



# Effects of Sponge Bath on Bilirubin Levels of Neonatals Who Underwent Phototherapy

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## HIGHLIGHTS

- > Bathing helps lower bilirubin levels in neonatals.
- > Bath can be used babies with high bilirubin levels in newborn intensive care units.
- > New studies should be done the effect of the bath on bilirubin levels.

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## ABSTRACT

The study was conducted to determine the effects of sponge bath care on bilirubin levels of neonatals who underwent phototherapy with a diagnosis of hyperbilirubinemia. This experimental study was conducted in the neonatal intensive care unit of a hospital in Eastern Turkey. Infants who met the selection criteria were included in the study without performing any sampling. A sponge bath was given to the infants in the experimental group (n=45) prior to phototherapy, and their bilirubin levels were evaluated. Except for routine clinical practices, no intervention was made for the infants in the control group (n=45). Ethical principles were applied in all phases of the study. In the study, no statistically significant difference was found between the groups, when the newborns in the experimental and control groups were compared in terms of gender, mode of delivery, gestational age, birth weight, and birth length or when they were compared in terms of Apgar score and physiological parameters ( $p>0.05$ ). In the comparison of the bilirubin levels of neonatals included in the study, there was no difference between the experimental and control groups before the intervention; however, after the intervention, the difference between the groups was significant in favor of the experimental group ( $p<0.05$ ). As a results the bilirubin levels were lower in experimental than control group. In the study, the sponge bath given prior to phototherapy was found to be effective in lowering the bilirubin levels. It is thought that this intervention can be used in neonatal care due to its positive effects. But more studies should be done to prove the decrease bilirubin levels of the sponge bath.

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## 1. Introduction

Hyperbilirubinemia (Jaundice) is defined as the bilirubin plasma level being so high that it leads to a jaundiced appearance on skin and sclera. Jaundice is observed when total serum bilirubin exceeds 2 mg/dl in adults and 5–7 mg/dl in neonates [1, 2] It may result in serious neurological sequels if it is not diagnosed and treated on time. The purpose of the treatment is to determine the causing factor and treatment and to prevent the formation of kernicterus [3, 4]. The most commonly used method of treating infants suffering from hyperbilirubinemia is phototherapy. Photo-therapy is a method used to help the body dispose of bilirubin by breaking it into pieces through the effect of the light of special fluorescent lamps. In phototherapy, indirect bilirubin fragments with the effect of light and turns into water-soluble particles that can be disposed of through bile. Due to the increasing gallbladder and peristaltic movements in a great majority of infants taken to phototherapy; undesired side effects such as frequent watery green stool, tanning of skin, dehydration, lactose intolerance, fluid electrolyte imbalance, and hyperthermia may develop. In order to avoid impaired skin integrity, which is one of the other commonly seen side effects in infants taken to phototherapy, skin care should be properly performed [1, 4].

Studies have indicated that bathing neonates does not involve any inconvenience [5]. In addition to its hygienic, aesthetic, cultural, and individual advantages, neonatal bathing is an important practice that affects neonates positively. Numerous studies on neonatal bathing have been conducted in the last 10 years. According to these studies, after bathing, infants feel relieved, their respiration and circulation become more regular, muscle relaxation, cell metabolism and capillary permeability increase, pain reduces, fatigue decreases, and bowel peristalsis increases [5, 6]. Although studies have reported that massage performed on infants taken to phototherapy reduces bilirubin levels [7–10] there is no study analyzing the effect of sponge baths on infants' bilirubin levels.

## 2. Material and Method

### 2.1. Type of Study

The study was planned as a quasi-experimental study.

### 2.2. Population and Sample Group of Study

The study was conducted in the neonatal unit of a regional training and research hospital located in the city center of Erzurum in Eastern Turkey, between April 2013 and February 2015. A total of 90 term neonates who were admitted to the neonatal unit with an indirect hyperbilirubinemia diagnosis and who underwent phototherapy treatment were included in the study. Russ Lenth's Java applet, "Power and Sample Size Calculation," was used to calculate the sample size of the

study. In the power analysis, when 90 infants were included in the experimental group, with a confidence interval of 95% and an error margin of 0.05, the study's power was found to be 0.90. While 45 of the newborns were included in the experimental group, the remaining 45 newborns were included in the control group. Infants' inclusion in groups was performed randomly, with the first infant's inclusion decided by lot. The study was completed by adding, one by one, the infants meeting the study's inclusion criteria into either the experimental or the control group.

### 2.3. Settings

#### 2.3.1. Study's Infant Inclusion Criteria

- Gestation of between 38 and 40 weeks,
- Birth weight of 2500 grams and above,
- The infant had phototherapy indication,
- The infant had no health problem other than hyperbilirubinemia diagnosed in the prenatal period,
- The infant's health condition was stable,
- There were no clinical dehydration findings,
- The infant was fed only with breast milk, and
- The newborn was at least two days old on the day it was taken to phototherapy.

### 2.4. Collection of Data

The data were collected the "Personal Information Form" and "Intervention Follow-up Form" prepared by researchers through. The "Personal Information Form" included questions related to the infant's weight, head circumference, gender, gestational age, the mother's mode of delivery, the infant's bilirubin level, and bilirubin level six hours after phototherapy. Before starting the intervention, the researcher filled this form. Vital signs (pulse, respiration, oxygen saturation, and body temperature values) were taken when starting intervention and end the of 8<sup>th</sup> hours from starting phototherapy and this document were recorded on the Intervention Follow-up Form.

### 2.5. Nursing Intervention

Before data collection began, the researcher informed the mothers about the study's purpose and the sponge bath to be performed on the infant, and the mothers' informed consent was received. Blood was taken from the infants to determine the Serum Total Bilirubin (STB) values. The Personal Information Form and the Intervention Follow-up Form were filled out by the researcher before starting to conduct the study.

Each newborn's eyes were covered with eye patches to stop the eyes from being affected by the light. All their clothes were taken off, their diapers were changed, and a six-hour phototherapy treatment was initiated. Their positions were changed in every two hours, and 15-minute breaks were taken for feeding, every three hours. Blood was taken once

again from the infants at the end of the six hours to determine STB values; the infant's pulse, respiration, oxygen saturation, and body temperature values were measured and recorded once again on the Intervention Follow-up Form. In the clinic routine blood was taken 8<sup>th</sup> hours after the treatment started. Differently from the control group, the sponge bath practice was performed by the researcher in the experimental group before phototherapy. The ambient temperature was set to 24 °C for the sponge bath procedure. Materials such as a portable washbasin, sterile water at a suitable temperature (38 °C), single-use cotton tissues, a cotton towel, etc. were prepared next to the infant's incubator. The sponge bath procedure was performed in the incubator in order to ensure minimum heat exchange in the infants.

First, the infant's eyes and then the external ear, ears, and the whole face were gently wiped with sterile water and cotton tissues. Every wiped area was immediately dried with cotton towels in order to prevent the infant from feeling cold. Then, successively the infant's neck, arms, body, back, and legs were wiped and dried. As the last step, the infant's diaper was taken off, and genital area cleaning was performed. This whole procedure was completed in five minutes, and then the eye patch was placed on the infant's eyes, a new diaper was fastened, and the infant was taken to phototherapy.

## 2.6. Ethical Principles of the Study

An ethics committee approval dated August 5, 2013 was obtained from the Ethics Committee of the hospital where the study was conducted. All personnel working at the neonatal unit were informed in detail of the purpose and management of the study. Families of infants who met the experimental group's selection criteria were informed of the study's purpose and duration and the procedures to be conducted during the study, and their written consents were received.

## 2.7. Assessment of Data

Assessment of data obtained as the result of the study was conducted in a computer environment in the SPSS (Statistical Package for Social Sciences) 18.0 package program. Percentage distribution, a chi-square test, mean, and dependent and independent sample t-tests were used to analyze the data. The results were evaluated at the confidence interval of 95% and at the significance level of  $p < 0.05$ .

## 3. Results and Discussion

According to the obtained data, 48.9% of newborns in the control group and 55.6% of newborns in the experimental group were female. Those born through caesarean section constituted 51.1% of newborns in the control group and 46.7% of newborns in the experimental group. When newborns in the control and experimental groups were compared in terms of gender and mode of delivery, no statistically significant difference was found between groups ( $p > 0.05$ , Table 1).

Table 1 Comparison of newborns in experimental and control groups in terms of gender and mode of delivery

Descriptive Characteristics		Experimental group		Control group		Test and p
		N	%	N	%	
Gender	Female	25	55.6	22	48.9	$X^2=0.401$
	Male	20	44.4	23	51.1	$p=0.527$
Mode of Delivery	Normal	24	53.3	22	48.9	$X^2=0.178$
	Caesarean	21	46.7	23	51.1	$p=0.673$

When newborns in the control and experimental groups were compared in terms of birth weight and birth length, no statistically significant difference was found between groups; they were found to be similar ( $p > 0.05$ , Table 2).

Table 2 Comparison of newborns in experimental and control groups in terms of gestational age, birth weight, and birth length

Descriptive Characteristics	Experimental group Mean $\pm$ SD	Control group Mean $\pm$ SD	Test and p
Gestational age	39.04 $\pm$ 0.92	39.09 $\pm$ 0.87	$t=0.234/p=0.816$
Birth weight	2979.26 $\pm$ 489.58	3047.56 $\pm$ 341.04	$t=0.768/p=0.445$
Birth length	49.41 $\pm$ 2.80	50.09 $\pm$ 2.12	$t=1.295/p=0.199$

\*SD= Standard Deviation

When newborns included within the scope of the study were compared in terms of Apgar scores, the mean Apgar score of newborns in the control group was found to be 8.43 $\pm$ 0.64, while the 5<sup>th</sup> minute mean Apgar scores of newborns in the experimental group was 8.24 $\pm$ 0.62; the groups were similar in terms of their Apgar scores ( $p > 0.05$ , Figure 1).

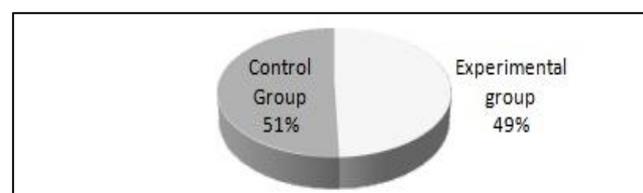


Figure 1 Comparison of newborns in experimental and control groups in terms of Apgar scores

When vital signs (fever, pulse, respiration, SpO<sub>2</sub>, systole, and diastole) of newborns in the control and experimental groups before and after the intervention were compared, no statistically significant difference was found between groups ( $p > 0.05$ , Table 3).

Table 3 Comparison of vital signs in experimental and control groups before and after the intervention

Vital Signs	Experimental X $\pm$ SD*	Control X $\pm$ SD	Test and p	
Before Intervention	Fever	36.74 $\pm$ 0.42	36.71 $\pm$ 0.33	$t=0.394/p=0.695$
	Pulse	142.84 $\pm$ 12.21	142.62 $\pm$ 12.3	$t=0.087/p=0.931$
	Respiration	51.69 $\pm$ 2.85	50.96 $\pm$ 3.66	$t=1.061/p=0.292$
	SpO <sub>2</sub> **	91.1 $\pm$ 34.20	90.67 $\pm$ 3.36	$t=0.562/p=0.576$
	Systole	77.24 $\pm$ 8.78	73.62 $\pm$ 8.64	$t=1.973/p=0.055$
	Diastole	47.78 $\pm$ 6.19	48.78 $\pm$ 7.01	$t=0.717/p=0.475$
After Intervention	Fever	37.02 $\pm$ 0.23	36.00 $\pm$ 0.23	$t=0.909/p=0.366$
	Pulse	147.24 $\pm$ 12.11	141.07 $\pm$ 10.14	$t=2.623/p=0.010$
	Respiration	52.07 $\pm$ 4.85	51.09 $\pm$ 1.93	$t=1.256/p=0.213$
	SpO <sub>2</sub>	89.44 $\pm$ 4.47	90.16 $\pm$ 2.66	$t=0.916/p=0.362$
	Systole	76.96 $\pm$ 7.60	72.80 $\pm$ 5.19	$t=3.030/p=0.003$
	Diastole	47.5 $\pm$ 38.42	49.64 $\pm$ 5.48	$p=1.140/t=0.162$

\*Mean  $\pm$  Standard Deviation \*\*Oxygen Saturation

When the bilirubin values were compared for the newborns before intervention, for both the experimental and the control groups, no difference was found between the groups

( $p > 0.05$ ), although a significant difference was found in favor of the experimental group after the intervention. In addition, when within-group comparisons of the bilirubin values of the experimental and control groups before and after the intervention were examined, a statistically significant difference was also found between the mean scores ( $p < 0.05$ , Table 4).

Table 4 Comparison of bilirubin values in experimental and control groups before and after the intervention

	Experimental X±SD	Control X±SD	Test and p
Before intervention	15.49±2.10	15.11±1.49	$t=0.984/p=0.328$
After intervention*	11.08±2.25	12.32±1.45	$t=2.343/p=0.0021$
	$t=16.289$	$t=18.014$	
Test and p	$p=0.000$	$p=0.000$	

\* Indicates bilirubin values measured 6 hours after intervention.

When newborns included in the study were compared according to their bilirubin values, the mean bilirubin value of the experimental group was lower than that of the control group (Figure 2).

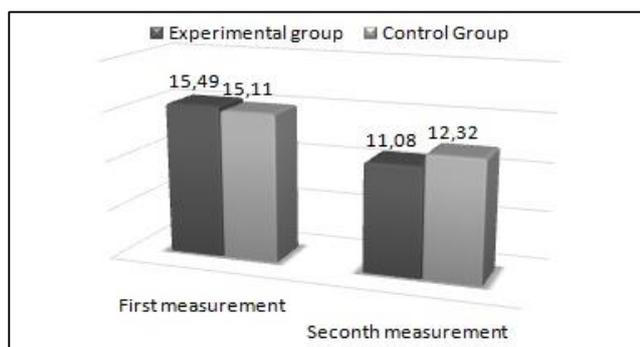


Figure 2 Comparison of experimental and control groups according to their bilirubin values

It is reported that in many regions of the world, neonatal bathing is a traditional practice performed for many hygienic, cultural and aesthetic reasons [1, 2]. In Japanese culture, all healthy newborns except for premature infants, infants born with asphyxia, and those born through caesarean section are bathed as soon as they are born [11]. In Turkey, there are different practices in relation to the timing of neonatal bathing [12]. Although neonatal bathing, which is one of the important practices needed in neonatal care [13] is a standard nursing practice in many neonatal intensive care units, there is very little scientific evidence to support its use [14]. However, neonatal bathing in neonatal intensive care units is generally performed routinely for hygiene and skin care purposes and to avoid infections such as HIV and Hepatitis B [15]. Many studies have been conducted on the physiological effects of neonatal bathing, showing that neonatal bathing supports the physical development of infants (weight, length, head circumference), increases sleep duration [16, 17]. and reduces bacteria colonization [18]. In addition, neonatal bathing is a very important intervention in establishing and strengthening mother-infant bonds [19, 20]. Bathing has also been reported to have soothing effects on the infant and to relieve the infant [6, 21].

Hyperbilirubinemia is one of the most commonly encountered problems in neonatal units. Although it is generally a temporary condition, neonatal jaundice is the most common

reason for hospitalization of infants within the first week after birth [22].

It was determined in this study that infants who were bathed before phototherapy had lower bilirubin levels than the infants in the control group ( $p < 0.05$ ). **This result supports hypothesis.** In the study of Eğri and Gölbaşı, investigating traditional practices used by mothers in infant care in Turkey, it was reported that the most common practices performed to prevent the infant from having jaundice were the practices of laying a yellow cover on the infant's face and bathing the infant with a pot of water in which a piece of gold is put [23]. Similarly, it was reported by Özyazıcıoğlu and Polat that mothers used a set of methods to treat neonatal jaundice such as pinning gold coins on their infant's clothing, bathing the infant with a pot of water in which a piece of gold or egg yolk was added, or clothing the infant with yellow clothes [24]. Similarly, Aydın et al. reported that methods such as pinning cold coins on an infant's clothing, clothing the infant with yellow-colored clothes, and bathing the infant with a pot of water in which a piece of gold or egg yolk is added are used to treat the infant's jaundice [25].

As seen in these studies in Turkey, although bathing is performed at homes as a traditional practice in cases of jaundice, no national or international studies analyzing the effect of bathing on bilirubin level have been found. Chen et al [26]. applied infant massage on infants before phototherapy in order to reduce bilirubin levels, and these researchers reported that infants' peristaltic movements increased and that therefore, their defecation accelerated and bilirubin levels decreased more rapidly. It was found in other studies that massage increases an infant's defecation rate [10, 27]. In our study, the sponge bath performed on infants before phototherapy may have increased peristaltic movements by providing a tactile stimulus such as that in massage and by this means may have reduced the infants' bilirubin levels through more urination and defecation compared to the control group.

Bathing practice leads to a general vasodilation in the body and has many effects such as muscle relaxation, an increase in cell metabolism and capillary permeability, pain reduction, the elimination of fatigue, an acceleration of blood circulation, an acceleration of the inflammation period, an acceleration of the recovery period, and an increase in bowel peristalsis [28]. As well as neonatal bathing, massage of infants has also been reported to increase weight gain, enhance sleep duration, have positive effects on elimination and colic [29], and increase mother-infant interaction by reducing the infant's stress [8].

In this study, although it is thought that the sponge bath practice may have had a massage effect on the infants, bilirubin levels are thought to have reduced even faster by means of the effects of hot water and touching, such as reducing muscle strain, decreasing the cortisol level and therefore the infant's stress level [30, 31] and increasing the activation of enterokinesis, which helps digestion [28].

#### 4. Conclusions

In the study, the sponge bath given prior to phototherapy was found to be effective in reducing the bilirubin levels. It is thought that this intervention can be used in neonatal care due to its positive effects. This study is the first work on this

subject. This study shows that the sponge bath affects the level of bilirubin but can't explain how it has such an effect. There is a need for new work to be done in this topic.

## 5. Acknowledgements

The authors wish to thank the parents who participated in the study and neonatal specialist nurses and doctors at the hospital, who helped by asking the parents if they wanted to participate.

## 6. Author Contributions

Graduate student Çınar planned the study, conducted data collection, and was responsible for the data collecting and writing the manuscript. Assoc. Professor Küçüköğlü was responsible for the data analysis and evaluation of data and reviewing/proofing the manuscript.

## 7. Conflict of interest

The authors declare that they have no conflicting interests.

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