

# Over-investigated and under-treated: children with febrile convulsion in a Malaysian district hospital

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## ABSTRACT

**Introduction:** We conducted a retrospective audit on the inpatient assessment and care of children admitted with febrile convulsion to Hospital Batu Pahat, a district hospital in Malaysia, using the Malaysian national clinical practice guidelines and the American Academy of Paediatrics practice parameters on febrile convulsion as the reference standards.

**Methods:** The case notes of 100 consecutive children admitted in 2004 were analysed. The documentation of major clinical features, selection of investigations, the timeliness of antipyresis and frequency of parental education were evaluated.

**Results:** In general, the major clinical features that were relevant to the presenting problem were adequately documented, although fever was not mentioned as a presenting complaint in one quarter of the cases. On an average, about five investigations were ordered for every patient on admission. There was no major difference in the number of investigations conducted between children who were more severely ill and the rest of the patients. The majority of the investigations did not yield any useful diagnostic information. Only 38 percent of the children received antipyretics and 53 percent were tepid-sponged during fever, with 23 percent having received tepid-sponging without concurrently receiving antipyretics. No parental education on febrile convulsion was recorded in half of the cases.

**Conclusion:** Excessive unjustified investigations, deficient antipyresis when required and inadequate communication with the family of children with febrile convulsion were observed. Awareness of such deficiencies from this audit should lead to regular staff education, monitoring and future audits in order to improve

the quality of our clinical care.

**Keywords:** clinical audit, febrile seizures, fever

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## INTRODUCTION

Febrile convulsion is a common and benign condition, usually without any long-term neurodevelopmental sequelae.<sup>(1)</sup> Clinical assessment to identify the underlying causes of fever, judicious selection of investigations, effective temperature control and parental education with collaborative input from medical and nursing staff help to determine the overall quality of care for children with this condition. Children with febrile convulsions constitute 5% of the approximately 270 monthly paediatric admissions to Hospital Batu Pahat, a 300-bed district hospital in Johor, Malaysia. The Malaysian National Clinical Practice Guidelines (CPG) on febrile convulsion, developed in 2000, have been used as a reference standard to direct clinical care. The guidelines delineate the clinical features, management and prognosis of this condition.<sup>(2)</sup> Although the recommendations in this CPG are consistent with those made in other available guidelines,<sup>(3-6)</sup> a detailed account on the indications for further investigation is lacking.

The American Academy of Paediatrics (AAP) has published a practice guide specifically on the neurodiagnostic evaluation of a child with febrile convulsion, which includes blood studies, lumbar puncture and neuroimaging.<sup>(7)</sup> The guide clearly advocates the selective use of laboratory investigations. For instance, full blood count is recommended for the evaluation of children who are clinically suspected to have bacterial infections, particularly in children younger than two years of age. Serum electrolytes, glucose, calcium and magnesium are not recommended as routine screening tests, except in prolonged seizures with or without the presence of focal features, and in prolonged postictal obtundation.<sup>(7)</sup> Based on the available evidence, the guide also recommends against the routine use of specific neurological investigations such as electroencephalogram (EEG) in simple or

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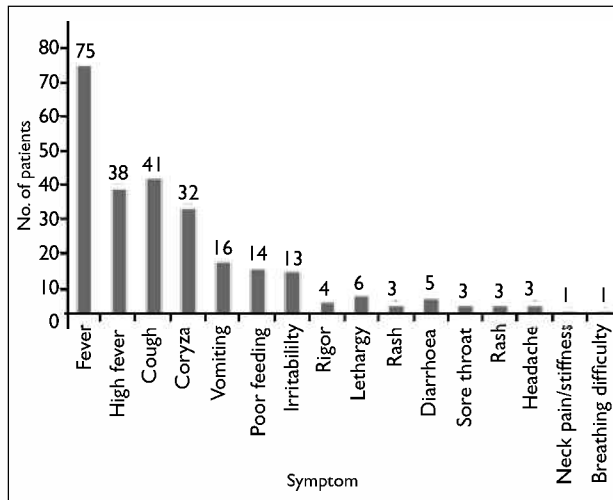
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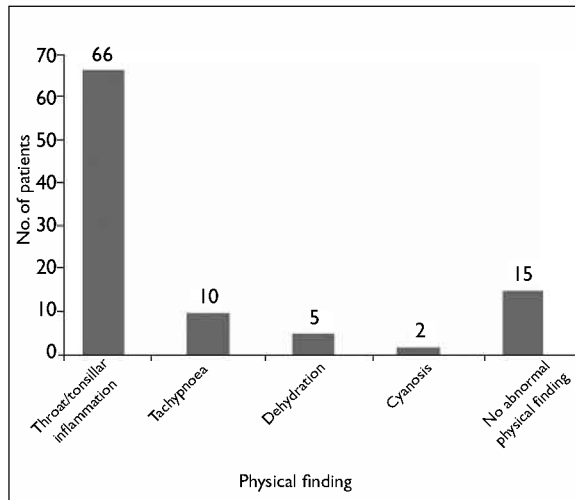
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**Fig. 1** Bar chart documents the symptoms of children admitted with febrile convulsions.



**Fig. 2** Bar chart shows the major physical findings of children with febrile convulsion on admission.

complex febrile convulsions.<sup>(7)</sup>

Using the Malaysian CPG and the AAP guidelines as reference standards, a clinical audit was conducted to evaluate the assessment and care of our inpatients with a diagnosis of febrile convulsion. In particular, the quality of clinical information collected that led to the diagnosis, the appropriateness of the investigations, the timeliness of antipyresis and the adequacy of parental education were examined.

## METHODS

This was a retrospective case note audit conducted in the Paediatric Department, Hospital Batu Pahat, Malaysia, in January 2005. We aimed to assess 100 consecutive admissions in 2004 with a diagnosis of “febrile convulsion”, “febrile fit” or “febrile seizure”, as coded in the ward census, and whose case notes were available for inspection in the hospital medical records department. We excluded patients with a diagnosis of “afebrile seizures”, “seizures”, “fits” or any other diagnoses of seizures without any reference to fever. Data was extracted from the case notes using standard data collection forms that were designed for this study.

Specifically, we evaluated whether the type and duration of the seizures and the concomitant symptoms of febrile illnesses were duly recorded in the history. We also evaluated whether investigations were ordered based on the following indications: (1) Full blood count for patients with at least a moderate fever ( $> 38.5^{\circ}\text{C}$ ) on admission and for children  $< 2$  years of age; (2) Electrolytes for patients with prolonged ( $> 15$  minutes) seizures, or with symptoms and/or signs suggesting dehydration; (3) Calcium and magnesium for patients with prolonged seizures; and (4) Serum glucose for

patients with prolonged seizures or a prolonged period ( $> 30$  minutes) of postictal obtundation or drowsiness. The next area that was evaluated was whether antipyretics and tepid sponging were administered concurrently during all fever episodes. We examined the temperature chart for the documentation of tepid sponging at the height of the temperature, and inspected the drug prescription sheets to determine whether the administration of antipyretics coincided with the fever episodes. Next, we evaluated whether parental education on febrile convulsion was documented for every patient. Finally, we analysed the patients’ clinical course, including the time taken for fever resolution, any recurrence of fever or other major clinical complications during the hospital stay, and the length of the stay.

The data was collated, analysed and charted, where applicable, using Microsoft Excel for Windows (Microsoft, Redmond, WA, USA). The standard descriptive statistics are presented and the *t*-test was used to compare the number of investigations between the various patient groups. This study was approved concurrently by the Quality Improvement Unit, International Medical University, Malaysia and the Director of Hospital Batu Pahat, Johor, Malaysia.

## RESULTS

Among the initial 100 cases obtained, 61 were male and 39 were female. Three patients were erroneously coded as “febrile convulsion”, but their diagnosis was recorded as meningitis in the case notes, leaving 97 case notes that were eligible for subsequent analysis. The sample consisted of 91 Malay, four Chinese, one Indian and one mixed race Chinese-Indian. The mean age of presentation was 27.2 (range 1.3–109) months. Five (5.2%) children who

**Table I. Distribution of seizure type.**

Seizure type	No. of cases (%)			Total
	Generalised	Partial	Undocumented	
Simple	67 (71.2)	0	0	67 (71.2)
Complex	23 (24.4)	2 (2.2)	1 (1.1)	26 (27.7)
Undocumented	1 (1.1)	0	0	1 (1.1)
Total	91 (96.7)	2 (2.2)	1 (1.1)	94 (100)

Only 94 cases are presented here, as three cases were documented as having only "fits" with no further description provided.

presented for febrile convulsion were not within the typical age range of three months to six years.<sup>(2)</sup>

Most of the children (64%) presented on the first day of illness. Fever was documented as a presenting complaint in 75% of the cases; in one quarter of the cases, fever (present or absent) was not mentioned. 38 (39.2%) children were reported to have "high fever". The documented clinical symptoms are charted in Fig. 1. From the sample, there were 17 cases with only fever and no other recorded symptoms. The duration of seizure before admission was reported in 92 (95%) cases. The average seizure duration before admission was 6.4 (range 0.5–30, mode 5) minutes. The majority presented after one or two episodes of seizure (71% and 19%, respectively). 41 (42%) children had antipyretics prior to admission. The types of seizures reported are shown in Table I. 29 (30%) children had previous episodes of seizures associated with fever (1–6 episodes). A positive family history of febrile convulsion was noted in 23 (24%) cases and of epilepsy, in two cases. All the children in the sample were otherwise healthy, with no known neurological or developmental problems.

On admission and upon physical examination, 67 children were febrile (temperature > 37.5°C), with 20 children having a temperature > 38.5°C. Fig. 2 illustrates the major positive findings of the physical examination. The sources of fever were documented in 88% of the cases, the most common being "viral upper respiratory tract infection" or "viral fever" (70%) and acute tonsillitis or pharyngitis (9%). Severe bacterial infections were rare; pneumonia was diagnosed in only 2% of the children.

As shown in Table II, blood tests (at least a full blood count) were ordered for all children regardless of age and clinical conditions, which included 77 (79%) children with an admission temperature < 38.5°C and 30 who were afebrile. 40 (41%) patients had elevated total white cell counts ( $\geq 15 \times 10^9/l$ ), and 38 (39%) had neutrophilia (> 65% of the total

**Table II. Investigations performed for children with febrile convulsion on admission.**

Investigation	No. (%)
Full blood count	97 (100)
Electrolytes and renal profiles	86 (89)
Serum calcium	79 (81)
Serum glucose	77 (79)
Serum magnesium	77 (79)
Urine microscopy	27 (28)
Chest radiograph	9 (9)
Blood culture	3 (3)

white cells). Electrolytes and renal profile tests were performed along with full blood count in nearly 90% of the cases. Around 80% of the children had serum glucose, serum calcium and magnesium performed in addition to the other tests. Lumbar puncture was not performed in any child in this sample. On average, 4.9 (range 1–10) investigations were ordered for each patient on admission. Children with complex febrile convulsion had a slightly higher number of investigations conducted (mean  $\pm$  standard deviation [SD] 5.4  $\pm$  1.8, range 2–10) compared to children with simple febrile convulsion (mean  $\pm$  SD 4.7  $\pm$  1.7, range 1–8), although the difference did not reach statistical significance ( $p = 0.1$ ). However, when each specific investigation, including full blood count, electrolytes, glucose, calcium and magnesium, was compared, the proportions of children who had such tests ordered were similar between children with simple (76%–85%) and those with complex (80%–100%) febrile convulsions. There was no significant difference in the number of investigations ordered for children with a parental report of high fever vs. those without fever (mean  $\pm$  SD 5.2  $\pm$  1.8 vs. 4.7  $\pm$  1.6, respectively,  $p = 0.13$ ). The number of investigations ordered for children who had worrying clinical features, such as poor feeding, lethargy, irritability, neck stiffness, cyanosis and dehydration, was identical to those without these features (mean  $\pm$  SD 4.9  $\pm$  1.7 for both groups,  $p = 0.96$ ). A few more investigations were ordered for children aged  $\leq$  one year than for older children (mean  $\pm$  SD 5.3  $\pm$  1.4 vs. 4.5  $\pm$  1.9,  $p = 0.02$ ). There was no record at all on specific indications for each investigation, and none of the investigations were abnormal.

In terms of the management of the illness and its clinical course, most of the children (98%) received oral paracetamol as antipyretics, with all but one who received the medication every six hourly. There was

no record in the case notes of whether paracetamol was administered for fever or discomfort. The administration of paracetamol coincided with a febrile episode in 30% of the children. During fever, 53% received tepid sponging, and 23% were tepid-sponged alone, i.e. without being administered paracetamol concurrently.

A total of eight children had seizures during their hospital stay, five of whom had a single episode, two had two episodes and one child had three episodes. The seizures lasted between 20 seconds and 5 minutes, and occurred 1–40 hours after admission. However, none of these patients had any neurological deficit on discharge, and none required further neurological investigations such as EEG or brain imaging.

The first fever resolution, defined in this study as a temperature < 37.5°C without a subsequent surge in the next 24 hours, occurred on average at 9.4 hours after admission (median and mode four hours). Fever resolved within 24 hours in 77% of the cases, and remained normal until the time of discharge in nearly 60% of the cases. For the other cases, all episodes of fever recurred within the next 24 hours.

In all, 20 children received antibiotics, including nine with a viral illness as the sole diagnosis. Five children received anticonvulsants to abort their seizures while they were hospitalised, out of whom four were administered diazepam rectally, although only one child had a seizure that lasted for five minutes. One child was administered with intravenous phenobarbitone during his third seizure episode, although all his seizures lasted  $\leq$  20 seconds with or without intervention. Parental education on febrile convulsion was conducted for 53 (55%) children. The median length of hospital stay was three (range 1–6, mode 2) days. No case of readmission within two weeks due to febrile convulsion or any other fever-related illnesses was reported.

## DISCUSSION

This clinical audit revealed several findings that were of concern, including the omission of fever as a presenting complaint, the excessive use of laboratory investigations, the inappropriate administration of antipyretics, antibiotics and anticonvulsants, as well as an apparent lack of parental education. The omission of fever as a presenting complaint was possibly due to the oversight of the admitting doctor, who may have assumed during history-taking that fever was present without enquiring about it, or simply due to a lack of documentation. Although both reasons are matters of

concern, the former is more serious because it may lead to delayed identification of alternative diagnoses. Unfortunately, we were unable to identify from this audit whether the former or the latter was the major problem.

Our primary concern from this audit was over-investigation. It is clear that the vast majority of the children had obvious symptoms and signs, which by themselves would be sufficient to lead to a diagnosis of the underlying febrile illness with confidence; however, an array of blood investigations, including full blood count, urea and electrolytes, calcium, magnesium and glucose, were ordered without any valid reason. This practice is at odds with evidence-based recommendations, which advocate clinical assessment as the sole means of making a definitive diagnosis in most cases, without the need for extensive investigations to direct further care.<sup>(2,5,7-9)</sup> Alarming, in this study, no specific record was made in the entire sample regarding the reasons for the investigations. A similar number of investigations was ordered for children who were at a higher risk of developing complications (children aged  $\leq$  one year, with reported high fever or other worrying clinical features) and other children, and this reflects a lack of critical judgement when ordering investigations. Most of the investigation results were unremarkable and did not add diagnostic value to the clinical assessments, thus further confirming their redundancy. The findings here echo those of several other studies.<sup>(8-11)</sup> A previous study attributed the excessive use of inappropriate investigations to inexperience on the part of the treating doctors.<sup>(11)</sup> We recommend strengthening the in-house training for resident doctors so as to improve reliance on clinical assessments in making a diagnosis, and to justify every laboratory investigation.

There are some time-honoured practices in managing children with fever and seizures, which include tepid sponging, antipyresis through the use of Western or traditional medications, bed-rest, induced sweating and ice pads. Some of these practices have been scrutinised more extensively than others. Among the measures that have been studied, physical methods of antipyresis, such as tepid sponging, have been shown to lower body temperature effectively only when employed in combination with antipyretics,<sup>(12)</sup> and this combination has been the recommended method of antipyresis for children with fever. However, while antipyretics like paracetamol and ibuprofen are effective at lowering body temperature, they do not seem to reduce the recurrence of febrile seizures.<sup>(13-16)</sup> Recent practice guidelines recommend the use of antipyretics with the primary aim of reducing discomfort rather

than reducing fever or febrile seizure recurrence.<sup>(2,17,18)</sup> The effectiveness of combined tepid sponging and antipyretics in reducing febrile seizure recurrence has not been studied. Our audit reveals questionable practices in the use of antipyretics, antibiotics and anticonvulsants at a more fundamental level. We observed that there was regular prescription of paracetamol for most children, regardless of their symptoms or fever pattern. Nearly a quarter of the children in our study received tepid-sponging alone during fever, which might have reduced the effectiveness of antipyresis as a result of peripheral vasoconstriction,<sup>(19)</sup> induced shivering and raised core body temperature.<sup>(20)</sup> The inappropriate antipyretic practice observed in this study, along with the unjustified prescription of antibiotics and over-eager administration of anticonvulsants, reflects a failure to exercise clinical reasoning in patient management. Although no major resultant complications were reported from the cohort of children assessed in this audit, the practice of targeted treatment and justified therapeutic decisions according to the practice guidelines might well have shortened their hospital stay, as demonstrated in a recent study.<sup>(21)</sup>

Another important issue that deserves attention is the lack of parental education, which seems to be a common problem across countries.<sup>(8,11)</sup> Doctors and nurses may be unwilling to spend time with the patient's family as febrile convulsion might be perceived to be of low priority. However, it has been shown that major misconceptions and fears are commonplace among parents of children with febrile convulsion, regarding various alleged associations, treatments and the prognosis.<sup>(22-24)</sup> It has also been shown that conducting specific counselling sessions with parents to address their anxieties and misconceptions improves parental confidence and practice.<sup>(25,26)</sup> We recommend that parental counselling be made a standard part of the care plan for every child with febrile convulsion, with clear documentation in the case notes after counselling has been provided.

In conclusion, this audit has demonstrated that there exist some striking discrepancies between our prevailing practice and the current standards in the assessment and care of children with febrile convulsion. The issues of concern that have been highlighted here are similar across various clinical settings in different countries,<sup>(8,10,11,27)</sup> and they mandate regular staff education, monitoring and future audits so as to improve our standard of care. Additionally, we suggest that a simplified guide be drafted that focuses on the indications for investigations of children with fever and seizures, to be placed in easily accessible locations in the accident and emergency

department and in children's wards for the reference of the attending doctors. Although febrile convulsion is a benign and self-limiting illness, judicious clinical assessment, selective investigation, targeted management and parental education for such a common condition could lead to substantial savings in healthcare costs and improved patient satisfaction.

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