

Effect of Polythene Wrapping and Standard SNCU Care vs Standard SNCU Care Alone on Mean Body Temperature of Low Birth Weight Neonate during SNCU Stay

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Abstract

Background & Objectives: Maintaining a normal body temperature is a critical function for newborn survival. Newborn who are premature, LBW drop their body temperature suddenly after birth because of disproportionate body mass to surface ratio, decrease subcutaneous fat, poor vasomotor control. Study is done to compare effectiveness of polythene wrap along with standard SNCU care in thermoregulation of preterm, low birth weight babies compared to newborn who are given standard SNCU care alone.

Objectives: Comparison of mean body temperature in two neonatal groups.

Methods: This randomized controlled trial among low birth weight neonates from SNCU of Kamla Raja Hospital, Gajra Raja Medical College, Gwalior M.P. between January 2021 to June 2022. Neonates weighing >1500gms to <2500gms are included in the study. Total of 100 LBW neonates were taken for the study. Mean temperature over 7 days were compared between polythene wrap group and standard care group.

Results: Total of 100 LBW neonates included in study randomized into polythene wrap group (n=50) and to standard care group (n=50) having similar baseline characteristics (birth weight, gestational age, baseline temperature). Neonates in polythene wrap group had lower rate of hypothermia and higher axillary temperature ($37.06 \pm 0.3^\circ\text{C}$ vs $36.6 \pm 0.26^\circ\text{C}$) with $p < 0.001$ as compared with infants receiving standard care alone. It was also found weight loss is less in experimental group than control group (150 gm vs 180 gm over 7 days) which is statistically not significant.

Interpretation & Conclusions: Use of polythene wrap might be simple innovative intervention for maintaining normal body temperature in LBW neonates.

Keywords: Axillary Temperature, Hypothermia, Low birth weight neonates, Polythene wrap, Standard care, Thermoregulation.

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Introduction

Hypothermia is the result of an imbalance between heat loss and production. WHO define hypothermia below 36.5°C . [1]

Worldwide about 2.5 million newborns die every year in first 4 weeks of life. Prematurity is most common cause of neonatal death. An 8-year survey reported

that 67% of high risk and LBW infants were hypothermic on admission which makes it a significant global issue. Hypothermia is one of the preventable causes of neonatal death. [2] Radiant warmer are commonly used in preterm, LBW babies. However, neonates nursed under radiant warmer tend to have higher evaporative and heat losses and therefore suboptimal temperature maintenance. [3,4]

Hypothermia has been shown to be associated with poor outcome in preterm babies. [5] Other methods such as heat shields, [6] transparent baby blankets, polythene films [7] and humidified incubators can be used. In developing countries heat shield and baby blankets are usually prohibitively expensive or not available. Incubators are very costly and less convenient. So polythene film commonly used in home for covering food can be used. Polythene wrap has been shown to reduce insensible water loss by 70% and improve temperature control.

Study was done to determine whether polythene wrapping would decrease the incidence of hypothermia in 1st 7 days and also compare postnatal weight loss between intervention and control group. They were limited data available to compare various physiological parameters such as heart rate, respiratory rate, SPO₂, RBS in intervention and standard care group. This study also compared these physiological parameters between these two groups.

Materials and Methods

This Randomized Controlled Trial among low birth weight neonates was conducted in Sick Neonatal Care Unit (SNCU) of Government hospital tertiary centre.

Approval for study was taken from institutional ethical committee and written informed consent was taken from their parents. Anonymity & Confidentiality were maintained.

Period Of Study: Two years

Study Type: Randomized Controlled Trial

Sample Size:

$$n = \frac{(S_1^2 + S_2^2)(Z_{\alpha/2} + Z_{1-\beta})^2}{(\mu_1 - \mu_2)^2}$$

Considering primary outcome temperature on admission to NICU

$$S_1 = 0.91^\circ\text{C}, S_2 = 1^\circ\text{C}$$

$Z_{\alpha/2} = 1.96$ at 5% level of significance, $Z_{1-\beta} = 1.64$ at 95% power of test

$$\mu_1 = 35.4^\circ\text{C} \quad \mu_2 = 34.7^\circ\text{C}$$

$$n = \frac{23.758}{0.49} = 48.48 \approx 50$$

So in each group polythene wrap group and control group 50-50 patients were taken.

Total sample size of study is 100 patients.

Statistical Analysis

Data was entered in Microsoft Excel and analyzed using SPSS version 16.0 and EPI INFO version 7.0. Pearson's Chi Square Test for association and trend (for categorical variables) for inferential statistics and repeated measure anova with post hoc analysis wherever applicable. As needful t-test was applied for the testing of mean. A p-value of <0.05 was considered to be statistically significant at 5% level of significance.

Inclusion Criteria:

- All neonates weighing >1500gms to <2500gms who were admitted in Sick Neonatal Care Unit.

Exclusion Criteria:

- Very sick Newborn requiring CPAP, ventilation or inotropic support
- Major congenital malformations.

Methods

Those low birth weight neonates fulfilling inclusion criteria informed consent were taken from their parents. Following informed consent neonates were randomized into polythene wrap group and standard care group by stratified

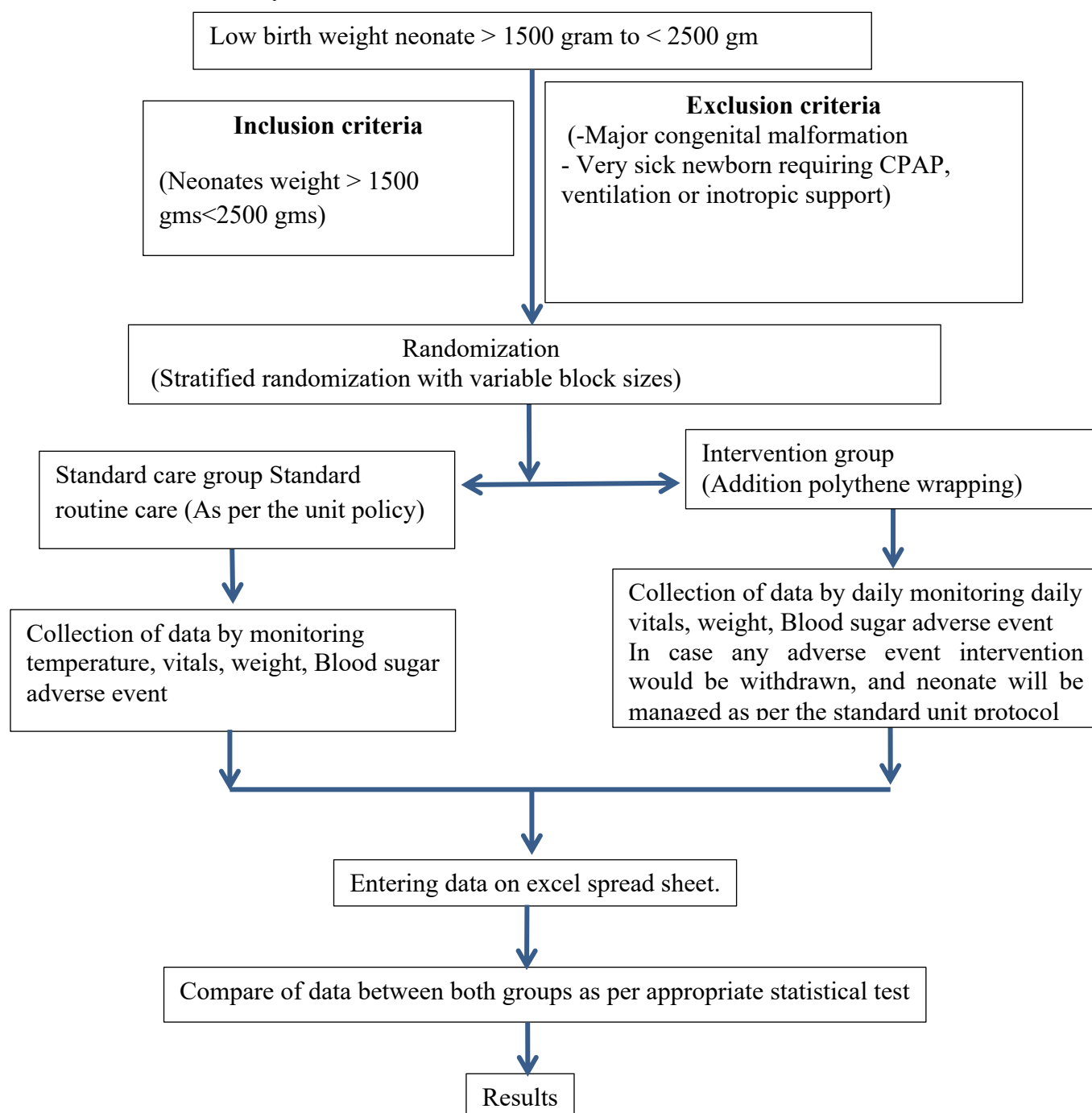
randomisation method. Neonates in polythene wrap group were wrapped with polythene bag from head to toe except face and vitals along with temperature, weight & random blood sugar were monitored regularly. These low birth weight neonates were followed up till day 7 of hospitalization or discharge whichever is earlier.

The data collected was taken care for privacy and anonymity. Parents were informed that they could withdraw from the

study at any point of time as and when desired for any or no given reason. Study participants did not receive any gifts and were not monetarily compensated.

Axillary Temperature recording were done in every shift by digital thermometer as per WHO reference. Weight recording were done daily.

Blood sugar level was monitored daily by heel prick between 8 – 10 AM 1 hour after feeding or Intravenous fluid.



Results

Table 1: Demographic variable of neonatal characteristics

Variables	Standard care group		Polythene wrap group	
	Frequency	Percentage	Frequency	Percentage
Gender				
Boy	24	49	25	50
Girl	26	50	25	50
Gestational age				
< 32 wks	10	20	13	26
32-34 wks	20	40	27	54
35-37 wks	20	40	10	20
Weight at birth				
1.5-2 kg	25	50	25	50
2-2.5 kg	25	50	25	50
Mode of delivery				
NVD	39	78	42	84
LSCS	11	22	8	16
Residence				
Urban	18	36	20	40
Rural	32	64	30	60

Demographic data of patients involved in this study is shown in table 1. 100 patients were included in study in which total male neonates were 49 (49%) male and remaining were female. Majority neonates belonged to age group of 32 to 34 weeks which was 47 (47%). Neonates were

equally distributed by birth weight with 25 number distributed in each control and experimental group and 1.5 to 2 kg and 2 to 2.5 kg group. NVD was most common mode of delivery (81%). Most of the parents were from rural areas (62%).

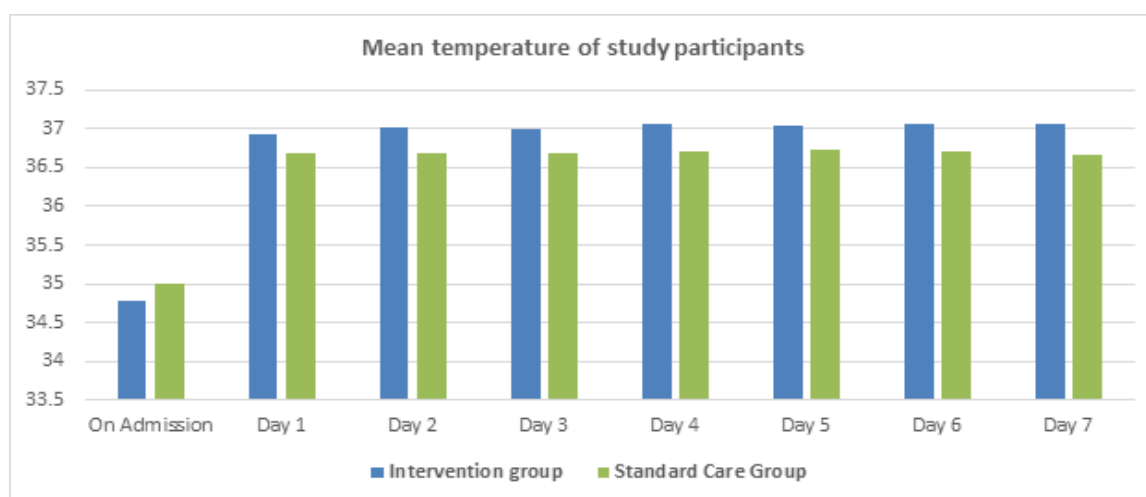


Figure 1: Clustered Bar Graph showing Mean temperatures in polythene group and Standard care Group.

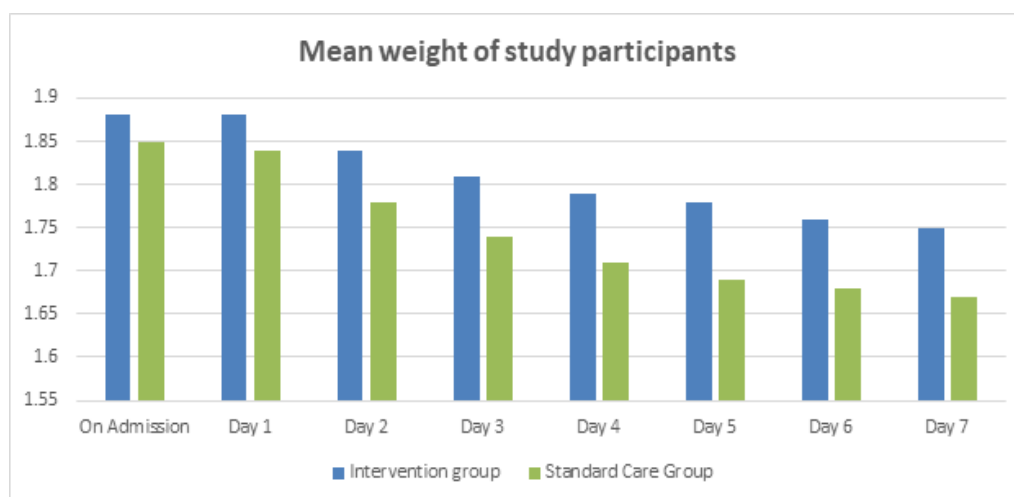
Table 2: Comparison of increase in mean body temperature in both polythene wrap and standard care group from day of admission.

	Polythene wrap group	Standard care group	P value
On admission	34.79±0.55	34.99±0.6	0.082
On day 1 increase in temperature	2.13±0.24	1.7±0.18	0.000
On day 2 increase in temperature	2.2±0.22	1.1±0.22	0.000
On day 3 increase in temperature	2.11±0.21	1.71±0.19	0.000
On day 4 increase in temperature	2.27±0.25	1.82±0.17	0.000
On day 5 increase in temperature	2.26±0.21	1.82±0.19	0.000
On day 6 increase in temperature	2.28±0.26	1.80±0.21	0.000
On day 7 increase in temperature	2.27±0.28	1.72±0.24	0.000
Mean increase in temperature	2.2±0.5	1.6±0.27	0.000

Table 3: Incidence of hypothermia in polythene wrap and standard care group over 7 days

	Polythene wrap group	Standard care group	P value
Day 0	50	50	NA
Day 1	1	5	<0.001
Day 2	0	4	<0.001
Day 3	0	1	<0.001
Day 4	0	0	NA
Day 5	0	0	NA
Day 6	0	2	<0.001
Day 7	0	0	NA

As shown in table 3, It was found that only 1 of the neonate was found hypothermic in polythene wrap group while in control group neonates having hypothermia are 12 out of 50.

**Figure 2: Clustered bar graph showing Mean weight loss of study participants in both polythene wrap and standard care group.**

As shown in Figure 2, In polythene wrap and standard treatment group weight loss was almost similar in initial 4 days between the two groups but it was observed that weight loss was higher in standard group

than in polythene wrap group which was statistically not significant. (p-Value < 0.05).

Discussion

In this study it was observed that babies

nursed under radiant warmer along with polythene wrap resulted in better thermal control. On admission it was seen that temperature in intervention as well as control group is not statistically different. In intervention group temperature increased from $34.79 \pm 0.5^\circ\text{C}$ to 37.07 ± 0.33 with increase in rate of $2.2 \pm 0.5^\circ\text{C}$ over 7 days while in control group temperature raises from baseline temperature of 34.9 ± 0.6 to 36.89 with increase in rate of $0.5 \pm 0.2^\circ\text{C}$.

Incidence of hypothermia in intervention group is 1/50 while in control group it is 12/50 over 7 days.

A randomized control trial was done by Alicia E, Leadford et al [8] on 104 newborn at University Teaching Hospital in Lusaka Zambia with gestational age between 26 to 36 weeks and birth weight of 1000 g to 2500 g born in that hospital. After randomization by using a 1:1 allocation and parallel design to standard thermoregulation (blanket or radiant warmer) care or to standard thermoregulation care plus placement inside a plastic bag. Primary outcome was axillary temperature at 1 hr after birth. It was concluded that after 1 hour of birth infants randomized to plastic bag having temperature of $36.5 \pm 0.5^\circ\text{C}$ compared to control group $36.1 \pm 0.6^\circ\text{C}$ in standard SNCU care ($p < 0.00001$). Hyperthermia didn't occur in any infant.

Finding of the present study are congruent with findings of Oatley HK et al [9] in a systematic review where the use of polythene bag associated with 43% reduction in the risk of hypothermia (35 vs 61%, RR= 0.57).

Sahenaz et al [10] conducted similar study in medical college of west Bengal among 60 low birth weight neonates. It was found from the study that mean temperature on day 1 in control group is 36.37 ± 0.09 and in intervention group mean temperature is 36.73 ± 0.11 . On day 5 of admission mean temperature in control group is 36.25 ± 0.09 and in intervention group it is 36.78 ± 0.02

with P value < 0.05 .

Dr. Manchu polay et al [11] conducted a study on low birth weight babies in which 90 neonates were included mean temperature of babies with polythene wrap is 36.13 ± 0.6 which was significantly higher than the mean temperature of babies with standard care thermoregulation. In polythene wrap group 17% (8/45) neonates in polythene wrap were hypothermic while in control group 71.1% (32/45) were hypothermic this study supported present study showing that incidence of hypothermia in neonates wrapped in polythene is less than the neonates who were given only standard SNCU.

M. Kaushal et al [12] conducted study over preterm neonates and concluded that incidence of hypothermia during the 7 days was significantly lower in cling wrap group, of total 51 neonates none of the neonates in cling wrap develop hypothermia in 1st 7 days but 36 % of neonates in non-cling wrap group develop hypothermia ($p = 0.06$).

It is seen from present study that mean weight on admission of all the 100 neonates between weight 1.5 to 2 kg is 1.8kg and between weight 2 to 2.5 kg is 2.2 kg. It is seen from study that weight loss within seven days in polythene wrap group is 130 grams while in standard care group it is 180 grams. It is observed from study that mean weight loss in polythene wrap group is comparatively less than neonates given only standard care group.

M. Kaushal et al [12] conducted study on babies having birth weight between 750 grams and 1500 grams axillary temperature and incidence of hypothermia was taken as primary outcome and cumulative weight loss in 1st 48 hours taken as secondary outcome. Cumulative weight loss in 1st 48 hours in cling wrap group is $5.0 \pm 5.6\%$ and $8.6 \pm 7.0\%$ in the non-cling wrap ($p = 0.06$).

Sahenaz et al [10] conducted similar study on 60 neonates 30 neonates included in intervention group and 30 in standard care

group it was found from study that there was no significant difference in body weight between intervention and control group on admission but weight loss is less in intervention group than control group which is not statistically significant. [14]

Conclusion

Study concluded that polythene wrap is effective in reducing the incidence of hypothermia. Use of polythene wrap also increases the mean body temperature in low-birth-weight neonates significantly. Use of polythene bag decrease the weight loss in initial 7 days in low-birth-weight neonates although not significant. These advantages are not at cost of any increase incidence of adverse effect like apnea, feed intolerance, hyperthermia, perspiration, rashes, increase requirement of oxygen and inotropes.

Implication

Hypothermia is a major contributing factor to neonatal morbidity and mortality. Low birth weight and preterm neonate are more vulnerable to hypothermia. Present study concludes that polythene wrap is effective in reducing hypothermia and helps low birth weight neonates to maintain body temperature. Though polythene wrap is a simple intervention yet not in practice in SNCU. Use of polythene wrap need to be emphasized in low-birth-weight neonates for maintenance of temperature.

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