

# COMPARISON OF RECTAL AND AXILLARY TEMPERATURES IN NEONATES ADMITTED TO A NEONATAL UNIT

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## ABSTRACT

To determine whether axillary temperature could be used as an alternative to rectal temperature, 45 neonates were subjected to simultaneous rectal temperature and axillary temperature recordings. Each baby had an average of 10 recordings over the first 72 hours. The mean of these readings was taken and subjected to regression analysis and the 't' paired test. The overall mean difference between the rectal and axillary temperature was 0.3°F. The mean difference was least in preterm small for date (SFD) babies (0.2°F) and most in preterm appropriate for date (AFD) babies (0.5°F). The mean difference was less in incubator babies (0.2°F) compared to those in warmer cradles (0.4°F). The regression analysis showed that the correlation was good in all groups except the term small for date babies. We conclude that axillary temperature could be used as an alternative to rectal temperature in neonates.

**Key words :** Temperature, Neonate.

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Thermoregulation is a major problem in the neonatal period and fluctuation in the temperature can cause problems to the neonate. Frequent temperature recordings are therefore necessary. Usual sites of temperature recordings in neonates are skin, axilla, rectum while auditory canal and skin mattress temperatures have also been used(1,2). Rectal temperature is a reasonable measure of core temperature; the length of the thermometer to be inserted varies from 2-4 cm. However, rectal temperature recordings can be hazardous causing problems such as infection and trauma(3,4). Axillary temperature can be recorded easily, is less traumatic and less likely to spread infection. Hence, a prospective study was done to compare rectal and axillary temperatures in newborns admitted to the neonatal unit.

## Material and Methods

All babies admitted to the neonatal unit had simultaneous measurement of rectal and axillary temperature. Both the temperatures were recorded every 6 h, for the first 48 to 72 hours. The mean number of readings per baby was  $10 \pm 2$ . The mean value of each baby's recordings were taken and the difference between the axillary and rectal temperature was noted. The values were compared using the 't' paired test and were also subjected to regression analysis.

Rectal temperature was recorded using a rectal thermometer which was inserted for 2.5cm and the reading was taken after 2 minutes. The axillary temperature was recorded in the axilla using an ordinary clinical thermometer and the reading was taken after 3 minutes. Assuming the following relationship: oral temperature = axillary temperature + 1°F; oral temperature = rectal temperature - 1°F(5), readings were subjected to the following modi-

fications: axillary temperature  $+1^{\circ}\text{F}$  = recorded axillary temperature (t Ax) and rectal temperature  $-1^{\circ}\text{F}$  = recorded rectal temperature (t Rec).

## Results

A total of 45 babies were studied. All babies were less than 7 days old; 23 were preterm and 22 were term. Of the 23 preterm babies, 13 were appropriate for date (AFD) and 10 were small for date babies (SFD). Of the 22 term babies, 9 were appropriate for date and 13 were small for date. The weight of the babies ranged from 750 g to 4500 g and the gestation ranged from 30 to 40 weeks. Sixteen sets of recordings were taken when the babies were in the 'warmer cradle' and 31 sets of readings were taken when the babies were in the incubator (this overlap is because few babies were both in incubator and warmer cradle during the study period). The rectal temperature (t Rec) ranged from  $95^{\circ}$  to  $101.6^{\circ}\text{F}$  and axillary temperature (t Ax)

ranged from  $94.6^{\circ}\text{F}$  to  $101.2^{\circ}\text{F}$ . The mean rectal temperature was  $97.8^{\circ}\text{F}$  and the mean axillary temperature was  $98.2^{\circ}\text{F}$ . The mean difference between the paired rectal and axillary temperatures was statistically significant in all the groups except the preterm small for date babies. The mean difference between the rectal and axillary temperatures was more in the warmer cradle group  $0.4^{\circ}\text{F}$  than in the incubator group  $0.2^{\circ}\text{F}$  (Table I).

The rectal and axillary temperature values among the various groups were further subjected to regression analysis. The correlation was good in all the groups except the term small for date group ( $r=0.1$ ). The best correlation was in the preterm small for date babies ( $r=0.91$ ) and the preterm appropriate for date babies ( $r=0.83$ ). Moderate correlation was present for all categories of babies ( $r=0.5$ ) and in the full term appropriate for date babies ( $r=0.56$ ), the correlation did not vary when the babies were in the incubator

TABLE I—Comparison of Axillary and Rectal Temperature

Groups	(n)	Axillary temp. in $^{\circ}\text{F}$ mean (SD)	Rectal temp. in $^{\circ}\text{F}$ mean (SD)	Mean difference (SD)	p value
Total	(45)	98.2 (2.6)	97.8 (0.6)	0.28 (0)	>0.001
Term/AFD	(9)	98.3 (0.6)	98.1(0.35)	0.22(0.5)	0.02
Term/SFD	(13)	98.4 (0.5)	97.9(0.38)	0.23(0.6)	>0.001
Preterm/AFD	(13)	98.1 (0.5)	97.9(0.42)	0.45(0.3)	0.02
Preterm/SFD	(10)	98.1 (0.7)	97.9 (0.7)	0.17(0.3)	0.1
Incubator	(31)	98.1 (0.4)	97.8 (0.4)	0.24(0.3)	>0.001
Warmer cradle	(16)	98.5 (0.6)	98.1 (0.6)	0.36(0.5)	>0.001

Actual readings modified as follows:

Rectal  $-1^{\circ}\text{F}$ ; axillary  $+1^{\circ}\text{F}$ .

( $r=0.68$ ) or in the warmer cradle(0.5).

The mean (SD) incubator temperature was  $92.8 \pm 1^\circ\text{F}$  and the mean (SD) room temperature was  $78 \pm 0.7^\circ\text{F}$ .

### Discussion

Many studies have been done to compare temperature recordings at different sites(2,5,6). In all studies there has been difference in the rectal and axillary temperature with the rectal being higher in most of the studies. The difference between the rectal and axillary temperature varied from  $+0.48^\circ\text{C}$  in term and  $+0.24^\circ\text{C}$  in preterm babies(2) to  $+0.02^\circ\text{C}$  in term to  $-0.01^\circ\text{C}$  in preterm babies(6) and  $+0.49^\circ$  in a third study.

In our study the mean difference was  $0.3^\circ\text{F}$  which is comparable to those reported previously. The small mean difference in our study may be because of the modifications done to the actual reading (rectal temp  $-1^\circ\text{F}$  and axillary temperature  $+1^\circ\text{F}$ ). The previous studies have been done on normal babies and stabilization time has been used(2,6) (that is the time taken for temperature to stabilize). However, we have used a standard recording time of 2 and 3 minute for rectal and axillary recordings, respectively.

According to our study the difference between axillary and rectal temperature was statistically significant in neonates and in all groups of babies and the difference remains statistically significant whether the

baby is kept in an incubator or warmer cradle. Only in the preterm small for date babies the difference was not significant. Regression analysis shows that the correlation of axillary and rectal temperature was satisfactory in all groups of babies except the term small for date babies. We conclude that axillary temperatures with the above mentioned modification can be used to measure temperatures in sick neonates instead of the rectal temperature.

### REFERENCES

1. Edmund H, Scopes JW. Thermoregulation in newborn. *In: Neonatology: Pathophysiology and Management of the Newborn*, 3rd edn. Ed Avery GB. Philadelphia, J.B. Lippincott Co, 1987, p 209.
2. Khan MN, Ahmed SH, Fakhir S. Comparison of temperatures at different sites in the term and preterm neonates. *Indian Pediatr* 1990, 27: 801-809.
3. Frank JD, Brown S. Thermometers and rectal perforations in the neonate. *Arch Dis Child* 1978, 53: 824-825.
4. Martin W. Hazards of temperature taking. *Br Med J* 1970, 3: 4-5.
5. Mary JFE, Meier RS, Miller C. Temperature measurement in infants. *Nurs Res* 1974, 23: 457-460.
6. Mayfield SR, Bhatia J, Nakamura KT, Rios GR, Bell EF. Temperature measurement in term and preterm neonates. *J Pediatr* 1984, 104: 271-275.