

# Effect of Massage Therapy on Transcutaneous Bilirubin Level in Healthy Term Neonates: Randomized Controlled Clinical Trial

Homa Babaei<sup>1\*</sup>, Mazyar Vakiliamini<sup>2</sup>

1. Department of Neonatology, Imam Reza Hospital, Kermanshah University of Medical Sciences, Kermanshah, Iran

2. Department of Neonatology, Dr. Kermanshahi Hospital, Kermanshah University of Medical Sciences, Kermanshah, Iran

## ABSTRACT

**Background:** Neonatal jaundice is a common condition in approximately 60% of term newborns during the first week after birth. Therefore, it is necessary to detect methods for the prevention of this problem. This study was conducted to evaluate the impact of massage therapy on transcutaneous bilirubin level in healthy term newborns.

**Methods:** The present study was conducted on 102 healthy term newborns. The newborns were randomly assigned to massage group and control group. The massage group received daily massage for five days from the first postnatal day while the control group received only routine neonatal care (without massage). In both groups, transcutaneous bilirubin level and frequency of defecation were the main studied variables.

**Results:** The frequency of defecation in the massage group increased from 1.08 on the first day to 4.08 on the fifth day, whereas it increased from 0.865 on the first day to 2.731 on the fifth day in the control group, indicating a significant difference between the two groups ( $P < 0.005$ ). Moreover, transcutaneous bilirubin levels on the first and second days were not significantly different in both groups, while it was significantly lower during the third to fifth days in the massage group compared to that in the control group ( $P < 0.005$ ).

**Conclusion:** The results of this study revealed that massage therapy could reduce transcutaneous bilirubin level and increase the frequency of defecation in healthy term neonates.

**Keywords:** Bilirubin, Jaundice, Massage, Neonate

## Introduction

Jaundice is one of the most prevalent problems in neonatology and it is observed in 60% of term and 80% of preterm neonates in the first week after birth (1). Jaundice is one of the most common causes of hospital admission in neonates (2). Although jaundice is harmless in most cases, high level of unconjugated bilirubin is neurotoxic and causes kernicterus, mental retardation, and death (3).

The main methods of hyperbilirubinemia treatment is phototherapy and blood exchange. Phototherapy is a safer method than blood transfusion; however, it has side effects, such as cutaneous rash, diarrhea, hypocalcaemia, hyperthermia (4). Several studies have reported that phototherapy for jaundice may increase the risk of melanoma later during life (5, 6).

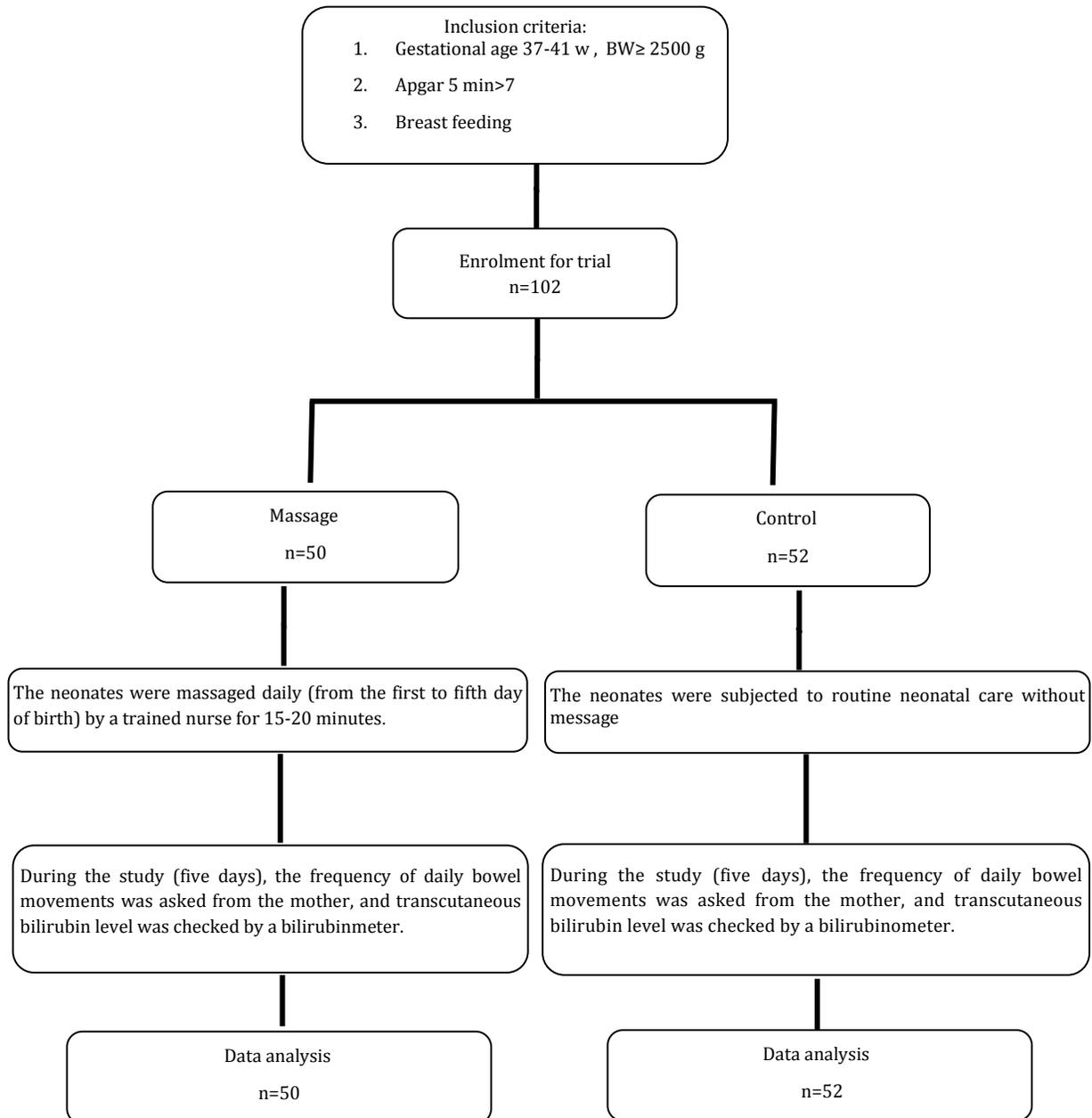
Consequently, the use of methods that prevent the increase of bilirubin level or maintain its normal range reduces the need for phototherapy.

In many parts of the world, such as African and Asian countries, infant massage therapy is a common practice. Many studies have been conducted on massage therapy in neonates, which showed the beneficial effects on the physical development of neonates such as weight gain, increased head circumference, and height. Furthermore, it has been revealed that newborn massage therapy improves sleep patterns, respiratory condition, and increases bowel movements, and reduces colic attacks (7-10). Increased enterohepatic circulation is one of the causes of neonatal jaundice and each deciliter meconium contains 1 mg bilirubin. It seems that

\* Corresponding author: Homa Babaei, Department of Neonatology, Imam Reza Hospital, Kermanshah University of Medical Sciences, Kermanshah, Iran. Tel: 09188317464; Email: [homa\\_babaei@kums.ac.ir](mailto:homa_babaei@kums.ac.ir)

Please cite this paper as:

Babaei H, Vakiliamini M. Effect of Massage Therapy on Transcutaneous Bilirubin Level in Healthy Term Neonates: Randomized Controlled Clinical Trial. Iranian Journal of Neonatology. 2018 Dec; 9(4). DOI: [10.22038/ijn.2018.28906.1386](https://doi.org/10.22038/ijn.2018.28906.1386)



**Figure 1.** The flow chart of study population

the factors causing rapid excretion of meconium from the intestines in neonates partly inhibit serum bilirubin increase.

Based on the literature, massage therapy leads to faster excretion of meconium and reduce bilirubin reabsorption. Moreover, massage therapy can increase sucking in newborns and may reduce serum bilirubin level by increasing calorie intake. The increased frequency of defecation decreases conjugated bilirubin reuptake secreted in intestines, and consequently reduces serum bilirubin (11, 13).

This study was investigated to assess the effect of massage therapy on transcutaneous bilirubin measurement in healthy term neonates.

### **Objectives**

This study was conducted to evaluate the impact of massage therapy on transcutaneous bilirubin level in healthy term newborns.

### **Methods**

This randomized clinical trial was carried out on

healthy term neonates born at Imam Reza Hospital, Kermanshah, Iran, from February to December in 2014. The inclusion criteria were the healthy term neonates with postnatal age less than 12 h and gestational age of 37-41 weeks, birth weight  $\geq$  2500 g, a fifth-minute Apgar score of more than seven, breastfeeding, and the absence of any diseases at birth (e.g., hemolytic condition). The exclusion criteria were the neonates with gestational age less than 37 and more than 41 weeks, congenital anomalies, sepsis, need for phototherapy, hospitalization, cephalohematoma, formula feeding, and exchange transfusion in older siblings.

The purpose of the study was explained to the mothers before their participations in the study, and parental consent was obtained. Afterwards, adequate training on frequent breastfeeding was provided to the mothers (i.e., feeding the baby every 2 to 3 h). Mothers were also advised to avoid taking any kind of medicine or traditional treatment for jaundice.

A total of 102 healthy neonates were enrolled and randomly assigned to the massage group (intervention group) and the control group (without massage). Any infant phototherapy need for jaundice was excluded from the study. In both groups, transcutaneous bilirubin was measured daily (i.e., every morning from the first to fifth day after birth) by a bilirubin meter JH20-1A (Ningbo David, China). Until discharge, the bilirubin in neonates would be measured in the caesarean and midwifery department of Imam Reza Hospital, after which parents would take them to the hospital every morning for transcutaneous bilirubin check, until the fifth day after birth. Daily stool frequency was recorded from the first to the fifth postnatal day by the mother. In this study, blinding was achieved by having a co-investigator without prior knowledge of the intervention in order to control the neonates for transcutaneous bilirubin check.

In the massage group, the neonates were massaged daily (i.e., from the first to fifth day after birth) for 15-20 min by a nurse trained for neonatal massage. The massage therapy method by Field et al. was used in the present study. The room temperature was kept at 24-28°C. After washing the hands, the neonate oil massage was performed by pressing the thumb on the face and from around the eyes to the cheeks, chest, stomach, and colon. Afterwards, massaging was carried out with moderate pressure on the upper and lower limbs and finally from the spines toward the sides of the neck and hips (13).

In the control group, the neonates underwent

the routine daily care (without massage). The obtained data were analyzed by statistical tests. The t-test was utilized to evaluate the differences between mean values, while chi-square test was used to compare the ratios between massage and control group. Furthermore, Mann-Whitney U test was applied for the comparison of transcutaneous bilirubinometry and stool frequency in the two groups, since this was not normally distributed. The level of statistical significance was considered  $P < 0.05$ . The analysis was performed using SPSS software (version 19).

This study was approved by the Ethics Committee of Kermanshah University of Medical Sciences and registered in the Iranian Registry of Clinical Trials (IRCT201010274961N3). In addition, a written informed parental consent was obtained from the parents of the neonates.

## Results

The present study was performed on 102 healthy term neonates, 50 newborns in the massage group and 52 neonates in the control group. Table 1 tabulates that there was no significant difference between the control and massage groups in terms of the mean birth weight and gender distribution. The only significant difference was reported for the mean of gestational age ( $P < 0.005$ ) as 0.713 weeks higher in the control group than in the massage group. However, according to the literature, this difference did not affect the study results because the bilirubin level in low gestational age was higher than high gestational age. In the case of the present study, the mean of gestational age in the massage group was five days less than that of the control group.

Table 2 presents daily defecation from the first to fifth day after birth. According to this table, defecation frequency was not significantly different between the control and massage groups on the first day of birth ( $P = 0.336$ ), while a significant difference existed between the second, third, fourth, and fifth days, indicating that massage therapy increased the frequency of bowel movements in the massage group compared to the control group ( $P < 0.005$ ).

Table 3 tabulates the mean of transcutaneous bilirubin in both control and massage groups from the first to the fifth day after birth. As indicated, there was no significant difference between the first ( $P = 0.866$ ) and second ( $P = 0.086$ ) days; however, a significant difference was noticed for the third to fifth days ( $P < 0.005$ ). The massage group had significantly lower transcutaneous

**Table 1.** Demographic characteristics of the studied neonates

	Message group N=50	Control group N=52	P-value
Gender	Male	23	0.858
	Female	27	
Gestational age (week)	38.46 (37-40)	39.17 (37- 41)	<0.005
Mean birth weight (gof ording to the literature, ed on)	2583±196 (2500-4000)	2513±216 (2550-4000)	0.782

**Table 2.** Comparison of daily defecation in massage and control groups

	Message group N=50	Control group N=52	T	P-value
First day	1.14±1.08	1.10±0.865	0.966	0.336
Second day	0.886±3.52	2.725±2.288	3.044	0.003
Third day	1.025±3.64	0.697±2.154	8.591	<0.005
Fourth day	0.917±3.66	0.711±2.75	5.614	<0.005
Fifth day	0.805±4.08	0.660±2.731	9.278	<0.005

**Table 3.** Comparison of transcutaneous bilirubin means in massage and control groups

	Message group N=50	Control group N=52	T	P-value
First day	1.877±9.84	1.943±9.903	-0.169	0.866
Second day	2.174±13.08	2.592±13.904	-1.736	0.086
Third day	2.838±14.06	2.933±16.788	-4.771	<0.005
Fourth day	3.688±14.70	2.854±18.115	-5.243	<0.005
Fifth day	3.924±14.46	0.660±2.731	9.278	<0.005

bilirubin level compared to the control group on days 3, 4, and 5. Massage therapy could increase the number of bowel movements in the massage group than that in control group; consequently, this increase could reduce the enterohepatic circulation and reduce the transcutaneous bilirubin level.

## Discussion

The results of this study showed that the massage group had a lower transcutaneous bilirubin level compared to the control group. The defecation frequency in the massage group was significantly higher than in that the control group on the second, third, fourth, and fifth days of massage therapy. The significant reduction of transcutaneous bilirubin level in the massage group could be associated with the increased bowel movements and reduced enterohepatic circulation. In a study performed by Semmekrot et al., it was revealed that the frequent bowel movements diminished the enterohepatic circulation of bilirubin level in a neonate. Moreover, the present study confirmed the findings of the mentioned study (14).

The results of a study carried out by Nishida et al. showed that the increased enterohepatic circulation was accompanied by an increase in the serum bilirubin level (15). In each deciliter of meconium, there is about 1 mg bilirubin;

therefore, the factors causing an increase in bowel movement and facilitating the excretion of meconium in the first day of birth will be helpful in the reduction of jaundice. The results of the present study confirmed the fact that in the case of reduced enterohepatic circulation following increased bowel movements, serum bilirubin level and transcutaneous bilirubin level will be decreased.

The results of a study conducted by Dalili et al. showed a significant difference between the control and massage groups in transcutaneous bilirubin level ( $P=0.000$ ) that was lower in the massage group compared to that in the control group. As for the frequency of bowel movements, it was higher in control group on the first day ( $P=0.042$ ); however, no significant difference was found between the two groups in the following days (16). In a study performed by Seyyedrasooli et al., no significant difference was observed between the control and massage groups with regard to transcutaneous bilirubin level; however, there was a significant difference between the two groups regarding the number of bowel movements, which was reported to be higher in the case group compared to that in control group (17). Moreover, Field and Diego reported that therapeutic massage in the neonates receiving moderate-pressure massage was more effective than in those receiving low-pressure massage. In

addition, the results indicated that maternal therapeutic massage was performed with low pressure despite receiving sufficient training, since they find the newborns very delicate (18).

The effectiveness of this study in the reduction of transcutaneous bilirubin level can be associated with the massage techniques. The massage technique used in the present study was based on the Field's massage technique and performed by an experienced nurse, in which the massage pressure was stronger than the massage pressure performed by the mother.

Furthermore, BasiriMoghadam et al. reported a significant difference between the control and massage groups in the frequency of bowel movements ( $P=0.002$ ) and bilirubin level ( $P=0.003$ ); the number of bowel movements was higher and transcutaneous bilirubin level was lower than those in the massage group (19). Moreover, Lin et al. revealed that the number of bowel movements was higher ( $P=0.045$ ) and bilirubin level was lower ( $p=0.03$ ) than those in the massage group, indicating a significant difference between the two groups. They reported no significant difference between the groups in terms of nutrition level and body weight (20).

In a study conducted by Jun Chen et al. (2011) on the effects of massage in neonatal jaundice in healthy term neonates, 42 neonates were divided into treatment ( $n=20$ ) and control ( $n=22$ ) groups. According to the results, it was revealed that the number of bowel movements in the treatment group was significantly increased compared to that in the control group, and transcutaneous bilirubin level in the treatment group was significantly lower than that in the control group (4).

Although the number of neonates in the present study (i.e., 50 neonates in the massage group and 52 newborns in the control group) was more than that of the abovementioned studies and similar to those in other studies, the present study showed a significant increase in the number of bowel movements and significant reduction in transcutaneous bilirubin level in the massage group than in the control group.

## Conclusion

Based on the findings it was revealed that neonatal massage at an early stage after birth for five days could significantly improve bowel movements, reduce enterohepatic circulation, and prevent further increase in bilirubin levels in healthy term neonate. Therefore, it is

recommended that neonatal massage should be utilized by mother as a part of newborn routine care.

## Acknowledgments

The authors would like to appreciate Ms. Yasaman Delfizadeh for her assistance in conducting this study.

## Conflicts of interests

None declared.

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