The Effect of Massage on Serum Bilirubin Levels in Term Neonates with Hyperbilirubinemia Undergoing Phototherapy

CITATION
1

READS
1,130

6 authors, including:

Mojtaba Kianmehr
Gonabad University of Medical Sciences
18 PUBLICATIONS 27 CITATIONS

Kokab Basiri
Mashhad University of Medical Sciences
2 PUBLICATIONS 2 CITATIONS

Saeid Pasban-Noghabi
Tarbiat Modares University
11 PUBLICATIONS 17 CITATIONS

Mahdi basiri moghadam
Gonabad University of Medical Sciences
8 PUBLICATIONS 23 CITATIONS

Some of the authors of this publication are also working on these related projects:

Assessment of DNA damage induced by mutagens using comet assay View project

All content following this page was uploaded by Saeid Pasban-Noghabi on 12 March 2015.

The user has requested enhancement of the downloaded file. All in-text references underlined in blue are added to the original document and are linked to publications on ResearchGate, letting you access and read them immediately.
INTRODUCTION
Most infants are diagnosed with hyperbilirubinemia in the first days of their lives, and it is considered a common neonatal problem as 60% of term and 80% pre-term neonates suffer from the same (Surapaneni & Vishnu Priya, 2008; Barbara, 2008). Approximately 60–70% of the 4 million babies annually born in the United States suffer from jaundice; this rate is higher in neonates born in East Asia (Setia et al., 2012). Hyperbilirubinemia is a frequent cause of recurring hospitalization in the neonatal period (Escobar et al., 2005) and although this condition is short-lived, it is the reason for 75% of hospitalizations occurring within the first weeks after birth (Barbara, 2008). In a study undergone in Najmieh Hospital in Tehran in 2005 (Kavehmanesh et al., 2008), the rate of repeated hospitalization on account of jaundice was registered at 12.6%. Hyperbilirubinemia can cause transient, reversible encephalopathy and if the bilirubin levels are not controlled, kernicterus can occur resulting in central nervous system dysfunctions and possible death (Steffensrud, 2004). Even though suitable therapy can prevent brain damage in infants, procedures aiding a speedy recovery are constantly being evaluated (Valaes et al., 1996). Phototherapy is the common treatment used for increased hyperbilirubinemia, however it has various side effects such as damage to the retina and genitals, cause dehydration, diarrhea and Bronze Children's Syndrome. Thus, finding solutions for the reduction of the time of phototherapy or finding alternate treatment for the same has always been a matter of consideration (Barbara, 2008). Massage has been accepted as a supplementary treatment in this regards. In the 70s, methods were considered for the substitution of traditional and common health care procedures, and the name
supplementary medicine was given to the same (Mainous, 2002). In nursing, too, massage has been considered as a supplementary medical procedure. Many studies have proven that neonates who were given massage showed a faster weight gain (though having similar calorie intake to the control group), shorter hospitalization periods and lower hospital expenses (Holand & Pokorny, 2001; Underdown et al., 2006; Arora et al., 2005; Basiri-Moghaddam et al., 2005). Daily Massage can improve airway tonicuity, decrease airway sensitivity, and better control of asthma (Nekoeee et al., 2008). But there was not enough study about effect of massage in neonatal jaundice. Massage is a non-invasive therapeutic technique. It does not require any special technology or equipment; can easily be carried out alongside classical medicine and can result in a lowering of treatment costs, shortening of the length of the disease and its side-effects. It can also lead to a better emotional relationship – which could have been disturbed by phototherapy – between mother and infant. Few studies with different techniques of massage have been done in the field of the effect of infant massage on the amount of bilirubin and same result has not been found (Jing, 2008; Feng et al., 2007; Li and Wu, 2005; Sun et al., 2004; Meng et al., 2006; Harrison et al., 2000; Ludington-Hoe & Swinth, 2001; Chen et al., 2011). Therefore, this research has been carried out with the aim of studying the effect of massage with Field's technique (Field et al., 1986) on serum bilirubin levels in term neonates with hyperbilirubinemia undergoing phototherapy.

**PATIENTS AND METHODS**

The present study is a parallel randomized control trial that was carried out on 34 full-term infants with hyperbilirubinemia undergoing phototherapy at the 22nd of Bahman Hospital in Gonabad city in 2009 in Iran. According to formula of comparative study of two independent population means, the sample size was estimated 12 neonates for each group, level of power considered 80% and 95% for confidence level. This is a clinical trial undergone to study the relationship between the independent variable of massage with the dependent variable of serum bilirubin level of term neonates born after 37–42 weeks of pregnancy, weighing between 2500 g and 4000 g and having a bilirubin level of 13–24 mg/dl. All the children were breast fed, were not under any medication and showed no contra-indications to massage. Based on routine ward, the room temperature was at between 24–28 °C. Exclusion criteria of the research included having jaundice on the first day of birth, hyperbilirubinemia caused by hemolysis, diseases (Genetic disorders, congenital cardiac malformation, gastro-intestinal disorder, neurologic dysfunction) or infections (Pneumonia, gastro-enteritis, sepsis, bronchitis) occurring in the course of the study, blood transfusion carried out in the infant, the occurrence of bronze children's syndrome during phototherapy, diarrhea during phototherapy, and lastly the desire of the parent to be omitted from the study. After parental consent was obtained, for matching two groups, the neonates were divided into three stratiﬁcations according to bilirubin levels of 13–15.9, 16–19.90 and 20–24 mg/dl respectively. Then, the neonates from each stratum were randomly assigned to the massage or control group by table of random numbers before any kind of contact with infant. At first, researchers draw a chart including 45 rows (01-45). Then, we carried out an allocation to the control and intervention group (massage group) using the table random numbers. Neonates were divided into 2 groups: control group (n=16) and massage group (n=18). Names and characteristics of patients were allocated to each group, and only the researchers were aware of this table, and the laboratory does not know about the group (massage or control). Also, the supervision of the research was not aware of the groups before allocation of participants. The neonates in the control group were administered routine ward care where as the neonates in the massage group were allowed the same along with massage carried out by the mother under the supervision of the same researcher. Mother was taught to wash her hands and warm them.

**Massage Technique**

We performed massage methods and procedures based on the method of massage therapy due to Field et al (Field et al,. 1986). Each infant in treatment group received massage for three, 15–minute periods at beginning of three consecutive hours (starting at approximately 30 minutes after the first morning feeding). Massage starting on the face, mother use two thumbs gently rubbing the preorbital and cheek regions; and then moving on the chest, two hands of performer from the lower margin of chest slide to opposite upper edge alternately; then to the abdomen, corresponding to the conformation of colon, the
performer push a half circle gently, next is on the limbs, the performer use hand by hand with moderate pressure external side of the upper and lower limbs; and finally the back, the performer slide two hand from vertebra to two sides by neck to buttok. Massage intervention was carried out alongside phototherapy (without interruption) in the sample group at a fixed hour between 7 am and 7 pm every day. Initially, phototherapy lamps were checked and adjusted at a height of 30 cm above the neonates who were kept in the cots with eyes closed and reproductory organs protected. After every 2 hours of therapy a rest period of 30 min was given in which the neonates were allowed to breast feed with eyes open. Bilirubin was measured at 6 am every day. The person who was doing the testing bilirubin did not know that the neonate belonged to which group.

**Statistical Analyses**

Data was analyzed by SPSS software (version 14, SPSS Inc., Chicago, IL) and using independent samples t-test and Fisher's exact test. Statistical results were considered significant in less than 0.05.

This study was approved by the ethics committee of Gonabad University of Medical Sciences and the registration ID of this study in Iranian Registry of Clinical Trials is IRCT138811043150N1.

**RESULTS**

Among these 34 neonates, 2 neonates were dropped due to the parent's unwillingness to continue massage intervention, 5 neonates were discharged prior to completion of the 4-day period, and 2 neonates were dropped when they required antibiotics due to infection. shows the diagram of the study and details of the numbers of participants randomly assigned, receiving intended treatment, and completing the study protocol. According to the findings of this study, the neonates in the massage group were comprised of 61.54% males (n=8) and 38.46% females (n=5), while as the control group had 75% males (n=9) and 25% females (n=3). With regards to the frequency of kind of delivery in the two groups, the massage group consisted of 56% normal delivery and 44% cesarean, while the control group had 75% normal delivery and 25% cesarean cases. Fisher's exact test did not show any significant statistical difference in terms of variables of delivery or gender (P=0.44) in the two groups and in fact the two groups were similar in these variables. The independent samples t-test showed that both groups had similar variables of age of mother, age and bilirubin level of neonates on day of admission, birth rank, gestational period, weight at birth and weight on admission in the two groups were not significant statistically (P>0.05) (Table 1).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Massage group N (Mean±SD)</th>
<th>Control group N (Mean±SD)</th>
<th>P-value</th>
<th>Df</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (day)</td>
<td>18 (4.7±1.66)</td>
<td>16 (5.25±1.12)</td>
<td>0.35</td>
<td>32</td>
<td>0.95</td>
</tr>
<tr>
<td>Birth rank</td>
<td>18 (1.78±1.35)</td>
<td>16 (1.62±0.72)</td>
<td>0.4</td>
<td>32</td>
<td>0.4</td>
</tr>
<tr>
<td>Gestational age (wk)</td>
<td>18 (37.67±1.28)</td>
<td>16 (37.12±0.96)</td>
<td>0.18</td>
<td>32</td>
<td>1.38</td>
</tr>
<tr>
<td>Birth weight (g)</td>
<td>18 (3045.56±317.14)</td>
<td>16 (3137.5±551.21)</td>
<td>0.55</td>
<td>32</td>
<td>0.6</td>
</tr>
<tr>
<td>Weight on admission (g)</td>
<td>18 (3020.56±245.8)</td>
<td>16 (2941.87±478.88)</td>
<td>0.54</td>
<td>32</td>
<td>0.61</td>
</tr>
<tr>
<td>Age of mother (y)</td>
<td>18 (25±5.46)</td>
<td>16 (26.87±4.6)</td>
<td>0.17</td>
<td>32</td>
<td>1.41</td>
</tr>
</tbody>
</table>

Independent samples t-test was used to compare the mean of the demographic variables in massage and control groups. There was no difference in the mean values between two groups.

The independent samples t-test did not show any significant statistical difference in terms of variables of breast feeding and phototherapy times in the two groups and in fact the two groups were similar in these variables (P>0.05) (Table 2). The bilirubin mean at time of admission (on day 1 before intervention) was 17.89 ± 2.12 for the massage group and 17.87 ± 2.46 for the control group showing no considerable difference (P=0.98). The bilirubin on day 4 was measured at 9.92 ± 1.3 in the massage group but was 11.97 ± 1.52 in the control group, which was statistically significant (P=0.001) (Table 3).
Table 2. The Average of Breast Feeding Times and Phototherapy Duration in Massage and Control Groups

<table>
<thead>
<tr>
<th>Variable</th>
<th>Massage group N (Mean±SD)</th>
<th>Control group N (Mean±SD)</th>
<th>P-value</th>
<th>Df</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breast feeding (times)</td>
<td>18 (9.44±2.28)</td>
<td>16 (9.12 ±2.65)</td>
<td>0.7</td>
<td>32</td>
<td>0.37</td>
</tr>
<tr>
<td>Phototherapy duration (h)</td>
<td>18 (17.05±2.26)</td>
<td>16 (18.09±1.01)</td>
<td>0.09</td>
<td>32</td>
<td>1.7</td>
</tr>
</tbody>
</table>

Independent samples t-test was used to compare the mean of the demographic variables in massage and control groups. There was no difference in the mean values between two groups.

Table 3. The Average Bilirubin in Massage and Control Groups

<table>
<thead>
<tr>
<th>Day</th>
<th>Massage group N (Mean±SD)</th>
<th>Control group N (Mean±SD)</th>
<th>P-value</th>
<th>Df</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>18 (17.89±2.12)</td>
<td>16 (17.87±2.46)</td>
<td>0.98</td>
<td>32</td>
<td>0.018</td>
</tr>
<tr>
<td>2</td>
<td>18 (15.29±1.86)</td>
<td>16 (15.32±1.71)</td>
<td>0.95</td>
<td>32</td>
<td>0.06</td>
</tr>
<tr>
<td>3</td>
<td>15 (12.77±1.22)</td>
<td>14 (13.21±1.67)</td>
<td>0.42</td>
<td>27</td>
<td>0.82</td>
</tr>
<tr>
<td>4</td>
<td>13 (9.92±1.3)</td>
<td>12 (11.97±1.52)</td>
<td>0.001*</td>
<td>23</td>
<td>3.63</td>
</tr>
</tbody>
</table>

Independent samples t-test was used to compare the mean of variables in massage and control groups.
* The level of statistical significance was P<0.05.

Also, mean difference in bilirubin levels of day 1 and day 4 in the massage group stood at 7.83 ± 2.19, while that of the control group was 6.22 ± 1.75.

DISCUSSION

The findings of this research have shown a decrease in bilirubin levels in neonates that were given massage. The mean of total bilirubin levels in both massage and control groups were similar at admission and before commencement of phototherapy and massage intervention; and did not have a significant difference (P=0.98). This was an expected outcome considering the sampling procedure. A surprising fact was the usage of phototherapy for under 15 mg/dl groups which is against the guidelines printed by the American Children's Association recommending phototherapy for term neonates of above 24 hours of age having minimum bilirubin levels of 15 mg/dl (American Academy of Pediatrics-Medical Specially Society, 1994). The commencement of phototherapy for bilirubin levels of under 15 mg/dl could be due to the remoteness of villages from town centers and the unavailability of specialists in those areas. Gartner et al have also reported commencement of phototherapy by pediatrician’s at a bilirubin level of 13 mg/dl (Gartner et al., 1998). Mean bilirubin level of the massage and control group showed a meaningful difference statistically on the fourth day of intervention (P=0.001). In a study that was done in order to survey the effects of gentle baby massage on neonatal jaundice in full term newborn infants, the results showed that the transcutaneous bilirubin level on the second to fifth day and serum total bilirubin level on fourth day significantly decreased in the massage group, compared to the control group (P<0.05) (Chen et al., 2011). The result of Jing's research has also shown a meaningful reduction in serum bilirubin level in neonates receiving massage on the fourth day after birth (P<0.01) (Jing, 2008). In another study by Feng et al. (2007) a meaningful reduction in the transcutaneous bilirubin level of the neonates on the fifth day of receiving massage (P<0.05). Studies undertaken by Li and Wu (2005) and Sun et al. (2004) and Meng et al. (2006) have shown much fewer incidence of hyperbilirubenia in the neonates of the massage group as compared with those in the control group (P<0.05). Moreover, the findings of the present research are similar to that of Harrison et al who have reported that phototherapy period was shortened in preterm neonates that had received gentle human touch (Harrison et al., 2000). In a study that was undergone to see the effect of kangaroo mother care on bilirubin levels of neonates undergoing

39
phototherapy, it was observed that the bilirubin level of the neonates in the intervention group fell significantly on the fourth day of phototherapy (Ludington-Hoe & Swinth, 2001). We can explain significantly decrease of bilirubin in massage group in comparison control group by: Massage increases lymph flow and blood circulation. An increased blood circulation speeds up the excretion of the bilirubin broken down by phototherapy. On the other hand, stools contain a large amount of bilirubin and delayed stools passage is associated with increase in bilirubin levels. Massage accelerates the excretion of stools and helps baby to pass more stools and decreases the re-absorption of bilirubin into the blood. More stools passed may make the jaundice go away faster. Jaundice tends to reach higher levels when babies don't excrete often and well after birth. Semmekrot et al. (2004) reported that frequent bowel movement diminished the enterohepatic circulation of bilirubin in a newborn infant, therefore bilirubin excretion increase. The most important limitation of this study was the lack of completely random sampling. Other limitations were being the immeasurability of the amount of milk during breast feeding and lack of follow-up patients for more than four days because of discharge. In conclusion on the basis of the findings of this research it can be concluded that massage is effective in decreasing bilirubin levels during phototherapy. Massage can be a good tool to reduce bilirubin in neonates with hyperbilirubinemia and it is an effective supplementary medication used for the lowering of bilirubin level while undergoing phototherapy.

ACKNOWLEDGEMENTS

The authors would like to gratefully acknowledge the financial assistance of the research deputy of Gonabad Medical University, and extend their gratitude to the respected the research committee, whose guidelines have been the basis of the present research. Also researchers would like to thank from the mothers and their infants and 22nd of Bahman Hospital staffs in Gonabad city for their participation

REFERENCES


1- PhD in biophysics, assistant professor, department of medical physics, faculty of medicine, Gonabard University of medical sciences, Gonabard, Iran
2- MD in anesthesiologist, faculty member of anesthesiology department, Gonabard University of medical sciences, Gonabard, Iran
3- MSc. in nursing education, faculty member of nursing department, faculty of nursing and midwifery, social development & health promotion research center, Gonabard University of medical sciences, Gonabard, Iran
4- MSc. in nursing education, faculty member of nursing department, faculty of nursing and midwifery, Mashhad University of medical sciences, Mashhad, Iran.
5- BSc. in anesthesia, student research committee, member of experimental talents, Gonabard University of medical sciences, Gonabard, Iran.
*6- Corresponding author: MSc. in nursing education, faculty member of nursing department, faculty of nursing and midwifery, social development & health promotion research center, Gonabard University of medical Sciences, Gonabard, Iran.

*Corresponding Author’s Address: basiri1344@gmu.ac.ir, +985337223028, Journal’s USL: http://www.nautilusjournal.net