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Newborns' Behavioral Adaptations during Hot Tub Bath: A Randomized Clinical Trial

Abstract

Background: Bathing is a daily activity that aims at cleaning and protecting the outer covering of the body. This procedure stands out for presenting a high level of manipulation, and may interfere with the NB's physiological and behavioral reactions, but when performed in a humanized way, like a bucket bath, it seeks to minimize the deleterious effects on these systems. The present study aims to evaluate the infant's behavior in the bucket and shower bath.

Methods: This is a randomized controlled trial, blind with healthy newborns allocated to bucket bath or shower bath group. During the bucket bath, newborns were wrapped in a towel and the body was semi-inflected and moved lightly and slowly in the water. For the shower bath, the same technique routinely adopted by the team was performed.

Results: A total of 198 newborns were assessed. Shower bath increases the pain (x286.12; p<0.001) and when assessed during the shower, increased by 57% [RR=1.57(95%CI:1.47-1.68) and after, increased by 34% [RR=1.34(95%CI:1.23-1.46)]. Although both bath types have altered the behavioral state (x21.99;p=0.15), instances of crying are four times more significant during the shower bath (x233.01;p<0.001). Conclusions: Bathing in the bucket changes positively the newborn's behavioral state, as well as protects the baby from pain, when compared to the shower bath.

Trial registration: ReBEC number: RBR-4z26f3

Keywords: Behavioral control; Newborn; Sleep; Neonatology; Pain

Research Article

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Abbreviations: NB: Newborn; UHAB: University Hospital Ana Bezerra; NFCS: Neonatal Facil Coding System Scale; GEE: Generalized Estimated Equation; RR: Relative Risk; PTNB: preterm newborns

Background

Bathing is a daily activity that aims at cleaning and protecting the outer covering of the body, besides stimulating the general circulation of the skin and providing a comfort and well-being feeling [1]. When performed in a humanized way, it seeks to minimize the deleterious effects on the newborn's (NB) physiological and behavioral systems [2].

According to the Ministry of Health [3], this procedure stands out for presenting a high level of manipulation, which may interfere with the NB's behavioral reactions. It must be done, therefore, assessing the newborn's physiological and behavioral aspects.

Whereas that, the world has worked with humanized care to children, mothers and families, respecting their characteristics and individualities, it appears that the bucket bath is an alternative for this purpose [4].

The humanized bath recommended by the Ministry of Health is very similar to the bucket bath's characteristics. During this procedure, the NB is immersed in warm water up to the neck, with no exposure to airflow, and containment of the flexor pattern by being wrapped with a towel-diaper in order to avoid stress, motor disorganization and energy expenditure and also to provide relaxation and pleasure to the NB [3,4].

Several studies have demonstrated benefits of including immersion baths in the NB's daily routine [2,5,6], such as crying reduction, decreased pain, improved behavior, adequacy of the sleep-wake and relaxation cycle states. However, studies comparing this procedure to the traditional bath are still necessary, especially as regards the behavioral effects such as pain and sleep-wake cycle [5,6], because the behavioral effects directly reflect the humanized care.

Thus, the present study aims to evaluate the infant's behavior in the bucket and shower bath.

Methods

This is a randomized controlled trial, blind with newborns that were allocated to the intervention (bucket bath) or control (shower bath) group by drawing sealed envelopes in order to determine the bath type: bucket or shower bath. It was held in the Rooming Unit at the University Hospital Ana Bezerra (UHAB/EBSERH), RN, Brazil. The study was approved by the Research Ethics Committee, Faculty of Health Sciences of Trairi (Protocol. 352 851/2013) and registered at platform of Brazilian clinical trials (REBEC, number RBR-4z26f3).

The study included NBs born full term, clinically stable and excluded NBs weighing over 3.5 kg, requiring ventilatory support, infectious processes, with wounds, presenting changes in temperature, neurological problems, heart failure and convulsions.

The sample was calculated for 78 newborns in the intervention group, but was inclused 100. For this calculation we considered 30 births per month (birth statistics from UHAB in 2012), 0.05 alpha value, statistical power of 90% and a 20% sample loss, but the occurrence of births during data collection was higher and allowed to have a sample of 100 NBs in the intervention group and 98 in the control group.

For data collection we used our own questionnaire for clinical assessment, including data such as gender, birth weight, gestational age (assessed by the last menstrual period), type of birth, Apgar score at five minutes and hours of life. In order to assess the behavior and sleep-wake cycle it was used the Neonatal Facial Coding Scale (NFCS) [7,8] and the adapted Brazelton Scale [9].

The NFCS assesses pain through the presence or absence of eight facial movements: frowning, narrowed palpebral fissure, deepened nasolabial fold, open mouth, mouth vertically or horizontally stretched, tender tongue and trembling chin. One point is assigned for each facial movement, and when the score is greater than three[7, 8] it is considered pain/stress.

The Brazelton scale [9], provides a score for each sleep or wake state and classifies the NB in six states: State 1 – Deep sleep, no movements, regular breathing; State 2 – Light sleep, eyes closed, some body movement; State 3 – Sleepy, eyes opening and closing; State 4 – Awake, eyes opened, minimum body movements; State 5 – Fully awake, vigorous body movements and State 6 – Crying [9].

A preliminary survey at UHAB, in order to identify individuals who met the inclusion criteria, was conducted and a sealed envelope was chosen by the mother, in order to determine the type of bath.

The water temperature, for both types of bath, was kept between 36.5°C and 37°C during the entire procedure. A transparent plastic bucket by Sanremo, Zyk & Zuk® model, was used in order to perform the bucket bath. The bucket was positioned on a support bench routinely used by nursing and sanitized with chlorhexidine solution and alcohol 70%.

In the bucket bath, the NBs were gently placed inside bucket, with warm water up to the neck, wrapped in a towel with body in semiflexion. During three minutes, the baby was lightly and slowly moved inside the bucket, in semicircles, pendulum and voluntary movements caused by buoyancy and flotation. In the final two minutes the NBs was sanitized with a liquid soap, routinely used by nursing staff. At the end of the procedure, the NBs were wrapped in a dry towel and sent to the room Figure 1.

For shower bath, was used the same technique routinely used by the team. The NBs was suspended by the caregiver's hand in ventral decubitus position and placed under the shower water jet. The NBs was sanitized in the same bucket bath standards according to the following routine, for the two baths: head cleaning, trunk, limbs and finalized by genitals.

The bucket bath procedures were conducted by the researcher and shower baths were held by the babies' mothers with the researcher's supervision. For both procedures, variables related to the behavioral effects were collected before, during and immediately after the bath. All variables, except the variables during the bath, were assessed by a researcher who was blind to the study. This reviewer was unaware of the bath type that was held: shower or bucket bath.

Data were grouped and presented as frequency. In order to observe the experimental factors effect (bucket and shower) before, during and after bath, as well as their interactions, a Generalized Estimated Equation (GEE) was performed by adopting an unstructured correlation matrix and the Poisson link function for the NFCS outcome, and Ordinal Logistics when the outcome was Brazelton's. As an estimative of effect the relative risk (RR) obtained through hypothesis testing of Wald Chi-square was elected. We adopted a significance level $\alpha \leq 0.05$ and considered as null hypothesis the nonexistence of behavioral differences between the bucket and shower baths.

Results

Between May and September, 2013, 198 newborns were assessed, among which 100 underwent a bucket bath and 98 a shower bath. The average number of life hours was 16 ± 14 hours (2h-72h). Following detailed description of the sample in Table 1.

The pain increases, during and after, shower bath (x^2 Wald=86.12; p<0.001), when assessed during the shower, increased by 57% [RR=1.57 (95% CI: 1.47-1.68) and when assessed after bathing in the shower it increased by 34% [RR=1.34 (95% CI: 1.23-1.46)]. The bucket bath group did not show alteration in the NFCS results in the periods before, during and after bath (p>0,05), Table 2.

Both baths alter the newborn's behavioral state (x^2 Wald=1.99; p=0.15) and crying is four times more significant during the shower bath when compared to the bucket bath. (x2 Wald=33.01; p<0.001). However, after the bucket bath, the light sleep state was more evident when compared to the behavioral state before the bucket bath.

Table 1: Baseline characteristics of newborns.

Newborn Characteristics	Mean (SD) n=198
Delivery	
Normal	122 - 61,6%
Cesarean	75 - 37,9%
Forceps	1 - 0,5%
Gender	
Female	99 - 50%
Male	99 - 50%
GA	39s ± 1,8s
Weight	3054g ± 446,83g
Apgar after 5 min	9 ± 0,6

GA: Gestational age; SD: Standard deviation; Min: Minutes

Table 2: Modeling on the effect of the bucket and shower bath on pain in healthy newborns (NFCS).

Interaction Bath *vs* Moment	Test of Hypothesis				
	x^2 Wald	gl	Sig.	RR	95% CI
Intercept	38,07	1	<0,001	1,22	1,14-1,30
After the shower bath	46,77	1	<0,001	1,34	1,23-1,46
During the shower bath	174,52	1	<0,001	1,57	1,47-1,68
Before the shower bath	1,44	1	0,22	0,95	0,87-1,03
After the bucket bath	0,07	1	0,78	1,01	0,93-1,09
During the bucket bath	0,001	1	0,97	0,99	0,91-1,08
Before the shower bath				1	

Table 3: Modeling on the effect of the bucket and shower bath on the sleep-wake state in healthy newborns (Brazelton).

Interaction Between Bath and the Moment		Test of Hypothesis				
		x^2 Wald	gl	Sig.	RR	95% CI
Limit of tendency to cry	Light sleep	63,09	1	<0,001	0,20	0,13-0,30
	Sleepy	2,71	1	0,09	0,76	0,55-1,05
	Awake	5,99	1	0,01	1,43	1,07-1,92
	Fully awake	63,66	1	<0,001	3,01	2,30-3,96
	Crying	98,79	1	<0,001	4,24	3,19-5,64
After the shower bath		6,96	1	<0,01	4,42	1,46-13,33
During the shower bath		8,08	1	<0,01	4,70	1,61-13,69
Before the shower bath		0,09	1	0,75	1,18	0,40-3,47
After the bucket bath		17,04	1	<0,001	2,60	1,46-2,90
During the bucket bath		29,70	1	<0,001	2,56	1,82-3,59
Before the shower bath					1	

Discussion

The bucket bath did not modify, negatively, the behavior state. According to Caromano [10], put on the NB gently inside bucket, wrapped in a towel with body in semiflexion and warm water, helps to relieve pain and promotes muscle relaxation, reducing the nerve endings sensitivity and increasing peripheral circulation.

On the other hand, the shower bath increases the frequency of crying indicating a nociceptive stimulus. The pain is one of the most harmful factors that, if not treated, causes numerous deleterious effects, such as metabolic changes, increased levels of circulating hormone, susceptibility to infections, changes in the cerebral blood flow, hypoxia, changing sleep-wake patterns, besides behavioral changes [11]. In addition to impacting the NB's relation with their family and their cognition and learning's capacity [12].

The bucket bath changes positively the NB's behaviors, protects from pain and promotes improvement on the behavior and sleep quality [13], essential for neurodevelopment, learning, memory, and the preservation of brain plasticity for the individual's life [11].

A study at the University of Alberta (Canada) with 14 preterm NBs (PTNB), weighing from 745g to 1,830g, who presented no breathing problems and no neurological problems, analyzed the physiologic and behavioral changes, before and after taking a shower with sponge demonstrated that, the sponge bath can hinder the growth and development of PTNBs, since it has led to changes in heart rate, peripheral oxygen saturation and motor behavior [14]. Similar to sponge baths, shower baths assessments were statistically different in all three comparisons, showing a worsening of scores during and after bathing. Research suggests that pain and stress increase the NB's clinical instability in ICU [15].

The therapeutic effects in warm water, when in simple immersion, produce an improvement in the circulation and respiratory muscles [16]. The aquatic environment provides increased vital capacity, besides the body weight reduction, allowing the NBs to rediscover their fetal life movements, to continue developing their motor coordination [17,18] and to relax without causing behavior changes, as the bucket bath.

Although there is the involvement of a blind researcher to behavioral assessments in different types of bath, the present study is limited by the use of subjective behavioral tools for assessing sleep-wake cycles and pain. And it uses a rating scale with facial movements to punctuate the pain sensation [6]. Facial changes are fast and could have been sub-classified or could have other explanations, besides the intervention effect, such as changes in environmental conditions, the assessment's schedules effects, circadian cycle oscillations. A way to control this result would be the inclusion of salivary cortisol analysis coupled with the behavioral assessment.

Conclusions

Bucket bath changes positively the NB's behavior, as well as protects the baby from pain, when compared to the shower bath. It is an effective and safe method to reduce the painful stimuli and, when indicated, it can be used as a non-pharmacological method for stress relief, contributing with the multidisciplinary principles of humanization in maternity hospitals. Analyses performed with objective and calculated methods need to be stimulated in order to prove effectiveness and eligibility of the best benefits and results.

Authors' contributions

SAP: participated in the design, development and coordination of the study;

JOSP and VAA: participated in the design and data acquisition;

GGFF: participated in the sequence alignment and drafted the manuscript;

KSM: participated in the design of the study of the and revised it critically for important intellectual content;

JML: participated in the statistical analysis and interpretation of data

CAM: participated in the design, development and coordination of the study.

The authors given final approval of the version to be published. Each author participated sufficiently in the work to take public responsibility for appropriate portions of the content; and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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