INTERNATIONAL JOURNAL OF CURRENT MEDICAL AND PHARMACEUTICAL RESEARCH

IJCMPR

Available Online at http://www.journalcmpr.com

CASE REPORT

A STUDY TO ASSESS THE EFFECTIVENESS OF PLASTIC BAG WRAPPING IN PREVENTING HYPOTHERMIA AMONG PRETERM NEONATES

Arunprasad S., Ramesh S and Saravanan S

Department of Pediatrics, Rajah Muthiah Medical College and Hospital, Annamalai University, Annamalai Nagar – 608 002

ARTICLE INFO

Article History:

Received 19th, July, 2016,
Received in revised form 5th, August, 2016, Accepted 16th, September, 2016, Published online 21st, October, 2016

Key words:

Hypothermia, preterm, plastic bag, temperature regulation.

ABSTRACT

Hypothermia contributes to neonatal mortality and morbidity, especially in preterm and low birth weight infants in developing countries. Plastic bags covering the trunk and extremities of preterm and very low birth weight infants reduces hypothermia. This technique has not been studied in larger preterm infants or in many resource-limited settings. The objective was to determine if placing preterm and low birth weight infants inside a plastic bag at birth maintains normothermia.

INTRODUCTION

Annually, about 3 million infants die during the neonatal period worldwide[1]. More than 80% of these neonatal deaths can be attributed to infection, birth asphyxia, complications of premature delivery, including hypothermia, and congenital anomalies.[2] Hypothermia has long been recognized as a serious risk to newborns, especially premature and low birth weight infants.[3-6]

Newborns are more prone for hypothermia because of their limited ability to generate and conserve heat. Preterm babies have decreased thermal insulation due to less subcutaneous fat and reduced amount of brown fat.

The current thermal care guideline is based on NRP, which suggest to dry infants by placing them under a radiant warmer with dry, pre- warmed towels. Despite adherence to this guideline, the incidence of hypothermia among premature infants remains high.

The Neonatal Resuscitation Program recommends the use of a plastic bag to prevent hypothermia in infants born <29 weeks gestation.[7] The International Liaison Committee on Resuscitation Consensus statement recommends the use of a plastic bag in addition to standard techniques in the delivery room for preterm infants.[8]

Plastic bags may be an affordable option for developing countries. The current trial was designed to test the hypothesis that use of low-cost plastic (polyethylene) bags starting at birth reduces hypothermia without causing hyperthermia at 1 hour after birth in preterm infants.

This trial enrolled more mature and larger preterm infants than previously studied because in resource-limited settings these infants are at high risk of hypothermia. This Practice is being used in under resourced countries when environmental temperatures cannot be controlled, even in larger, term infants **(Lester, Kiamani, & Cartledge, 2014).**

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 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 labour 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 and30 (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.

CLINICAL PHOTOGRAPHS

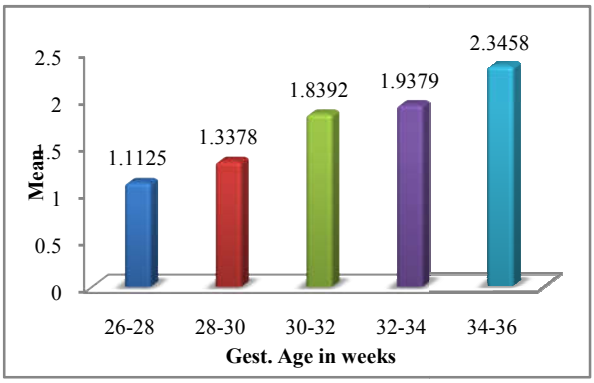
Picture taken after getting consent from the parents

Plastic sheet used in the study

Table 1 Gestational Age vs Birth Weight mean

Gest. Age	N	Mean	Std. Deviation	F	Sig.
26-28	**4**	**1.1125**	**0.16520**		
28-30	18	1.3378	0.22683		
30-32	24	1.8392	0.31690		
32-34	28	1.9379	0.21619	54.597	0.000
34-36	26	2.3458	0.22897		
Total	100	1.8792	0.44109		

The mean weight of the babies among gestational age 32 to 36 weeks is 2.141kg.



Graph 1 Gestational Age vs Birth Weight mean

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.

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.

Vohra *et al* and **Vohra *et al*.,** found that wrapped infants <28 weeks gestational age had higher mean rectal admission temperatures.[9]

Knobel *et al*., recently showed similar results with polyurethane wrapping. This appears to be very important in extremely premature infants.[10]

Larger Preterm infants also have trouble maintaining a normal temperature in the early minutes to hours after birth, and the current trial demonstrates that plastic bags may also reduce hypothermia in these infants. The relatively high prevalence of hypothermia, even in the larger preterm infants enrolled in the current trial suggests that these infants may benefit from placement inside a plastic bag shortly after birth.

CONCLUSION

Despite decades of research on thermal care practices, neonatal hypothermia remains a common global problem, contributing to needless deaths. Our review provides strong support for the efficacy of plastic wraps to reduce heat loss and prevent hypothermia immediately following a hospital delivery in neonates of all gestational ages.

Plastic wraps are available globally, cheap, are easy to use and carry a low risk of adverse events. Further research is required to assess their role outside hospital settings (for example, as part of birth kits), investigate morbidity or mortality decreases, as well as investigate instances other than delivery where they are useful;

References

1. Liu L, Johnson HL, Cousans S, *et al* Child Health Epidemiology Reference Group of WHO and UNICEF . Global, regional, and national causes of child mortality, an updated systematic analysis for 2010 with time trends since 2000. Lancet. 2012; 379 (9832):2151-2161 [Pubmed].
2. Lawn JE, Kerber K, Enweronu-Laryea C, Cousens S.. 3.6 million neonatai deaths - what is progressing and what is not? Semin Perinatal. 2010, 34 (6):371-386 [PubMed].
3. Silverman WA, Fertig JW, Berger AP. The influence of the thermal environment upon the survival of newly born Premature infants. Pediatrics. 1958;22(5):876-886 [PubMed].
4. Day RL, Caliguiri L, Kamenski C, Ehrlich F. Body temperature and survival of premature infants. Pediatrics. 1964;34:171-181 [PubMed].
5. Klaus MH, Fanaroff AA. Care of the High-Risk Neonate. 6th ed. St. Louis, MO: W. B. Saunders Company; 2001.
6. Mullany LC, Kate J, Khatry SK, LeClerq SC, Darmstadt GL, Tielsch JM. Neonatal hypothermia and associated risk factors among newborns of southern Nepal. BMC Med. 2010;8:43 [PMC free article] [PubMed].
7. Kattwinkel J, editor., ed. Neonatal Resuscitation. 6th ed. Elk Grove Village, IL: American Academy of Pediatrics; 2011.
8. Perlman JM, Kattwinkel J, Richmond S, *et al*. International Liaison Committee on Resuscitation. The International Liaison Committee on Resuscitation (ILCOR) consensus on science with treatment recommendations for pediatric and neonatal patients: pediatric basic and advanced life support. Pediatrics. 2006;117(5).
9. Vohra, S., Roberts, R S., Zhang, B., Janes, M., & Schmidt, B. (2004). Heat Loss Prevention (HeLP) in the delivery room: A randomized controlled trial of polyethylene occlusive skin wrapping in very preterm infants. *Journal of Pediatrics, 145(6),* 750-753.
10. Knobel, R. B., Vohra, S., & Lehmann, C. U. (2005). Heat Loss Prevention in the Delivery Room for Preterm Infants: A National Survey of Newborn Intensive Care Units. *J Perinatol,* 25(8), 514-518.
11. Rohana, J., Khairina, W, Boo, N. Y, & Shareena, I. (2011). Reducing hypothermia in preterm infants with polyethylene wrap. *Pediatrics International,* 53(4), 468- 474.
12. Vohra, S., Frent, G., Campbell, V., Abbott, M., & Whyte, R. (1999). Effect of polyethylene occlusive skin wrapping on heat loss in very low birth weight infants at delivery: a randomized trial. *Journal of Pediatrics, 134(5),* 547-551.
13. Ibrahim, C. P. H., & Yoxall, C. W. Use of plastic bags to prevent hypothermia at birth inpreterm infants - do they work at lower gestations? *Acta Paediatrica, 98(2),* 256-260.
14. Trevisanuto, D., Doglioni, N., Cavallin, K, Parotto, M., Micaglio, M., & Zanardo, V. (2010). Heat loss prevention in very preterm infants in delivery rooms: a prospective, randomized, controlled trial of polyethylene caps. *Journal of Pediatrics, 156(6),* 914-917, 917.e911.