



A STUDY TO ASSESS THE EFFECTIVENESS OF PLASTIC BAG WRAPPING IN REDUCING MORBIDITIES AMONG PRETERM NEONATES

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ABSTRACT

Thermal management of the preterm infant is a cornerstone of neonatology because thermal stress is an important determinant of survival. Premature infants are born without the adaptive mechanisms needed for survival outside of the womb. These fragile infants require thermoprotective interventions that begin in the delivery room. Current heat preservation interventions such as a pre-warmed delivery room, warm blankets/towels, drying, radiant warmer tables, and skin-to-skin with mother are not as effective in preserving heat in the smallest of infants.

Despite the use of current heat preservation strategies premature infants remain vulnerable to hypothermia and associated morbidities and mortality. This evidentiary review will explore the most recent research on occlusive skin wrap in the delivery room for heat preservation in the premature infant and preventing the morbidities.

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INTRODUCTION

One of the most critical factors in the survival of newborn babies is the satisfactory maintenance of their body temperature. Birth is a major challenge to the newborn to negotiate successfully from Intrauterine to extra uterine life. At birth, the newborn must adopt to transition from warm uterine environment to the cooler extra uterine environment to maintain stable body temperature.

The temperature range during which the basal metabolic rate of the baby is at a minimum, oxygen utilization is least and baby thrives well is known as 'Thermo- neutral range of temperature' or 'Neutral Thermal Environment. For each baby, this range of temperature varies depending on gestational age.

Newborn loses heat by evaporation particularly soon after birth (due to evaporation of amniotic fluid from skin surface), conduction (by coming in contact with cold objects-cloth, tray etc.), convection (by air currents in which cold air replaces warm air around baby-open windows, fans) and radiation (to colder solid objects in vicinity-walls). The process of heat gain is by conduction,

convection and radiation in addition to non-shivering thermogenesis.

Infants are most at risk for hypothermia in the first few minutes to hours after birth, when they are first removed from the thermally regulated intrauterine environment. The use of plastic bag wrapping in preterm neonates in addition to routine care after delivery helps in maintaining temperature level and prevention of morbidities.

MATERIALS AND METHODS

Study Design

In this single-centre randomized controlled trial conducted at the rural tertiary Hospital in Chidambaram, Tamilnadu, a standard thermoregulation care strategy (control group) was compared with a strategy including standard thermoregulation care plus wrapping of the newborn in a low-cost polyethylene bag (intervention group).

Infants born at the hospital were eligible for inclusion if they were below 37 weeks of gestation at birth according

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to the best obstetrical estimate or those requiring only initial few steps of resuscitation.

Infants were excluded if they had an abdominal wall defect, myelomeningocele, other major congenital anomaly, or those requiring later steps of resuscitation. Neonates of the mother who are not willing to participate are also excluded.

In a 1:1 allocation and parallel design, infants were randomly assigned to 1 of the 2 treatment groups at birth. Randomization occurred at birth or within the first 10 minutes after birth. Twins and higher-order multiples were randomized individually. Randomization was blinded and done by using sealed numbered envelopes assigned by a random number generator. Study investigators kept the sealed envelopes and opened them at the birth of the infant. Blinding of the intervention was not possible.

Control Groups

Infants randomized to the control group were delivered and immediately set on their mother’s abdomen, then dried with blankets and stimulated on the mother’s abdomen while the cord was cut and placenta delivered. If the infant was delivered by cesarean section, the infant was initially dried and stimulated under a radiant warmer in the operating room and then transferred to the nursery in the labor and delivery unit.

An initial axillary temperature was obtained at the time of weighing in the nursery and a repeat axillary temperature was obtained at 1 hour after birth. Temperature measurements were obtained with a digital thermometer.

Intervention Group

Infants randomized to the intervention group received the same care, except they were placed inside a plastic bag (nonmedical) low-cost, linear low-density polyethylene bag covering the trunk and extremities. The head of the baby was covered with a cap.

The infants remained in the plastic bag for at least 1 hour after birth, at which time the axillary temperature was measured.

Temperature measurements were all taken with the same digital thermometer.

Outcomes

The primary outcome was normothermia at 1 hour after birth. Temperatures were classified as per WHO guidelines. Normothermia was defined per WHO guidelines as an axillary temperature of 36.5 to 37.5°C (97.7–99.5°F).

Prespecified secondary outcomes on patients admitted to the NICU included seizures during the first 24 hours after birth, sepsis (monitored using CRP and WBC counts), metabolic abnormalities including glucose levels(CBG) and serum calcium levels, weight gain, initiation of feeds and death before discharge.

RESULTS

Majority of the cases were between 32 to 36 weeks (>50%). Very few cases were between 26 to 28 weeks

(7%). In the present study, there is no significant difference in the number of male and female neonates. There were 28(56%) males among cases and 30 (60%) males among controls. There were 22 (44%) females among cases and 20 (40%) females among controls. In our present study, the mean weight of the babies in study group is 1.8542±.44245kg and 1.9042±.44278kg in the control group. The mean weight of the babies among gestational age 32 to 36 weeks is 2.141kg.

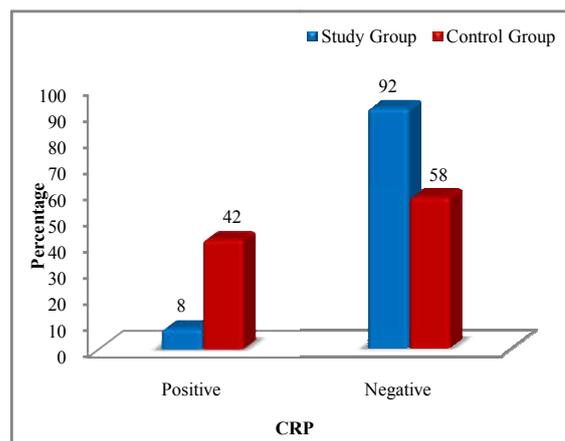
There is an 98% incidence of hypothermia among the cases participated in our trial at birth. The incidence of hypothermia in study group is 24% when compared to 76% in the control group. There is an incidence of 42% positive CRP levels in control group when compared to 8% in study group. The levels of WBC were elevated in 12% of study group when compared to 38% in control group. The incidence of hypoglycemia is 6% in study group when compared to 28% in control group.

The incidence of hypocalcemia is 22% in control group when compared to 6% in study group. The incidence of seizures is nil in study group when compared to 14% in control group. Majority of babies (68%) were started on feeding <15 hrs in study group when compared to 24% in control group. The weight gain of babies were adequate in 80% of babies in study group when compared to 28% in control group. There is no incidence of mortality in study group when compared to 2% in control group.

Table 1 C-Reactive Protein levels

CRP	Group				Total	
	Study group		Control group		N	%
	N	%	N	%	N	%
Positive (>5.0mg/dl)	4	8.0	21	42.0	25.0	25.0
Negative (<5.0mg/dl)	46	92.0	29	58.0	75	75.0
Total	50	100.0	50	100.0	100	100.0

There is an incidence of 42% positive CRP levels in control group when compared to 8% in study group.

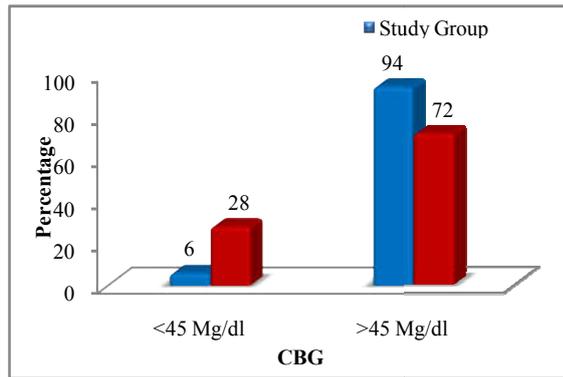


Graph 1 C-Reactive Protein levels

Table 2 Capillary Blood Glucose level

CBG	Group				Total	
	Study group		Control group		N	%
	N	%	N	%	N	%
<45 Mg/dl	3	6	14	28	17	17
>45 Mg/dl	47	94	36	72	83	83
Total	50	100	50	100	100	100

The incidence of hypoglycemia is 6% in study group when compared to 28% in control group.

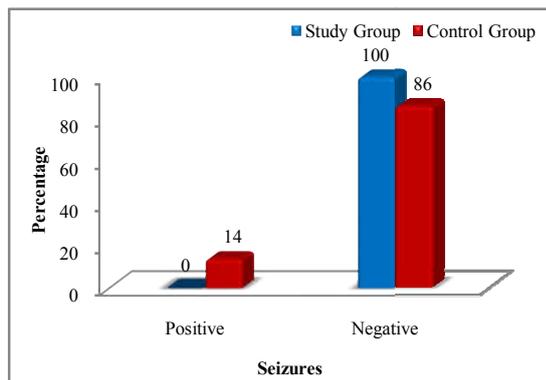


Graph 2 Capillary Blood Glucose level

Table 3 Incidence of Seizures

Seizures	Group				Total	
	Study group		Control group		N	%
Positive	0	.0	7	14.0	7	7.0
Negative	50	100.0	43	86.0	93	93.0
Total	50	100.0	50	100.0	100	100.0

The incidence of seizures is nil in study group when compared to 14% in control group.



Graph 3 Incidence of Seizures

DISCUSSION

This trial shows that placement of the trunk and extremities of preterm infants in a plastic bag and covering the head with a cap at birth or shortly after birth decreased hypothermia at 1 hour after birth and helps in preventing secondary morbidities.

Limitations

1. The short duration of the intervention.
2. The inaccuracy of pregnancy dating, which is common in low- resource countries and may explain the high proportion of infants 2500 g birth weight.
3. We cannot exclude the possibility that term infants were enrolled.
4. The lack of control of the environmental temperature in the delivery rooms and resuscitation areas. The hospital did not have central air-conditioning or heating, and strict control of the ambient temperature was not

possible. This could affect the infants' temperature and the study could not control for it.

The AAP's most recent neonatal resuscitation guideline for premature infants advocates the use of commercially available polyethylene plastic wrap, plastic food wrap or a foodgrade plastic bag for infants for the prevention of hypothermia and its morbidities.

CONCLUSION

Simple and easy interventions can make large differences in the thermal stability of infants. A warm environment in the delivery suite in conjunction with prompt intervention of routine care, utilizing polyethylene exclusive wraps, and environmental humidity for preterm babies can help maintain body temperature and protect infants against the detrimental effects of hypothermia.

Our review provides strong support for the efficacy of plastic wraps in reducing hypothermia and its morbidities among preterm neonates of all gestational ages.

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