



POLYTHENE WRAP VERSUS ROUTINE CARE ON TEMPERATURE REGULATION FOR PRETERM AND LOW BIRTH WEIGHT BABIES DURING TRANSPORT FROM DELIVERY ROOM TO NICU- AN OPEN LABEL RANDOMIZED CONTROLLED TRIAL

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ABSTRACT **BACKGROUND AND OBJECTIVES:** Maintaining a normal body temperature is a critical function for newborn survival. The body temperature of premature infants drops suddenly after birth because of their disproportionate body mass-to-surface ratio, exposed body posture, decreased amounts of subcutaneous fat, poor vasomotor control, and thin skin with increased permeability. This study is to compare the effectiveness of polythene wrap in thermoregulation of preterm and low birth weight babies compared to routine care during transport from delivery room to NICU.

METHODOLOGY: This study was conducted from August 2015 to June 2016 at Labour room, OT and Neonatal Intensive Care Unit, GEMS and Hospital, Ragolu, Srikakulam in Infants born at 29 to 37 weeks gestation at birth and low birth weight neonates (birth weight below 2500 g). Total of 90 preterm babies were included in the study and randomly allocated into two groups. Babies in one group were wrapped with polythene wrap (B) in addition to standard care. Babies in the control group received standard thermoregulation (A). Axillary temperature were recorded before wrapping the neonate and at the time of NICU admission.

RESULTS: The mean temperature of babies with polythene wrap ($36.13^{\circ}\text{C} \pm 0.6190^{\circ}\text{C}$) was significantly higher than the mean temperature of babies with standard thermoregulation ($35.65^{\circ}\text{C} \pm 0.5795^{\circ}\text{C}$). The mean admission temperature was 0.48°C higher in the babies with polyethylene wrap. In babies with gestation of 32-36 weeks the mean admission temperature in the polyethylene wrap group (36.16°C) was significantly higher than the control group (35.61°C). The mean temperature of babies with polythene wrap ($35.79^{\circ}\text{C} \pm 0.6713^{\circ}\text{C}$) and those babies with standard thermoregulation ($35.94^{\circ}\text{C} \pm 0.5900^{\circ}\text{C}$) were almost similar after resuscitation. At admission to NICU 17% (08/45) babies in polythene wrap were hypothermic while in the control group 71.1% (32/45) babies were hypothermic, a difference which was statistically significant.

CONCLUSIONS: The average mean temperature at admission to NICU was higher in preterm neonates 29- 36 weeks wrapped with polythene wrap in addition to standard care than the neonates receiving standard care alone. The use of polythene wrap reduced the incidence of hypothermia in preterm neonates. Use of polythene wrap is a safe, economical and easy method to prevent hypothermia during transfer of newborns from delivery room to the NICU.

KEYWORDS : Pre-term Neonates, Thermoregulation, Polythene wrap, Axillary temperature.

INTRODUCTION

Maintaining a normal body temperature is a critical function for newborn survival. Hypothermia in newborns defined as axillary temperature less than 36.5°C . Hypothermia, in particular, is associated with increased neonatal mortality,^{2,3} and each 1°C decrease in axillary temperature is associated with a 75% increase in neonatal mortality.⁴ At birth, the risk for hypothermia is high, secondary to the colder extrauterine environment coupled with evaporative heat loss.⁵ The body temperature of premature infants drops suddenly after birth because of their disproportionate body mass-to-surface ratio, exposed body posture, decreased amounts of subcutaneous fat, poor vasomotor control, and thin skin with increased permeability.^{6,7} The deleterious effects of hypothermia, particularly in premature and low birth weight infants is increased oxygen and metabolic demands, acid-base derangements, respiratory compromise, hypoglycemia, and even death once the neonate's compensatory mechanisms fail.^{5,8,9} Evaporative heat loss is the major source of heat loss in the first 30 min after birth, especially in preterm babies.¹⁰ Hypothermia occurs often during transport from the place of delivery to the NICU. Even if the transport time from the delivery room to the NICU is minimal preterm babies often develop hypothermia.¹¹

Polyethylene wrap has been shown to reduce insensible water loss by 70% and improve temperature control.^{12,13} The AHA in the NRP 2010 guidelines recommend polyethylene wraps to be used for babies delivered at less than 29 weeks gestation for temperature regulation.

OBJECTIVE:

To compare the effectiveness of polythene wrap in thermoregulation of preterm and low birthweight babies compared to routine care during transport from delivery room to NICU

METHODOLOGY:

A prospective, randomized controlled open label study and this study was conducted in Labour room, OT and Neonatal Intensive Care Unit, Great Eastern Medical School & Hospital, Ragolu, Srikakulam in the period of August 2015 to June 2016 with the study population and

Inclusion criteria was infants born at our hospital between 29 to 37 weeks gestation at birth and low birth weight neonates (birth weight below 2500 g).

OBSERVATIONS:

TABLE 1: Baseline Clinical Characteristics of Neonates:

	With polythene wrap	With standard thermoregulation	P value
1. Sex of babies			
No. of males (%)	43(95.5%)	43(95.5%)	1.00
No. of females (%)	2(4.45%)	2(4.45%)	
2. parity			
Multiparous	16(35.5%)	13(28.9)	0.499
Primi	29(64.5%)	32(71.1%)	
3. Antenatal steroids (%)	41(91.1%)	43(95.5%)	0.398
4. Maternal age in years	28.51 \pm 4.98	26.11 \pm 4.22	0.016
5. Resuscitation details			
Cried immediately after birth	37(82.2%)	41(91.1%)	0.125
Required resuscitation	08(17.8%)	04(8.9%)	
6. Mode of deliveries			
LSCS	33(73.4%)	33(73.4%)	1.000
NVD	12(26.6%)	12(26.6%)	
7. preeclampsia	15(33.4%)	13(28.8%)	0.649
8. GDM	11(24.4%)	09(20%)	0.612
9. PROM	02(4.5%)	02(4.5%)	1.000
10. Hypothyroidism	11(24.5%)	12(26.6%)	0.809
11. Birth weight in grams	1679.78 \pm 319.5	1743.56 \pm 332.3	0.356
12. Gestational age in weeks	33.98 \pm 1.33	34.04 \pm 1.216	0.15
13. Temperature after resuscitation ($^{\circ}\text{C}$)	35.81 $^{\circ}\text{C}$ \pm 0.6713 $^{\circ}\text{C}$	35.94 $^{\circ}\text{C}$ \pm 0.590 $^{\circ}\text{C}$	0.277
14. Time period of transport in min	24.09 \pm 6.33	22.87 \pm 6.47	0.368

Flow chart of study procedure:

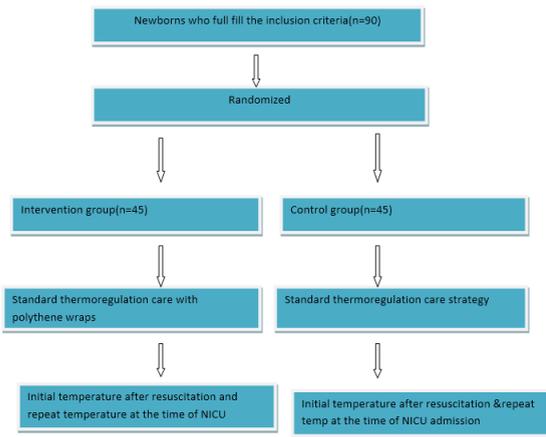


TABLE 2: Primary outcome and adverse events

	With polythene wrap	With standard thermoregulation	P value
Temperature at admission to NICU	36.13°C±0.619°C	35.65°C±0.57°C	0.000
Hypoglycaemia within 2 hours	19(42.2%)	14(31.2%)	0.274
Apnea within 24 hours	09(35.5%)	06(28.8%)	0.369
Temperature at one hr of life(°C)	36.41°C±0.435°C	36.51°C±0.50°C	0.313
Hyperthermia	0	0	NA

The mean temperature of babies with polythene wrap (36.13°C ±0.6190°C) was significantly higher than the mean temperature of babies with standard thermoregulation (35.65°C ±0.5795°C) with p value of 0.000. None of the babies had hyperthermia.

TABLE 3: TEMPERATURE AT ADMISSION TO NICU

Variable	Group	Mean (°C)	SD (°C)	t-value	p-value
Temperature at admission to NICU (°C)	Group with standard thermoregulation	35.65°C	0.5795	3.750	0.000
	Group with polythene wrap	36.13°C	0.6190		

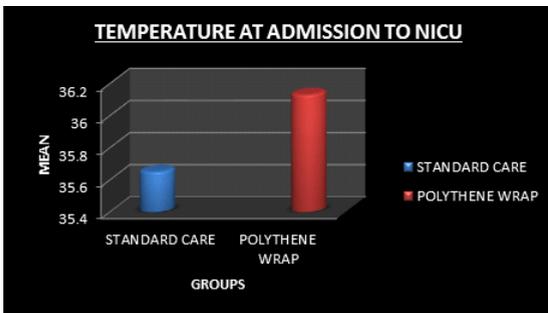


Figure 1 The mean temperature of babies with polythene wrap (36.13°C ±0.6190°C) was significantly higher than the mean temperature of babies with standard thermoregulation (35.65°C ±0.5795°C) with p value of 0.000

TABLE 4: TEMPERATURE AT NICU ADMISSION IN 32-36 WEEKS

Variable	Group	Mean (°C)	SD (°C)	t-value	p-value
Temperature at NICU admission (°C)	Group with standard thermoregulation	35.616°C	0.5915	3.904	0.000
	Group with polythene wrap	36.161°C	0.6387		

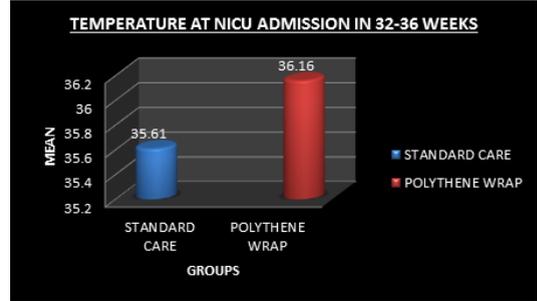


Figure 2: The mean temperature of babies with 32-36 weeks of gestation with polythene wrap (36.16°C ±0.6387°C) was significantly higher than the mean temperature of babies without polythene wrap (35.61°C ±0.5915°C) with p value of 0.000

TABLE 5: DISTRIBUTION OF HYPOTHERMIC (<36°C) AFTER RESUSCITATION

	Group with standard thermoregulation (n=45)	With polythene wrap(n=45)
No. of babies with temperature <36°C in delivery room (n=43)	20	23

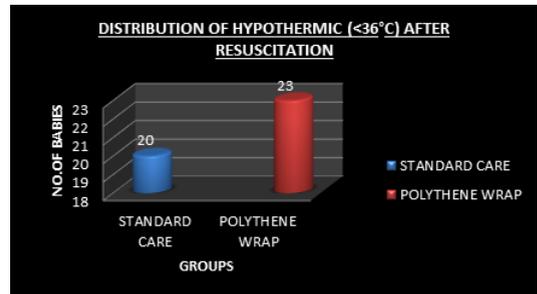


Figure 3 Out of 90 babies, 43 babies had hypothermia (<36°C) after resuscitation.

TABLE 6: ADMISSION TEMPERATURE OF HYPOTHERMIC (<36°C) BABIES AFTER RESUSCITATION

Temperature at NICU admission(n=43)	Group with polythene wrap(n=23)	Group with standard thermoregulation (n=20)	Chi-square	P-Value
>36°C	15(65.5%)	00(0.00%)	20	0.0000
<36°C	08(34.5%)	20(100%)		

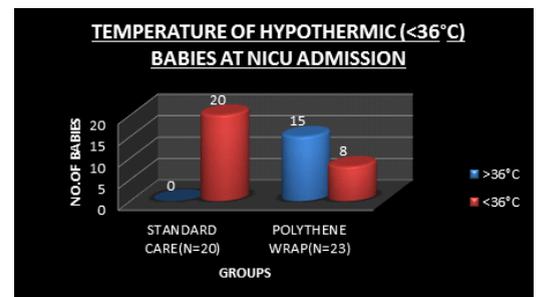


Figure 4 Admission temperature of hypothermic babies to NICU after resuscitation, group with polythene wrap (n=23) 65.5% babies had temperature of >36°C and 34.5% babies had temperature <36°C whereas babies with standard thermoregulation care (n=20), 100% had <36°C temperature at NICU admission. This was statistically significant with p value of 0.000

DISCUSSION:

In our study we included 90 preterm babies delivered by NVD and LSCS in our hospital and randomly allocated into two groups. Babies in one group were wrapped with polythene wrap (B) in addition to standard care. Babies in the control group received standard thermoregulation (A). There were 45 babies in each group. Axillary temperature was recorded before wrapping the neonate and at the time of NICU admission. The labour room and OT were equidistant from

the NICU at a distance of 400 meters. The mean transfer time from the delivery room to the NICU was 24 min and 22 min in the polythene wrap group and control group respectively in our study which was similar to the transfer times in the study by Mathew et al.¹⁴ The mean temperature of babies with polythene wrap ($36.13^{\circ}\text{C} \pm 0.6190^{\circ}\text{C}$) was significantly higher than the mean temperature of babies with standard thermoregulation ($35.65^{\circ}\text{C} \pm 0.5795^{\circ}\text{C}$). The difference was found to be statistically significant (p value 0.0001). The mean admission temperature was 0.48°C higher in the babies with polyethylene wrap. These findings are similar to studies conducted by Mathew et al,¹⁴ Leadford et al¹⁵ and Vohra et al.¹⁶ The mean temperature of babies with polythene wrap ($35.79^{\circ}\text{C} \pm 0.6713^{\circ}\text{C}$) and those babies with standard thermoregulation ($35.94^{\circ}\text{C} \pm 0.5900^{\circ}\text{C}$) were almost similar after resuscitation. There was no statistically significant difference in the mean temperature (p value of 0.320). In babies with gestation of 32-36 weeks the mean admission temperature in the polyethylene wrap group (36.16°C) was significantly higher than the control group (35.61°C). At admission to NICU 17% (08/45) babies in polythene wrap were hypothermic while in the control group 71.1% (32/45) babies were hypothermic, a difference which was statistically significant. Of the 43 babies who were hypothermic in the delivery room, 100% (20/20) of the babies in the control group and 34.7% (8/23) in the group with polythene wrap remained hypothermic at admission to NICU. No differences were observed between the groups with regard to baseline variables (sex, birth weight, gestational age, need for resuscitation, APGAR scores of the newborn babies, parity of mothers, mode of delivery and obstetric risk factors such as gestational diabetes, preeclampsia and PROM). There was no significant difference in the occurrence of apnea, hypoglycemia and hypotension in the two groups and none of the babies developed hyperthermia.

CONCLUSIONS:

The average mean temperature at admission to NICU was higher in preterm neonates 29- 36 weeks wrapped with polythene wrap in addition to standard care than the neonates receiving standard care alone. The use of polythene wrap reduced the incidence of hypothermia in preterm neonates. Use of polythene wrap is a safe, economical and easy method to prevent hypothermia during transfer of newborns from delivery room to the NICU.

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