An Experience On The Use Of BEMPU To Detect Hypothermia In 5 Premature Newborns Over A Period Of 4 Weeks In Services Hospital, Lahore, Punjab, Pakistan

Background:

Globally, neonatal mortality contributes to two-thirds of all deaths of children under the age of five years. Each year about 20 million infants of low birth weight are born worldwide, which imposes a heavy burden on healthcare and social systems in developing countries. Pakistan has a neonatal mortality rate (NMR) of 55/1000 live births (PDHS 2012-13). Premature newborns, i.e. babies born before 37 weeks of pregnancy, are more prone to hypothermia as they cannot fully regulate their body temperature.

We are sharing a four-week experience with BEMPU, a smart bracelet used to maintain safe and healthy temperature of newborn babies, in order to assess its utility for detecting and controlling hypothermia.

About BEMPU:

BEMPU is a smart bracelet to maintain safe and healthy temperature of a newborn baby. It is a device specially designed to detect the drop in body temperature of newborn babies. This device is wrapped around the wrist of a newborn baby. If the temperature is normal it blinks a blue color every 30 seconds. As soon as the temperature of the baby falls below 36.5 degrees, BEMPU starts to blink orange color and beeps, alerting the mother that the baby is hypothermic. Prompted by this alarm, she can perform Kangaroo Mother Care (KMC) or can cover the baby with a blanket in order to normalize the temperature. When the temperature becomes normal the blinking color of the BEMPU changes to back to blue and the bracelet stops beeping. BEMPU is validated for 28 days of use.

In the KMC unit of Services Hospital, Lahore in Punjab province, five BEMPUs were used for this experience-sharing effort. Four bracelets have been successfully used and recovered, and one was lost to follow-up.

Selection of Mothers/ Newborns:

The following eligibility criteria was applied for the inclusion of mothers and newborns in this experience:

Mother's criteria:

- Willing
- Educated
- Compliant
- Accessible for follow-up

Newborn's criteria:

- Preterm
- Stable
- Part of KMC

Orientation/Counseling of mothers on the use of BEMPU:

All five participant mothers were given a proper orientation on the use of BEMPU and were counseled/ trained in KMC daily during their stay. Participant mothers were provided with BEMPU along with the KMC kit, which includes following items:

- Thermometer
- Binder
- Gown
- Mirror
- Hand sanitizer
- Cup & spoon
- Bottle for milk storage
- Cap, socks and vests for the new born

All mothers were trained to take their baby's temperature at the times mentioned in the "Daily Monitoring of BEMPU Babies by Mothers" daily record sheet. They were also counseled to take the baby's temperature as soon as BEMPU beeped, or indicated hypothermia. For the convenience of mothers, a daily record sheet was developed in Urdu and they were properly guided about keeping this record on daily basis.

Profile of Mother/ New born:

Data Collection of Premature Babies Given BEMPU During KMC in Services Hospital, Department of Obstetrics & Gynecology Unit 2

Name of Patient					
Serial No.					
Unit					
DOA in KMC					
Mother Age					
Contact					
Address					
Registration No.					
Duration of Pregnancy					
Risk during pregnancy					
Mode of delivery					
Type of KMC					
Baby shifted to Gynae KMC or Peads KMC					

Data of KMC Babies Given BEMPU in Services Hospital

Mother's Name					
Sr #					
Sex of baby					
Weight of baby at birth (Kg)					
Temp at Birth (centigrade)					
Head Circumference (cm)					
Length (cm)					
Any other risk besides prematurity					

Daily monitoring record:

Daily Monitoring of BEMPU Babies by Mothers

Mother's Name Baby's Name	Baby's Data	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
	Temperature at 9 am							
	Temperature at 3 pm							
	Temperature at 9 pm							
	*No. of times light turned **ORANGE** with Sound*							
	Temperature of the Baby at that time							
	KMC support given (write in mins)							
	*After how many minutes the light turned **BLUE***							

Comments from mothers:

No. of times BEMPU was cleaned:

Any issues with BEMPU:

Do you think it is easy to use?

Do you think it is useful for the baby and why?

Daily Monitoring of BEMPU Babies by Mothers

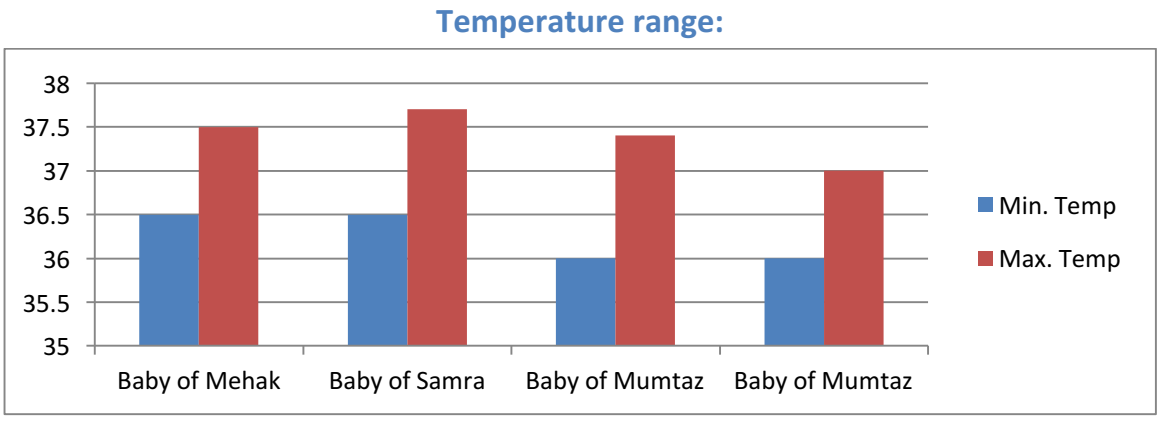
ماں کا نام بچے کا نام	بچے کا DATA	پہلا دن	دوسرا دن	تیسرا دن	چوتھا دن	پانچواں دن	چھٹا دن	ساتواں دن
	درجہ حرارت صبح 9 بجے							
	درجہ حرارت دوپہر 3 بجے							
	درجہ حرارات رات 9 بجے							
	کتنی مرتبہ BEMPU کی آواز کے ساتھ نارنجی رنگ کی روشنی ہوئی							
	اس وقت بچے کا درجہ حرارت کیا تھا؟							
	کیا KMC دی گئی (مدت)							
	کتنی دیر کے بعد روشنی نیلی ہوئی							

کمنٹس Comments	
کتنی مرتبہ BEMPU کی صفائی ہوئی؟	
BEMPU کے ساتھ کوئی شکایت؟	
کیا اس کا استعمال آسان تھا؟	
کیا یہ بچے کے لیے مفید تھا اور کیوں؟	

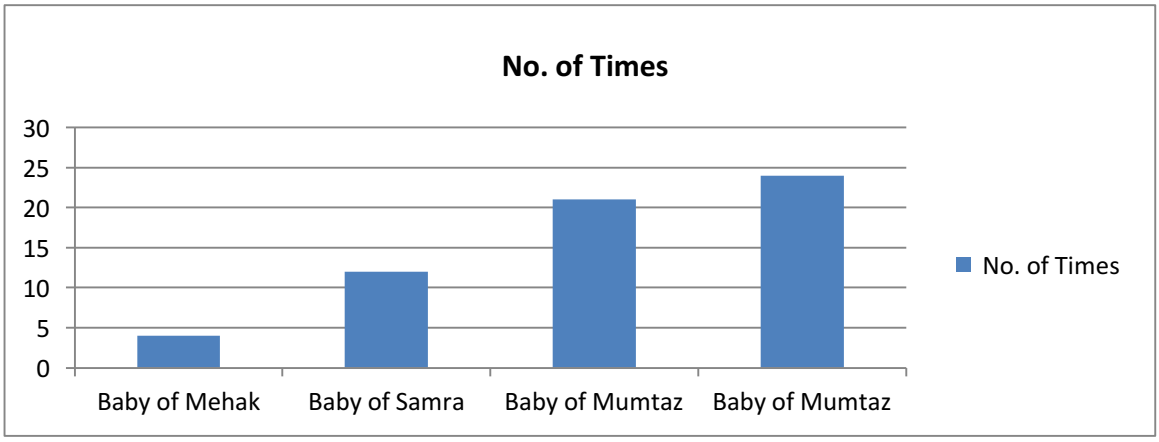
Analysis report:

Indicators	Mother's Name			
	Mehak W/O Zubair (1)	Samara W/O Shafique (2)	Mumtaz W/O Qasim (3)	Mumtaz W/O Qasim (4) Twin
Temperature Range	36.5-37.5	36.5-37.7	36-37.4	36-37
*No. Times Light Turned **ORANGE** with Sound in 28 days*	4	12	21	24
Temperature of the Baby at that Time (during hypothermia)	36.5	36.5	36-36.5	36-36.5
KMC support given in mins before temp was normalized	20 to 30	5 to 15	10 to 15	5 to 15
*After how many minutes the light turned **BLUE***	5 to 15	1 to 8	10 to 15	5 to 15

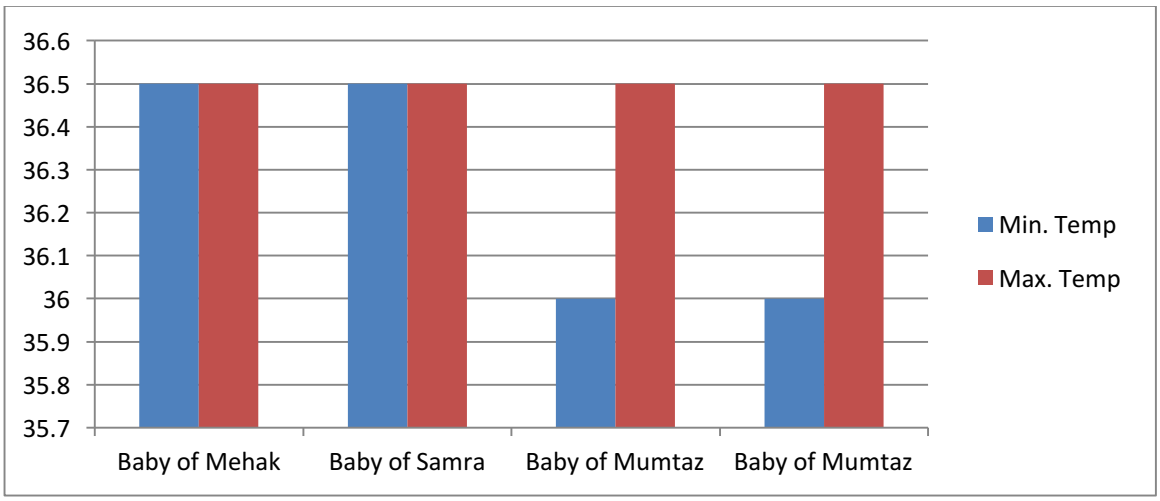
Graphical Representation:



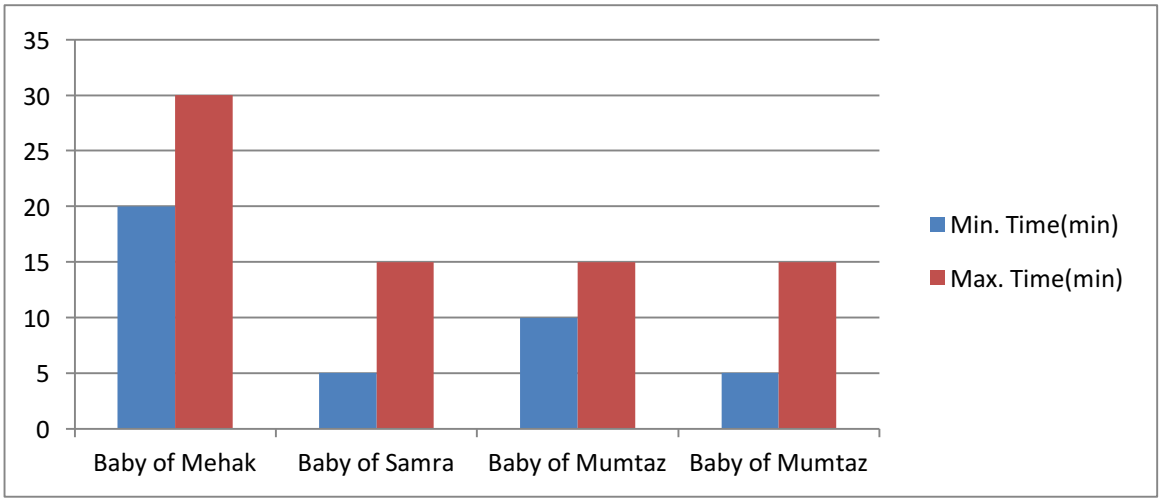
No. Times Light Turned ORANGE with Sound in 28 days

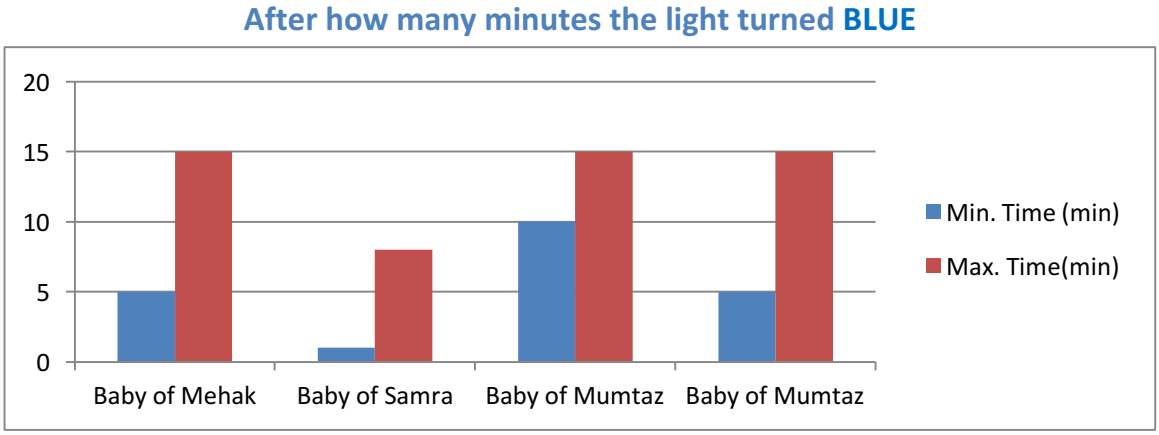


Temperature of the Baby at that Time (During hypothermia)



KMC support given in minutes before temp was normalized





Summary:

Explanation of graphical representation:

BEMPU babies were observed regularly for the period of 28 days, which included the neonatal period at the KMC ward and time at home. It was observed that the routine temperature of babies ranged from 36-37.7^{0}C. The number of times the light turned orange with the beep varied from 4 to 24, depending upon the temperature of the respective baby. The temperature of the baby during hypothermia ranged from 36-36.5^{0}C and the number of minutes KMC was given to normalize the baby's temperature varied from 5-30 minutes. Babies returned to normal temperature after provision of KMC in 1- 15 minutes.

Comments of mothers:

All participant mothers were completely satisfied with BEMPU. They said that the device was very user-friendly and easy to handle. Further, they said this device helped them to identify the main cause of their baby's cry, as previously hypothermia was mistaken for stomach pain and the baby was not treated accordingly. They suggested adding information on "how to clean the BEMPU" in the insert of the BEMPU box. They wiped the device with a clean cloth and water once a day.

Challenges:

The major challenge faced during implementation of BEMPU was identifying mothers who were willing to participate in the study, educated, compliant, and accessible to follow-up.

Picture:

Picture of BEMPU baby at follow-up