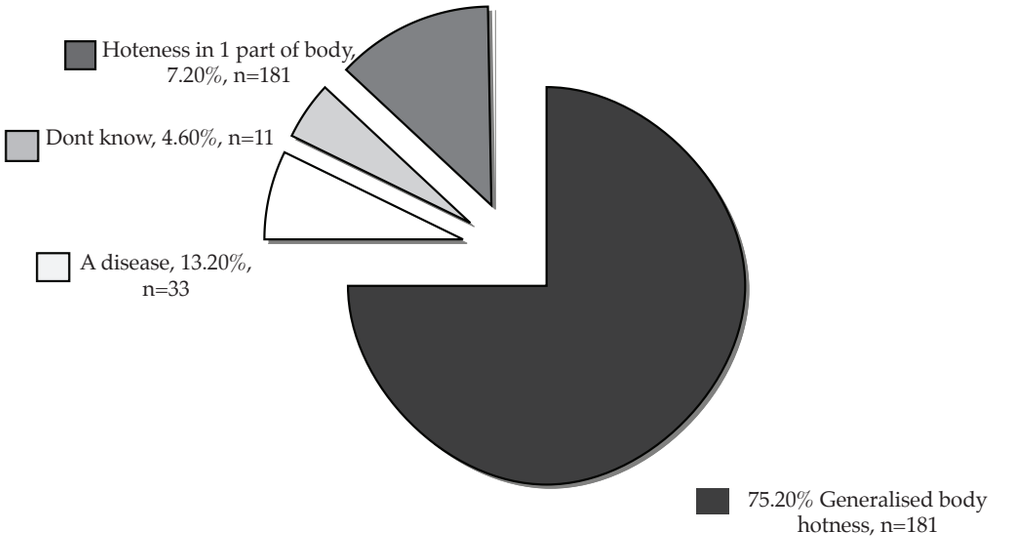
A total of 250 caregivers of children who presented with fever as one of their complaints were recruited into the study from July to September 2011. Majority of the caregivers were mothers (81.2%), while fathers contributed 12% and grandparents 4%.The mean age of the caregivers was 30.3 years with a range of 14 to 65years. The caregivers had a median of two children with a range of one to twelve children. One hundred and eighty three caregivers (73.2%) had secondary education and above while 26.8% had primary education or none. Table 1.

Table 1
Socio-demographic characteristics of the study population

Variable	Number		Percentage %
Relation to patient	203		81.2
Mother	30		12.0
Father	10		4.0
Grandparent	7		2.8
Other(aunt/uncle)			
Level of education			
None	13		5.2
Primary	54		21.6
Secondary	108		43.2
Tertiary	75		30.0
Age in years	Mean(SD)	Median(IQR)	Range
		30.3(8.2)	14-65
Number of children		2.0(1.0-3.0)	1-12

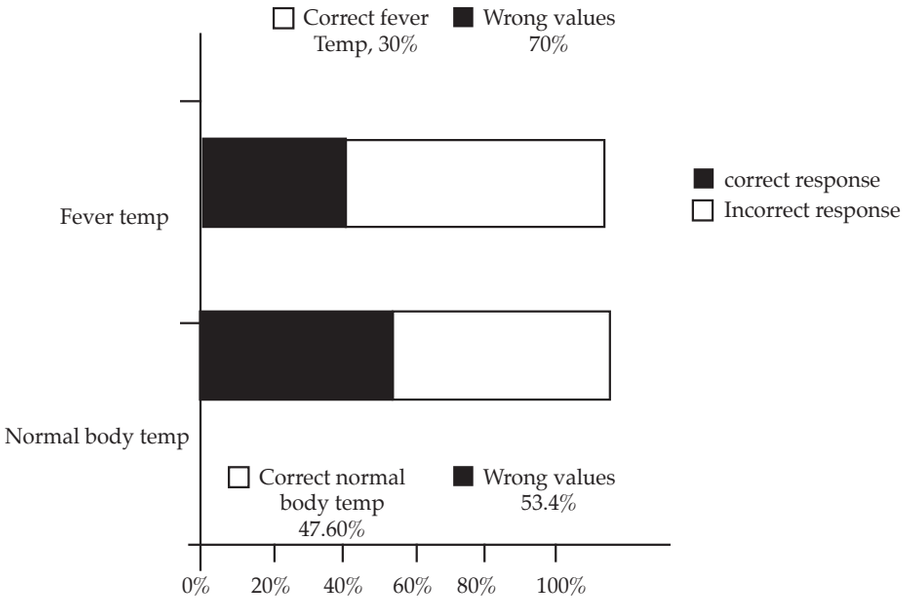
One hundred and eighty eight (75.2 %) of the caregivers defined fever correctly as the generalised body hotness, while24.8% gave an incorrect response (Figure1).

Figure 1
A pie chart representing the Caregivers' definition of fever



The normal body temperature was considered 36-37ºC by119 (47.6%) caregivers, while the rest did not know or gave other values. Seventy five caregivers (30%) knew the temperature above which fever is present (>380C) while 70 % either did not know or gave an incorrect response. Figure 2.

Figure 2
A bar chart representing caregivers' knowledge on normal and fever temperature



The caregivers' knowledge on the general causes of fever in children indicated that infection was the leading cause, cited by 95% of the caregivers. Teething and change of weather were 80.4% and 58.4% respectively. Sixteen of the mothers (6.4%) felt that the fever was due to witchcraft. This is in the background of a large majority (95%) of the care takers having gone to school. Table 2.

Table 2
Knowledge about Causes of fever

Variable	Frequency	Percentage %
Infection	238	95.2
Teething	201	80.4
Change of weather	146	58.4
Witch craft	16	6.4
Drugs	7	2.8
Other	7	2.8

The symptoms associated with fever are highlighted in Table 3 below as decreased appetite 189 (75.6%), irritability 165 (66.0%) and restlessness144 (57.6%). On the complications that could occur if fever was not treated, majority of the caregivers (77.6%) indicated that fits and brain damage could occur. A large proportion (65.6%), felt that the fever could lead to dehydration while 31.6% felt that it could lead to death.

Table 3
Caregivers' view about symptoms and complications associated with fever

Variable	Frequency	Percentage (%)
Symptoms associated with fever	189	75.6
Decreased appetite	165	66.0
Irritability	144	57.6
Restlessness	80	32.0
Vomiting	65	26.0

Pain		
Complications that could occur if fever was not treated		
Fits/Brain damage	194	77.6
Dehydration	164	65.6
Death	79	31.6
Others	8	3.2

Two hundred and twenty eight caregivers (91.2%) detected temperature by touching the skin of a sick child. Only 22 caregivers (8.8%) used a thermometer, which was placed in the axilla. The head was most frequently (86.4%) touched to elicit fever. Table 4.

Table 4
Measurement/detection of fever

Variable	Frequency	Percentage (%)
Method used to detect/measure fever		
Touching the skin	228	91.2
Thermometer	22	8.8
Part of the body to place thermometer		
Axilla (armpit)	22	100%
Body areas touched to detect fever		
Head	197	86.4
Abdomen	117	51.3
Chest	41	18.0
Extremities	10	4.4

Of the 250 caregivers, 243 (97.2%) treated fever at home. Medication was used by 232 (92.8%) caregivers. The caregivers who treated febrile children at home were older (mean = 30.4 years) than those who did not give treatment (mean= 27.4 years). The behaviour difference between the more educated and the less educated caregivers' was significant {p= 0.001, OR=0.1 95% CI = (0.0-0.4)}. Those who had secondary and tertiary education were more likely to treat fever at home. There was no difference whether the caregiver was a parent or a guardian {p=1.000, OR =1.0 (95%CI) = 0.9-1.0 (Table 5).

Table 5
Association of the caregivers' characteristics with the home treatment of fever

Variable	Home treatment of fever		OR (95% CI)	P-value
	Yes	No		
Caregiver's age in years, mean (SD)*	30.4 (8.3)	27.4 (7.3)	-	0.426
Number of children, Median (IQR)**	2.0(1.0-3.0)	2.0(1.0-4.0)	-	
Level of education***				
<=Primary	57(23.8%)	6(85.7%)	0.1(0.0-0.4)	0.001
>=Secondary	182(76.2%)	1(14.3%)		
Relation to patient***				
Parent	226(94.2%)	7(100.0%)	1.000	
Guardian	14(5.8%)			

*Student's t test, **Mann Whitney U test, ***Chi square test, <= caregivers with primary and those with no formal education ,=> Caregivers with secondary education or more.

Antipyretics were the leading medication used by 127caregivers (54.7%) to treat fever in their children at home. This was given at either a high dosage or at too frequent intervals. Other medications given to febrile children were antibiotics (40.1%), anti-malaria (4.7%), antihistamine and herbs 6.8% (Table 6). Of the caregivers who used antibiotics, 77% had post-primary education while the rest had primary or no education. Those with secondary education and above significantly used antibiotics compared to those with primary education or no education {p=0.016, OR=12, 95% CI = (1.4-112.6)}. Although not statistically significant(p=0.65), caregivers with an age range of 30-39 years tended to use anti-biotic to treat fever in their children compared to other caregivers.

Table 6

Medication used to treat fever and the sources of information on the use of the medicines at home

Variable	Number	Percentage (%)
Specific medication		
Antipyretic	127	54.7
Antibiotic	93	40.1
Anti-malaria	11	4.7
Other(piriton, herbs)	16	6.8
Information on the use of medicines (above)		
Pharmacy(Without prescription)	171	68.4
Health worker(Prescription	87	34.8
Relatives	36	14.4
Friends	16	6.4
Other(herbalist)	1	0.4

Two hundred and thirty seven mothers (96.6%) provided light clothing during fever while only one hundred and twelve (44.8%) used sponging to reduce the temperature. Of these 55.4% used lukewarm water. One hundred and ninety-eight (79.2%) of the caregivers modified the amount of fluids given to the children with fever. Of these, 111 (56.1%) increased fluid intake while 87 (43.9%) reduced fluid intake. This was 34.8% of the total study participants. Table 7.

Table 7

Supportive measures given to febrile children

Variable	N (%)
Modifying the clothes	
Yes	237(94.8)
Reduced the number of clothing	229(96.6)
Increased clothing	8(3.4)
No	13(5.2)
Sponging	
Yes	112(44.8)
Warm water	62(55.4)
Cold water	50(44.6)
No	138(55.2)
Modifying child`s food	
Yes	49(19.6)
Increased food intake	15(30.6)

Decreased food intake	34(69.4)
No	201(80.4)
Modifying child`s drinks(fluids)	
Yes	198(79.2)
Increased fluids/drinks	111(56.1)
Decreased fluids/drinks	87(43.9)
No	52(20.8)

DISCUSSION

Studies done previously in Africa on caregivers' knowledge and home management of fever concentrated on fever resulting from malaria (9,10). Studies in other parts of the world concentrated on fever as a result of a specific cause mostly infectious diseases (11).The aim of this study was to assess the caregivers' knowledge and their treatment practices at home irrespective of the cause of fever.

A majority of the caregivers in this study were mothers of the sick children. This finding indicates that mothers have a leading role as primary caregivers to children. Although this study found 75.2 % of the caregivers to be knowledgeable on the definition of fever, their knowledge on the normal body and fever temperatures was a contrast. Globally, there are no standardised guidelines that have been developed to grade the caregivers' knowledge on fever.

While infection was cited correctly by the majority (95.2%) of the study participants as a cause of fever 58.4% thought that change of weather could cause fever. This indicates a lack of understanding of temperature regulation mechanisms.

On the analysis of the complications that could occur as a result of fever, most caregivers perceived a risk of fits and brain damage in a child with fever. A review of literature indicates that febrile convulsions occur in 3-4% of febrile children, while neurological damage occurs with temperature above 42°C[2]. With such strong feelings of apprehension it was not a surprising finding that 64.4% of the caregivers felt that febrile children should always be brought to hospital irrespective of the cause of fever. This also could have translated into a majority (97.2 %) of febrile children given medication such as antipyretics and antibiotics at home to reduce fever.

Unlike studies done in America (12) and Britain (13) which reported that most caregivers used a thermometer to detect fever, only 8.8 % of the study participants used a thermometer. The difference could be attributed to the different health education practices and availability of mass media (14). Majority of our study participants (91.2%) used touch to detect fever. Palpation has been found to be inaccurate, although it might be useful when a thermometer is not available (15).

This study reiterated that most febrile illnesses are treated at home with medication, primarily paracetamol. The use of antibiotics was quite high 40.1%. Antibiotics should be used only with good indications. The implication of irrational use of antibiotics is that the children are at risk of developing drug resistance and adverse reactions (5,16) .

In addition to giving medications, caregivers used various supportive measures in an attempt to reduce fever. Such treatments include tepid sponging, reducing clothing, cooling the environment and increasing fluids. These supportive measures play a role in reducing the temperature of febrile children. Tepid sponging has been found to reduce fever when used as an addition to paracetamol, but seems to offer little advantage over paracetamol when used alone. However some caregivers in this study sponged their children with cold water. This is uncomfortable to the child and it is counter-productive because the physiologic response to cooling is heat generation by shivering (1,2).

Fluid intake should be increased during febrile episodes to prevent dehydration caused by sweating, reduced intake due to lack of appetite, increased metabolism and respiration (3). However, this study found that only 44% of the caregivers increased fluid intake while 34% reduced fluids. This practice did not correlate well with their knowledge of fever where 65.5% indicated that dehydration was a complication of fever. Casey (3) indicated that an educational intervention for parents helped the caregivers to relate their knowledge to the management of fever.

In conclusion, this study indicates that most childhood febrile illnesses are managed at home (75.2% of study participants) and that the caregivers do not have adequate knowledge on fever. Other studies (6-11) found that health care workers did not also have adequate knowledge on fever. This resulted in inappropriate investigations and treatment of fever by the health workers irrespective of the causes of fever. The health workers also gave wrong information to patients and their caregivers'. Their data suggested that health care providers required education in order to dispel their own misconceptions about fever

before advising caregivers, and that closer scrutiny of information presented in lay publications about fever is warranted.

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