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Original Article

Comparison of the Effectiveness of Bath and Massage in Bilirubin Levels in Neonates

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ABSTRACT

Background: Jaundice is one of the most common health problems among neonates, involving almost 60% of full-term newborns, therefore requiring consequent phototherapy. Since phototherapy has several complications, considering alternative treatments has long been of pivotal importance. Therefore, the present study aimed at comparing the effectiveness of bath and massage in bilirubin levels in neonates.

Methods: This was a randomized clinical trial conducted on neonates who were born in Zeyaei Hospital in Ardakan, Iran, in 2018. A total of 90 neonates were selected using the convenience sampling method and then assigned into two intervention groups (i.e., bath group and massage group) and a control group through random allocation method. In the bath group, the neonates were bathed immediately after birth. In the massage group, the neonates received field massage twice a day each lasting 15 min for 5 consecutive days. The neonates belonging to the control group were served with routine care. The jaundice meter China 800 (jk) device was used to measure the skin bilirubin levels of the neonates in the three groups in a scheduled manner (i.e., days 1, 3, 5, and 7) at 9 a.m. The data were analyzed using the ANOVA, Chi-square test, Tukey's post hoc test, and repeated measures ANOVA in SPSS software (version 18).

Results: There was no significant difference between the mean bilirubin scores of the three groups over the first, third, and fifth days. A significant difference was found between the mean bilirubin scores of the bath and massage groups compared with that of the control group on the seventh day (P=0.001). Also, no significant difference was seen between the mean bilirubin levels of the bath and massage groups on the seventh day.

Conclusion: The findings revealed that there was no difference between the bath and massage techniques in reducing neonatal jaundice. Therefore, both techniques can be utilized in this regard.

Keywords: Baths, Bilirubin, Jaundice, Massage, Newborn

Introduction

Neonatal jaundice is one of the common problems in the healthcare system of Iran (1). According to the statistics on a global scale, 80% of preterm infants and 60% of term infants have jaundice (2). In Iran, there is no general report on the prevalence of jaundice in term and preterm infants. In a study performed in Northern Iran, the prevalence of jaundice was reported as 12% (3).

Neonatal jaundice is a major factor contributing to the hospitalization of newborns (4) and accounts for 75% of the reasons for the hospitalization of newborns over their first week of birth (5). Phototherapy is a common treatment for neonatal jaundice that has various side effects, including retinal and genital injuries, dehydration, diarrhea, bronze baby syndrome, and hypocalcemia (6).

Therefore, considering the alternative treatments and procedures that control jaundice as well as reducing the need for phototherapy and neonatal hospitalization and its consequences (e.g., infant-mother separation and increased treatment costs) have long been of pivotal importance. In this sense, the bath and massage techniques are alternative therapies that are simple and cost-efficient (7). Touch is the first sensation that occurs over the course of infancy

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and continues throughout life (8).

Reduced bilirubin levels following infant massage have been reported in some studies (6, 9, 10). Other studies, however, have regarded this procedure ineffective (7, 11). This controversy can be due to diversity in the type of massage and the duration of the procedure. Therefore, the effectiveness of massage in neonatal jaundice is still unclear and requires further investigation (12).

Besides massage technique, bathing a newborn has also been introduced as an effective procedure to reduce bilirubin levels (13, 14). Since bathing the newly-born babies immediately after birth might lead to possible hypothermia, the application of this caring method seems to be controversial. Nonetheless, the careful bathing of newborns in the early hours after birth might prevent them from losing their body temperature (15). The appropriate time for bathing the newborns has still remained unclear. The term infants who are healthy, however, can be bathed after birth provided that the measurements preserving their body temperature are taken into account (16). Also, the determination of the appropriate time for bathing the newborns is under the influence of different beliefs and cultures to some extent (17).

In 2007, a panel of neonatologists and dermatologists declared that the appropriate time to bathe the term and healthy neonates can vary in accordance with the families' preferences as well (18). Bathing is a personal hygiene need for infants that parents usually tend to perform, and massage is an easy and costly technique. No study in Iran has explored the effect of bathing on the level of bilirubin, and the studies on massage are scarce. Therefore, the present study aimed to investigate and compare the effect of the two methods as easy and cost-effective techniques for the prevention of neonatal hyperbilirubinemia.

Methods

This was an experimental study conducted on the neonates who were born in the delivery room of Zeyaei Hospital of Ardakan in 2018. After receiving the permission letter with the code of IR.SSU.REC1395.224 from the Ethics Committee, the researcher performed the sampling after providing the eligible parents who attended the delivery room with explanations about the goals and procedures, and completing the written consent form by the eligible parents.

The sample size was determined as 25 individuals per each group using a significance level of 5%, power of 80%, and standard deviation of 4.2 for bilirubin levels following the previous studies (9) and considering a significant difference of at least one unit in the mean bilirubin scores belonging to the intervention and control groups. The maximum sample size changed to 30 individuals, considering the probable 10% dropout.

The inclusion criteria included: (1) fetal age of 37-42 weeks, (2) weight of > 2,500 g, (3) no visible congenital malformations, (4) first- and fifth- Apgar scores of > 7, (5) skin bilirubin level of < 3 mg/dl at birth, and (6) permission from a physician to participate in the study. The exclusion criteria were: (1) having pathologic jaundice, (2) having asphyxia at birth, (3) requiring hospitalization in order to receive fluid, antibiotic, and/or oxygen therapy, (4) undergoing hypothermia with the axillary temperature of less than 36.5°C, and (5) being born from a smoker, alcoholic, and/or addict mother.

For the random allocation of the samples, the sampling was performed through the lottery method. To do so, three identical envelopes containing three papers with labels (i.e., bath group, massage group, and control group) were prepared for this purpose. After the birth of the newborn, an envelope was randomly selected by a nurse who was unaware of the content of each envelope in order to determine the group of each eligible newborn. The data were gathered using a demographic questionnaire, consisting of the fetal age, newborn's gender, birth weight, maternal educational level, and type of delivery.

A checklist of daily data was also used to assess the bilirubin levels on the first, third, fifth, and seventh days. The demographic questionnaire was completed by an assistant researcher in the delivery room. The assistant researcher also completed a checklist recording the skin bilirubin of eligible newborns by means of a Jaundice Meter China 800 (jk) device after their admission to the Neonatal Intensive Care Unit (NICU) on the first, third, fifth, and seventh days at 9 a.m. using the blind method. It should be noted that the device was calibrated by a biomedical equipment technician in order to ensure the accuracy of measurements prior to the implementation of the study.

In the bath group, essential equipment was prepared earlier, the radiant warmer was used to prevent hypothermia in newborns, and two warm towels were laid on the warmer. The distance

between the infant and the warmer was 50 cm, the room temperature was held at 26-27°C using a wall thermometer and the water temperature was kept at 37-37.5°C through a water thermometer manufactured by the Meheconova Company. After hand washing, the newborns' umbilical cords were cut, their Apgar scores were measured, and they were given a bath. To do so, the newborn was placed in a bathtub in a sitting position, the assistant researcher covered the ear of the newborn with her non-dominant hand, and the researcher washed their head and hairs and covered their head with a hat. Thereafter, the newborn's trunk and limbs were bathed gently not to remove vernix caseosa. The newborn was then placed under a warmer, wrapped with a warm and soft towel, and the axillary temperature was measured in the delivery room and in the presence of the mother. The entire process lasted 5 min (17).

In the massage group, the newborns were massaged in accordance with the field method (15) by the researcher 8-12 h after the newborn's admission to the NICU and in the presence of the mother. The relevant instructions were provided to the mothers to continue this procedure at home after discharge. The newborn was massaged two times a day (i.e., 9 a.m. and 9 p.m.) during three phases, 1 h after feeding the newborn, each lasting for 5 min. In this regard, the researcher washed and dried their hands, and then robbed them with olive oil.

Over the first and third phases of the massage, the newborn was held in a prone position, and the massage technique was performed as follows: (1) massage from the head to the neck and vice versa, (2) massage from the neck to the shoulders and vice versa, (3) massage from the shoulder to the low back and vice versa, (4) massage from the shoulder to the hand and vice versa on both sides, and (5) massage from the thigh to the ankle and vice versa.

Each body part mentioned earlier was massaged with 12 motions each lasting for 5 sec. During the second phase of the study, the newborn was placed in a supine position and the active-passive and separate-conjunctive motions in the forms of flexion and extension of the limbs were performed in 5 steps (each lasting for 1 min) with 6 motions, each for 10 min. The newborns assigned to the control group received the routine care of the hospital under consideration over the first 24 h after birth, including the control of vital signs and feeding. The parents in the three groups were requested to attend the hospital on the third, fifth, and seventh days after birth in order to measure the level of bilirubin.

Statistical analysis

The descriptive and analytical tests, including the ANOVA, Chi-square test, Tukey's post hoc test, and repeated measures ANOVA were used for data analysis by means of SPSS Software (version 18). The significance level was considered at less than 0.05.

Results

Out of total 30 neonates in each group, the numbers of neonates who were dropped out of the massage, bath, and control groups were 5, 6, and 8, respectively, due to the parents' withdrawal from the study because of the long distance or the need for the hospitalization of the newborn. The most common reason for dropouts in the three groups was increased bilirubin level. Overall, 25 neonates in the massage group, 24 neonates in the bath group, and 22 newborns in the control group were included in the study.

The findings showed that there was no significant difference among the three groups in terms of the demographic variables, including the newborn's weight, fetal age, gender, and maternal delivery type, age, and educational level (tables 1 and 2). No significant difference was found in the bilirubin levels among the three groups over the first, third, and fifth days. However, a significant difference ($P<0.0001$) was found in the bilirubin levels of the bath and massage groups with that of the control group on the seventh day (Table 3). No significant difference ($P> 0.05$) was found between the bath and massage groups regarding the bilirubin levels on the seventh day (Table 4).

The results of the intergroup comparison showed that there was no significant difference between massage and bath groups considering the mean bilirubin levels, suggesting that both interventions had a similar effect on the level of bilirubin in neonates. In order to compare the mean

Table 1. Comparison of quantitative variables among groups

Variable	Mean±standard deviation (Bath group)	Mean±standard deviation (Massage group)	Mean±standard deviation (Control group)	P-value (ANOVA test)
Mother's age	27.7±5.7	25.2 ±5.9	25.3±6.1	P=0.23
Birth weight (gr)	3186.2±465.3	3227.6±404.41	4317.7±57.4	P=0.40
Fetal age	37.3±1.4	40.04±1.5	39.0± 1	P=0.16

Table 2. Comparison of the qualitative variables in three studied groups

Variable	Groups	Bath	Massage	Control	P-value (Fisher test)
Type of delivery	Vaginal	13 54.2%	15 60.0%	13 59.1%	P=90
	C-section	11 45.8%	10 40.0%	9 40.9%	P=0.90
Newborn's gender	Female (Number)	41.7% 10	52% 13	50% 11	P=0.748
	Male (Number)	58.3% 14	48% 12	50% 11	
Mother's educational status	Illiterate (Number)	2 8.3%	3 12%	2 9.1%	P=0.9
	Elementary (Number)	91.7% 22	22 88%	20 90.9%	P=0.9

Table 3. Comparison of mean bilirubin level among three groups in different courses of time

Variable Bilirubin	Mean±standard deviation (Bath)	Mean±standard deviation (Massage)	Mean±standard deviation (Control)	P-value (ANOVA test)
First day	2.6±0.7	2.86±0.76	2.7±0.7	P=0.51
Third day	7.2±1.2	7.8±1.1	7.3±0.8	P=0.68
Fifth day	8.8±1.1	9.1±0.1	9.3±0.1	P=0.30
Seventh day	1.2±7.4	7.1±0.1	8.4±0.1	P=0.001

Table 4. Comparison of the mean difference on the seventh day among three groups

Groups	Compared groups	Mean of difference	P-value (Tuky Test)
Massage	Bath	-0.32	P=0.55
	Control	-1.33	P=0.001
Bath	Massage	0.32	P=0.55
	Control	-1	P=0.008
Bath	Massage	1.33	P=0.001
	Bath	1	P=0.008

Table 5. Mauchly's test of sphericity

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig	Epsilon		
					Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Bilirubin	.783	16.319 5	5	.006	.856	.919	.333

level of bilirubin at different times in three groups, repeated measures ANOVA was used. Mauchly's test of sphericity indicated that the assumption of sphericity had been violated, (P=0.006). Therefore, the results of Greenhouse-Geisser (Table 5) correction demonstrated that the change of bilirubin level was significant over time regardless of the group (P=0.001), and also its changing trend among the three groups was significantly different over time (P=0.001; Figure 1).

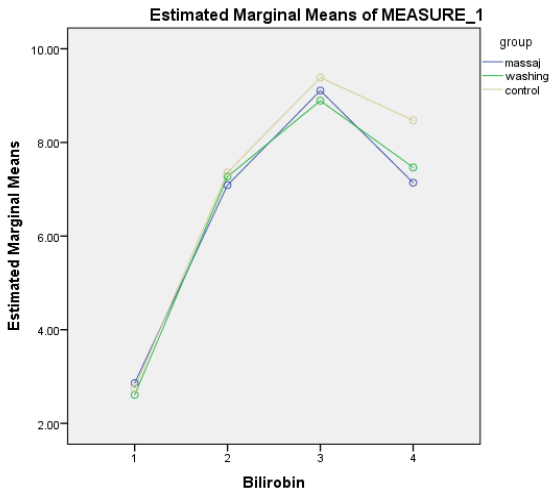

Figure 1. Comparison of the changes of bilirubin levels in three groups on days 1, 3, 5, and 7

Discussion

According to the findings, no significant difference was found in the mean bilirubin levels of the three groups over the first, third, and fifth days. The results of a study performed by Hong et al. revealed that bathing the newborns twice a day in the first 24 h until discharge reduced the bilirubin levels on the first, third, and fifth days after the intervention (19). This was in contrast with the findings of the present study that might be due to the use of higher numbers of bath in the mentioned study.

Another study was carried out by Kianmehr et al. in the Hashemi Nejad Hospital of Mashhad, Iran, to determine the effect of field massage on the bilirubin levels of stable newborns hospitalized in the NICU. Their findings revealed that the bilirubin level was higher in the massage group, compared with that in the control group, which was in disagreement with the findings of the present study (7). The reason for this inconsistency can be the longer duration of massage in their study which was performed twice a day for 4 days, lasting for 20 min.

The findings of a study by Chen et al. investigating the effect of massage on physiological jaundice showed that the newborns receiving field massage procedure had a higher frequency of meconium excretion on the first and second days, compared with the control group. Also, the skin and serum bilirubin levels over the second to fifth days were significantly lower in the control group, compared with that in the intervention group (9), which was different from this study. Seyyed Rasouli et al. in their study found out that the field massage might have a positive effect on the bilirubin levels provided that it was performed over a course of more than 4 days. This was consistent with the findings of the present study in which the changes in the bilirubin levels occurred after the fifth day (3).

Regarding the effect of bathing on bilirubin levels, a study by BAI et al. revealed that bathing the newborns led to the reduced levels of bilirubin and increased body weight after a course of four days (20). This discrepancy could be explained by the fact that the newborns in the above-mentioned study were bathed twice per day for 10-15 min until discharge, while it was only once immediately after birth in the present study. The results of another study conducted by Xiaohua et al. in which the newborns were bathed from 48 h to 10 days after birth on a daily basis showed a reduced level of bilirubin on the fifth day (14) which is in contrast with our findings. One explanation for this could be the higher frequency of bathing in the previously mentioned study.

The findings revealed a significant difference in the mean level of skin bilirubin on the seventh day after birth among the three groups. It appears that the bath and massage techniques can facilitate the excretion of meconium and elimination of bilirubin in newborns. In addition, the consumption of energy in the newborns following these techniques can improve their feeding and develop the natural flora of their intestine, thereby better controlling their jaundice. These procedures can also lead to other advantages, such as the reduced possibility of hospitalization, as well as lower complications and costs (15).

Limitations

Giving medications, such as shir-e-khesht drop and/or clofibrate capsule, to the newborns which might affect the newborn's bilirubin level was a limitation. To control this limitation, the researcher made daily contacts in order to remind their mothers about the avoidance of over-the-counter medications. The newborn's type of feeding was another limitation of this study which was beyond the control of the researcher. Further studies are recommended to investigate the effect of a higher frequency of bath and also bath performed by mothers on the level of bilirubin.

Conclusion

The findings showed that the bath and massage techniques in newborns can change the bilirubin levels, with no difference between the two methods.

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Conflicts of interests

The authors of the current study declare no conflict of interest for this study.

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