

Comparison of the effect of plastic cover and blanket on body temperature among pre-term neonates - A randomized clinical trial

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Abstract—Preterm neonates are not able to maintain their body temperature and so, they are vulnerable to hypothermia. The present study objective was to compare the effects of plastic cover and blanket on body temperature among preterm neonates. A randomized clinical trial with simple random sampling technique was used for this study. The target population of the study were the preterm neonates admitted in NICU with gestational age 28–34 weeks. 50 samples were recruited for the study i.e 25 in each group. In group 1, the babies were wrapped with plastic cover till the neck and head covered by a cap and in group 2, the babies were wrapped with blanket till the neck and head covered by a cap. Baseline temperature were checked initially before the intervention. After 1 hour of wrapping, the babies temperature were checked every 15 mins for 2 hours with a digital thermometer. The baseline body temperature of the two groups have no significant difference. The comparison of body temperature between the plastic cover and blanket group among the preterm neonates after 2 hours of interventions were found to be highly significant at 15mins ($P < 0.001$), 30 mins ($P < 0.001$ in plastic cover group whereas in blanket group there was no significant association of clinical characteristics with the level of body temperature. The study results showed that plastic cover is found to be more effective than the blanket in maintaining body temperature among the preterm neonates.

Index Terms—Effectiveness, Plastic-cover, Blanket, Temperature, Thermometer, Preterm neonates.

I. INTRODUCTION

Hypothermia is a serious problem especially in preterm babies.¹ In India approximately 10–12% are born preterm². Preterm infants are vulnerable to hypothermia due to their poorly developed heat

regulating system, large body surface area, poor insulating fat and less of brown adipose tissue². A preterm infants are those infants who were born alive before completing 37th weeks of gestation counting from the first day of the last menstrual period.^{3,4,5} Preterm infants are much prone to hypothermia as compared to term infants. In developing countries, the incidence of preterm baby is 20–25%.³ Preventing hypothermia at birth and at first few days of life in preterm infants is much essential for survival of the preterm infants. The rate of hypothermia in preterm infants at the time of birth is 42–73% whereas preterm infants are associated with complications like hypoglycaemia, asphyxia, hypothermia, cerebral haemorrhage, neonatal shock, Infection, dehydration and academia etc^{2,6,7}. In new born infants, heat lost is mainly by evaporation of the amniotic fluid that cover the babies body¹. Wrapping of plastic cover or sheet at birth and in neonatal unit has been found to be effective in preventing hypothermia in preterm neonates^{1,7}. The plastic cover or wrap prevent hypothermia by preventing the evaporation of the amniotic fluid and also by preventing direct contact with cold linen and mattress.¹⁸ And many studies have proved that plastic cover is found to be more effective than conventional drying under radiant warmer in maintaining body temperature among the preterm neonates. A preterm infants need to be cared in the Neonatal Intensive Care Unit (NICU)⁵. The preterm infants are usually placed under radiant warmer to prevent hypothermia. In NICUs, a lot of health personnel like doctors, nurses take care of the preterm infants by close monitoring, preventing heat loss by evaporation, infection, hypoglycaemia etc.⁵ Nurses and doctors played an active role in maintaining the

body temperature of the preterm infants. Considering that plastic cover and blanket are two methods which prevent hypothermia. They are more safe, inexpensive, easy to use and cost effective. But plastic cover is found to be more effective than blanket in prevention of hypothermia among the preterm neonates as it prevents dehydration and heat loss by convection. As proper maintenance of temperature and preventing hypothermia is very much essential for the preterm neonates to prevent any complications so the best method should be used. It can be prevented by using polyethylene plastic sheets or cover.

II. MATERIALS AND METHODS

After getting approval from ethical committee, JIPMER and Written informed consent was obtained from mothers of pre-term neonates before starting data collection. Assurance was given to participants that anonymity and confidentiality would be maintained. Participants were given the freedom to leave from the study at any time. The research design adopted for the present study was randomized clinical trial. The total sample size of the study was 50. The sample size was estimated with an expected mean difference in the level of temperature between 2 groups as 0.8 & 0.16 SD at 5 % level of significance and 90% power. The sample consisted of 50 pre-term neonates with gestational age 28- 34 weeks admitted in Neonatal intensive care unit (NICU), JIPMER during the course of data collection as per inclusion and exclusion criteria. The pre-term neonates who were sick, with major congenital malformations and mothers who refused the consents were excluded from the study. The study was conducted in in NICU (Neonatal intensive care unit), JIPMER. After getting written informed consent from the parent, babies were assigned into two groups, Group 1 & Group 2, by simple randomization technique. The allocation was done using computer generated random numbers concealed in opaque envelopes kept in the Neonatal intensive care unit.

Pre-interventional phase: Baseline temperature were checked initially before the intervention Interventional phase: Plastic cover and blanket were used for wrapping the babies till the neck and head was covered by a cap. Plastic cover which was used for wrapping the babies, was made up of polyethylene sheet of length 100cm and width 70cm. Blanket used for

wrapping the baby was made up of woolen sheet of length 110 cm and 72 cm width. For Group 1, the babies were placed under the radiant warmer and the heat was set in low temperature and the babies were wrapped with pre-warm plastic cover which was made up of polyethylene sheet. In Group 2, the babies were placed under the radiant warmer and the heat was set in low temperature and the babies were wrapped with pre –warm blanket which was a JIPMER hospital Supplied. In Group 1 axillary temperature was checked primarily and plastic cover was wrapped till the neck of the babies and head was covered by a cap. In Group 2, axillary temperature were checked primarily and blanket were wrapped till the neck of the babies and head was covered by a cap. After 1 hour of wrapping in both the groups, axillary temperature was checked by using a digital thermometer for every 15 minutes for 2 hours. The data collected from the subjects were transferred into Excel master sheet and analyzed using statistical package for social sciences (SPSS) version 21. The distribution of discrete or continuous variables such as gestational age, weight of baby, temperature value had been expressed in terms of mean with standard deviation. The comparison of the continuous data between the groups has been carried out by using independent t-test. The association of temperature with the categorical variable mentioned above has been carried out by using chi square. All statistical analysis had been carried out at 5% level of significance.

III. RESULTS

Among the 50 study participants, In plastic group, 17 (68%) belonged to female whereas in blanket group 14 (56%) belonged to female. Majority of the preterm neonates i.e 22(88%), 20(80%) were born in gestational age of 32-34 weeks in plastic cover group and blanket group respectively. 20(80%) and 17(68%) were categorized under 2.5-1.5kg in plastic cover and blanket group respectively and 5(20%), 8(32%) were categorized under 1.5-1kg in plastic cover and blanket group respectively. Regarding the current gestational age, 2(8%),5(20%) were 28 32 weeks in plastic cover group and blanket group respectively and 23(92%), 20(80%) were 32- 34 weeks in plastic cover group and blanket group respectively. Regarding the current weight, 20(80%), 16(64%) were categorized under

2.5-1.5kg in plastic cover and blanket group respectively and 5(20%), 9(36%) were categorized under 1.5-1kg in plastic cover and blanket group respectively. The comparison of baseline body temperature of plastic cover group and blanket group. In plastic cover group, the mean and standard deviation were 97.7+ .0735 and in blanket groups, the mean and standard deviation were 97.7+ .204. There was no statistically significant difference between the two groups.(table 1) The comparison on body temperature between the plastic cover group and blanket group after the intervention revealed that at 15 minutes, the mean body temperature in plastic cover group and blanket group were 98.0(.117) and 97.8(.057) respectively with a statistical significance less than 0.001 level, at 30 minutes, the mean body temperature were 98.0(.145) and 97.8(.052) in plastic cover group and blanket group respectively with a statistical significance less than 0.001 level. At 75 minutes, the mean body temperature were 98.2(.125) and 97.8(.070) in plastic cover group and in blanket group respectively with a statistical significance less than 0.01 level. At 105 minutes, the mean body temperature were 98.3(.135) and 97.6 (.085) in plastic cover group and blanket group respectively with a statistical significance less than 0.05 level. At 120 minutes, the mean body temperature were 98.4(.132) and 98.0(.072) in plastic cover group and blanket group respectively with a statistical significance less than 0.001 level (Table 2). There was significant association between the level of body temperature with birth weight at $p < 0.01$ and current weight at $p < 0.001$ (table 3), but there was no significant association between the level of body temperature and clinical characteristics.

Table I: Comparison of baseline body temperature of plastic cover group and blanket group. N=50(25+25)

Baseline body Temperature among pre-term neonates	Plastic cover Group (25)	Blanket group (25)	t-value p-value	t-value p-value
	Mean ± SD	Mean ± SD		
	97.70 ±.073	97.74 ±.020	-1.013	.224

Table –II: Comparison on body temperature between the plastic cover group and blanket group after the intervention. N = 50(25+25)

Time Interval	Body temperature among pre term Neonates		t-value	p-value
	Plastic cover group	Blanket group		
	Mean ± SD	Mean ± SD		
15 min	98.0 ± .117	97.8 ± .057	7.45	.000***
30 min	98.0 ± .145	97.8 ± .052	8.93	.000***
45 min	98.1 ± .120	97.8 ± .093	9.72	.131
60 min	98.2 ± .139	97.8 ± .100	10.0	.200
75 min	98.2 ± .125	97.8 ± .070	12.4	.003**
90 min	98.3 ± .136	97.9 ± .101	11.4	.114
105 min	98.3 ± .135	97.9 ± .085	11.9	.012*
120 min	98.4 ± .132	98.0 ± .072	14.8	.000***

* significant at $p < 0.05$

** Highly significant at $p < 0.001$

*** very highly significant at $p < 0.001$

IV. DISCUSSION

In preterm neonates hypothermia is considered as one of the silent killer as it increases the neonatal morbidity and mortality. Proper maintenance of body temperature of the neonates enhanced their survival. The normal body temperature of the neonates is between 36.5- 37.5° C.1 Hypothermia occurs when temperature drops below 36.5° C or 97.7 °F.8. The present study revealed that baseline body temperature of the preterm neonates in both the groups were not significant. But after the intervention, the comparison of body temperature between plastic cover group and blanket group were found to be significant at 15mins with $p < 0.001$, at 30 mins with $p < 0.001$, at 75 mins p value < 0.01 and at 120 mins, with p value < 0.001 . The study showed that plastic cover is more effective in maintaining body temperature among the preterm neonates. The association of body temperature with clinical characteristics of pre- term neonates such as gender, birth weight, birth gestational age, current weight, current gestational was calculated by using Chi-square test. The study has found that there was significant association of body temperature with birth weight and current weight with p value < 0.01 and $p < 0.001$ respectively in the plastic cover group. But there was no significant association of clinical variable with body temperature in blanket group. Other studies have found similar results i.e, Leila et al. (2017) conducted a study to evaluate the effect of plastic

cover and blanket on body temperature of preterm neonates hospitalized in NICU. The study design used was randomized cross-cover clinical trial with total 80 preterm infants of gestational age 28-30 weeks. The study result showed that the mean body temperature of infants covered with plastic cover (36.8°C) was found to be higher than those infants covered with blanket (36.6°C) with p value $<0.001^3$.

Rohana et al. (2011) conducted a study in reducing hypothermia in preterm infants with polyethylene wrap. 110 preterm infants were included in the study. The preterm infants were randomly assigned into wrap and control groups. The study result showed that the mean admission temperature of the wrap group (35.8 °C) was significantly higher than the control group (34.8 °C) with P value < 0.01 . Mathew et al. (2007) conducted a study to assess the effect of vinyl bag in preventing hypothermia. The study included 27 preterm infants with ≤ 28 weeks of gestation. The study were randomly assigned into vinyl bag group and control group. The study result showed that the body temperature in the vinyl bag group was significantly higher than the control group (35.9 +/- 0.13 vs 34.9 +/- 0.24 °C), with p value < 0.00 . The study found that plastic cover is more effective than blanket in maintaining temperature of preterm neonates. Plastic cover is an inexpensive material that can be effectively used in preterm neonates. The most common form of heat loss in preterm babies are mainly evaporation, conduction and convection. So far many studies have been conducted to assess the effectiveness of plastic cover immediately at birth and have proved it also. But still, there is less study done to assess the effectiveness of plastic cover over blanket in the neonatal intensive care unit (NICU). So, more studies is required to investigate the effectiveness of it. The present study was done to compare the effectiveness of plastic cover and blanket on body temperature among the preterm neonates.

CONFLICT OF INTEREST.

The authors declare that they have no competing interests. In addition, this study was not funded.

STATEMENT OF HUMAN AND ANIMAL RIGHTS.

All procedures were followed in accordance as per the ethical principles of the IEC (Institutional ethical committee), JIPMER.

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