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SHORT REPORT

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The role of a neonatal hypothermia alert device in promoting weight gain in LBW infants

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ABSTRACT

Background: Neonatal hypothermia is a significant risk factor for preterm and low birth weight (LBW) newborns, especially in India. Kangaroo Mother Care (KMC) is one recommended method of thermal control. A wearable device, TempWatch, has been developed to monitor for and detect hypothermia and to promote KMC for preterm and LBW infants.

Purpose: This randomized controlled trial was designed to evaluate TempWatch's impact on weight gain, amount of KMC received, and length of hospital stay for LBW infants as compared to standard care.

Methods: Otherwise healthy LBW infants (with birthweights 1500–2300 g) admitted to a KMC ward of a government hospital in New Delhi, India were randomly allocated to a TempWatch group or a control group and wore the device until their time of discharge. 50 infants were enrolled in each group. All participants received standard-of-care temperature monitoring, and those in the control group were monitored using the hand-touch method. Each group also received sixth-hourly temperature monitoring. Infants' daily weight and the number of hypothermia episodes they experienced per day were recorded, and mothers of infants in both groups completed daily KMC diaries.

Results: The TempWatch group experienced statistically significant weight gain as compared to the control group (0.06 vs. 0.02 kg, $p = .024$). There were no statistically significant differences between the groups in the number of hypothermia events detected, the amount of KMC received.

Conclusion: TempWatch promotes statistically significant weight gain for LBW infants as compared to standard care.

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Neonatal hypothermia; hypothermia alert device; kangaroo mother care; weight gain

Introduction

Neonatal hypothermia poses a particular challenge for low birth weight (LBW) and preterm newborns, who struggle to regulate their own body temperatures [1]. Given the high prevalence of hypothermia in India, it is crucial that newborns be monitored for and receive interventions to address hypothermia. The WHO recommends Kangaroo Mother Care in providing thermal control for LBW infants [2]. KMC has been associated with significant reductions in hypothermia and with increased weight gain as compared to standard neonatal care for LBW infants [3].

A device to provide continuous hypothermia monitoring and promote thermal care in the form of KMC, called the TempWatch, has been clinically validated for its accuracy in diagnosing hypothermia (95.8%) with high sensitivity (98.6%) and specificity (95%) [4].The TempWatch is a bracelet device worn on the wrist of a neonate that beeps and sounds an alarm when the infant experiences hypothermia. Caregivers are trained to provide KMC to warm the infant when the bracelet alarms.

This randomized controlled trial was conducted at Swami Dayanand Hospital, a government hospital in New Delhi, India form March 2018 – August 2019, to determine the impact of providing LBW infants with continuous temperature monitoring using TempWatch on their weight gain, amount of KMC received (Table 1).

Objectives

1. To compare average daily weight gain in babies using hypothermia alert device and in babies using human touch method and standard of care for detection of hypothermia.
2. To compare average duration of KMC(Kangaroo Mother Care) hours in babies using hypothermia alert device and babies using human touch method for detection of hypothermia.

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Table 1. Distribution of weight.

	Mean SD	Median	95% CI:	*p* Value:
BIRTH WEIGHT				
Intervention	2.11 (0.22)		−0.12, 0.06	.699
Control	2.08 (0.27)			
ENROLLMENT WEIGHT				
Intervention	1.99 (0.21)		−0.09, 0.08	.71
Control	1.98 (0.24)			
DISCHARGE WEIGHT				
Intervention	2.05 (0.20)		−0.13, 0.03	.252
Control	2.0 (0.22)			
CHANGE IN WEIGHT GM/KG/DAY				
Intervention	7 (11.03)	6.74		.039
Control	2.72 (9.87)	3.28		
KMC Hrs.				
Intervention	3.62 (2.01)			.07
Control	3.15 (2.27)			

Methods

50 babies were enrolled in the intervention group and 50 were enrolled in the control group. After parents provided written informed consent, participants were randomly assigned in a 1:1 ratio to the intervention and control groups by simple randomization.

Babies in the intervention group received a TempWatch device and babies in the control group received temperature monitoring by the hand-touch method, in which a caregiver checked a baby's temperature with the dorsum of their hand to assess the baby's abdominal and limb temperatures. If the baby's limbs were cold in comparison to their abdomen they were classified as experiencing cold stress; if their abdomen and limbs were both cold, they were classified as hypothermic.

Mothers from both groups were instructed in the hand touch method. When the bracel*et al*armed or when the infant experienced cold stress or hypothermia as identified by the hand-touch method, temperature was cross-checked with measurements taken using a digital thermometer at the axilla. Mothers were instructed to provide KMC when hypothermia was identified. A KMC diary was provided to mothers of infants in both groups to track daily sessions of KMC.

Infants were enrolled in the study until the time they were discharged from the hospital.

Discharge criteria

- Weight gain should be consistently demonstrated for 3 consecutive days.
- Weight should be more than or equal to 1500 gm
- Mother should be confident in feeding the neonate (Breastfeeding or any alternative method).
- The required nutritional supplements should have been started.
- Mother is well versed with KMC and has adequately practiced in the hospital under supervision.

Results

Results were used to calculate the incidence of hypothermia, average daily weight gain, the average daily hours of KMC provided in both groups, and the length of hospital stay in groups.

From March 2018 to August 2019, 100 babies were studied. 50 in the intervention group and50 in the control group. In the intervention group 23 (44%) were females and 27 (56%) were males, while in the control group 29 (55.7%) were females and 21 (43.6%) were males.

The birth weight distribution of the subject showed that the mean birth weight in the intervention group was 2.11 kg and 2.08 kg in the control group which is not significantly different at $p = .699$.

Median study duration was 4 days in both the groups. At enrollment the average weight in the intervention and control groups were almost similar at 1.99 ± 0.21(SD) kg and 1.98 ± 0.24(SD) kg respectively with statistically insignificant *p* value of .71.

The distribution of weight at discharge showed that the mean weight in the intervention group was 2.05 kg and in mean weigh in the control group was 2.0 kg and *p* value was .25.

The statistical analysis of the change in weight (discharge minus enroll weight) showed significant difference between the intervention and the control group. The change in weight was calculated as difference of weight at enrollment and weight at discharge in gm/kg/day. The median increase in the intervention group was 6.74 gm and in the control group was 3.28 gm with a statistically significant *p* value of .039 (Mann – whitney test). This shows that Temp-Watch has a significant effect in better weight gain.

The intervention group received an average of 3.62 h of KMC and the control group received an average of 3.15 h, and the difference was not statistically significant. Participants in the intervention group spent an average of 4.28 days in the study and participants in the control group spent an average of 4.32 days in the hospital, and this difference was also not statistically significant.

Discussion

The statistically significant weight gain experienced by the TempWatch group as compared to the control

group in this study demonstrates the device's utility in promoting weight gain for LBW infants as compared to standard care. These findings have positive implications for the role of TempWatch in supporting improved growth for LBW infants. Better growth in these infants has been shown to reduce their likelihood of experiencing neurodevelopmental impairments [5] and may improve their long-term motor outcomes [6]. As almost 15% of babies worldwide are born LBW [7], the TempWatch could be useful in promoting healthy growth for a large proportion of vulnerable babies born annually. Further studies could evaluate the impact of use of TempWatch on growth in different countries or settings to understand whether the device will have a similar impact for babies in various contexts.

Conclusion

TempWatch improves growth for LBW infants at a statistically significant manner, which has positive implications for these infants' long-term health outcomes. There could be several factors that may have contributed to more weight gain in the intervention group, like, better breastfeeding component, better bonding between the mother and child, higher KMC hours and sustained thermal care maintained.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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