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Original Article

To assess the thermoregulation of neonates in the postnatal wards of the hospital: A prospective study

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ABSTRACT

Introduction: Hypothermia is a major cause of neonatal morbidity and mortality. **Objective:** To know the frequency of hypothermia in the postnatal wards and to know the relation of gestation and birth weight with the temperature of the neonates. **Materials and Methods:** Rectal temperature of 420 consecutive neonates shifted to postnatal wards of the hospital was measured. The gestation and birth weight of the neonates were recorded. The details were entered, and association of temperature to the birth weight and gestation was calculated. **Results:** About 70% of the neonates showed mild hypothermia. Gestation and weight of the neonates showed no significant association. **Conclusion:** The study shows the need to have more vigorous efforts to maintain the temperature in all the neonates in the postnatal wards.

Key words: *Hypothermia, Neonates, Postnatal wards*

Neonatal hypothermia is recognized as a major contributing factor for the morbidity and mortality of neonates by the World Health Organization [1]. Many studies have been done, especially in the developing countries in a controlled environment as well as in the community to study the burden of hypothermia and its effects [2,3]. A number of studies have also been done in low-resource settings to show the burden of hypothermia [4,5]. To decrease the neonatal mortality rates, prevention and treatment of hypothermia are one of the important therapeutic principles during and after resuscitation in both developing and developed settings [6,7]. A few studies have shown the temperature instability owing to the gestation of the neonates [4,8] and also low birth weight (LBW) of the neonates [4,9].

MATERIALS AND METHODS

The study was conducted on 420 consecutive neonates shifted to the postnatal wards of a tertiary care center in southern part of India during the months between June and September. Informed consent was taken from the mothers of the respective neonates included in the study. Neonates who were stable and on direct breastfeeds or pallade feeds were included in the study. Exclusion criteria were neonates with APGAR score <7 at 5 min after birth, neonates with congenital anomalies, babies with a birth weight of <1800 g, babies <35 weeks of gestation, neonates on intravenous fluids, intravenous antibiotics, and phototherapy. After delivery, the neonates were placed under the radiant warmer. The neonates were wiped with dried cloth and wrapped with a fresh dry cloth. The neonates were shifted to the postnatal wards by mothers' side within 30 min of birth. The postnatal ward is a general ward with open room for mothers and babies with no air conditioning or central heating system. The mothers were instructed to cloth the babies and were placed next to the mothers in a single bed; though, kangaroo mother care was not practiced. Soiled clothes were changed as and when required. All the neonates were on exclusive breastfeeding.

The details of the neonates such as gender, gestation, weight, length, head circumference, associated complications, if any, were noted. Room temperature was measured every day which ranged between 28°C and 30°C. The temperature of all the neonates included in the study was recorded in the morning between 7:30 and 8:00 am using a rectal thermometer [10]. The measuring range in the thermometer was 32-42°C with the nearest tenth of degree accuracy. The thermometer was sterilized with 70% alcohol before each use. The lubricated bulb of the rectal thermometer was placed one-half to one inch inside the rectum and temperature measured after 2 min. The temperature criteria were according to the World Health Organization classification of hypothermia [10]. A temperature of >36.5°C was normal, 36-36.4°C was defined as mild hypothermia, 32.0-35.9°C as moderate hypothermia, and <32.0°C as severe hypothermia [10]. The neonates who were recorded with a temperature of <36.5°C were placed under the

warmer. The temperature was rechecked every 30-45 min till the temperature was >36°C and later nursed by mother's side. Neonates with gestation at birth ≥37 weeks were taken as full term babies and <37 weeks as preterm babies. The gestation was recorded in completed number of weeks, and weight of the neonates was recorded to the nearest 10 g. The neonates were classified into two groups based on the weight ≥2.5 kg and <2.5 kg.

All the data were entered in an excel sheet and were imported to SPSS 18.0 version for the statistical analysis. The percentage on neonates with hypothermia was estimated with 95% confidence interval. Further, cross tables were developed with the association of rectal temperatures of the neonates with the gestation at birth as well as the birth weight of the neonates. Chi-square test was employed to test for the statistical significance.

RESULTS

The study sample consisted of 420 neonates with 208 males and 212 females. As shown in Table 1, out of 420 neonates, 397 (94.5%) were ≥37 weeks of gestation as compared to 23 neonates with <37 weeks of gestation. Among the 397 full term neonates, the temperature of <36.5°C was recorded in 288 neonates. 208 (52.4%) full term neonates had temperature between 36°C and 36.4°C, and 80 (20.2%) neonates had temperature between 32°C and 35.9°C. Among 23 preterm neonates, 14 (60.9%) neonates had temperature between 36°C and 36.4°C and 5 (21.7%) had temperature between 32°C and 35.9°C. Rest of the 113 babies (26.9%) had temperature ≥36.5°C. However, the analysis of the data according to the gestation and temperature did not reveal any significant association (p=0.565).

Of the 420 babies, 175 (41.7%) had birth weight of <2.5 kg as compared to 245 (58.3%) babies with birth weight of ≥2.5kg. Among the neonates with birth weight of <2.5 kg, 99 (56.6%) had temperature between 36°C and 36.4°C, and 30 (17.1%) had temperature between 32°C and 35.9°C. Among the neonates with birth weight of ≥2.5 kg, 123 (50.2%) had temperature between 36°C and 36.4°C, and 55 (22.4%) had temperature between 32°C and 35.9°C. Rest of the 113 babies (26.9%) had temperature >36.5°C. Association of birth weight with temperature revealed that both groups had an equal proportion of normothermic babies (46 babies, 26.3% vs. 67 babies, 27.3%). Slightly higher percentage of neonates with weight <2.5 kg (56.6%) had mild hypothermia as compared to those with weight of ≥2.5 kg (50.2%). However, the analysis of the data according to the body weight and temperature did not reveal any significant association (p=0.325).

DISCUSSION

The body temperature of the neonate in utero is generally 0.5°C higher than the mother's temperature [7], and there is rapid cooling of core temperature at the rate of 0.1°C and skin cooling at the rate of 0.3°C after delivery [11,12]. Few studies showed that there is hypothermia in just 1% of the neonates immediately after birth while most of them start maintaining the temperature by 24 h of life [12]. Very few studies of Indian origin are available to know the prevalence of hypothermia in India. The present study was conducted in the postnatal wards in a hospital where the warm chain is maintained from the time of birth of the baby by drying the baby immediately, delaying the bathing, placing the baby next to the mother. In spite of all the measures, mild to moderate hypothermia was noticed in the postnatal wards.

Brown fat which can be identified after 26 weeks of gestation constitutes for 1.4% of body mass [13]. Hence, preterm babies are more susceptible to altered thermoregulation while term babies maintain good temperature because of the distribution of brown fat [10,13-17]. In the present study, 27.5% of the full term neonates maintained normal temperature as compared to 17.4% of the preterm babies. There was no statistical significance in the association between the gestation and temperature. It was a similar state even in the other temperature ranges.

About 1.4% of the body mass is constituted by brown adipose tissue in a newborn of >2 kg. In the present study, marginally higher percentage of LBW neonates (56.6%) were

Table 1: Association of temperature of neonates with gestation at birth and birth weight

Factor	Neonate temperature, n (%)			
	32-35.9°C	36-36.4°C	>36.5°C	Total
Gestation (in weeks)				
Full term (≥37)	80 (20.2)	208 (52.4)	109 (27.5)	397 (94.5)
Preterm (<37)	5 (21.7)	14 (60.9)	4 (17.4)	23 (5.5)
		Chi-square=1.41, df=2, p=0.565		
Neonate birth weight (kg)				
<2.5	30 (17.1)	99 (56.6)	46 (26.3)	175 (41.7)
≥2.5	55 (22.4)	123 (50.2)	67 (27.3)	245 (58.3)
		Chi-square=1.41, df=2, p=0.325		
Total	85 (20.2)	22 (52.9)	113 (26.9)	420

mildly hypothermic as compared normal weight (50.2%) neonates. However, no significant association was seen between body weight and temperature. A study by Kambarami and Chidede [18] shows an association of birth weight to cold stress in newborns. Kumar and Agarwal [19] showed 38% hypothermia in home delivered babies while a community-based study in Shivgarh showed the prevalence of 49% hypothermia in LBW and 43% in normal birth weight babies [20].

In the present study, the temperature was measured in the morning every day. Studies where continuous monitoring of the temperature have shown better identification of hypothermia in neonates [20,21]. Lack of knowledge among health workers and mothers of simple methods to maintain the warm chain from birth has been found to be the most common factor contributing to hypothermia [22-25].

The temperature was maintained by drying the babies immediately after birth, placing them under the radiant warmer. However, drop in core temperature occurred when the neonates were transferred to the postnatal ward. This represented an avoidable additional cold stress on an infant with the prolonged time taken for core temperature to recover to 36°C. It was noted especially during the first and second day of life. In the present study, it was noticed that the mothers would often keep the neonates open for some time while changing the diapers and also while feeding. These may have been the reasons for the mild hypothermia noticed in the babies though these were not statistically significant.

Few similar studies done previously also showed that 44-63% of uncomplicated neonates had hypothermia depending on the season. This was a limiting factor in the present study where seasonal changes with body temperature were not measured. Further studies are needed for the same.

CONCLUSION

A better approach to maintain the warm chain is necessary to maintain the temperature in the neonates irrespective of the weight or gestation of the neonates.

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