Brief Report

The Accuracy of Mother’s Touch to Detect Fever in Children: A Systematic Review

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Summary

Universally, mothers often use touching to detect fever in their children. We perform a systematic review of published diagnostic studies evaluating the ability of mothers to detect fever in their children by touching. We found 10 studies satisfying our inclusion criteria. The meta-analysis revealed a summary sensitivity of 89.2% and summary specificity of 50%—maternal touch is perhaps more useful to exclude fever rather than to ‘rule in’ fever. However, due to significant heterogeneity in the included studies, interpretation of the summary data is difficult.

Key words: fever, mother, palpation, children, systematic review.

Introduction

Fever in children is a common problem in primary care. In resource-poor settings, where the use of thermometer is restricted to the healthcare facilities, the initial diagnosis of fever in a child is based almost entirely on the assessment by the mothers, often by mere touching [1, 2]. Even in developed countries where thermometers are more readily available at home, mothers may not use them correctly or they still prefer touching to detect fever [3–5]. Maternal touch as a method for fever detection is especially important in regions endemic for malaria and dengue—the carers often need to make quick decision whether to seek professional help or to administer treatment (e.g. antimalarials [2]). When the child has reached a healthcare facility, the presence of fever can be confirmed by thermometer. However, not infrequently, the maternal report of fever in their children cannot be confirmed, e.g. when the prior use of antipyretic has lowered the body temperature and the intermittent nature of most fevers. The question that is in our mind is: ‘in a sick child for whom fever is suspected, can maternal touching accurately detect fever?’ To answer this question, we proceeded to perform a systematic review of diagnostic studies evaluating this issue.

Methods

One investigator (C.L.T.) performed a literature search of Medline covering the period 1956–2006 for diagnostic studies using the method reported by Deville et al. [6]. We then looked within the above retrieval for citations containing these search terms: (fever OR febrile) AND (palpate OR palpation OR touch) [note: ‘OR’, ‘AND’ are Boolean operators, the asterisk (*) is a truncation symbol used in PubMed]. The initial search identified 27 studies (full list is available from the author). Perusal of this list and their references identified 10 studies comparing maternal touching with thermometer for temperature measurement [7–16]. We excluded the following studies: (i) one study that did not formally evaluate touching [2], (ii) one prospective study where calculation was based on patient-visit rather than individual patients [17] and (iii) three studies that evaluated only the accuracy of healthcare personnel’s palpation for fever [18–20]. Seven independent assessors (all primary care doctors) evaluated included studies using a checklist [21]. We extracted numerical data of true positive, true negative, false positive and false negative from the included studies and attempted a meta-analysis (random effect models) using Meta-Disc [22].
The study by Hooker, et al. [14] was excluded from the meta-analysis because numerical data were not available.

Results
All 10 studies were cross-sectional studies evaluating maternal touching vs. an objective method of temperature measurement. Considerable differences in the study design in these studies were noted (Table 1):

(i) Setting: five studies were conducted in hospital outpatient clinics or paediatric clinics [8, 9, 11, 12, 15], four in emergency room [7, 10, 13, 14] and one in a hospital ward [16]. Five of them were conducted in the United States [9, 10, 12–14], the rest were conducted in four other countries (Brazil [1], India [11, 15], Malawi [8], Zambia [16]).

(ii) Subject selection: in two studies, children with complaints of fever were selected [7, 11]. One study included only children whose mothers used palpation method for fever detection [12]. The rest of the studies either included children with various complaints or did not mention the type of presentation.

(iii) Site of maternal touching: only four studies mentioned the body parts touched by mothers [7–9, 16].

(iv) Type of thermometer: three studies used electronic thermometer [10, 12, 14], four studies used mercury thermometer [7, 11, 15, 16], one study used a mixture of electronic and mercury thermometer [9] and two studies did not identify the type of thermometer used [8, 13].

(v) Site of temperature measurement: two studies measured axillary temperature [7, 16], two studies measured rectal temperature [8, 14], one study measured forehead temperature [10], five studies measured temperature at more than one site [9, 11–13, 15].

(vi) Cut-off value of fever was variable (37.5–38.3°C), depending on the type of thermometers.

Two studies excluded children who had received antipyretics [11, 13]. Four studies [7, 9, 11, 15] enquired whether the children had temperature taken at home with a thermometer, but only one of them excluded these children [11]. Maternal touching appeared to precede objective temperature measurement in all studies, but only one study [8] mentioned blinding of the assessment by mother and healthcare personnel.

The sensitivities of maternal touching for fever were 70.6–97.3%, but the ranges for specificities were much wider (19.2–90.6%) (Table 1). Eight out of ten studies showed higher sensitivities than specificities for maternal touching. The meta-analysis showed a summary sensitivity of 89.2% and a summary specificity of 50%, with a diagnostic odds ratio of 15 (Table 2). However, analysis showed statistically significant heterogeneity (\(P<0.01\)) in the included studies.

Discussion
We used only MEDLINE for our literature search (plus tracking of cited references in the full papers) and may have missed potentially useful studies captured only in other databases, e.g. CINAHL or EMBASE (but we think this is unlikely). This systematic review suggests that maternal touch for fever detection in children is probably more sensitive than specific. The 95% confidence level for diagnostic odds ratio is above one, this shows that maternal touching has some diagnostic value. As the summary sensitivity is higher than the summary specificity, maternal touching is probably more useful to exclude fever rather than to confirm fever. However, the significant heterogeneity of the included studies (hence, the wide confidence interval of the diagnostic odds ratio) also makes the results difficult to interpret. Among the included studies, only two of them specifically included children complaining of fever [7, 11]. This group of children is closest to the intended study group (‘sick child for whom fever is suspected’). In the study by Alves et al. [7] maternal report of fever was almost invariably correct [positive predictive value (PPV) 97.2%], on the other hand, in the study by Chaturvedi et al. [11], the PPV was only 38.1%. It appears that the PPV in these two studies were influenced a great deal by the prevalence of fever in the study samples (Table 1). Of the 10 studies included in our systematic review, only three of them showed a PPV exceeding 80% [7, 14, 15].

Based on the aforementioned, perhaps it is unwise to rely on maternal report of fever unless it is collaborated by more objective measurement. However, Dunyo et al. [17], argued otherwise. In a prospective study where 130 children were examined weekly for 3 months by carers (using touching) and trained interviewers (using electronic thermometer), they showed that ‘hot body’ turned out to be fever in 79% of instances while the proportion of afebrile children not having ‘hot body’ was 99.3%. This study suggested that carers could be taught to recognize fever accurately given the chance to verify their touching with objective measurement. We conclude that, notwithstanding our systematic review, the utility of maternal touching as a method of fever detection is still unresolved and deserved further study. Clearly, better studies should be done by avoiding the methodological problems identified, the main issues
<table>
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<tr>
<th>Study</th>
<th>Characteristics of included diagnostic studies</th>
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<tr>
<td>1</td>
<td>Alves [7] 169 children reporting fever, age 2 months to 13 years, ER, Brazil</td>
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<tr>
<td>2</td>
<td>Nwanyanwu [8] 1120 children with various complaints, age &lt;5 years, hospital OPD, Malawi</td>
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<tr>
<td>3</td>
<td>Banco [9] 261 children with acute (non-trauma) illness, age 5 days to 15 years, hospital paediatric clinic, USA</td>
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<td>4</td>
<td>Callanan [10] 179 infants with various complaints, age &lt;3 months, ER, USA</td>
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<td>5</td>
<td>Chaturvedi [11] 200 children reporting fever, age 0–12 years, hospital paediatric clinic, India</td>
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<td>6</td>
<td>Ernst [12] 100 children whose mothers used palpation to measure temperature, age 1 month to 18 years, hospital outpatient clinic, USA</td>
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<tr>
<td>7</td>
<td>Graneto [13] 322 children, age ≤10 years, ER, USA</td>
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<td>8</td>
<td>Hooker [14] 180 children, age 0–4 years, ER, USA</td>
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<tr>
<td>9</td>
<td>Singhi [15] 301 children with various complaints, age 3 months to 2 years, hospital paediatric clinic, India</td>
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<tr>
<td>10</td>
<td>Whybrew [16] 862 children, age 1 month to 16 years, hospital, Zambia</td>
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Note: ER, Emergency room; LR+, likelihood ratio positive; LR−, likelihood ratio negative; NA, not available; NPV, negative predictive value; OPD, Outpatient department; TM, tympanic membrane; temp, temperature.
being variability in the prevalence of fever, lack of standardized methods of maternal touching, different reference tests and variable cut-off level for fever.

### Table 2

<table>
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<tr>
<th>Diagnostic parameters</th>
<th>Summary statistics (%, 95%CI)</th>
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<tr>
<td>Sensitivity</td>
<td>89.2 (87.3–90.9)</td>
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<td>Specificity</td>
<td>50.0 (47.9–52.0)</td>
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<td>Likelihood ratio positive</td>
<td>3.0 (2.0–4.5)</td>
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<tr>
<td>Likelihood ratio negative</td>
<td>0.2 (0.1–0.3)</td>
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<td>Diagnostic odds ratio</td>
<td>15.3 (7.4–31.9)</td>
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*Study by Hooker excluded (numerical data cannot be extracted).

bDiagnostic odds ratio is the odds of positive test results in participants with disease compared with the odds of positive test results in those without disease.

### References