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Original Research Article

Evaluating the optimal duration of skin-to-skin contact for normothermia in a newborn: an observational study

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ABSTRACT

Background: The Neonatal Resuscitation Program (NRP) emphasizes the prevention of hypothermia by providing skin-to-skin contact (SSC) immediately after birth on the mother's abdomen as a part of routine care for all neonates who cry immediately after birth. However, the duration of SSC in achieving normothermia immediately after birth has not been studied. The duration of SSC for 1 hour is usually consensus-based. In a public sector tertiary care hospital, practicing SSC for one hour may not be feasible because of the high delivery load. Therefore, we studied the minimum duration of SSC immediately after birth necessary to attain normothermia in newborns.
Methods: 525 newborns (≥34 weeks and weight≥1800 grams), who cried immediately after birth, were placed on the mother's abdomen for routine care. Axillary temperature was monitored using a digital thermometer at 20 min, 30 min and 40 min during SSC. Newborns were observed for breastfeeding within one hour and exclusive breastfeeding at discharge. The chi-square test was used to analyze the data.
Results: 389/525 (74.1%), 507/525 (96.6%) and 525/525 (100%) of newborns achieved normothermia at 20 min, 30 min and 40 min of SSC, respectively. 391/525 (74.5%) of babies were breastfed within the first hour and 486/525 (92.6%) of babies were discharged on EBF. Breastfeeding within 1 hour of birth was significantly higher in the group of newborns who achieved normothermia within 20 minutes of immediate SSC (p value<0.001).
Conclusions: A minimum of 30 minutes of SSC immediately after birth is required to achieve normothermia in a term or near-term newborn, which is feasible and scalable in high delivery load facilities.

Keywords: Duration of skin-to-skin contact, Early initiation of breastfeeding, Neonatal hypothermia, Neonatal resuscitation program, Routine care

INTRODUCTION

Normothermia in a newborn is defined within the range of 36.5°C to 37.5°C, while temperatures below 36.5°C are classified as hypothermia.[1] Hypothermia can cause respiratory distress, acid-base imbalances, shock, altered cerebral blood flow, severe intraventricular haemorrhages, coagulation defects, necrotizing enterocolitis, acute renal failure and potentially fatal outcomes in the absence of timely interventions.[2] Each 1°C fall in core body temperature in a newborn escalates the risk of mortality by 80%.[3] Maintenance of a newborn's temperature is, therefore, a significant and critical intervention for survival. The WHO recognizes temperature maintenance as a pivotal element of newborn care within the ten steps of the warm chain, which includes SSC.[4]

As per the NRP, a newborn should be kept in SSC with the mother for routine care.[5] SSC involves placing the newborn on the mother's abdomen in a frog-legged position, in between the breasts and the head turned sideways, where they receive warmth and are breastfed.[4,6] The immediate postnatal period poses a risk of the

newborn's temperature reduction by 2-4°C or more, depending on the effectiveness of thermal protection measures employed.[7] Despite the well-established benefits of SSC, there are no specific guidelines available regarding the minimum duration of SSC immediately after birth to achieve normothermia.

Currently, the practice of SSC immediately after birth for 1 hour is mainly based on consensus and not evidence-based. In a public sector referral hospital, practicing SSC for one hour is not feasible because of the high delivery load.

Therefore, the primary objective was to ascertain the minimum duration of SSC immediately after birth during routine care necessary to attain normothermia in newborns. Additionally, we assessed the proportion of newborns breastfed within the first hour of birth and the prevalence of exclusive breastfeeding at discharge.

METHODS

This prospective observational study was conducted in the Department of Pediatrics and Department of Obstetrics and Gynecology, UCMS and G.T.B. Hospital, Delhi, a tertiary care teaching hospital from September 2022 to February 2024. Approval from the ethical committee of the institute was obtained (IECHR-2022-55-47). The study was registered under the Clinical Trials Registry of India (CTRI/2023/01/049152). Written informed consent was obtained from the parents.

All the relevant maternal clinical condition was discussed with the obstetrician and a pre-resuscitation team briefing was done as per the standard NRP. All singleton uncomplicated vaginal deliveries with birth weight ≥1800 grams and ≥34 weeks of gestation were included. Baby requiring NICU admission due to any reason immediately after birth, neonates requiring resuscitation, vacuum and forceps delivery and major congenital malformations were excluded.

Normothermia was defined as an axillary temperature of 36.5°C to 37.5°C in the study, as defined by WHO.[1] The delivery room temperature was maintained at 26-28°C using a centralized heating, ventilation and air conditioning (HVAC) system and monitored using a wall-mounted thermometer. Immediately after delivery, the baby was placed on the mother's abdomen and routine care was provided as per NRP (Figure 1).[8] The baby was placed in a frog-legged position over the mother's abdomen in between the breasts and the head turned sideways. The back of the baby was covered with a standard pre-warmed cotton linen.

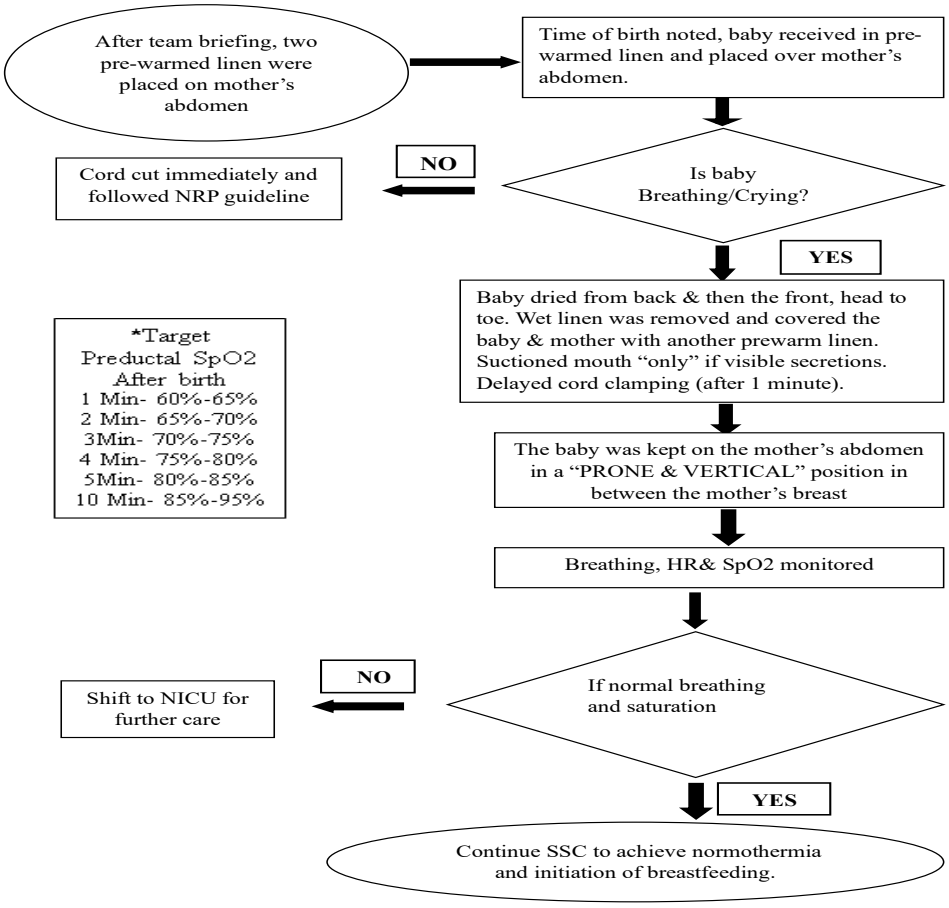

Figure 1: Steps of providing routine care for the newborn.[8]

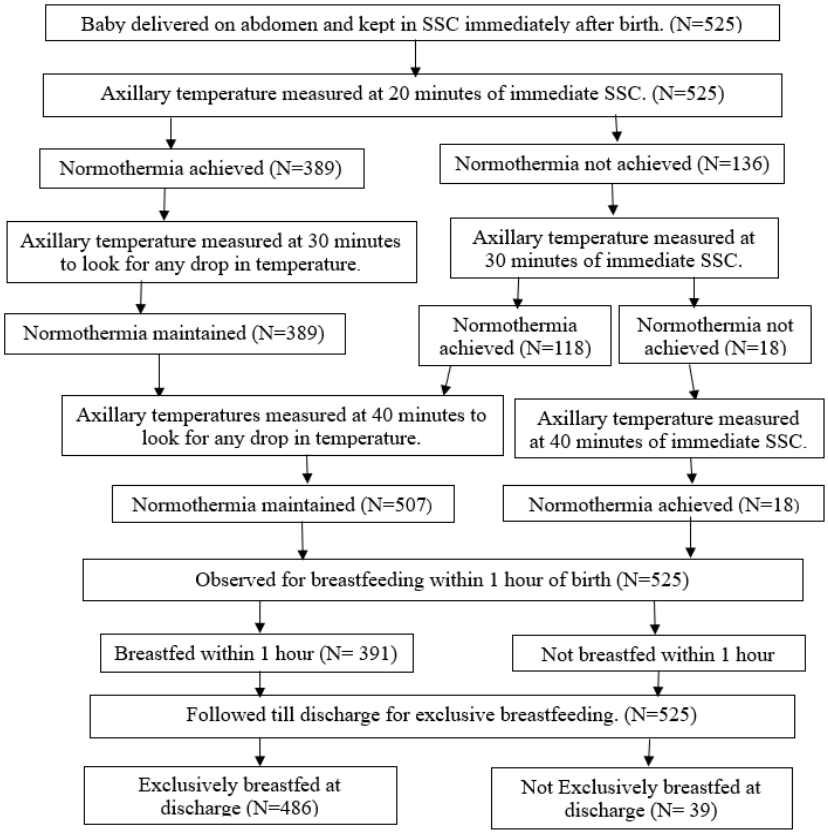

Figure 2: Flow of participants in the study design.

Each baby enrolled in the study was serially monitored for their axillary temperatures using a digital thermometer, at 20 min, 30 min and 40 min of SSC. They were observed for breastfeeding for 1 hour. They were also followed up closely for exclusive breastfeeding at discharge. The flow of participants in the study has been highlighted in Figure 2.

Sample size

There is no study available where newborns were assessed for the duration of SSC immediately after birth to achieve normothermia. In a study conducted by Luma Maiara et al, to analyze the occurrence of hypothermia in neonates before and after bathing in the first hours of life, with a sample consisting of 149 newborns with a gestational age of ≥ 35 weeks and a weight of ≥2000 g.[9] The prevalence of hypothermia was observed in 12% at 1 hour of life. Therefore, the Prevalence of Normothermia at 1 hour is 88%. Assuming a prevalence of normothermia at 40 min, to be 75%, Type-1 error (α) of 5% and relative marginal error of 5%, a sample size of a total of 525 cases was calculated.

Statistical analysis

All the data were entered in MS EXCEL and analyzed using SPSS software. Continuous parametric data, like period of gestation and birth weight, were reported as means and standard deviation. Categorical variables like the sex of the participants, normothermic cases at various time intervals and breastfeeding rates at 1 hour and discharge were reported as percentages. The comparison of categorical data was done using the Chi-square test between two or more groups and within the groups. A p value of less than 0.05 was considered statistically significant.

RESULTS

A total of 525 newborns were enrolled. The flow of participants is shown in Figure 2. The demographic data of the newborns is shown in Table 1. Out of 525 newborns, 273 (52%) were females and 252 (48%) were males. The mean (SD) period of gestation of 38.41 (1.67) weeks (range-34 to 42 weeks) and the mean (SD) birth weight of 2881.07 (419.14) grams (range 1827-4100 grams). 389/525 (74.1%), 507/525 (96.6%) and 525/525 (100%) of newborns achieved normothermia at 20 min, 30 min and 40 min of SSC after birth, respectively (Table 2).

391/525 (74.5%) of babies were breastfed within the first hour. 486/525 (92.6%) of babies were discharged on exclusive breastfeeding. Out of the 389 babies who achieved normothermia at 20 min of SSC, 307 (78.9%) were breastfed within 1 hour. Out of the 118 newborns who achieved normothermia in the 30 minutes of SSC, 75 (63.6%) newborns were breastfed within 1 hour of birth, while only 50% (9 out of 18) newborns who required 40

minutes of SSC to achieve normothermia were breastfed within 1 hour of birth. Breastfeeding within 1 hour of birth was significantly higher in the group of newborns who achieved normothermia within 20 minutes of SSC (p value <0.001) (Table 3).

Table 1: Demographic details of the newborns enrolled.

Demographic details		
Period of gestation, mean (SD) weeks	38.41 (1.67)	
Sex	Males	252 (48%)
	Females	273 (52%)
Weight, mean (SD) grams	2881.07 (419.14)	

Table 2: Distribution of cases according to temperature measurement done at each interval of skin-to-skin contact (n=525).

Interval	Number of cases	
	Normothermia (36.5°C – 37.5°C)	Mild hypothermia (36- 36.4°C)
Measurement at 20 minutes of SSC	389 (74.09%)	136 (25.9%)
Measurement at 30 minutes of SSC	507 (96.57%)	18 (3.42%)
Measurement at 40 minutes of SSC	525 (100%)	0 (0%)

Table 3: Association of breastfeeding rates within 1 hour to duration of SSC required to achieve normothermia.

Interval	Breastfed within one hour	Normothermia		P value
		Achieved	Not achieved	
SSC at 20 minutes	Yes	307 (78.9%)	84 (61.8%)	<0.001
	No	82 (21.1%)	52 (38.2%)	
SSC at 30 minutes	Yes	75 (63.6%)	9 (50%)	0.270
	No	43 (36.4%)	9 (50%)	
SSC at 40 minutes	Yes	9 (50%)	-	-
	No	9 (50%)	-	

DISCUSSION

Authors conducted this study to ascertain the duration of SSC immediately after birth to achieve normothermia in neonates born through normal vaginal delivery by serially monitoring the axillary temperatures of the newborns, using a digital thermometer at 20 min, 30 min and 40 min of life. The results of the study revealed that 507/525 (96.6%) newborns were normothermic at 30 min, signifying that about half an hour of immediate SSC may achieve thermal stability in a newborn. Nimbalkar et al.[10]

In 50 newborns with a comparable mean birth weight and mean gestational age, a mean temperature of 36.89±0.24°C was measured at 30 minutes of life in the SSC group, but after providing initial care under a radiant warmer. Similarly, Christensson et al.[11] In 25-term healthy neonates, the recorded mean axillary temperatures in the SSC group as 36.7±0.38°C at 30 minutes. In contrast, Fardig et al demonstrated that 17-term healthy newborns of birth weight >2500 grams achieved mean skin temperatures exceeding 36.5°C (normothermia) within 6 minutes of SSC, which may be attributed to the broader gestational age and birth weight spectrum in our cohort.[12] Additionally, our temperature measurements commenced after 20 minutes, with three readings taken at 10-minute intervals using a digital axillary thermometer, whereas Fardig et al, employed an electronic thermometer attached to the abdominal skin, recording temperatures every 3 minutes up to 45 minutes post-birth, minimizing assessment interruptions.[12] Bystrova et al reported a mean axillary temperature of 34.5±1.21°C at 30 minutes of life in the 44 newborns in the SSC group, with normothermia attainment occurring later, specifically at 120 minutes.[13] This could be attributed to the differing post-birth care protocols. In Bystrova et al's study, infants first underwent routine care under a radiant warmer, followed by washing under tap water and subsequent care by a midwife, including weighing and anthropometric measurements. SSC was initiated at an average time of 22 minutes after delivery.

Whereas the study implemented immediate SSC initiation after birth, with postponement of weighing and other procedures. Bergman et al.[14] Conducted a similar study on 18 newborns with a mean birth weight of 1813±260 grams and a mean gestation of 34.2±1.9 weeks, achieved normothermia at around 120 minutes in the SSC group, which is delayed as compared to our study, probably because of the higher mean birth weight and gestation in our study group. Furthermore, the study encompassed a

significantly larger sample size of 525 newborns, which enhances the generalizability of the findings.

Through the study, authors found that 96.6% of newborns attained normothermia within 30 minutes of SSC with the mother. Thus, we conclude that SSC lasting for nearly 30 minutes can be deemed an effective and physiologically sound method for warming healthy-term or near-term newborns. The duration of the third stage of labor (the time between the delivery of the baby and the expulsion of the placenta) is nearly 6-30 minutes.[15] Immediate SSC can thus readily be administered on the delivery table during the delivery of the placenta, concurrently with the suturing of episiotomy or tears, following the NRP guidelines.

According to NFHS-5 data, 44.7% and 40.7% of children under 3 years of age were breastfed within one hour of birth in urban and rural India, respectively.[16] In our study, we found that out of 525 newborns, 391 (74.5%) were breastfed within the first hour of birth, which is higher as compared to the NFHS data. Also, 486/525 (92.6%) were discharged on EBF from the postnatal ward in our study. Thus, we found that SSC has a positive impact on breastfeeding rates. Carfoot et al in their study on term newborns kept in SSC also showed that 89/98 (91%) newborns had their first successful breastfeeding.[17] Gabriel et al found 118 newborns with a mean gestational age of 38.9±1.3 weeks and a mean birth weight of 3166.2±389.2, kept in SSC with their mothers, showed that 100/118 newborns (84.7%) were discharged on EBF.[18]

The results in their study were comparable to our study, probably because of similar gestational age and birth weight profile. Srivastav et al also in their study on 122 term newborns with a similar mean birth weight of 3.004.79±352 grams cared for in SSC by their mothers, they found nearly 86.1% were exclusively breastfed at the 4th day of life.[19] Thukral et al, showed that EBF rates at 48 hours were significantly higher in the early-SSC group infants than those in the control group at 48 h.[20] (relative risk (RR): 2.5, 95% confidence interval (CI): 1.4–4.3) demonstrates the positive impact of SSC on breastfeeding rates.

In the study, authors also found that breastfeeding within 1 hour of birth was significantly higher in the group of newborns who achieved normothermia within 20 minutes of immediate SSC (p value<0.001). However, there is no study available that establishes a relationship between these two variables. To explain the findings, we propose that the newborns who achieved normothermia within 20 minutes of birth might have higher catecholamine levels, which makes them more active and perhaps higher basal metabolic rates, which help them to achieve normothermia sooner as well as effective breast crawl and breastfeeding early, as compared to newborns who achieve normothermia later. Also, authors propose that higher maternal oxytocin levels, bonding with their newborns and confidence could explain the better milk letdown reflex, allowing for early and exclusive breastfeeding.

CONCLUSION

Temperature maintenance is the first step immediately after birth in routine care of a newborn as per the NRP. SSC is a low-cost intervention for achieving normothermia in a newborn in LMICs. We recommend that a minimum of 30 minutes of SSC immediately after birth is required to achieve normothermia in a term or near-term newborn, which is feasible and scalable in high delivery load facilities. High rates of babies being breastfed within the first hour and a substantial proportion being discharged on exclusive breastfeeding support the multifaceted benefits of SSC. Authors also suggest multi-center studies to ascertain the minimum duration of SSC required to achieve normothermia in newborns to reconfirm the findings.

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