SHORT REPORT

Touch detection of neonatal hypothermia in Nepal

M Ellis, D Manandhar, L Hunt, S Barnett, K Azad

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The use of touch by health workers to detect hypothermia was examined in 250 newborns in Nepal. Palpation of the feet shows fair interobserver agreement ($\kappa = 0.4$ – 0.7) and high sensitivity ($>80\%$) but low specificity (36%–74%) compared with axillary thermometry. Traditional birth attendants should feel an infant's feet to detect hypothermia.

We recently designed a training programme for traditional birth attendants for trial in Bangladesh. Thermal monitoring is an important component of newborn care,^{1,2} but has been little studied at the community level.³ As part of the baseline survey, we collected qualitative data to describe the current practice of traditional birth attendants, which suggested that thermal care was patchy, and palpation of either feet or abdomen was used to assess temperature. We revisited unpublished data collected by our group previously in Kathmandu to investigate the ability of health workers to detect hypothermia using palpation. Female health workers in a government maternity hospital performed the temperature assessment by palpating the abdomen and foot in turn, classifying each as "warm" or "cold". Blinded to this, a senior nurse took contemporaneous mercury thermometer readings of infant axillary temperature. Core thermometer readings were initially categorised as normothermic (37°C and above), cold stressed (36 – 37°C), or hypothermic ($<36^{\circ}\text{C}$). Following the approach to palpation suggested by WHO, we initially categorised a warm abdomen and foot to indicate a normothermic infant, a warm abdomen with cold feet to indicate cold stress, and cold abdomen and cold feet to indicate hypothermia.¹

RESULTS

A total of 250 well infants were examined with local ethical clearance and maternal consent. Ambient temperatures were low (overall mean (SD) 17.0 (2.0) $^{\circ}\text{C}$). Forty five infants (18%) remained normothermic during both assessments, 126 (50%) showed evidence of cold stress, and 78 (32%) were hypothermic. Five (2%) infants showed a deterioration in thermal status during the examination.

Reliability

We assessed interobserver agreement of palpation for each observer pair. κ values were calculated to measure the degree of agreement between the pairs of observers using the three categories of assessment and interpreted using conventional guidelines. At 0.30 and 0.57 respectively, the degree of agreement can be said to be moderate to fair. When we merged the cold and stressed categories together, leaving just warm and cold categories, interobserver agreement improved to 0.40 (fair) and 0.69 (good) for the two pairs; this was equivalent to simply using peripheral assessment of the feet.

Validity

To assess the validity of touch for the detection of cold stress and hypothermia, we compared the findings of each observer using palpation with contemporaneous mercury thermometer readings. Table 1 shows sensitivity and specificity estimates for each observer. The sensitivity of palpation using the two site approach to detect hypothermia as distinct from cold stress was 11–42% depending on the observer. The specificity of palpation to detect hypothermia was 93–100%. Palpation using a comparison of central and peripheral palpation is a specific but insensitive method for detecting hypothermia. Sensitivity improves considerably if only peripheral assessment is used.

DISCUSSION

Two site palpation does not reliably detect cold stress or mild hypothermia because of low interobserver reliability. Palpation is a specific but insensitive method for detecting mild hypothermia. Sensitivity improves with decreasing temperature.

For practical reasons—that is, to identify a large number of newborns over a short period—this study was performed in hospital, but, given the grade of health worker who performed the temperature estimates for this study, the results are likely to be generalisable to a community setting.

A small Indian study has shown that, in a hospital setting, male doctors were able to determine hypothermia by touching the abdomen, but only four of the 50 (8%) infants were actually hypothermic.⁴ Thirty nine (78%) had cool feet, successfully detected in the vast majority of cases. However, a larger community based study by the Chandigarh community group led by Kumar has shown that mothers and female health workers find this more difficult, correctly identifying only half of the 61 cold infants from a population of 189.⁵ Colleagues in Kathmandu suggest that temperature assessment by touch may be more sensitive in the hands of male than female junior doctors (P Shrestha, personal communication). We speculate that this may be related to greater variance in superficial vascular flow in women than men. Our findings confirm significant interobserver variability between pairs of female health workers.

Temperature monitoring by touch underestimates the degree of hypothermia of newborn infants. In a few cases, the process of unwrapping contributes to the fall in temperature. It does, however, achieve improved levels of predictive power when infant core temperatures fall below 35°C . Combining the high sensitivity of peripheral palpation with the specificity of central palpation in selected cases may be the pragmatic solution.

Recommendations

In Bangladesh, where 94% of all births occur at home and 78% are delivered by traditional birth attendants, we recommend peripheral palpation for the detection of hypothermia in the first instance. If the infant's peripheries feel cool, we suggest that the traditional birth attendant should unwrap the infant and palpate the abdomen. If this is

Table 1 Sensitivity and specificity of touch to detect hypothermia (core temperature <36°C) for four observers using the two site or single site method

		2 site palpation (3 categories)	1 site palpation (2 categories)
Observer 1	Sensitivity	35%	94%
	Specificity	93%	36%
Observer 2	Sensitivity	42%	88%
	Specificity	95%	40%
Observer 3	Sensitivity	11%	82%
	Specificity	100%	74%
Observer 4	Sensitivity	25%	94%
	Specificity	99%	34%

also cold, then the infant requires further assessment and enhanced thermal care. This advice is in line with recently drafted guidelines extending the Integrated Management of Childhood Illness to the first week of life in Nepal.

Authors' affiliations

M Ellis, L Hunt, Centre for Child and Adolescent Health, Bristol University, UK

D Manandhar, Maternal and Infant Research Activities, Kathmandu, Nepal

S Barnett, International Perinatal Unit, UCL, London, UK

K Azad, Perinatal Care Project, DAB, Dhakka, Bangladesh

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Since the data reported here were collected under her supervision, Sister Purna Shrestha has died. This paper is dedicated to her memory.

Correspondence to: Dr Ellis, Hampton house, Cotham Hill, Bristol BS6 6JS, UK; m.ellis@bristol.ac.uk

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