

ASSESSMENT OF NEWBORN BABY'S TEMPERATURE BY HUMAN TOUCH: A POTENTIALLY USEFUL PRIMARY CARE STRATEGY

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ABSTRACT

Fifty healthy term neonates delivered at All India Institute of Medical Sciences Hospital were assessed by three pediatricians for skin temperature to the nearest $\pm 0.5^{\circ}\text{C}$ at the three body sites, i.e., mid-forehead, abdomen and dorsum of right foot by touch. The predicted temperatures at different sites were compared with simultaneously recorded temperatures at the same sites with the help of an electronic thermometer having a sensitivity of $\pm 0.1^{\circ}\text{C}$. Rectal temperature was also recorded in all the babies with a rectal thermister to compare the variations between the core and skin temperatures. There was a good correlation between the skin temperatures of the babies as perceived by touch and values recorded with the help of an electronic thermometer. All the hypothermic babies were correctly picked up by all the observers. There was good correlation between core temperature and skin temperature at different sites except forehead. It is amazing that even during the month of May, when ambient temperature was maintained between $26-28^{\circ}\text{C}$, nearly one fifth of the healthy term babies were under cold stress as evidenced by $>2^{\circ}\text{C}$ difference between the core and peripheral skin temperatures. It is recommended that health professionals and mothers should be explained the importance of evaluating the core and peripheral skin temperature by touch for

The newborn babies are physiologically homeothermic but their thermoregulatory mechanisms are often inadequate especially in the low birth weight (LBW) babies. Satisfactory maintenance of body temperature is one of the most crucial determinants of survival of LBW infants. Inadequate brown fat stores, greater body surface area relative to body weight, and frequently compromised nutritional and cardio-respiratory status, and infections predispose newborn babies to develop hypothermia(1). Hypothermia is a major problem in newborn babies in the community throughout the world. It is estimated that annually 17 million neonates develop hypothermia in the developing world(2).

It is mandatory to identify hypothermia early in order to reduce neonatal morbidity and mortality(3,4). Cold stress is an important cause of inadequate postnatal physical and even mental growth despite satisfactory caloric intake. Accurate monitoring of body temperature requires the availability of low reading clinical thermometer or electronic thermisters which are expensive and are not readily available. The routine monitoring of rectal temperature in term healthy babies is both unnecessary and unsafe.

The present study was undertaken to assess the hypothesis that the baby's tem-

early identification of babies under cold stress in order to prevent occurrence of life threatening hypothermia.

Key words: *Temperature assessment, Hypothermia, Electronic thermometer.*

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perature can be assessed with reasonable precision by human touch, the reliability of which can be enhanced by experience. Doctors, nurses, dais and mothers can thus be guided and trained to assess the baby's temperature by touch to identify hypothermia with ease and without delay. The present study also evaluated the differences in the simultaneously recorded temperatures at forehead, mid-abdomen, foot and rectum with the help of an electronic thermometer.

Material and Methods

Fifty neonates admitted in the rooming-in-ward of All India Institute of Medical Sciences Hospital during May, 1990 were taken in the study. All babies were term and healthy. The ambient temperature of the maternity ward was maintained between 26-28°C by central air conditioning. All infants received exclusive breast feeding.

Three pediatricians with varying levels of experience in the field of neonatology (P1 = MS 20 years, P2 = AKD 10 years, P3 = AKM 5 years) were asked to predict the skin temperature of the babies to the nearest 0.5°C at three different body sites, *i.e.*, centre of the forehead, abdomen (between epigastrium and umbilicus) and dorsum of right foot. The palpating hand was allowed to assume body temperature after the wash before evaluating the temperature. Whether to use the dorsum or palm of the hand for assessment was left to the discretion of the pediatrician.

Temperature at the above mentioned sites was also taken simultaneously with the help of a digital electronic thermometer (sensitivity $\pm 0.1^\circ\text{C}$) by an independent observer (GR). Rectal temperature was also recorded in all the babies with a

special rectal probe. Statistical analysis was done using Microstat software.

Results

Simultaneous recording of temperatures over the skin and rectum with an electronic thermometer showed that abdominal skin temperature values were 0.3°C lower than the core temperature readings. However, the temperature of foot was nearly 1.5°C lower than the core temperature values (*Table I*).

There was a good correlation between skin temperature at abdomen and foot as perceived by touch and the values recorded with the help of a digital thermometer (*Table II*). The discriminatory capability of the personnel to correctly perceive the skin temperature by touch was directly related to the experience of the pediatrician. The babies with skin temperature of $<36.5^\circ\text{C}$ were correctly picked up by all the observers in most instances (*Table III*). The sensitivity of diagnosing skin temperature of $<36^\circ\text{C}$ by touching the abdomen was 100% with a specificity of around 90%. Only one infant had an abdominal skin and core temperature of $<36^\circ\text{C}$ and it was correctly picked up by all the three observers. Four babies had abdominal skin temperature of

TABLE I—Mean Difference and Correlation of Temperature Between Core (rectal) and Skin at Different Sites with Digital Thermometer (DT)

Site	Mean difference \pm SD	Correlation* coefficient
Forehead	0.8020 \pm 0.4474	0.08325
Abdomen	0.3260 \pm 0.3069	0.70410
Foot	1.4380 \pm 0.880	0.72046

*Critical value (2-tail, 0.05 \pm 0.27841).

TABLE II—Correlation Between Skin Temperatures at Different Sites as Assessed by Touch (T) and Taken with a Digital Thermometer (DT)

Pediatrician code	Coefficient of correlation (r)		
	P ₁	P ₂	P ₃
Abdomen (T) and DT*	0.55015	0.28627	0.28655
Foot (T) and DT**	0.45413	0.40033	0.25725
Forehead (T) and DT***	-0.14660	-0.20243	-0.05129

* $p < 0.005$ for all the pediatricians

** $p < 0.05$ for P₁ and P₂, NS for P₃

*** p NS for all the pediatricians

TABLE III—Number of Hypothermic Sites (Skin Temperature $< 36.5^{\circ}\text{C}$) Correctly Diagnosed by Touch

Pediatrician code	Forehead (n = 46)*	Abdomen (n = 4)*	Foot (n = 39)*
P1	45	4	39
P2	45	3	38
P3	43	3	38

* Hypothermic ($< 36.5^{\circ}\text{C}$) temperature picked up by digital thermometer.

$< 36.5^{\circ}\text{C}$ while 39 babies had foot temperature of $< 36.0^{\circ}\text{C}$.

Discussion

Early recognition of hypothermia by the mother or health worker is crucial to institute corrective action to reduce the severity of hypothermia and improve the survival of newborn babies. It appears that with training and experience, human touch can accurately predict the temperature of abdomen or an extremity with an accuracy of $\pm 0.5^{\circ}\text{C}$. The physicians should usefully exploit and harness this capability while evaluating newborn babies as it has high degree of sensitivity and reasonably good specificity. The thermal sensitivity to touch can be enhanced by concerted efforts and

experience. The abdominal temperature in a neonate is representative of the core temperature and it is reliable for the diagnosis of hypothermia. Most babies in our study were normothermic but skin/core temperature was $< 36.5^{\circ}\text{C}$ in 4 babies. It has been suggested that the peripheral skin temperature of lower by more than 3°C as compared to core temperature should be taken as a clinical criterion for the diagnosis of neonatal sepsis or shock(6,7). In our study, temperature of the feet was lower by more than 1.5°C as compared to the core temperature in 21 out of 50 healthy newborn babies. We were rather surprised to find that in 10 babies in our study the foot temperature was lower by more than 2°C as compared to the core temperature. These infants were apparently under cold

stress but none had any evidences of septicemia. The cold feet were relatively pale while warm feet appeared healthy and pink.

The mothers, dais, nurses and doctors can be trained to assess baby's temperature by touching the abdomen and feet. When the baby's feet are warm and pink it indicates that the baby is in thermal comfort but when feet are cold and abdomen is warm, it indicates that the baby is in cold stress. In hypothermia, both feet and abdomen become cold, indicating a need for urgent attention to the baby. There is a need to test the validity of these observations in the field setting after imparting training to the basic health professionals and mothers.

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