

Effect of Vimala Massage on Hyperbilirubinemia among Full Term Neonates: A Randomized Controlled Trial

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Abstract

Background: The primary treatment of neonates with unconjugated hyperbilirubinemia is phototherapy. As phototherapy has potential side-effects for neonates, another modality could be used along with it to increase the excretion of bilirubin, such as, Vimala Massage (VM). The VM can promote early defecation of neonates by increasing the intestinal movement which would accelerate bilirubin excretion with the possibility of reducing neonatal hyperbilirubinemia. **Aim:** The aim of this study was to determine the effect of VM on hyperbilirubinemia among full term neonates. **Design:** A quasi-experimental study was used. **Setting:** the study was carried out in the Neonatal Intensive Care Unit (NICU) of EL-Raml Children Hospital at Winget in Alexandria. **Subjects:** Sixty full-term neonates with hyperbilirubinemia who were at the first day of exposure to phototherapy were included in this study. Eligible neonates who fit the inclusion criteria were equally assigned into two groups. Each group comprised of 30 full term neonates. The study group received VM and the routine care of the NICU, while the control group received only routine care of the NICU. **Tool:** One tool was used, namely, Neonatal Hyperbilirubinemia Assessment Sheet. **Findings:** Neonates who received VM exhibited reduction in the mean total serum bilirubin from 14.5 ± 3.82 mg/dl during the first day of the study period to 11.4 ± 3.67 and 8.5 ± 3.25 in the second and third days respectively and finally reached to 6.3 ± 2.75 mg/dl at the fourth day. Meanwhile, the mean total serum bilirubin for those neonates in the control group were 15.9 ± 2.48 , 12.7 ± 1.72 , 10.9 ± 1.95 and 8.9 ± 2.20 mg/dl respectively. There were evident significant statistical differences between both groups in the third and the fourth days of the study period ($P = 0.001$ and $P = 0.000$ respectively). **Conclusion and Recommendations:** Combination between phototherapy and VM showed positive effects in increasing amount of feeding, enhancing frequency of bowel movement and minimizing bilirubin level among full term neonates with hyperbilirubinemia. Therefore, this technique can be used as adjunctive nursing intervention along with phototherapy among neonates with hyperbilirubinemia.

Keywords : Vimala Massage, Hyperbilirubinemia, Full Term Neonates.

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I. Introduction

Jaundice is one of the most frequently encountered problems in the neonatal stage. It is defined as yellowish discoloration of the skin, sclera and mucous membranes due to raised serum bilirubin level in the circulation which is known as hyperbilirubinaemia (Hockenberry & Wilson, 2018). Hyperbilirubinemia can be caused by an accumulation of conjugated (direct) or unconjugated (indirect) bilirubin. But, most neonatal hyperbilirubinemia is caused by accumulation of unconjugated bilirubin in the blood (American Academy of Pediatrics [AAP], 2017). Hyperbilirubinaemia is noticed in approximately 60% of term neonates and 80% of preterm ones suggesting that about 84 – 112 millions of neonates affected yearly worldwide (Basiri-Moghadam et al., 2015). About one in ten neonates are likely to develop clinically significant jaundice thus requiring close monitoring and treatment (United Nations Children's Fund [UNICEF], 2017). According to the recorded statistics of the Health Information Center in Alexandria (2014), the percentage of neonates who had hyperbilirubinemia registered in the Neonatal Intensive Care Units (NICUs) was 43.09 % of the total number of admissions in all ministry of health hospitals in Alexandria. Whereas, the recorded statistics of EL-Raml Children Hospital in Alexandria (2014) reported that the percentage of neonates with hyperbilirubinemia who were registered in the NICU was 35.6% of the total number of admissions.

Any process that results in increased degradation or lysis of red blood cells, decreased bilirubin conjugation in the liver, decreased elimination of conjugated bilirubin into the gut, or increased reabsorption of unconjugated bilirubin can result in hyperbilirubinemia (AAP, 2017). Clinically, jaundice appears in neonates when the total serum bilirubin level reaches 5 mg/dl. Hyperbilirubinemia can be classified as either physiologic or pathologic, based on age-specific statistical analysis of serum bilirubin measurements (AAP, 2017). Physiologic hyperbilirubinemia is the most common type of neonatal jaundice. It appears on the second or third day of birth and is caused by increased bilirubin production due to a shorter neonatal red blood cells life span, deficient conjugation due to the deficiency of uridineglucuronyltransferase enzyme and the increased entero-hepatic circulation of bilirubin. While physiologic hyperbilirubinemia is generally benign, but elevated serum bilirubin level may cause acute bilirubin encephalopathy or kernicterus (Chen et al., 2011). Kernicterus is fatal in almost 5% of cases with hyperbilirubinemia. Moreover, 80% of survivors encountered neurodevelopmental problems such as mental retardation, motor and balance disorders, seizures, hearing loss and speech disorders (McGillivray et al., 2016; Scrafford et al., 2013). Therefore, early diagnosis and treatment of neonatal hyperbilirubinemia are extremely important (Namnabati et al., 2019).

Currently, several methods can be used for the treatment of hyperbilirubinemia such as pharmacological treatment, phototherapy, and blood exchange transfusion. Nevertheless, the main form of treatment involves the use of phototherapy (Boskabadi et al., 2015; Bratlid et al., 2011). Phototherapy involves the use of fluorescent light on the neonates' naked skin to promote bilirubin excretion by photoisomerization that alters the structures of bilirubin from the insoluble form to the soluble one for easier excretion (Hockenberry & Wilson, 2018). Phototherapy is associated with several side effects such as transient skin rashes, mild hyperthermia, and retinal damage. So, reducing the duration of phototherapy may diminish its side effects (Ahmed et al., 2019). Recently, studies have been still conducted on innovative different practices that would shorten the length of hospital stay by supporting phototherapy as massage. Hence, it is crucial to incorporate supportive therapies as Vimala Massage (VM) with phototherapy to control hyperbilirubinemia within the normal range whilst avoiding the harmful side effects of phototherapy (Chen et al., 2011; Seyedrasooli et al., 2014).

The use of complementary and alternative medicine therapies such as VM in health care systems is being emphasized nowadays around the world. Vimala massage was invented by Vimala Schneider McClure the founder of the International Association of Infant Massage, by combining Indian and Swedish massages. It is a simple approach that could be done by parents and health professionals (Seyedrasooli et al., 2014). Several studies have reported that neonatal massage can improve weight gain, sleep pattern, growth and development, and autonomic nervous system functions (Kulkarni et al., 2010; Moyer-Mileur et al., 2013; Smith et al., 2013). In addition, it can reduce neonates' stress and promote positive emotional bonding between parents and their neonates. Vimala massage also accelerates meconium excretion and reduces constipation by increasing the frequency of bowel movement (Field, 2016; Field, 2019). Certainly, defecation is a mechanism whereby bilirubin is removed which decreases the probability of hyperbilirubinemia. Thus, VM is effective therapy in reducing bilirubin level among neonates with hyperbilirubinemia (Chen et al., 2011; Seyedrasooli et al., 2014).

Neonatal nurses are key persons involved in the neonates' care. They have a proactive role in the assessment and management of hyperbilirubinemia among neonates. So, they should be equipped with the most innovative evidences in the neonatal care. Neonatal nurses have to be alert to the most optimum therapies of complementary and alternative medicine such as VM to enhance the quality of care and maintain the best long-term outcomes of neonates (Ibrahim et al., 2019). Unfortunately, researches addressing the incorporation of VM in NICUs policies are limited. Hopefully, the current study would implement VM as a complementary intervention to enhance the clinical outcomes of neonates with physiological hyperbilirubinemia.

Aim

This study aimed to determine the effect of Vimala massage on hyperbilirubinemia among full term neonates.

Hypotheses

1. Neonates with hyperbilirubinemia who receive Vimala massage exhibit a lower level of serum bilirubin than those who do not.
2. Neonates with hyperbilirubinemia who receive Vimala massage exhibit a higher frequency of stool than those who do not.

Operational definition

Vimala massage:

It is a simple type of moderate pressure massage that combines Indian and Swedish massages. In this study, it is performed on full term neonates from head to toes and from center to periphery in both supine and prone positions by researchers' fingertips and palms of hands.

II. Materials & Method

Design: A quasi-experimental research design was used to accomplish this study.

Setting: The study was carried out in the NICU of EL-Raml Children Hospital at Winget in Alexandria.

Instruments

Tool: Neonatal Hyperbilirubinemia Assessment Sheet:

This tool was developed by the researchers after reviewing the relevant literature to assess indicators of hyperbilirubinemia improvement evidenced by total serum bilirubin/day, amount of feeding and frequency of stool/ day (Abo El-Magd et al., 2017; Chen et al., 2011; Seyedrasooli et al., 2014; Tekgündüz et al., 2014). Characteristics of neonates such as; postnatal age, gender, current weight, gestational age, type of delivery as well as their type of feeding were attached to the tool. This tool was submitted to a panel of five experts in the neonatal and pediatric nursing specialties to assess its content validity, feasibility, and clarity. Based on their comments, the necessary amendments were carried out. Two trained raters independently recorded their observations using the assessment tool. The intraclass correlation coefficient (ICC) was used to assess the inter-rater reliability that revealed 0.90, which reflected excellent agreement among raters, and Cronbach Alpha Coefficient was 0.97.

Participants:

Sample size was estimated according to Epi-Info program using the following parameters

- Population size =110 full-term neonates (in the last three months prior to data collection).
- Expected frequency = 50%.
- Acceptable error =10%.
- Confidence coefficient =95%.
- Minimum sample size = 55 full-term neonates.

Sixty full-term neonates with hyperbilirubinemia (37- 42 weeks of gestation) who were at the first day of exposure to phototherapy were included in this study, as illustrated in **Figure 1**. While, neonates who had asphyxia, congenital anomalies or other medical conditions that hinder application of VM and those who were attached to mechanical ventilators were excluded. Eligible neonates who fit the inclusion criteria and their guardians agreed upon their participation were equally assigned into two groups by simple random sampling technique using random number generator program. Each group was comprised of 30 full term neonates. The study group received VM and routine care of the NICU. While, the control group received only routine care of the NICU.

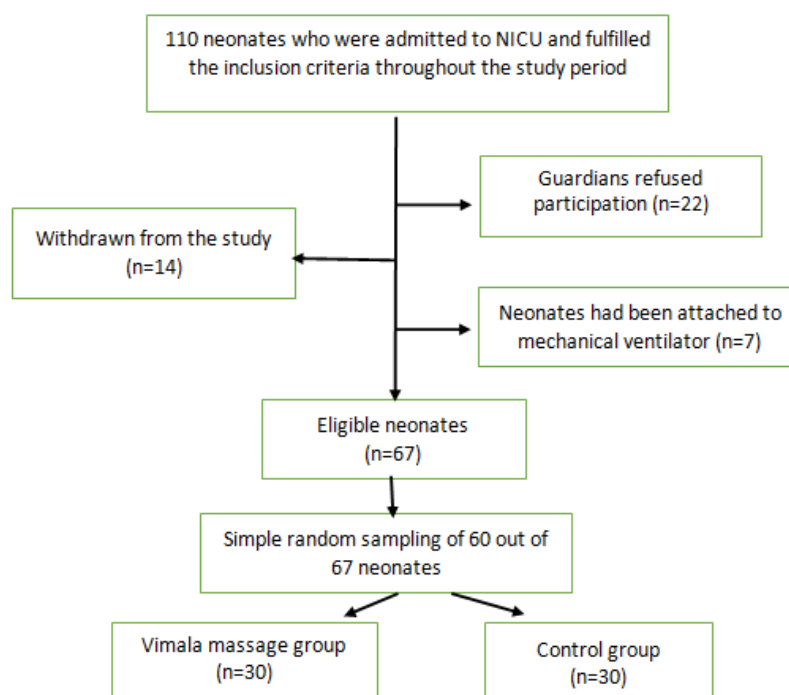


Figure-1: Flow chart of participants' recruitment process.

Ethical considerations

An approval from the Research Ethics Committee of Faculty of Nursing, Alexandria University was obtained. An official permission for conducting the study was also obtained from the director of the previously mentioned setting. Guardians of the neonates who matched the inclusion criteria were approached by the researchers. The aim of the study, benefits, and possible risk of participation were explained, and their free decision to voluntarily participate in the study was emphasized. The researchers also stressed the guardians' right to withdraw from the study at any time. After their agreement, written informed consent was obtained from the neonates' guardians. Confidentiality of the obtained data was assured, and participants' anonymity was respected. Neonates' privacy was maintained during the implementation of the study.

The researchers received a training course on Vimala massage by professor expert in massage at Biological Science and Sport Health Department, Faculty of Sport Education for Girls, Alexandria University. The training course included 40 credit hours.

Method & Data collection

- A pilot study was conducted on six full-term neonates (10% of the study subjects) to test the research tool's clarity, feasibility, and applicability. These neonates were excluded from the total study subjects.

- Initially, the neonates' characteristics were extracted from their hospital records for the two groups. Baseline total serum bilirubin, amount of feeding and frequency of stool were assessed at the first day of phototherapy exposure in both groups using the study tool.

- Data was collected first from the control group and thereafter from the VM group to prevent subjects' contamination.

For the control group: the neonates in the control group received only the routine care of the NICU.

For VM group:

- The neonates in the study group were assessed for needed diaper care at least 10 minutes before applying massage. They did not receive any procedures or handling for at least 10 minutes before starting VM because handling may affect the physiological and behavioural status of the neonates.

- Vimala massage was started in the first day of neonate's exposure to phototherapy till the fourth day. It was done 3 times daily for 15 minutes, one hour after first feeding of each shift to avoid regurgitation or vomiting and to accelerate bilirubin metabolism. A stop watch was used to determine the required time for the massage (Seyedrasooli et al., 2014).

- The study group received VM in the form of structured massage with researchers' warm bare hands after hand washing in two phases when the neonate was calm as follows:

During the first phase: The neonate was placed in supine position and massaged in the following sequence:

- The neonate's face was massaged from the center of forehead to the sides of face. Area in front of ears and jaw were massaged in a rotary scheme.

- The neonate's chest was massaged from the center to the sides across the ribs.

- Both arms and hands of the neonate were massaged from shoulder to wrist, and then from wrist to fingers via rotating movements (Indian milking).

- The neonate's abdomen was massaged by 'I love you' method by starting at the base of the rib cage, stroking downwards with one hand, while the other hand in a paddle-wheel-like motion with moderate pressure using fingertips in a circular, clockwise motion. Firstly, the researcher traced the letter "I" down the neonate's left side. Then, an inverted letter "L" was traced, stroking across the abdomen along the base of neonate's ribs from the right side to left and down. Finally, an inverted letter "U" was traced, stroking from lower segment of the abdomen on the neonate's right side, up and around the umbilicus and down the left side.

- Both neonate's legs were massaged from thighs to the knees and then to the feet by Indian milking

During the second phase:

- The neonate was placed in prone position, and neck was massaged to the waist and vice versa with both hands in tangential position to the back, with movements in opposite directions (Seyedrasooli et al., 2014).

- During VM, when the neonate was demonstrating signs of distress (heart rate less than 100 or greater than 170 b/min for 12 seconds or more and respiratory rate greater than 60 c/min, the massage was immediately discontinued until reaching the baseline values. The researchers also stopped VM temporarily when neonates were passing stool or crying during the massage till the neonate become comfortable (Badiee et al., 2012).

- Indicators of hyperbilirubinemia improvement for both groups were measured daily from the first day of exposure to phototherapy to the fourth day which were daily total serum bilirubin level, daily amount of feeding and daily stool frequency.

- A comparison was made between the two groups, for determining the effect of VM on hyperbilirubinemia among full term neonates in NICU.

- Data were collected over a period of 12 months starting from May 2020 till the end of April 2021.

Data Analysis

The Statistical Package for Social Sciences (SPSS) version 23 was utilized for data analysis. Descriptive statistics included number, percentage, mean and standard deviation to describe the neonates' characteristics. The mean and standard deviation were also used to describe the neonates' total serum bilirubin, amount of feeding and stool frequency. Kolmogorov-Smirnov test was used to check the normality of study variables, and it showed that they were normally distributed. In Analytical statistics, Studentt-test was used to compare the differences and test the significance between the neonates' mean total serum bilirubin, amount of feeding as well as stool frequency. Moreover, the Chi-square and Fisher's Exact tests were used to compare the differences and test the significance between neonates' characteristics. All of the statistical analyses were considered significant at $P < 0.05$.

III. Results

Table 1 portrays the characteristics of the neonates in the study and control groups. In relation to postnatal age, 76.7% of neonates in the study group and 66.7% of those in the control group were in the third day of their life. Regarding gender, male neonates constituted 66.7% in both the study and control groups. Almost three quarters of neonates in the study and control groups had 38 weeks of gestation (73.3% and 70.0% respectively) with mean gestational age 37.73 ± 0.450 and 37.70 ± 0.466 weeks respectively. The same table revealed that the majority of neonates in both the study and control groups weighed 3000 grams and more (80.0% and 83.3% respectively) with mean current weight 3310 ± 355.59 and 3333 ± 350.69 grams respectively. All of neonates in the control group (100%) and 93.3% of those in the study group were delivered by caesarean section. Concerning the type of feeding, all of neonates in the study and control groups received mixed feeding (100.0% for each).

Table 2 reveals effect of Vimala massage on the neonates' mean amount of feeding. It was found that the mean amount of feeding was slightly higher among the neonates in the control group (253.6 ± 41.37) than those in the study group (250.0 ± 43.62) during the first day of the study period with no significant statistical difference. However, the mean amount of feeding began to increase during the second, third and fourth days of the study period among neonates in the study group (331.3 ± 112.30 , 351.3 ± 116.87 and 362.0 ± 124.19 respectively) compared to those in the control group (317.3 ± 103.48 , 334.0 ± 116.69 and 345.0 ± 125.66 respectively) and the differences were not statistically significant.

Table 3 discloses effect of Vimala massage on the neonates' mean frequency of stool. It was reflected from the table that the neonates in the study group experienced higher mean frequency of stool during all days of the study period in comparison with those in the control group. For instance, the mean frequencies of stool among neonates in the study group were 3.4 ± 1.30 , 4.2 ± 0.44 , 5.0 ± 0.98 and 5.7 ± 0.91 respectively. While, the mean frequency of stool among those in the control group were 2.8 ± 0.64 , 3.8 ± 0.50 , 4.5 ± 1.10 and 5.1 ± 1.26 respectively. The differences were statistically significant in the four days where $P = 0.037$, $P = 0.002$, $P = 0.040$ and $P = 0.040$ respectively.

Effect of Vimala massage on the neonates' mean total serum bilirubin was illustrated in **Table 4** and **Figure 2**. Amazingly, it was apparent from the table that neonates of the study group exhibited reduction in the mean total serum bilirubin from 14.5 ± 3.82 mg/dl during the first day of the study period to 11.4 ± 3.67 and 8.5 ± 3.25 in the second and third days respectively and reached to 6.3 ± 2.75 mg/dl at the fourth day. Meanwhile, the mean total serum bilirubin for those neonates in the control group were 15.9 ± 2.48 , 12.7 ± 1.72 , 10.9 ± 1.95 and 8.9 ± 2.20 mg/dl respectively. There were evident significant statistical differences between both groups in the third and the fourth days of the study period ($P = 0.001$ and $P = 0.000$ respectively).

Table 1: Characteristics of the Neonates in the Study and Control Groups

Neonates' Characteristics	Study Group (n=30)		Control Group (n=30)		Test of Significance
	No.	%	No.	%	
Post-natal Age (days)					
• 2	7	23.3	10	33.3	X ² :0.739 P: 0.390
• 3	23	76.7	20	66.7	
Mean± SD	2.69 ± 0.435		2.50 ± 0.428		
Gender					—
• Male	20	66.7	20	66.7	
• Female	10	33.3	10	33.3	
Gestational Age (weeks)					
• 37	8	26.7	9	30.0	

• 38	22	73.3	21	70.0	X ² :0.082 P: 0.774
Mean± SD	37.73 ± 0.450		37.70 ± 0.466		
Current Weight (grams)					
• 2000 -	6	20.0	5	16.7	X ² :0.111 P:0.739
• ≥ 3000	24	80.0	25	83.3	
Mean± SD	3310 ± 355.59		3333 ± 350.69		
Type of Delivery					
• Normal vaginal delivery	2	6.7	0	0.0	FET:0.246 P = 0.492
• Cesarean section	28	93.3	30	100.0	
Type of Feeding					
• Formula feeding only	0	0.0	0	0.0	—
• Mixed feeding	30	100.0	30	100.0	

X² = Chi Square test

FET = Fisher's Exact Test

*Significant at P < 0.05

Table 2: Effect of Vimala Massage on the Neonates' Mean Amount of Feeding

Amount of Feeding/day (cc)	Study Group (n=30)	Control Group (n=30)	Test of Significance t (P)
The First Day			
• Mean± SD	250.0 ± 43.62	253.6 ± 41.37	0.331 (0.742)
The Second Day			
• Mean± SD	331.3 ± 112.30	317.3 ± 103.48	- 0.502 (0.617)
The Third Day			
• Mean± SD	351.3 ± 116.87	334.0 ± 116.69	- 0.575 (0.568)
The Fourth Day			
• Mean± SD	362.0 ± 124.19	345.0 ± 125.66	- 0.527 (0.600)

t = Studentt-test

*Significant at P < 0.05

Table 3: Effect of Vimala Massage on the Neonates' Mean Frequency of Stool

Frequency of Stool/ day	Study Group (n=30)	Control Group (n=30)	Test of Significance t (P)
The First Day			
• Mean± SD	3.4 ± 1.30	2.8 ± 0.64	- 2.134 (0.037)*
The Second Day			
• Mean± SD	4.2 ± 0.44	3.8 ± 0.50	- 3.231 (0.002)*
The Third Day			
• Mean± SD	5.0 ± 0.98	4.5 ± 1.10	- 2.100 (0.040)*
The Fourth Day			
• Mean± SD	5.7 ± 0.91	5.1 ± 1.26	- 2.100 (0.040)*

t = Student t-test

*Significant at P < 0.05

Table 4: Effect of Vimala Massage on the Neonates' Mean Total Serum Bilirubin

Total Serum Bilirubin (mg/dl)	Study Group (n=30)	Control Group (n=30)	Test of Significance t (P)
The First Day			
• Mean± SD	14.5 ± 3.82	15.9 ± 2.48	1.657 (0.103)
The Second Day			
• Mean± SD	11.4 ± 3.67	12.7 ± 1.72	1.702 (0.094)
The Third Day			
• Mean± SD	8.5 ± 3.25	10.9 ± 1.95	3.488 (0.001)*
The Fourth Day			

• Mean± SD	6.3 ± 2.75	8.9 ± 2.20	3.946 (0.000)*
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t = Student t-test

*Significant at P < 0.05

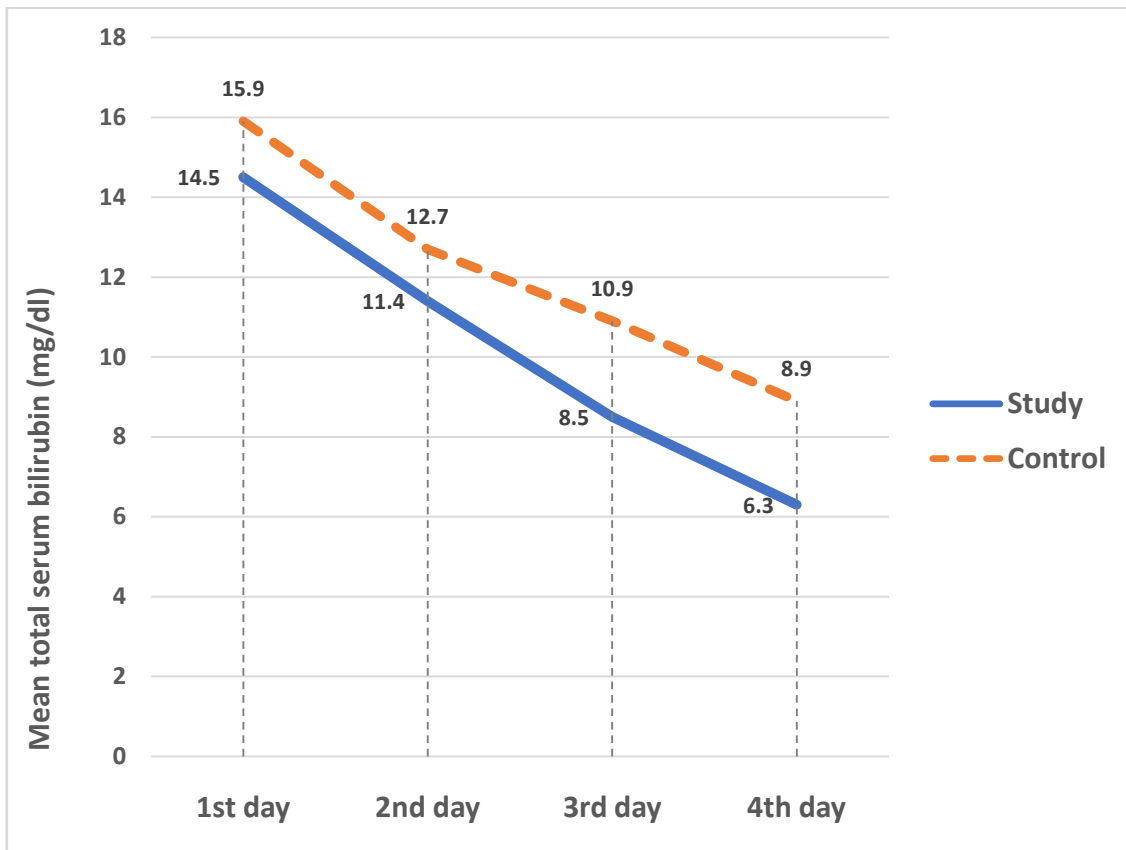


Figure 2: Effect of Vimala Massage on the Neonates' Mean Total Serum Bilirubin

IV. Discussion

The principal treatment of neonates with unconjugated hyperbilirubinemia is phototherapy. It is the most widely used treatment of hyperbilirubinemia by virtue of its effectiveness and non-invasive nature. However, it is accompanied with serious adverse events as dehydration, damage to the retina and bronzy baby syndrome. So, it is reasonable to use adjuvant treatment as VM(Chen et al., 2011; Seyedrasooli et al., 2014).

Amazingly, the findings of the current study reflected that the neonates who were subjected to VM exhibited reduction in the mean total serum bilirubin during the first, second, third and fourth days of the study period than those in the control group. Moreover, there were evident significant statistical differences between the two groups in the third and the fourth days of the study period. These findings could be explained by the fact that VM increases lymphatic blood flow and blood circulation which enhance gastric motility leading to more frequent stooling that contains large amount of bilirubin broken down by phototherapy (Tekgündüz et al., 2014). Increased frequency of bowel movements might also be expected to diminish the enterohepatic circulation of bilirubin in neonates, reduce the re-absorption of conjugated bilirubin that is secreted in the intestines and thus thereby leading to increased bilirubin excretion (AboEl-magd et al., 2017; Tekgündüz et al., 2014). The present study findings are congruent with the findings of Lin et al. (2015) who conducted study about effects of infant massage on jaundiced neonates undergoing phototherapy. They showed that bilirubin level was significantly lower in the massage group than the control group on the third day of the intervention. Moreover, Kianmehr et al. (2014) and Dalili et al. (2016) also reported that there were no significant differences in serum bilirubin levels in the first three days of the intervention, but total serum bilirubin level was significantly lower among neonates of the massage group than those of the control one in the fourth day of the study period. Conversely, Karbandi et al. (2016) showed that serum bilirubin level was slightly higher among neonates of the massage group than the control group on the fifth day of the study period with no significant statistical difference.

Massage therapy can prevent poor feeding and enhance digestive and central nervous system functions (Choi et al., 2016; Tekgündüz et al., 2014). In this context, the present study highlighted that the mean amount of feeding began to increase among neonates in VM group during the second, third and fourth days of the study

period compared to those in the control group but the differences were not statistically significant. Several mechanisms have been suggested to explain the reason beyond the increased amount of feeding among VM group. One mechanism is that moderate-pressure massage such as VM stimulates vagal activity, leading to increasing in gastric fluids and motility as well as the release of food absorption hormones such as insulin, glucose and gastrin (Diego et al., 2005; Field, 2019). Another underlying mechanism is that moderate-pressure massage stimulates the parasympathetic activity via baroreceptors and mechanoreceptors which enhance food absorption and appetite that made the neonates' nursing more frequent (Field et al., 2010). The findings of Amini et al. (2014) are in agreement with the present study findings as they conducted a study entitled "the effect of massage therapy on weight gain and calories intake in premature neonates". They declared that neonates who were subjected to massage therapy had increased oral nutritional intake compared to the control group. Moreover, the results of Diego et al. (2014) are in harmony with the current study findings as they reported higher caloric intake, energy conservation, and hormonal changes among massage therapy group. Similarly, Tekgündüz et al. (2014) found out that abdominal massage is an efficient intervention that prevents gastric residual volume excess, abdominal distension and vomiting in enterally fed preterm neonates. On the other hand, the finding of Dewi and Endy (2011) is not consistent with the results of the present study as they reported that there was no difference in the average daily formula intake between the massage and the control groups.

Regarding stool frequency, it was revealed from the current study results that the neonates in VM group experienced higher mean frequency of stool during all days of the study period compared to neonates of the control group with significant statistical differences. In that sense, increased frequency of bowel movement is likely to be explained by receiving moderate pressure massage therapy such as VM which causes greater increase in vagal activity and gastric motility leading to excretion of meconium (Tekgündüz et al., 2014). Similar findings were reported by Lin et al. (2015) who found that defecation frequency was significantly higher in the massage group than that of the control group on the third day of massage therapy. Seyedrasooli et al. (2014) also reported that defecation frequency of infants who were subjected to massage treatment was significantly higher than that in the control group by the fourth day of intervention. Furthermore, Chen et al. (2011) found that stool frequency was higher in the massage treatment group compared to that of the control group on the first two days of the intervention.

Based on the finding of the present study, it can be concluded that VM is nursing intervention with a holistic approach that can be effective in improving neonatal jaundice. So, Neonatal Nurses should be aware of the drastic impact of VM and not trivialize its effect on the neonates' health as it can be used as adjunctive nursing intervention along with phototherapy among neonates with hyperbilirubinemia.

V. Conclusion

Combination between phototherapy and VM was effective in increasing amount of feeding intake, enhancing frequency of bowel movement as well as minimizing total serum bilirubin level among full term neonates with hyperbilirubinemia.

VII. Recommendations

There is an urgent need for combination between phototherapy and VM as a holistic routine care for neonates with hyperbilirubinemia in NICUs to enhance the reduction of total serum bilirubin. Besides, educational workshops should be conducted for neonatal nurses and parents to increase their awareness regarding the drastic effect of massage therapy.

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CONFLICT OF INTEREST

The authors have declared no conflict of interest

References

- [1]. Abo El-Magd, A., Dabash, S., El-Guindy, S., Masoed, E., & Elhouchi, S. (2017). Effect of massage on health status of neonates with hyperbilirubinemia. *IMPACT: International Journal of Research in Applied, Natural and Social Sciences*, 5(5), 33-44.
- [2]. Ahmed, Y., Kassem, Y., & Ismail, S. (2019). Effect of intensive phototherapy on bilirubin induced neurological defect (BIND) score in neonates with severe hyperbilirubinemia. *Egypt J Hosp Med*, 74(7), 1643-8.
- [3]. American Academy of Pediatrics. (2017). Neonatal Jaundice. In A. H. McInerny TK, Campbell DE, DeWitt TG, Foy JM, Kamat DM (Ed.), *American Academy of Pediatrics Textbook of Pediatric Care*. American Academy of Pediatrics.
- [4]. Amini, E., Ebrahim, B., Dehghan, P., Fallahi, M., Sedghi, S., Amini, F., & Shariat, M. (2014). The effect of massage therapy on weight gain and calories intake in premature neonates: A brief report. *Tehran-Univ-Med-J*, 71(10), 674-8.

- [5]. Badiee, Z., Samsamshariat, S., & Pourmorshed, P. (2012). Effect of massage on weight gain in premature infants. *Iranian Journal of Neonatology*, 3(2), 57-62.
- [6]. Basiri-Moghadam, M., Basiri-Moghadam, K., Kianmehr, M., & Jani, S. (2015). The effect of massage on neonatal jaundice in stable preterm newborn infants: A randomized controlled trial. *J Pak Med Assoc*, 65(6), 602-6.
- [7]. Boskabadi, H., Ashrafzadeh, F., Azarkish, F., & Khakshour, A. (2015). Complications of neonatal jaundice and the predisposing factors in newborns. *J BABOL Univ Med Sci*, 17(9), 7-13.
- [8]. Bratlid, D., Nakstad, B., & Hansen, T. (2011). National guidelines for treatment of jaundice in the newborn. *Acta Paediatr*, 100(4), 499-505. <https://doi.org/10.1111/j.1651-2227.2010.02104.x>.
- [9]. Chen, J., Sadakata, M., Ishida, M., Sekizuka, N., & Sayama, M. (2011). Baby massage ameliorates neonatal jaundice in full-term newborn infants. *Tohoku J Exp Med*, 223(2), 97-102. <https://doi.org/10.1620/tjem.223.97>.
- [10]. Choi, H., Kim, S., Oh, J., Lee, M., Kim, S., & Kang, K. (2016). The effects of massage therapy on physical growth and gastrointestinal function in premature infants: A pilot study. *J Child Health Care*, 20(3), 394-404. <https://doi.org/10.1177/1367493515598647>.
- [11]. Dalili, H., Sheikhi, S., Shariat, M., & Haghazarian, E. (2016). Effects of baby massage on neonatal jaundice in healthy Iranian infants: A pilot study. *Infant Behav Dev*, 42(1), 22-6. <https://doi.org/10.1016/j.infbeh.2015.10.009>.
- [12]. Dewi, N., & Endy, P. (2011). Effect of massage stimulation on weight gain in full term infants. *Paediatr Indones J*, 51(4), 202-6. <http://paediatricaindonesiana.org/pdf/51-4-4.pdf>.
- [13]. Diego, M., Field, T., & Hernandez-Reif, M. (2005). Vagal activity, gastric motility, and weight gain in massaged preterm neonates. *J Pediatr*, 147(1), 50-55. <https://doi.org/10.1016/j.jpeds.2005.02.023>.
- [14]. Diego, M., Field, T., & Hernandez-Reif, M. (2014). Preterm infant weight gain is increased by massage therapy and exercise via different underlying mechanisms. *Early human development*, 90(3), 137-140. <https://doi.org/10.1016/j.earlhumdev.2014.01.009>.
- [15]. Field, T. (2016). Massage therapy research review. *Complement Ther Clin Pract*, 24, 19-31. <https://doi.org/10.1016/j.ctcp.2016.04.005>.
- [16]. Field, T. (2019). Pediatric massage therapy research: A narrative review. *Children*, 6(6), 78. <https://doi.org/10.3390/children6060078>.
- [17]. Field, T., Diego, M., & Hernandez-Reif, M. (2010). Moderate pressure is essential for massage therapy effects. *The International Journal of Neuroscience*, 120(5), 381-5. doi:10.3109/00207450903579475
- [18]. Health Information Center of EL-Ramel Children Hospital. (2014). *Unpublished statistical records about high-risk neonates' admission in the NICU*. Alexandria, Egypt.
- [19]. Health Information Center of Ministry of Health. (2014). *Unpublished statistical records about high-risk neonates in NICUs*. Alexandria, Egypt.
- [20]. Hockenberry, M., & Wilson, D. (2018). *Wong's nursing care of infants and children* (10th ed). Louis, Missouri.
- [21]. Ibrahim, M., Ouda, W., Ismail, S., & Elewa, A. (2019). Assessment of nursing care provided to neonates undergoing phototherapy. *Egyptian Journal of Health Care*, 10(1), 1-12
- [22]. Karbandi, S., lotfi, M., Boskabadi, H., & Esmaily, H. (2016). The effects of Field massage technique on bilirubin level and the number of defecations in preterm infants. *Evidence Based Care Journal*, 5, 7-16. <https://doi.org/10.22038/ebcj.2015.6057>.
- [23]. Kianmehr, M., Moslem, A., Moghadam, K., Naghavi, M., Noghabi, S., & Moghadam, M. (2014). The effect of massage on serum bilirubin levels in term neonates with hyperbilirubinemia undergoing phototherapy. *Nautilus*, 128(1), 36-41
- [24]. Kulkarni, A., Kaushik, J., Gupta, P., Sharma, H., & Agrawal, R. (2010). Massage and touch therapy in neonates: The current evidence. *Indian Pediatr*, 47(9), 771-776.
- [25]. Lin, C., Yang, H., Cheng, C., & Yen, C. (2015). Effects of infant massage on jaundiced neonates undergoing phototherapy. *Ital J Pediatr*, 41, 94. <https://doi.org/10.1186/s13052-015-0202-y>.
- [26]. McGillivray, A., Polverino, J., Badawi, N., & Evans, N. (2016). Prospective surveillance of extreme neonatal hyperbilirubinemia in Australia. *J Pediatr*, 168, 82-87.e83. <https://doi.org/10.1016/j.jpeds.2015.08.048>.
- [27]. Moyer-Mileur, L., Haley, S., Slater, H., Beachy, J., & Smith, S. (2013). Massage improves growth quality by decreasing body fat deposition in male preterm infants. *J Pediatr*, 162(3), 490-5. <https://doi.org/10.1016/j.jpeds.2012.08.033>.
- [28]. Namnabati, M., Mohammadzadeh, M., & Sardari, S. (2019). The effect of home-based phototherapy on parental stress in mothers of infants with neonatal jaundice. *J Neonatal Nurs*, 25(1), 37-40.
- [29]. Scrafford, C., Mullany, L., Katz, J., Khatry, S., LeClerq, S., Darmstadt, G., & Tielsch, J. (2013). Incidence of and risk factors for neonatal jaundice among newborns in Southern Nepal. *Tropical Medicine & International Health: TM & IH*, 18(11), 1317-1328. <https://doi.org/10.1111/tmi.12189>
- [30]. Smith, S., Lux, R., Haley, S., Slater, H., Beachy, J., & Moyer-Mileur, L. (2013). The effect of massage on heart rate variability in preterm infants. *J Perinatol*, 33(1), 59-64. <https://doi.org/10.1038/jp.2012.47>.
- [31]. Tekgündüz, K., Gürol, A., Apay, S., & Caner, İ. (2014). Effect of abdomen massage for prevention of feeding intolerance in preterm infants. *Italian Journal of Pediatrics*, 40(1), 89. <https://doi.org/10.1186/s13052-014-0089-z>.
- [32]. United Nations Children's Fund. (2017) *The state of the world's children: Children in a digital world*. Retrieved from: https://www.unicef.org/publications/index_101992.html. (Accessed on March 25th, 2020).

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