

Frequency of Neonatal Hypothermia in Preterm Infants Wrapped with and without Plastic Bag after delivery

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ABSTRACT

Background: Preterm birth accompanies many complications including hypothermia that worsens neonatal health and may result in fatality if left untreated. Globally, plastic wraps are being used as a low-cost and effective method to maintain temperature.

Aim: To compare frequency of neonatal hypothermia in preterm infants wrapped with and without plastic bag after delivery.

Study design: This was randomized control trial.

Methodology: This study was conducted using at Pediatrics department of SIMS hospital, Lahore, during 6 months. Data was collected using non-probability, consecutive sampling from a sample of 92 (46 newborns in each group). Infants randomized to group-B (no bag group) received standard hospital care based on WHO thermoregulation of the newborn protocol. The data was entered and analyzed in SPSS 23.

Results: In plastic wrap group there were 32(69.57%) male and 14(30.43%) female cases while in no wrap group there were 27(58.70%) male and 19(41.30%) female cases, p-value >0.05. The median temperature after one hour was higher in plastic wrap and no wrap group was 37.6±0.7 and 36.85±1.8°C respectively, p-value < 0.05. There were 3(6.5%) cases in plastic wrap group and 15(32.6%) of the cases in no wrap group who developed hypothermia, the frequency of hypothermia was statistically less in wrap group when compared with no wrap group, p-value <0.05.

Practical Implication: However, there is limited literature in Pakistan that compares temperature maintenance among neonates wrapped and unwrapped with plastic bags. This investigation will help find better answers to this problem.

Conclusion: It is concluded that the preterm infants wrapped with plastic bag after delivery had less frequency of neonatal hypothermia after 1 hour. Plastic wraps are effective, low cost and low resource friendly method that should be opted for temperature maintenance of preterm babies.

Keywords: Hypothermia, Preterm Birth, Hyperthermia, plastic wraps, Neonates and Temperature.

INTRODUCTION

A Preterm Baby (PTB) is defined by World Health Organization (WHO) as one born before 259 days or 37 weeks of gestational period¹. In 2020 alone, 13.4 million babies were born prematurely with 152 PTB births in the last decade². In Pakistan, the prevalence of PTB is as high as 18.89%. The complications related to PTB may lead to morbidity and even fatality in severe cases³. In 2019, more than 900,000 babies died due to PTB related complications. Such complications need to be addressed timely to avoid worse health outcomes⁴.

One of such complications that are commonly reported among neonates admitted in Neonatal Intensive Care Units (NICUs) is hypothermia⁵. Hypothermia has been associated with higher risk of infant mortality as well as morbidity especially in developing countries⁶. Studies have reported a varying but alarming prevalence of hypothermia among children born in hospitals (32-85%) and in the homes (11-92%). Recent studies report that even tropical weather helps little to reduce the incidence of hypothermia as the frequency in tropical regions is equally high^{6,7}.

There have been a number of preventive and curative measures that have been adapted since long to avoid and minimize effects of hypothermia⁷. Such steps include reducing risk of maternal hypothermia before delivery, maintaining an optimum room temperature and covering the child using sheets, wraps, caps and socks⁸. Plastic bags have also been recently opted for wrapping around neonates to reduce thermal loss. The practice of wrapping the neonates in polythene bags has been a practice in developed countries for a while now, this approach is relatively uncommon here in Pakistan⁹.

One study compared the effectiveness of plastic wraps vs no plastic wrap in hypothermia and found that 0% neonates wrapped

with plastic bags compared to 32% with plastic bags developed hypothermia with statistically significant difference (p-value<0.05)¹⁰. One other study on 30 neonates without plastic wraps reported that 5 (16.6%) developed hypothermia compared to none in group with plastic wraps¹¹.

The rationale of this study is to find frequency of neonatal hypothermia in preterm infants wrapped with and without plastic bag after delivery. There is no local data published and international studies support the concept that neonatal hypothermia can be prevented by placing neonates in plastic bag after delivery. In Pakistan preterm birth is one of the most prevalent and conditions and they need an NICU admission. The lack of thermal protection in these neonates is still an underappreciated major challenge for newborn survival in developing countries like Pakistan. Through this study of we find protective effect of plastic bags in reducing hypothermia then this study can be a benchmark for our local neonatologist to adopt this easy and preventive method to reduce hypothermia and related risk of mortality.

METHODOLOGY

This Randomized Control Trial (RCT) was conducted in the Pediatrics department of SIMS hospital, Lahore, during 6 months. The data was collected using Non-probability, consecutive sampling from a sample of 92 (46 newborns in each group), which was estimated using percentage of hypothermia as 16.6% vs 0% in no plastic bags vs plastic bag wraps group¹². All preterm infants at birth (as per operational definition) admitted to NICU of both gender were included while those Infants with some congenital malformations, neural tube defects / abdominal wall defects, and Blistering skin conditions were excluded from study.

Using the lottery method, study groups were assigned at random to neonates. The newborns in group A had their trunk and extremities covered in plastic bags, which were nonmedical, low-cost, and linear low-density polyethylene bags measuring 10 × 8 ×

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24 in. and 1.2 mil [a thousandth of an inch] thick. The bags cost three cents each. After a short period of drying on the mother's belly, the baby was placed in the plastic bag no later than ten minutes after birth, at which point the chord was severed and the child was given to the paediatrician or helper. After birth, the babies were kept in the plastic bag for at least an hour, during which the temperature in their axilla was taken.

If the baby's temperature was within the usual range (36.5–37.5°C) or above, the bag was taken off after one hour of life. Babies whose temperatures fell below the standard range were kept in the plastic bag until they reached a normal temperature. Group-B (no bag) infants were randomly assigned to receive regular hospital care in accordance with the WHO thermoregulation of the newborn guideline. In the nursery, the baby was placed in an open cot or, if a radiant warmer was available, under a cover made of blankets the mother had given. The infant's head was also covered with a cap. Hypothermia was recorded in both groups as per operational definition and were managed as per standard protocol.

Statistical Analysis: Data was entered and analyzed using SPSS version 23. Mean±S.D or Median±IQR (where data was non-normal) was used for quantitative data like age, gestational age and birth weight and axillary temperature of baby at time of delivery and at 1 hour of admission. Frequency and percentage was calculated for gender and hypothermia. Independent sample t-test / Mann Whitney U test was applied to compare mean / median of birth weight, gestational age, temperature at delivery and at 1 hour. Chi-square test was applied to compare frequency of hypothermia and both study groups. Data was stratified for gender, gestational age (<34, ≥34 weeks) and birth weight (<1500 g, ≥1500g). Post stratification Chi-square test was applied. P-value ≤ 0.05 was considered as significant.

RESULTS

In plastic wrap group there were 32(69.57%) male and 14(30.43%) female cases while in no wrap group there were 27(58.70%) male and 19(41.30%) female cases, p-value > 0.05 as shown in Fig-1.

The mean gestational age in plastic wrap group was 33.09 ± 2.21 weeks and in no plastic wrap group the mean gestational age was 33.22 ± 2.19 weeks as shown in Table-1. In plastic wrap

group the mean birth weight was 1883.37±341.41g and in no wrap group the mean birth weight was 1867.28±366.96 g (Table-1).

The mean temperature at time of delivery in plastic wrap and no wrap group was 36.98±0.48 0cand 37.03±0.44 0 c respectively as shown in Table-2. The mean temperature after one hour in plastic wrap and no wrapgroup was 37.25±0.72 0c and 36.68±0.93 0 c respectively (Table 2).

The median±IQR of gestational age in plastic wrap group was 34.4±4 weeks and in no plastic wrap group was 34±4 weeks, p-value >0.05. In plastic wrap group the mean birth weight was 1883.37±341.41 g and in no wrap group the mean birth weight was 1867.28±366.96 g, p-value >0.05. The median temperature at time of delivery in plastic wrap and no wrap group was 36.9±0.9 and 37.1±0.8°C respectively. The median temperature after one hour was higher in plastic wrap and no wrap group was 37.6±0.7 and 36.85±1.8°C respectively, p-value <0.05 as shown in table-3. There were 3(6.5%) cases in plastic wrap group and 15(32.6%) of the cases in no wrap group who developed hypothermia, the frequency of hypothermia was statistically less in wrap group when compared with no wrap group, p-value < 0.05. When data was stratified for gender, among male cases the frequency of hypothermia was statistically less in wrap group (9.4%) when compared with no wrap group (44.4%), p-value < 0.05 while among female cases the frequency of hypothermia was also statistically less in wrap group (0%) when compared with no wrap group (31.6%), p-value < 0.05. When data was stratified for gestational age, among cases delivered at 30-34 weeks, the frequency of hypothermia was statistically less in wrap group (6.7%) when compared with no wrap group (28%), p-value < 0.05 while among cases delivered at 34-36 weeks the frequency of hypothermia was also statistically less in wrap group (6.2%) when compared with no wrap group (38.1%), p-value < 0.05. When data was stratified for birth weight, among cases who had < 1500 g of weight, the frequency of hypothermia was statistically less in wrap group (10%) when compared with no wrap group (60%), p-value < 0.05 while among cases who had birth weight ≥ 1500 g, the frequency of hypothermia was also statistically less in wrap group (5.6%) when compared with no wrap group (25%), p-value < 0.05 as shown in table -3.

Fig-1: Distribution of gender in both study groups

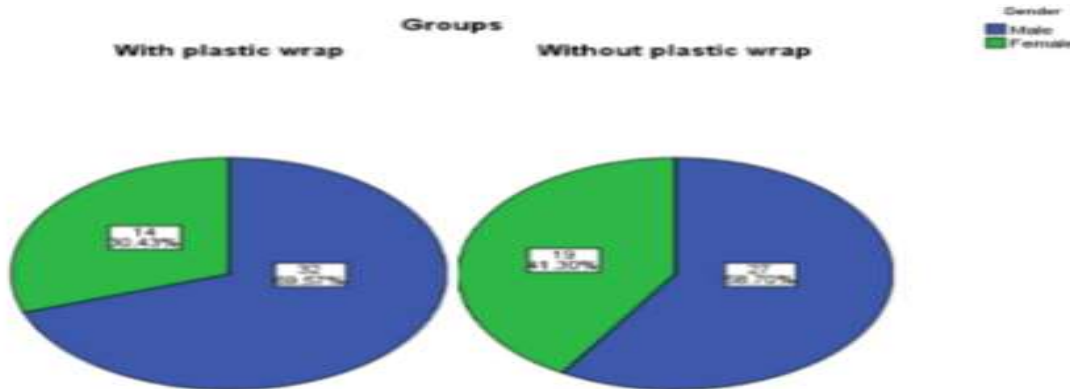


Table-1: Descriptive statistics of Gestational age and Birth weight in both study groups

Study groups	Gestational age (weeks)		
	Mean ± SD	Minimum	Maximum
With plastic wrap	33.09 ± 2.21	30	36
Without plastic wrap	33.22 ± 2.19	30	36
Total	33.15 ± 2.19	30	36
Study groups	Birth weight (g)		
	Mean ± SD	Minimum	Maximum
With plastic wrap	1883.37 ± 341.41	1305.00	2472.00
Without plastic wrap	1867.28 ± 366.96	1325.00	2454.00
Total	1875.33 ± 352.56	1305.00	2472.00

Table 2: Descriptive statistics of Temperature at delivery and 01 hour in both groups

Study groups	Temperature at time of delivery (c)		
	Mean \pm SD	Minimum	Maximum
With plastic wrap	36.98 \pm 0.48	36.40	37.90
Without plastic wrap	37.03 \pm 0.44	36.40	37.90
Study groups	Temperature at time of 1 hour (c)		
With plastic wrap	37.25 \pm 0.72	35.00	37.90
Without plastic wrap	36.68 \pm 0.93	35.10	37.90
Total	36.97 \pm 0.87	35.00	37.90

Table 3: Comparison of gender, Gestational age (w), Birth weight (g), Temperature (at delivery and 1 hour) and hypothermia

			Plastic Wrap		p-value
			Yes	No	
Gender	Male		32(69.6%)	27(58.7%)	0.277 ^[c]
	Female		14(30.4%)	19(41.3%)	
Gestational age (w)	Median \pm IQR		34.4 \pm 4	34 \pm 4	0.745 ^[b]
Birth weight (g)	Mean \pm S.D		1883.37 \pm 341.41	1867.28 \pm 366.95	0.828 ^[b]
Temperature at delivery	Median \pm IQR		36.9 \pm 0.9	37.1 \pm 0.8	0.508 ^[b]
Temperature After 1 hr	Median \pm IQR		37.6 \pm 0.7	36.85 \pm 1.8	0.002 ^{[a]*}
Hypothermia	Yes		3(6.5%)	15(32.6%)	0.002 ^{[c]*}
	No		43(93.5%)	31(67.4%)	
Gender	Male	Yes	3(9.4%)	9(33.3%)	0.023 ^{[c]*}
		No	29(90.6%)	18(66.7%)	
	Female	Yes	0(0%)	6(31.6%)	0.020 ^{[c]*}
		No	14(100%)	13(68.4%)	
Gestational age (weeks)	30-34	Yes	2(6.7%)	7(28%)	0.033 ^{[c]*}
		No	28(93.3%)	18(72%)	
	34-36	Yes	1(6.2%)	8(38.1%)	0.25 ^[c]
		No	15(93.8%)	13(61.9%)	
Birth weight (g)	<1500	Yes	1(10%)	6(60%)	0.019 ^{[c]*}
		No	9(90%)	4(40%)	
	\geq 1500	Yes	2(5.6%)	9(25%)	0.022 ^{[c]*}
		No	34(94.4%)	27(75%)	

[a] Mann Whitney U test was applied, [a] Independent sample t-test was applied, [c] Chi-square test was applied

* Statistically Significant

DISCUSSION

Preterm birth remains a challenge for developing world not only because of its increasing incidence but due to its implication on newborn health due to associated complications and risks¹³. Hypothermia is one of such commonly reported complication in PTB babies that contributes significantly in newborn mortality and morbidity¹⁴. The frequency of hypothermia is still very high globally despite of adapting all standard protocols at birth, resuscitation techniques and even following guidelines to maintain thermal environment for baby¹⁵. Hypothermia and its associated complications including respiratory disorders, metabolic acidosis, hypoglycemia, coagulation defects in babies, hypoxia, a late transition of fetal stage to newborn one, necrotizing enterocolitis and acute renal failure are dangerous for survival of the baby¹⁶. Hence this study aims to compare use of plastic wraps with no wraps in order to see if somehow the incidence of hypothermia could be reduced in our local setting.

A study reported that almost 14% children born preterm had hypothermia and they also found that the risk of mortality and late onset sepsis increased 28% and 11% with every 1°C temperature decrease. Another study reported that 32% children who were VLBW had hypothermia with 1.2 (1.06-1.50) OR for mortality¹⁷. In current study there were 3(6.5%) cases in plastic wrap group and 15(32.6%) of the cases in no wrap group who developed hypothermia, the frequency of hypothermia was statistically less in wrap group when compared with no wrap group, p-value <0.05.

A study was done in preterm neonates and they reported that Hypothermia in plastic bag group was 0% and in no plastic bag was 32%, with significant difference, p-value < 0.0001¹⁸.

Another study reported Hypothermia occurred in 5 out of 30 newborn (16.6%) in standard care group and 0% in bag wrapping group (p-value was not reported)¹². Like these studies we also found clinical efficacy of wrapping the neonates in plastic. Another systematic review showed that plastic wraps have higher association with baseline as well as post stabilization temperatures both in infants of less than 28 weeks and of >28 weeks of gestation. Plastic wrap had significantly lower risk of hypothermia however insignificant contribution in reducing risk for mortality.

Similarly one other study showed that among the 104 infants, 59.2% with plastic wrap compared to 32.7%; RR 1.81; 95% CI 1.16–2.81; p-value= 0.007. The post stabilization temperature was also better in plastic wrap group (p-value<0.05)^{19,20}. Yet another study compared study temperature adaptation among the preterm infants with and without the plastic wraps and found that infants with plastic wraps reached optimum temperature within 30 minutes compared to 75 minutes with conventional care²¹. Similarly, at 120 minutes, the temperature of incubator was higher in plastic wrap group compared to conventional group (p-value=0.0001)²². All these studies suggest that use of plastic wraps in an effective, low cost, limited resource friendly and no tech required method to maintain newborn temperature and can be used as a good method to reduce risk of hypothermia in children.

Limitations: Single centered study with limited financial constrains and limited resources.

CONCLUSION

It is concluded that the preterm infants wrapped with plastic bag after delivery had less frequency of neonatal hypothermia after 1

hour. In Pakistan, as prevalence of preterm birth is very high and these neonates have higher chances of different illness, so by wrapping them in recommended plastic bags we may reduce the risk of hypothermia and related conditions.

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MA, SF, RS & TL: Statistics application, analysis literature review, help in write up.

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