

Original Research Article

Usability and acceptability of a hypothermia monitoring device in a community setting

Madhuri Mukane¹, Annika Gage¹, Priyanka Choubey^{2*}

¹Department of Child Health and Nutrition, Aroehan, Palghar, Maharashtra, India

²Public health Impact, Bempu Health pvt. Ltd, Bangalore, Karnataka, India

Received: 25 February 2020

Revised: 06 April 2020

Accepted: 08 April 2020

*Correspondence:

Ms. Priyanka Choubey,

E-mail: priyanka@bempu.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: The present pilot study aimed to test the usability and acceptability of the hypothermia monitoring device, i.e., temp watch, among the mothers/caregivers of low birth infants (LBW) and community health workers (ASHA workers) who visited them.

Methods: Eligible LBW new-borns (<2500 grams) were recruited after written informed consent from parents and were followed-up for 28 days with intermittent visits from assigned ASHA workers. The parents recorded hypothermia episodes and KMC hours in a patient diary. Feedback was taken from these mothers and ASHA workers at the end of study.

Results: The weight gain at 28th day of the recruited babies was significant ($p=0.01$) as compared to the weight at enrolment on day 0. Among the recruited population ($n=50$ LBW infants), 57% of the subjects reported the device alerted for hypothermia at least once a week. All the mothers of the recruited babies thought that the temp watch device was useful for hypothermia monitoring and the alerts helped in maintaining the baby's temperature. All ASHA workers were satisfied with the device and reported a positive behavioral change in the mothers KMC hours at the end of the study.

Conclusions: The temp watch was useful in hypothermia monitoring in LBW infants in a low resource home setting. The usability and acceptability of the device was tested in mothers and ASHA workers with positive feedbacks from both populations. This suggests a need for the introduction of the device as a community-based intervention for hypothermia monitoring in LBW infants.

Keywords: Community health workers, Hypothermia, Intervention, Kangaroo mother care, Low birth weight feedback

INTRODUCTION

India's progress to reduce the neonatal mortality rates, especially those of infants and children under five, has been slow moving in the last decade.¹ The poor households report 5.6% infant deaths in the first 28 days of life.² In low income home settings, majority of these deaths can be attributed to preventable causes such as sepsis, diarrhea, respiratory infections and other illnesses.

Hypothermia i.e., temperature below 36.5°C, is also known to be one of these preventable causes of infant mortality and morbidity.³

Hypothermia is one of the important danger signs, especially in low birth infants, which needs to be monitored for babies after discharge from the hospital.⁴ For this, home based neonatal care (HBNC) needs to be made available to them as soon as feasible. The

accredited social health activist (ASHA) is instituted by the government of India to provide the HBNC for a period of 2 months after the baby's delivery.⁵ ASHA focuses on training the mother/caregiver for monitoring and recording hypothermia episodes among other danger signs of the low birth weight newborns. ASHA workers also document these episodes and provide training to the mother/caregiver of acceptable methods like kangaroo mother care (KMC) for hypothermia management during her visits⁶. The role of ASHA workers in hypothermia management is therefore crucial in the rural setting.



Figure 1: The hypothermia alerting device: Bempu temperature watch.

The BEMPU temp watch is simple innovative device which can continuously monitor the temperature in infants and alert the mother/caregiver of a hypothermic episode (Figure 1). The temp watch beeps with an orange light that sounds till the baby's body temperature becomes normal again. Once the temperature returns to normal, the orange light turns back to blue without alarm. This device is easy to use, infant friendly and is highly recommended in a home-based setting.⁷ The use of the device also promotes KMC uptake in mothers and indicates higher weight gain in LBW infants.⁸ However, the acceptability of the device in the low-income community setting by caregivers and ASHA workers has not yet been published.

The purpose of the present pilot study was to record the usability and acceptability of the BEMPU Bracelet, i.e., temp watch, for hypothermia monitoring by mothers/caregivers and ASHA workers in a rural setting.

METHODS

Study design

The present pilot intervention study was approved by the local health department authorities and was conducted at a Government hospital (Jawahar Cottage Hospital) in the remote village of Jawahar, Palghar. The study was conducted from the period February 2019 till May 2019. The study was done under the supervision of Aroehan, Palghar which is a local non-governmental organization that works for sustainable change in tribal communities in Jawahar. The study was financially supported by Dewan

Housing Finance Corporation Limited (DHFL)- changing lives foundation, the CSR arm of the company, and guided by Samhita Social Ventures, Mumbai. Eligible LBW newborns (less than 2500 grams), stable at the time of discharge and living in the 50 km radius (preferably residing in the Jawahar block and 2 neighboring blocks Mokhada and Vikramgad) for easy follow-up were recruited after written informed consent from parents.

Training

BEMPU trained the nurses and doctors at Jawahar Cottage Hospital and the ASHA workers in the Jawahar block on the importance of Kangaroo Mother Care (KMC) for health of low birth weight and preterm newborns. The BEMPU bracelets, i.e., temp watch, was given to SNCU staff at Jawahar along with Monitoring and Evaluation materials. The temp watch was given to the recruited babies two days prior to discharge. The nurses trained the mothers on the use of temp watch and facilitated its regular use till discharge. In brief, the temp watch shows a blue light when the baby's temperature is normal ($>36.5^{\circ}\text{C}$), however, it emits a beep with flashing orange light when the temperature goes hypothermic ($<36.5^{\circ}\text{C}$). Nurses also trained parents on corrective measures like Kangaroo Mother Care to keep the baby from getting cold when indicated by the temp watch.

Monitoring and evaluation

In order to gather baseline data on community-level weight gain and Kangaroo Mother Care, parents of 50 low birth weight babies were given a monitoring tool i.e., a patient diary upon discharge from the hospital. ASHA workers were notified of these parents in their catchment areas and motivated them to fill out information in the patient diary on daily KMC performance. ASHA workers also noted the weight of the newborn every week for four weeks. At the end of 4 weeks, the ASHA collected the patient diary and return it to the ASHA Supervisor to be handed over to the Aroehan and BEMPU staff for analysis.

Statistical analysis

Data recorded from the feedback of mothers ($n=49$) of recruited babies and ASHA workers ($n=40$) was analysed using Microsoft Excel. Continuous data points were summarized using count, mean, median and range and analysed using t-test (or its non-parametric equivalent). Categorical endpoints were summarized as counts and percentages and analysis was done using chi-square test.

RESULTS

The neonatal characteristics are depicted in Table 1. The neonatal weight gain i.e., difference between weight at enrolment and weight at 28th day was found to be significantly higher ($p=0.01$). However, there was no changes observed for any other parameters.

Table 1: Neonatal characteristics.

| Neonatal characteristics | Mean±SD |
|--|------------|
| Age (days) | 9.27±4.06 |
| Gender (M/F) | 24/25 |
| Birth weight (kg) | 1.73±0.37 |
| Weight at enrolment (kg) | 1.70±0.32 |
| Weight at 28 th day of study (kg) | 1.88±0.40* |
| KMC hours | 1.19±0.37 |

*p=0.01 significant as compared to weight at enrolment.

The feedback was taken from the parents who were given the temp watch with a set of pre-designed questions (Table 2). All mothers (n=49) used recruited in the study used the temp watch every day on their baby's. The temp watch beeped once a week for 57% (n=28) of the recruited babies while it beeped a few times a week for 43% (n=21) babies. All mother performed corrective measures like wrapping the baby in blanket and performing KMC when the temp watch alarmed. All mothers gave positive feedback for the usability the temp watch.

Table 2: Feedback analysis of the parents using the temp watch.

| S. no. | Feedback questions | % of subjects |
|--------|---|---------------|
| 1 | How often did the BEMPU Bracelet beep? | |
| | A few times in a week | 43 |
| | Once a week | 57 |
| 2 | Did you keep the BEMPU Bracelet every day on your baby for one full month? | |
| | Yes | 100.0 |
| 3 | When BEMPU Bracelet was beeping, what did you do? | |
| | Performed KMC and wrapped the baby with warm cloth | 100.0 |
| 4 | Was the BEMPU bracelet helpful to you and your family? | |
| | Yes | 100.0 |

Table 3: Feedback analysis of the ASHA workers.

| S. no. | Feedback questions | Yes (%) | No (%) |
|--------|---|---------|--------|
| 1 | Temp watch alarmed during ASHA visits | 8 | 92 |
| 2 | Mothers calling ASHA when the device alarmed | 3 | 97 |
| 3 | Device was useful in detecting low temperature? | 100 | - |
| 4 | Device was useful for KMC uptake/promotion? | 100 | - |
| 5 | Device was helpful for improving awareness of hypothermia in the family? | 100 | - |
| 6 | Families understood how to respond to the device | 100 | - |
| 7 | Observed behavior changes in KMC practice hours and swaddling | 100 | - |
| 8 | Families were cleaning the bracelet regularly? | 100 | - |
| 9 | Baby always wearing the bracelet when ASHA visited | 95 | 5 |

Further, feedback was also taken from ASHA workers designated to the recruited babies in the study (Table 3). A separate sheet of feedback questionnaires was administered to the ASHA workers at the end of the study. The temp watch alarmed for 8% of babies during the ASHA home visit for the entire study period. Only 3% of mothers called ASHA workers when the device alarmed during the study period for more information the device. According to ASHA workers, the device was 100% useful for detection of temperature and KMC uptake/promotion. All the users understood the device working and cleaned the brace-let regularly. The device was helpful for improving hypothermia awareness in the family. All ASHA workers observed and recorded a positive behaviour changes in KMC practice hours and swaddling. 95% babies reported wearing the bracelet during ASHA visits.

DISCUSSION

Evidence till date suggests that health workers in the community can effectively deliver postnatal care through planned home visits.^{9,10} These timely interventions of postnatal care can contribute towards the reduction of the existing high neonatal mortality rates (NMR). A better understanding of the existing community reach programme is needed to improve its reach. It was therefore essential to study an innovative tool (Bempu temp watch) that monitors hypothermia in infants and understand its effectiveness in a community based setting.

As observed in the current study, 100% of the mother/caregivers were satisfied with the hypothermia monitoring using the temp watch over a period of 28 days. Among the total recruited subjects, 57% reported

that the Bempu bracelet beeped once a week. The study was conducted in the period from March to May (the summer months), during which the weather in the study area is hot and dry with an average temperature of 28°C-37°C. It is known that environmental temperatures may influence the incidences of hypothermia in neonates.¹¹ The observed percent of the bracelet beeping in the current study is considerably more for the summer months indicating higher incidences of hypothermia than expected and may possibly be higher during the winters.

It has been documented in recent years that the population (especially in children under five) in Palghar district (mainly in the Jawahar, Mokhada and Vikramgad blocks) is malnourished.¹² This is mostly attributed to the geography of the region leading to food in-security and consumption of an unbalanced diet. Despite a number of existing public nutritional programme in the area, infant mortality due to malnourishment was reported to be 4.4% in 2016 and primarily attributed to low birth weight of the infants.¹³ As already mentioned that hypothermia is a danger sign for LBW babies, it was interesting to look at the aspect of weight gain due to intervention by the monitoring device. As expected, authors observed an increase in baby weight on 28th day in the infants that were followed-up after enrolment. This significant weight gain may possibly be due to increased KMC as a corrective measure by the mothers. The component of exclusive breast feeding in KMC may have facilitated the weight gain in neonates. However, the feedback in the present study did not record the breast-feeding hours of the baby and future versions of the questionnaire will be modified to get this data for better understanding. Also, weight gain will have more implication if it is compared to the average weight gain in LBW infants in the area or done on a larger number of infants.

Hypothermia incidences and resulting complications are reported in home settings in a number of small cohort studies all over India.^{14,15} A similar cohort study in the state of Maharashtra reports hypothermia incidences (temperatures less than 35.0°C) in 17% infants through the first month of life.¹⁶ These infants were monitored through multiple home visits by the village health worker (VHW) over a period of 28 days. This study, which is now recognized as primary model for community-based interventions, suggests that prompt involvement of ASHA workers during home visits will lead to a decline in NMR. Therefore, the feedback of ASHA workers for the hypothermia monitoring using the temp watch was essential to understand the need for this community-based intervention.

The feedback was also recorded from (n=40) ASHA workers who visited the allotted babies on day 3, 7, 14, 21, 28 in the home setup. All ASHA workers in the present study felt that the device was useful in the detection of hypothermia incidences in the low birth babies. These timely alerts to the mothers also facilitated the corrective measures like wrap-ping and kangaroo

mother care (KMC) for hypothermia management. All ASHA workers part of the study reported positive behavioral changes in KMC practice hours and swaddling in mothers/caregivers of these infants. Most mothers/caregivers remarked that “the bracelet is very useful and should be used by everyone”.

The home-based newborn care (HBNC) in India has contributed immensely towards reducing the NMR.¹⁷ To prevent the morbidity and mortality in low birth infants due to hypothermia, various interventions like KMC, other than primary care should be considered.¹⁸ The present study highlights the role of the temp watch in promoting the KMC in mothers of LBW infants in home settings. The usability and acceptability of the device is also replicated in the feedback given by the ASHA workers re-enforcing the need for the device in the home setting for neonatal survival. Future studies are ongoing to study the impact of the device on larger numbers in a community setting.

CONCLUSION

The temp watch, continuous hypothermia monitoring device, was introduced in the home setting for neonatal monitoring over a period of 28 days. The mothers and ASHA workers were satisfied with the device for hypothermia monitoring. The usability of the device also resulted in a positive change in the uptake of kangaroo mother care among these mothers suggesting a need for the device in the community.

ACKNOWLEDGEMENTS

The authors are grateful to the participants for the successful completion of the study. Authors wish to thank Dr. Ramdas Mahadu Marad, Medical Superintendent, Cottage Hospital Jawhar and other doctors and nurses of Cottage hospital, Jawhar involved the study. The authors also want to thank Ms. Anita Pagare and Ms. Sangeeta Pawar, Aroehen for their help in implementation, data collection and compilation. The authors acknowledge the members of the Samhita Social Ventures, Mumbai for their guidance.

Funding: The study was funded by Dewan Housing Finance Corporation Limited (DHFL)- Changing Lives Foundation, the CSR arm of the Company, New Delhi

Conflict of interest: None declared

Ethical approval: The intervention study was approved by the local health department authorities

REFERENCES

1. Singh A, Pathak PK, Chauhan RK, Pan W. Infant and child mortality in India in the last two decades: a geospatial analysis. *PLoS One*. 2011;6(11).
2. NIMS I, and Unicef. Infant and child mortality in India: Levels, trends and determinants, 2012. National Institute for Medical Statistics (NIMS),

- Indian Council of Medical Research (ICMR), and UNICEF, India Country Office, New Delhi. Available at: <http://www.indiaenvironmentportal.org.in/content/366656/infant-and-child-mortality-in-india-levels-trends-and-determinants/>. Accessed on 24th January 2020.
3. Shahraki AD, Khan KS, Wojdyla D, Say L, Gulmezoglu AM, Van Look PF, et al. World health report: make every mother and child count. *J Med Sci*. 2005;7(8):1066-74.
4. Nabiwemba EL, Atuyambe L, Criel B, Kolsteren P, Orach CG. Recognition and home care of low birth weight neonates: a qualitative study of knowledge, beliefs and practices of mothers in Iganga-Mayuge Health and Demographic Surveillance Site, Uganda. *BMC Pub Health*. 2014;14(1):546.
5. ALE, T. Operational guidelines, 2015. Available at: <http://www.nccmis.org/document/Operational-guidelines-Introduction-of-RVV-in-the-UIP-in-India.pdf>. Accessed on 20th January 2020.
6. Malhotra S, Zodpey SP. Operations research in public health. *Indian J Pub Health*. 2010;54(3):145.
7. Reddy MP, Murki S, Kiran S, Rao P, Maram S. Neonatal hypothermia monitoring and alerting device, acceptability among mothers and caregivers. *Inter J Res Rev*. 2019;6(12):217-20.
8. Jagadish AS, Benakappa A, Benakappa N, Morgan G. A randomized control trial of hypothermia alert device in low birth weight new-borns and the effect on kangaroo mother care and weight gain. *Inter J Contemp Pediatr*. 2019;7(1):52-6.
9. Aboubaker S, Qazi S, Wolfheim C, Oyegoke A, Bahl R. Community health workers: a crucial role in newborn health care and survival. *J Global Health*. 2014; 4(2):020302.
10. Gogia S, Sachdev HS. Home visits by community health workers to prevent neonatal deaths in developing countries: a systematic review. *Bullet World Health Organization*. 2010;88:658-66.
11. Lunze K, Bloom DE, Jamison DT, Hamer DH. The global burden of neonatal hypothermia: systematic review of a major challenge for new-born survival. *BMC Med*. 2013;11(1):24.
12. Ghosh S, Varkerkar SA. Undernutrition among tribal children in Palghar district, Maharashtra, India. *PloS One*. 2019;14(2):e0212560.
13. Matkar SL. "Please, Sir, I Want Some More." A Case Study of Child Mortality of Palghar District, State of Maharashtra, India. 2017. Available at: <https://boa.unimib.it/retrieve/handle/10281/150298/213942/7th.ISF.Oxford%202017.pdf>. Accessed on 18th January 2020.
14. Darmstadt GL, Kumar V, Yadav R, Singh V, Singh P, Mohanty S, et al. Introduction of community-based skin-to-skin care in rural Uttar Pradesh, India. *J Perinatol*. 2006;26(10):597-604.
15. Kumar R, Aggarwal AK. Body temperatures of home delivered new-borns in north India. *Trop Doct*. 1998;28(3):134-6.
16. Bang AT, Reddy HM, Baitule SB, Deshmukh MD, Bang RA. The incidence of morbidities in a cohort of neonates in rural Gadchiroli, India: seasonal and temporal variation and a hypothesis about prevention. *J Perinatol*. 2005;25(1):18-28.
17. Neogi SB, Sharma J, Chauhan M, Khanna R, Chokshi M, Srivastava R, et al. Care of newborn in the community and at home. *J Perinatol*. 2016;36(3):13-7.
18. Daga S. Reinforcing kangaroo mother care uptake in resource limited settings. *Mater Health Neonatol Perinatol*. 2018;4(1):26.

Cite this article as: Mukane M, Gage A, Choubey P. Usability and acceptability of a hypothermia monitoring device in a community setting. *Int J Community Med Public Health* 2020;7:1907-11.