

# Determining causes and frequency of misdosing of antipyretics in patients presenting with fever to the Pediatric Emergency Department

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## Summary

**Aim:** The aim of this study was to identify the frequency of misdosing of antipyretics in children presenting with fever to the pediatric emergency department and to identify factors affecting misuse.

**Material and Method:** This study was conducted between January and March 2008. Children with fever who were admitted between 08:00-16:00 hours were included in the study. A questionnaire including 30 questions was prepared for parents or caregivers.

**Results:** The caregivers of a total of 200 children were included in the study. It was observed that 54% of the patients received inaccurate doses of antipyretics. 66.5% of the patients received inaccurate dose of paracetamol including 58.1% underdose and 8.4% overdose. 37.3% of the patients received inaccurate dose of ibuprofen including 27.7% underdose and 9.6% overdose. It was found that as the age and weight of the child and the age of the parents increased, the probability of receiving inaccurate dose of antipyretic increased. It was found that 58% of the patients would have been taken to the emergency department, even if fever subsided. 97% of the families believed that fever had harmful effects.

**Conclusions:** Although the dose of antipyretics was reported to be learned from physicians in our study, it was observed that the dose of paracetamol and/or ibuprofen was inadequate in a significant portion of the patients. It was thought that the reason for wrong dosage of antipyretics was lack of updating of appropriate dosage knowledge with increasing age or weight. In addition, fever phobia was found to be common in our study group. To decrease the frequency of inadequate antipyretic use and fever phobia it should be emphasized that families should be educated about fever and use of antipyretics and body weight should be taken into account when educating families. (*Turk Arch Ped* 2012; 47: 116-20)

**Key words:** Fever, dose of antipyretics, acetaminophen, ibuprofen, pediatric emergency

## Introduction

Fever is a complaint about which families are concerned with the highest degree and the etiology of which they would like to find out as soon as possible. Therefore, children with fever constitute an important part of presentations to pediatric emergency departments. However, fever maintains its feature of being an important reason of fear for families, although it is known to be a natural defense mechanism and is an efficient warning for physicians. Because of this fear a mild increase in body temperature in the child triggers the thought that immediate intervention should be performed and causes irrational concerns that brain damage and even death may result if the body temperature is not lowered. However, there may be a risk of development of severe bacterial infections including meningitis, pneumoniae, joint and bone infections

and urinary infection in some children with fever. Occult bacteriemia is possible in some children in whom the focus of fever can not be determined. Besides the concerns experienced by the families, such clinical conditions should be well differentiated by the physicians. Despite all these concerns, families have been found to give inadequate doses of antipyretics to children in studies in which the approach to children with high fever was examined (1-4). The most commonly used antipyretic used in children is acetaminophen, since it has both analgesic and antipyretic effects and is relatively safe. The second most commonly used antipyretic is ibuprofen.

The aim of this study was to investigate if the antipyretics (paracetamol and ibuprofen) given to the patients who referred to Hacettepe University İhsan Doğramacı Children's Hospital pediatric Emergency Department were used with

appropriate doses and intervals and to determine the factors which affected misdosing.

### Material and Method

Children aged between one month and 16 years who were referred to Hacettepe University İhsan Doğramacı Children’s Hospital Pediatric Emergency Department between January the 1st and March the 31st between 08:00-16:00 hours with a complaint of fever and who were given at least one dose of paracetamol and/or ibuprofen before referral to the hospital were included in the study prospectively. Recurrent presentations and patients for whom the dose administered and the name and intensity of the drug given was not known exactly were excluded from the study. Approval was obtained from the Hacettepe University Medical Faculty Ethics Committee (HEK07/138-24).

A questionnaire form including 30 questions to be asked to the families was prepared. This questionnaire contained demographic information including age, gender, weight, maternal-paternal ages and education levels in addition to questions about fever and the drug used including the beginning time of fever, accompanying findings, history of febril convulsion, methods of measuring body temperature, name, dose and dosing frequency of the antipyretic given. In addition, families were asked the reason for bringing their children to the emergency department, how they decided on the dose of the antipyretic and if they would refer to the emergency

<b>Age</b>	4.5±3.2 (1 ay-13 y)
<b>Gender (female)</b>	101 (50.5%)
<b>Weight (kg)</b>	18.6±9.5 (4-56)
<b>Maternal age</b>	31.6±5.6 (20-50)
<b>Education level of the mother</b>	
1-11 yıl	145 (72.5%)
> 11 yıl	55 (27.5%)
<b>Paternal age</b>	35±5.9 (24-52)
<b>Education level of the father</b>	
1-11 yıl	126 (63%)
> 11 yıl	74 (37%)
<b>Is there a second person who gives antipyretic besides the mother? (Yes)</b>	45 (22.5%)
<b>Education level of the second person who gives antipyretic</b>	
1-11 yıl	41 (91%)
> 11 yıl	4 (9%)

department if the fever was controlled at home. To calculate the dose of the antipyretic given accurately the name and intensity of the drug was learned. For acetaminophen the appropriate dose range was determined to be 10-15 mg/kg and the dosing interval was determined to be 4 hours. For ibuprofen the appropriate dose range was determined to be 5-10 mg/kg and the dosing interval was determined to be 6 hours. In the study, the results of the patients who received antipyretic drug with an appropriate dose and with an inappropriate dose were compared. Patients who received both drugs consecutively and who received both drugs with the recommended doses were included in the appropriate dose group, while patients who received one of the drugs with an inappropriate dose in the misdosing group. To calculate the dose of the antipyretics accurately the body weights of all patients were measured again in the hospital.

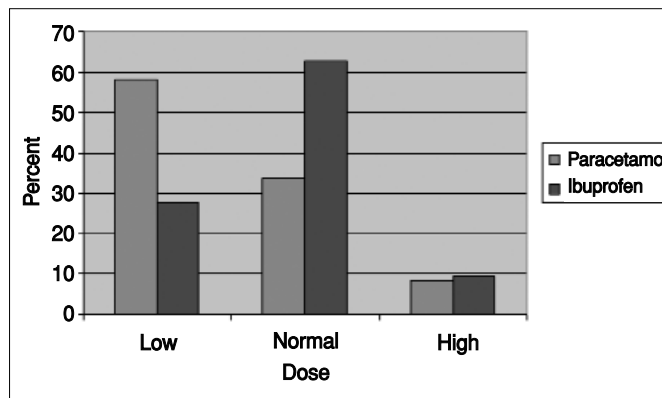
A leaflet containing information about approach to fever was given to the families who participated in the study by completing the questionnaire form.

Factors affecting misdosing were determined with student-t test.

### Results

During the study, the results of 200 patients who referred to the pediatric emergency department because of fever, who fulfilled the study criteria and who accepted to complete the questionnaire form were evaluated. Among these patients, 131 patients had used paracetamol (65.5%) and 83 patients had used ibuprofen (41.5%). 14 (7%) of these patients were found to have used the two drugs consecutively. The demographic properties of the patients are shown in Table 1.

It was learned that body temperature was measured before referral to the emergency department in 74% of the patients (148 patients), fever was decided to be present by feeling with hand in 24% and body temperature was not measured in only 4 patients. In 130 patients (65%), some traditional methods were performed in addition to antipyretic to lower the body temperature.



**Figure 1. Distribution of the patients who were given paracetamol and ibuprofen by the dose they received**

38 (19%) of the patients included in the study had a doctor whom they visited regularly. 56 patients (28%) referred to another doctor before presenting to the emergency department. Drug treatment was recommended for the complaints in 38 of these patients (67.9%), but 13% of the patients did not start using the recommended drugs. Responses to some important question about fever are given in Table 2.

Generally, 54% of the patients were found to have used antipyretics with inappropriate dosage. The mean drug dose in patients who received paracetamol was found to be  $9.7 \pm 5.0$  (2.8-48) mg/kg and the mean drug dose in patients who received

Question	Response
<b>Fever time (hours)</b>	42.2±37.8 (1-240)
<b>The highest fever measured (°C)</b>	38.6±0.75 (36-41.5)
<b>The value accepted as fever by the family (°C)</b>	37.7±0.8 (35-40)
<b>Presence of other complaints accompanying fever</b>	156 (97%)
<b>History of febrile convulsion</b>	18 (9%)
<b>Reasons of referral to the pediatric emergency department</b>	
Very high fever	73 (36.5%)
Prolonged fever	26 (13%)
Fear of febrile convulsion	30 (15%)
Persistence of fever	20 (10%)
Other complaints accompanying fever	61 (30.5%)
<b>How did you decide the dose of antipyretic you used?</b>	
With the recommendation of a physician	120 (60%)
By information in the prospectus	53 (26.5%)
With the recommendation of a nurse	4 (2%)
With the recommendation of a pharmacist	9 (4.5%)
With their own information	14 (7%)
<b>The most common accompanying complaints</b>	
Cough	59 (29.5%)
Nausea	39 (19.5%)
Diarrhea	28 (14%)
<b>Would you refer to the emergency department if you could control fever? (Yes)</b>	116 (58%)
<b>Is fever beneficial?</b>	
Yes	37 (18.5%)
No	163 (81.5%)
<b>Is fever harmful?</b>	
Yes	194 (97%)
No	6 (3%)

**Table 3. The factors affecting use of inappropriate antipyretic dose**

Risk factors	Patients who received appropriate dose of antipyretic	Patients who received inappropriate dose of antipyretic	p
<b>Age</b>	3.34±2.6	5.57±3.3	p<0.01
<b>Gender (female)</b>	42.6%	57.4%	AD
<b>Weight (kg)</b>	14.4±6.7	22.2±10.1	p<0.01
<b>Maternal age</b>	30.03±5.3	32.7± 5.6	p<0.01
<b>Education level of the mother</b>			
1-11 yıl	46.2%	53.8%	AD
> 11 yıl	47.3%	52.7%	AD
<b>Paternal age</b>	33.4±5.8	36.3±5.7	p<0.01
<b>Education level of the father</b>			
1-11 yıl	42.1%	57.9%	AD
> 11 yıl	52.7%	47.3%	AD
<b>Primary caregiver</b>			
Mother	46.5%	53.5%	AD
Other	44.4%	53.6%	AD
<b>Education level of the caregiver</b>			
1-11 yıl	44.2%	55.8%	AD
>11 yıl	25%	75%	AD
<b>Presence of physician visit before presentation</b>	51.8%	48.2%	AD
<b>Presence of regular physician</b>	50%	50%	AD
<b>*How was it decided that the child had fever?</b>			
By measuring	50%	50%	NS
By checking with hand	35.4%	64.6%	NS
I did not measure the body temperature	25%	75%	NS
<b>*Duration of fever</b>	41.6±40.0	42.7±36.0	AD
<b>*The highest fever</b>	38.6±0.85	38.6±0.65	AD
<b>Who gave the information about the dose of antipyretic drug?</b>			
Physician	45.3%	54.7%	NS
Nurse	45.8%	54.2%	NS
Pharmacist	75%	25%	NS
Prospectus	33.3%	66.7%	NS
Oneself	50%	50%	NS

NS: Not significant

ibuprofen was found to be  $7.0 \pm 3.6$  (2.9-30.7) mg/kg. Normal, low or high dose paracetamol and ibuprofen distributions are shown in Figure 1. 58% of the patients received low dose paracetamol and 8.4% of the patients received high dose paracetamol (the rate of inappropriate dose of paracetamol was found to be 66.5%). Among the patients who received ibuprofen, 27.7% received inadequate dose and 9.6% received high dose (the rate of inappropriate dose of ibuprofen was found to be 37.3%). 50% of 14 patients who received both drugs used accurate doses of both drugs, three used inappropriate doses of both drugs and the remaining 4 patients used inappropriate dose of paracetamol. When the dosing frequency of both drugs was evaluated, 40.5% of the patients (60 patients) received the drug more infrequently than recommended, 33% (49 patients) received the drug more frequently than recommended and 26.4% (39 patients) received the drug with an appropriate frequency (these rates belong to 148 patients who answered this question).

Patients who used antipyretic drugs with inappropriate and appropriate doses were compared according to the risk factors summarized in Table 3. Conclusively, it was observed mis dosing increased as the age and body weight of the child increased ( $p < 0.01$ ). When the properties of the parents were evaluated, no statistically significant relation was found between education level and giving appropriate dose of antipyretic ( $p > 0.05$ ). In contrast, young parents were found to give appropriate dose of antipyretic with a higher rate ( $p < 0.01$ ).

## Discussion

In this study, it was observed 54% of the patients received inappropriate antipyretic dose (low or high) and patients who received low dose of paracetamol (58.1%) and low dose of ibuprofen (27.7%) constituted the majority. Mis dosing of paracetamol (66.5%) which is used as the most common antipyretic was found to be more frequent compared to mis dosing of ibuprofen (37.5%). Although it was reported that the dose of antipyretics had been mostly learned from physicians in our study, it was observed that the dose of paracetamol and/or ibuprofen given to most patients were inadequate and the dosing intervals were not appropriate. It was thought that the reason for wrong dosage of antipyretics was lack of updating of appropriate dosage knowledge with increasing age or weight.

In studies investigating the frequency of accurate use of antipyretics by families revealed similar results with our study (3-8). Simon et al.(3) reported 40% of the patients received accurate dose of antipyretics and Linder et al. (4) showed that 57% of the families gave inappropriate doses of antipyretics. In another study which investigated if antipyretics were given at appropriate doses, half of the caregivers (51%) were found to have given inappropriate dose, the frequency of mis dosing

in young children (<2 years) was found to be higher and drug doses based on body weights were found to be more accurate. In this study, similar to the results of our study paracetamol was found to be given at a low dose with a higher rate compared to ibuprofen (paracetamol 47%, ibuprofen 12%). In addition, it was found that 80% of the doses were accurate when the leaflet containing doses based on the age was used and 100% of the doses were accurate when the leaflet containing doses based on body weight was used. Higher rate of mis dosing at younger ages was attributed to the fact that no prospectus information was given for children below the age of 2 (5). In the study performed by Bilenko et al. (6), children who had lower body weight and who received rectal paracetamol were found to have received higher dose antipyretic. Therefore, it was also recommended in this study that dose adjustment should be done based on the body weight rather than the age and body weight should be emphasized when educating the families. Supporting these results, it was decided by FDA (in May 2011) and by the Turkish Republic Ministry of Health General Directorate of Pharmaceuticals and Pharmacy (in June) that drug prospectuses contain dose information from the age of 6 months to provide convenient use and especially to prevent use of high dose paracetamol.

In our study, it was observed that the frequency of mis dosing increased as the age got older and the body weight increased. Although it was stated that the dose was decided with a doctor's recommendation in our study, it was thought that lower doses than should be used were given, since doses were used at the dose given as the last time and dosing information was not updated as the age increased. The tendency to use appropriate dose of drugs by younger parents was explained by the possibility of dose information at younger ages to be more updated. In a study performed in our country, it was shown the consciousness level of families about fever was not adequate and antipyretic usage was deficient or erroneous (9). As also recommended in previous studies, the results of our study support the recommendation that families should be informed about fever during hospital visits. However, studies on how this information should be given are continuing (10-12). In a study which tried to increase the accuracy rates of dosing information, it was shown that use of pictographic dose recommendation in addition to a written informing about use of antipyretics could prevent mis dosing to a large extent, but not completely.

About 20 years ago, Schmitt (2) showed that families performed wrong applications and had wrong thoughts about their children who had fever and named this irrational thoughts as "fever fobia". The reasons of fever fobia of the families included the belief that fever has some harmful side effects (94%), the belief that fever could lead to harmful outcomes for the child (67%) and fever even below  $38.90^{\circ}\text{C}$  would lead to severe outcomes (2,13,14). Crocetti et al. (1) have showed

that fever phobia still continues today. In this study, it was found that 91% of the families believed fever had harmful effects, families frequently checked the body temperature of their children, awakened them frequently to give antipyretic drug, gave antipyretic drugs with frequent intervals and usually used antipyretic drug even when the body temperature of their children was normal. In another study performed by Goldman et al. (17), it was found that lower dose than the appropriate dose was given in 41% of the patients who were given paracetamol. In this study, the rate of families who stated "if fever could be controlled, I would not refer to the emergency department" was found to be 54%. In our study, it was found that 58% of the patients would have been taken to the emergency department, even if fever subsided. This result showed that fever phobia was present in an important part of the families who participated in our study. This was supported by the answers which stated that fever was harmful, not beneficial.

Conclusively, it was observed that families frequently used inappropriate doses of antipyretics and tended to give lower doses than should be given, gave the drug more frequently or less frequently and fever phobia was common in our study group. It is thought that families have inadequate information about fever and they should be given information about drug doses, dosing frequency, time and different preparations containing antipyretics during hospital visits. Body weight should be emphasized when educating families. However, more studies on how this informing should be done and on the outcomes of these interventions should be performed.

**Conflict of interest: None declared.**

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