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The Effects of Field Massage Technique on Bilirubin Level and the Number of Defecations in Preterm Infants

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Abstract

Background: Hyperbilirubinemia is a common physiological problem in approximately 80% of preterm infants during the first week after birth. Increase in bowel movements reduces enterohepatic circulation and increases bilirubin excretion.

Aim: This study aimed to evaluate the effects of Field massage technique on bilirubin level and the number of defecations in preterm infants

Method: This clinical trial was performed on 80 preterm infants aged 30-36 weeks, who were hospitalized in neonatal intensive care units of Qaem, Imam Reza, and Ommolbanin hospitals of Mashhad, Iran, in 2011. The enrolled infants were randomized into intervention and control groups. The control group received the routine care, and the intervention group received a 15-minute massage twice a day (morning and evening), for five consecutive days. Field massage technique was applied by the researcher. The number of defecations and cutaneous bilirubin level were recorded on a daily basis until the sixth day after birth. Independent t-test and Mann-Whitney U test were performed to analyze the data, using SPSS version 14.

Results: The mean age of the intervention and control groups was 17.2±4.5 and 17.1±4.5 hours, respectively. The mean level of cutaneous bilirubin in the intervention and control groups on the first and sixth days were not significantly different (10.7±1.5, 10.8±1.4, 13.4±2.0, and 13.4±2.6, respectively; the first day: P=0.67, the sixth day: P=0.98). The number of defecations on the fourth (P=0.01), fifth (P<0.001), and sixth (P=0.005) days in the intervention group was significantly more than the control group.

Implications for Practice: The five-day massage using the field technique could not reduce the level of bilirubin in preterm infants; however, it increased the number of defecations during the bilirubin peak days in preterm infants (fourth-sixth days), which can decrease bilirubin level in preterm infants.

Keywords: Field massage technique, Bilirubin, Defecation, Preterm infant

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Introduction

Prematurity is one of the major causes of mortality in infant and the development of new methods of medicine has led to considerable increase in the survival rate of premature infants (1). Premature infants experience numerous problems in all their vital organs. Hyperbilirubinemia is one of the most common gastrointestinal problems in premature infants. This physiological problem occurs in 80% of preterm and 60% of term infants during the first week of life (2)

Pathological jaundice is one of the major problems in the first week of life and one of the most common causes of hospital readmission (51.8%) in neonates (3). Although neonatal icterus is usually benign, but high levels of unconjugated bilirubin is potentially neurotoxic (2). Due to increased toxicity of unconjugated bilirubin in the brain, timely diagnosis and treatment of neonatal hyperbilirubinemia is crucial to prevent dangerous complications. Given the blood-brain barrier permeability and susceptibility of brain cells to damage secondary to low serum bilirubin levels in neonates, premature infants are at higher risk of kernicterus (2). Presentation of physiologic hyperbilirubinemia in premature infants occurs three-four days after birth and it disappears seven-nine days after birth, which is later than term infants (2).

Moreover, severity and complications of hyperbilirubinemia in premature infants is different from term infants. Premature infants are at greater risk due to higher spinal-brain barrier permeability, susceptibility of brain cells to damage caused by low levels of serum bilirubin, lack of sufficient hepatic maturity, shortage of uridine diphosphate glucuronic acid enzyme, glucoroniel transferase, more comorbidities, lower serum albumin level, albumin-binding capacity, and red blood cell lifespan, gastroparesis, and several other medical problems (4).

The main methods of hyperbilirubinemia treatment are phototherapy, blood exchange, and therapeutic treatment (2). The most common treatment of hyperbilirubinemia is phototherapy, which is safer and more accessible as compared to other therapies, and it is the main intervention for prevention of hyperbilirubinemia (5). However, there are the side effects attributable to phototherapy include diarrhea, skin rashes, dehydration, hyperthermia, hypothermia caused by removing infants' clothes, Bronze baby syndrome, increased risk of melanoma later in life, and psychological stress on mothers and infants (2, 5-7)

Therefore, finding a way to reduce the use of harmful drugs to maintain bilirubin level at a normal range seems to be necessary (5). Massage is one of the most common complementary medicine therapies and one of the most popular complementary therapies in nursing care (8). Many studies have been done on the effects of massage on term and preterm infants.

Some of the effects of massage include: weight gain (9, 10), increased height (9, 11, 12), increased head circumference (9, 12), bone density (13), sleep duration (14-16), easy breathing (16), reduced incidence of late onset sepsis (17), reduced duration of hospital stay (9, 13, 14, 17), decreased hospital costs (9, 13, 14), reduction of stressful behaviors in infants (18, 19), and reduced positive relationship between mother and infant (9, 12, 20). The positive effects of massage on growth can be attributed to stimulation of the vagus nerve activity, increased gastrointestinal motility, elevated levels of insulin and insulin-like growth hormone (13, 14, 21, and 22).

Massage has positive effects on term neonates with icterus. Studies have shown the effects of massage on physiological jaundice, low bilirubin levels, and fewer incidence of neonatal hyperbilirubinemia. Studies have shown that massage leads to faster and shorter excretion of meconium and reduced bilirubin reabsorption through enterohepatic circulation, which results in reduced neonatal jaundice (23-25).

Chen et al. showed that massage might stimulate meconium excretion and increase the number of defecations on the first and second days of life, and reduce bilirubin level in healthy term neonates (5). Guiping (2002) demonstrated that defecation in newborn was improved by therapeutic touch, which resulted in reduced neonatal hyperbilirubinemia (24). Basiri Moghaddam et al. (2012) conducted a study on neonatal hyperbilirubinemia, the results indicated that massage for five days is effective on reduction of serum bilirubin levels in newborns with hyperbilirubinemia who were treated with phototherapy (26).

However, some studies did not confirm the effects of massage on bilirubin concentration in term infants. The results of Seyyedrasooli et al. (2014) study did not show any positive effects for massage on the cutaneous bilirubin concentration in term infants after four days of field massage (27). Keshavarz et al. (2010) found that the incidence of neonatal icterus after the third day of receiving

massage therapy was not significantly different in cutaneous contact (kangaroo care) and routine care groups (28).

A study was conducted on the effect of abdominal massage on icterus in premature infants in China; the results of this study, which was performed by Xiaoli et al. (2007), showed that abdominal massage can improve the performance of premature infants' digestive system, accelerate meconium excretion, reduce intestinal absorption of bilirubin, and decrease the risk of severe icterus (29).

In studies on term neonates with icterus, different massage techniques were used and it is not clear which technique is more suitable for clinical use. The applied techniques include: Vimala technique (the first phase in supine position facial massage to the legs, and the second phase prone, neck massage to waist and vice versa), Field technique (the first and third phases prone and massage from head to legs, and the second phase supine with flexion and extension of the limbs), therapeutic touch technique from Miami University of United States (facial, chest, abdomen, limbs, and back massage), and abdominal massage (clockwise, circular massage around the navel, alternating flexion and extension movements of legs) (29). The possibility of increased calorie consumption during massage should be taken into account in preterm infants; in field massage technique that is suitable for premature infants, energy is maintained and additional calorie is not required (13).

Considering the absence of studies on the effects of massage on neonatal icterus in Iran, and given the fact that the study performed in China used abdominal massage, while based on the previous studies Field technique is suitable for premature infants (13), this study was conducted to evaluate the effect of Field massage technique on bilirubin concentration level and the number of defecations in premature infants.

Methods

This randomized, clinical trial was carried out on 80 premature infants, who were admitted to the neonatal intensive care units (NICU) of Qaem, Imam Reza, and Omolbanin hospitals of Mashhad during October-March, in 2011. Since the main variables of this study were quantitative, the sample size was calculated using comparison of the average of the two communities' formula.

Mean and standard deviation of cutaneous bilirubin variable in the intervention and control groups were put into the formula based on similar studies (Chen et al., on neonatal icterus) (5). The mean cutaneous bilirubin level on the last day of intervention in the treatment and control groups was calculated to be 9.5±3.1 and 11.6±23.2, respectively. Moreover, coefficient of accuracy and power were 95% and 80 %, respectively. The sample size was calculated to be 26; however, to ensure the adequacy of the participants, 40 newborns were allocated to each group.

The inclusion criteria included: gestational age 30-36 weeks, birth weight over 1250 g, Apgar score of 7 and above (fifth minute), no prohibition of massage (such as ulcers, cutaneous lesions, burns, ecchymosis, fracture, dislocation, infection-associated rash, and hyperthermia), no obvious congenital anomalies, and absence of congenital infections.

The exclusion criteria included: presentation of clinical hyperbilirubinemia during the first 24 hours of birth, having the known causes of hyperbilirubinemia (including: lack of glucose-6-phosphate dehydrogenase, hypothyroidism, or ABO and Rh incompatibility, and evidence of globular lysis), receiving phototherapy, blood transfusion, and therapeutic treatment (drugs such as intravenous immunoglobulin, metalloporphyrin, and clofibrate) for hyperbilirubinemia during the first 24 hours of birth, placing the newborn on ventilation, transferring the baby to another hospital, and the risk of infection during the study (blood culture or cerebrospinal fluid positive culture).

At the end of the study, out of the 80 samples, 30 cases were excluded (15 neonates from the massage group and 15 infants from the control group). The main cause of exclusion was receiving phototherapy during the first 24 hours of birth (six infants in each group). Other reasons for exclusion included: parents' willingness to leave the study (two infants from the intervention group), discharge of patients younger than five days (two infants from the intervention group and three infants from the control group), septicemia (one infant from the control group), ventilation (one infant from the control group), transferring the baby to other hospitals (one infant from the control group), deficiency in glucose-6-phosphate dehydrogenase enzyme (three infants from the intervention group), and incompatibility of ABO (two infants from the intervention group and three infants from the control group).

The data collection tools included forms of the research unit, demographic information questionnaire, daily information forms, and transcutaneous bilirubin meter. Content validity of the demographics questionnaire and daily information form, which were designed school based on the latest books, articles, and research objectives, was established by ten faculty members of nursing and midwifery of Mashhad. Then, the final survey forms were developed using the comments and proposed amendment.

Several studies carried out in Iran and other countries performed transcutaneous bilirubin measurement, especially in infants with serum bilirubin less than 15 mg/dl, and its validity was confirmed for screening (2, 30-37). In this study, criterion validity was established using ten infants gestational aged 30-36 weeks, who were admitted to NICU and required serum bilirubin measurement according to physician advice. Blood sampling was conducted along with cutaneous bilirubin measurement. The results were compared using the Pearson correlation coefficient (r=0.72).

The infants admitted to the NICUs were randomized into massage and control groups. Using a table of random numbers, 40 numbers were randomly selected from 0 to 9; for each selected number between 0-4 and 5-9, AB and BA were assigned, respectively. Therefore, we had a string of 40 pairs of AB and BA. The As and Bs were allocated to the control and intervention groups, respectively. In the intervention group, massage was performed by a researcher, twice a day in the morning and evening (same time in each hospital, 12 hours interval between each massage) during five consecutive days (according to the same study(5)).

The intervention was performed as followed: in the massage group, 12-24 hours after birth and after stabilization of the infants (stabilizing characteristics included open airway, adequate ventilation, pink skin and lips, pulse of 120-140 beats per minute, axillary temperature 36.5 - 37° C, modified metabolic disorders, and management of special problems), the infants were placed in a relatively peaceful environment under radiant heaters one hour after being fed, and cutaneous bilirubin level was determined using JAUNDICE DETECTOR JH20-1A (China).

The bilirubin level was measured from glabella twice using a cutaneous bilirubin meter and the mean value was considered. Before initiating the massage, the researcher's hands were washed and warmed, and lubricated with maximum 1 ml sunflower oil (for better lubrication). Massage was done with the soft parts of the fingers of both hands with light pressure by the researcher using field technique. Massage duration was 15 minutes, and included three steps each lasting five minutes, according to the same study (23).

During the first and final stages, the infant was placed in prone position, and each minute one of the following areas was massaged: A) 12 massage moves (every five seconds one move) from head downwards (both sides of the face to neck and reversely); B) 12 massage motions from the neck to the shoulders and reversely; C) 12 massage moves from the upper back down to the waist and reversely; D) 12 massage moves from the thighs down to the ankles and reversely; E) 12 massage motions from the shoulders to the wrists and reversely, in the middle phase, the infant was put in supine position and six extension and flexion moves were done (10 seconds for each) in the right arm, left arm, right leg, left leg, and both legs.

On the sixth day, the routine care was provided for the intervention group. In the control group, the routine care was provided since the beginning of the intervention. In the intervention and control groups, the number of daily defecation and coetaneous serum bilirubin level were recorded until the sixth day. The number of daily defecations was recorded in the infants' profiles based on the intake and output forms.

This study did not hinder the newborns' treatment, and all the medical procedures were controlled since the second day of birth to assess the effects of massage on the need for other treatments (i.e., phototherapy, blood transfusion, and therapeutic treatment). During the course of intervention, the infants did not require blood transfusion and therapeutic treatment. From the second day, the hours of receiving phototherapy were controlled and recorded in the daily information form. When cutaneous bilirubin concentration was higher than the physiological rate or according to physician advice, serum bilirubin level was measured by the personnel and the results were recorded and controlled by the researcher in the daily information form.

All the ethical codes regarding clinical trials were observed, the most important of which are as follows: obtaining permission from the Ethics Committee of the university, receiving a written letter of introduction from the School of Nursing for the hospitals, introducing the researcher and

explaining the objectives and methods of the study, obtaining parents' permission to participate in the study, ensuring the participants of non-invasiveness and safety of the study, ensuring the parents of the right to quit participating in the study at any time, respect for scientific integrity in presenting results, and notifying the ability to perform routine treatment at every stage of the study. Finally, the data were analyzed using SPSS version 14.

After determining the normal distribution of variables, Kolmogorov-Smirnov test, independent t-test, Mann-Whitney U test, Chi-square, and Fisher's exact test were used. In all the tests, accuracy coefficient and statistical power were 95% and 80%, respectively.

Results

The mean age of the infants was 17.2±4.5 and 17.1±4.5 hours in the intervention and control groups (P=0.90), respectively. The results showed that both groups were quite the same in terms of gestational age, birth weight, head circumference, Apgar score of five minutes after birth, and maternal age (P>0.05). The samples' demographics are demonstrated in Table 1.

Table 1: Comparison of demographic characteristics of the samples in the intervention and control groups

Variable	Mean ± SD		Results of the statistical tests
	Intervention group	Control group	
Chronological age (hour)	17.2 ± 4.5	17.1 ± 4.5	* 0.90
Gestational age (week)	33.1 ± 1.4	33.1 ± 1.5	** 0.97
Birth weight (gr)	1893.7 ± 440.4	2000.2 ± 433.3	* 0.28
Infant's height (cm)	43.5 ± 3.5	43.7 ± 3.3	* 0.77
Head circumference (cm)	31.0 ± 2.0	30.9 ± 2.4	* 0.84
Five-minute Apgar score	8.6 ± 0.8	8.5 ± 0.9	** 0.77
Maternal age (years)	25.5 ± 5.0	26.6 ± 6.5	* 0.39

*independent t-test

**Mann-Whitney U test

In the intervention group, 12 (48%) and 13 (52%) samples were female and male, respectively. In the control group, 5 (20%) and 20 (80%) cases were female and male, respectively. Chi-square test reflected a significant difference between the two groups in terms of gender, and the two groups were not homogeneous regarding this variable (P=0.009, x^2= 6.76).

The two groups were homogeneous in terms of mode of delivery, maternal diabetes, previous history of child hospitalization due to icterus, induction of labor with oxytocin, maternal blood type and Rh, and infant blood type and Rh (P>0.05).

The mean cutaneous bilirubin concentration of the first day (before the intervention) was 10.7±1.5 and 10.8±1.4 in the intervention and control groups, respectively; independent t-test did not show statistically significant differences between the two groups (P=0.67).

The mean bilirubin concentration on the sixth day (the day after the intervention) was 13.4±2.0 and 13.4±2.6 in the intervention and control groups, respectively; there was no statistically significant difference the two groups (P=0.98).

The mean level of cutaneous bilirubin on the other days (second, third, fourth) did not show significant differences between the intervention and control groups (P>0.05). Comparison of the differences between the sixth and first days in the level of cutaneous bilirubin showed no significant differences between the two groups (P=0.82; Table 2).

Table 2: Comparison of daily cutaneous bilirubin in the intervention and control groups

Days of study	Intervention n= 25 Mean ± SD cutaneous bilirubin (mg/dl)	control n= 25 mean±SD cutaneous bilirubin (mg/dl)	Results of t-test
First	10.7± 1.5	10.8 ± 1.4	P=0.67
Second	13.6± 1.6	13.2 ± 1.7	P=0.36
Third	13.7± 2.3	13.1 ± 2.1	P=0.31
4th	13.5± 2.2	13.4 ± 2.0	P=0.86
5th	14.3± 2.5	14.0 ± 2.3	P=0.68
6th	13.4± 2.0	13.4 ± 2.6	P=0.98
Difference between the first and sixth days regarding bilirubin	2.7± 2.4	2.5 ± 2.5	P=0.82

Due to ethical considerations, blood sample was not taken to measure serum bilirubin concentration, but the results of the tests prescribed by the treating physicians were recorded in the form. After evaluating 19 infants on the third and fourth days, the results were analyzed using t-test. The results showed that there was no statistically significant difference between the two groups in terms of serum bilirubin level on the third (P=0.94) and fourth (P=0.12) days (Table 3).

Table 3: Comparison of daily serum bilirubin in the intervention and control groups

Variable	Group				Results of t-test
	No.	Intervention Mean ± SD cutaneous bilirubin (mg/dl)	No.	Control Mean ± SD cutaneous bilirubin (mg/dl)	
Serum bilirubin on the third day (mg/dl)	9	8.1±1.8	10	8.1 ± 2.2	P=0.94
Serum bilirubin of 4th day (mg/dl)	8	8.1±1.8	11	9.7 ± 2.2	P=0.12

T-test and Mann-Whitney U test reflected no statistically significant differences between the intervention and control groups in the number of daily defecation of the premature infants on the first (P=0.94), second (P=0.37), and third (P=0.10) days. However, a statistically significant difference was observed between the two groups on the fourth (P=0.01), fifth (P<0.001), and sixth (P=0.005) days (Table 4).

Repeated measures ANOVA (dependent variable was cutaneous bilirubin and independent variable was massage with controlling gender and the total hours of receiving phototherapy after the first day) was performed for the second and sixth days. The results did not show any statistically significant differences between the two groups in terms of cutaneous bilirubin (P=0.93); the same test demonstrated that gender did not affect bilirubin concentration (P=0.41; Figure 1).

Table 4: Comparison of mean daily defecation in the control and intervention groups

Days of study	Intervention n= 25	Control n= 25	P-value
First	0.5 ± 0.9	0.4± 0.6	*P=0. 94
Second	2.0± 1.4	1.6 ± 1.1	**P=0.37
Third	3.2 ± 1.4	2.6 ± 1.3	**P=0.10
4th	3.8 ± 1.5	2.7 ± 1.4	**P=0.01
5th	4.4 ± 1.0	3.2 ± 1.4	*P < 0.001
6th	4.2 ± 1.3	3.3 ± 1.2	*P=0.005

*Mann-Whitney U test
**independent t-test

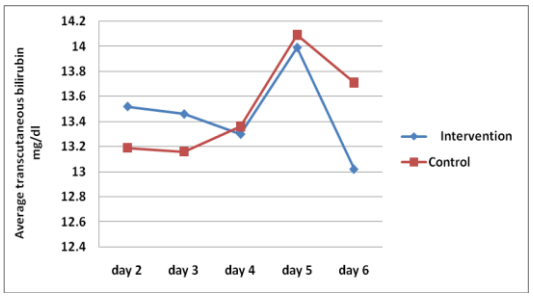

Figure 1: Comparison of bilirubin concentration on the second-sixth days with controlling gender and total hours of phototherapy variables in the intervention and control groups

Discussion

The results of the current study showed that the five-day Field massage technique could not affect cutaneous bilirubin concentration in premature infants; however, it could increase the number of defecations on the fourth, fifth, and sixth days. The mechanism of the effect of massage on the concentration of bilirubin in other studies was proposed as vagus nerve stimulation, elevated production of hormones affecting food digestion and absorption (gastrin and insulin) and as a result, increasing intestinal peristalsis and excretion of meconium (5). Since meconium contains 1 mg/dl

bilirubin, it may be deconjugated by intestinal glucoronidase and increase serum bilirubin concentration (2); thus, increasing meconium excretion can prevent further increase of bilirubin concentration in term infants. Massage can have varied effects on icterus in premature infants, due to delayed excretion of meconium in pre-term infants (the first 48 hours after birth) and other factors such as prematurity of muscular layers of the gastrointestinal tract, uncoordinated bowel movements, gastroparesis, fasting infants in the first days of life for various reasons, low hormone secretion in the gastrointestinal tract, and prolonged movement of food through the digestive tract (4).

In our study, the mean cutaneous bilirubin concentration level in the first (before the intervention), second-fifth, and sixth day (the day after the intervention) showed no significant differences between the intervention and control groups.

The results of a study performed by Chen et al. (2011) study showed that infant massage with therapeutic touch from Miami University of America (modified version of field technique) reduced cutaneous bilirubin level in the second-fifth days significantly in the treatment group, as compared to the control group. Additionally, total serum bilirubin level in the fourth day was significantly lower in the treatment group than the control group (5). The results of this study are not in agreement with those of our study, which may be due to the fact that Chen et al. (2011) conducted their study on term infants and that physiologic hyperbilirubinemia persists longer in preterm infants, as compared to term neonates. Other differences of preterm infants from term ones may prevent massage to affect bilirubin concentration in premature newborns.

A review of the literature done by Field et al. (2010) showed that the moderate pressure of massage did not affect weight gain in infants (13). This result might apply to bilirubin concentration as well.

Measurement of serum bilirubin concentration is more precise than cutaneous bilirubin concentration; however, due to ethical considerations this method was not used in this study. Moreover, the recorded test results were not reliable due to lack of homogeneity. Earlier initiation of massage renders better results, but in this study, massage was postponed to 12-24 hours after birth due to instability of the preterm infants.

The results of a study by Basiri et al. (2012) exhibited that mean serum bilirubin concentration of intervention group was significantly lower than control group on the fourth day (26). The results of this study are inconsistent with the findings of ours. As mentioned earlier, this discrepancy might be due to the fact that Basiri et al. (2012) conducted their study on term infants. Moreover, Basiri et al. (2012) measured serum bilirubin; while in this study, cutaneous bilirubin level was determined. Despite suitable correlation between measurement of serum and cutaneous bilirubin in the validity section of the present study, in-vitro conditions of the measurement method can affect bilirubin level.

More importantly, the Basiri et al. (2012) study was conducted on infants with hyperbilirubinemia, whereas in the present study not all the cases sustained hyperbilirubinemia. Excessive excretion of meconium in neonates with hyperbilirubinemia may be more effective in reducing bilirubin. The results of a study by Xiaoli et al. (2007) demonstrated that cutaneous bilirubin concentration in the fourth-tenth days after abdominal massage was significantly lower in intervention group than control group (29).

The abovementioned result is not in line with our results. This inconsistency might be due to the differences in massage techniques between our study and the one by Xiaoli et al. (2007) (in the Xiaoli study abdominal massage and in our study field massage techniques were used). In the field massage technique no massage is performed on infants' abdomen, but studies have shown that abdominal massage increases intestinal peristalsis (38). In addition, duration of intervention in the study by Xiaoli et al. (2007) was twice (ten days) as long as the current study.

In a study performed by Seyyedrasooli et al. (2014), no significant difference was observed between intervention and control groups in terms of cutaneous bilirubin on the first-fourth days of intervention (27). The results of this study are consistent with the findings of the present study. Although the study groups and the intervention duration (4 vs. 5 days) were different, the two studies were the same in terms of massage technique, and duration of massage (15 minutes).

The findings of the current study showed that massage increases the number of defecations in the bilirubin concentration peak days (4-6th days) in premature infants, which can reduce bilirubin in premature newborns. Chen et al. (2011) study showed that the number of defecations on the first and second days was significantly higher in the intervention group, as compared to the control group (5). These results are inconsistent with the findings of the current study, which might be due to different

study groups (term neonates), differences in massage technique and recording the number of defecations (in the study by Chen et al. it was recorded according to the mother's statements, and adsorption and excretions recorded by nurses, but in current study due to the absence of the majority of mothers in the NICUs, it was based on the numbers recorded by nurses in the infants' profile), depth of massage (gentle pressure in the present study, and in the Chen et al. study it was unknown), and the time of massage initiation (immediately after birth).

The current study also shows the positive effects of massage on the number of defecations, but this impact does not present in the early days of birth due to differences of premature infants and term newborns. Jiang et al. (2014) found a statistically significant difference between intervention and control groups in the number of defecations (39). The results of this study are not in agreement with the current findings. The reason for this inconsistency may be the differences in the study groups (neonates) and study method (in this study, swimming and massage once a day for ten days).

Field massage technique in the study by Seyyedrasooli et al. (2014) showed that the number of defecations was not significantly different in the intervention and control groups on the first-fourth days (27). This result is not in agreement with the findings of the present study, which might be due to studying term infants and shorter duration of the intervention (four days) (4). Vimala massage technique in the study by Seyyedrasooli et al. (2014) demonstrated that the number of defecations on the fourth day in the massage group was more than the control group (40), which is consistent with the findings of the present study.

The following limitations could affect the results of this study: not measuring serum bilirubin levels due to impossibility of frequent blood sampling out of the course of treatment, phototherapy administration during the first 24 hours of birth without testing and according to clinical diagnosis, great loss of samples and having a smaller sample size than expected, lack of accurate fecal measurement, several residents and neonatologists visiting the neonates (which resulted in frequent starting and stopping the phototherapy).

Implications for Practice

Field massage for five days could not reduce cutaneous bilirubin levels in preterm infants. However, the findings of this study indicate that massage increases the number of defecations on the bilirubin peak days in preterm infants (4-6 days); which can in turn, reduce bilirubin level in preterm infants. Due to the positive effects of massage on premature newborns and because of excretion of meconium, which could prevent further increase in bilirubin concentration, massage as a complementary therapy technique can be used to reduce the need for therapeutic treatment of icterus? Conducting further studies on the effect of massage on serum bilirubin concentration in newborns is recommended.

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Conflict of interest

The authors declare that there is no conflict of interest.

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