Effects of Applying Vimala Massage on Neonates with Exaggerated Physiological Jaundice on their Clinical Outcomes

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Abstract

Background: Exaggerated physiological jaundice is physiological jaundice that persists for longer period more than usual. Phototherapy is the first line of treatment for physiological jaundice but it has many adverse reactions. Recently, vimala massage has become increasingly used as complementary therapy for treating hyperbilirubinemia**. Aim**: Evaluate effects of applying vimala massage on neonates with exaggerated physiological jaundice on their clinical outcomes**. Design:** A randomized control experimental design was utilized in the current study. **Setting**: the study was carried out at Neonatal Intensive Care Units of EL Menshawy Hospital and Tanta Main University Hospital. **Sample**: A purposive sample of 60 neonates aged 36-38 weeks. The enrolled neonates were randomly selected into and control groups. **Tools of the study**: Tool I: A neonates bio-socio-demographic data. Tool II: Neonates' clinical outcomes. **Results**: The results indicated that mean score of total serum bilirubin reduced in the intervention group in third, fourth and fifth day of the study. Also, there was increase in the mean scores of intervention group frequencies of daily defecation than mean score of control group in the second, third, fourth, and fifth day of the study. **Conclusion**: there was a statistically significant improvement in relation to total serum bilirubin, frequencies of daily defecation, amount of daily feeding and discharge weight among vimala massage group than control group at second until fifth day of intervention. **Recommendations:** Vimala massage should be integrated as adjacent to phototherapy into the practice of nursing care for neonates suffering from hyperbiliubinemia.

Key words: Clinical outcomes, Exaggerated physiological, Jaundice, Neonate, Vimala massage

Introduction

Hyperbilirubinemia refers to an increased serum level of bilirubin that has accumulated in the blood above the usual range Hyperbilirubinemia can result from elevated levels of conjugated or unconjugated bilirubin. In newborns, the most prevalent type of hyperbilirubinemia is due to unconjugated hyperbilirubinemia **Hockenberry (2022)**.

Jaundice initially manifests on the head, face, and trunk before moving cephalocaudally to the extremities **Blackburn (2018)**. All newborns have elevated bilirubin levels, but only between 50 and 60 percent of them show outward symptoms of jaundice. Sixty percent of term neonates and eighty percent of preterm neonates get jaundice in the first week after birth **Marshall (2020).**

Jaundice that appears after the first day of birth and bilirubin levels that don't elevate above 5 mg/dl/day that decreased in 7–10 days are the criteria's of physiological hyperbilirubinemia **Hatfield (2022)**. When the typical pattern of physiological jaundice persists more than expected duration , it may be deemed to be exaggerated physiological jaundice. Identifying high-risk neonates for increased physiological jaundice, frequent monitoring of serum bilirubin levels, and avoiding bilirubin encephalopathy are the main priorities of treatment **Kiliac (2021)**.

Phototherapy, intravenous immunoglobulin, and newborn exchange transfusion are among the treatment modalities used in severe pathological cases **Lin (2015)**. photo-isomerization by phototherapy changes the bilirubin structure to a soluble state for easier execration, light facilitates bilirubin execration. Serum bilirubin levels need to be checked often, every 4 to 12 hours, once phototherapy has been started **Merenstein (2022).**

Frequent bilirubin assessment is possible through noninvasive bilirubin monitoring using transcutaneous bilirubinmetery and cutaneous reflectance measurements. It must be utilized as a screening tool rather than an indicator of therapy requirement. Since unconjugated bilirubin is extremely damaging to neurons, newborns with severe hyperbilirubinemia are at risk for bilirubin encephalopathy, which over time can result in learning disabilities, cerebral palsy, and sensorineural hearing loss **Shapiro (2020).**

Massage therapy has recognized as a novel approach to neonatal care that improves the management of neonatal illnesses and overall health **Lel (2021)**.It is the process of adjusting body tissues to reduce stress and suffering while promoting well-being. It involves a range of techniques as kneading, massaging, and applying pressure to specific locations **Nawaz (2021)**.

Vimala massage has many benefits for newborns, including support for the immune system, digestion and absorption, emotional bonding between mothers and infants, physical and intellectual development. It can also aid in the treatment of a range of newborn illnesses, such as hypoxia ischemic encephalopathy, hyperbilirubinemia, and bilirubin encephalopathy **Elmoneim (2021) & Hoggen (2017).** Early massage therapy-induced bilirubin level reduction may lead to shorter duration of phototherapy and an earlier discharge

Jin et al (2020). This decrease is associated with vagus nerve stimulation, which increases intestinal motility and, thus, improves the frequency of bowel movements. It also reduces bilirubin therapy's entrohepatic circulation, which ultimately results in an increase in bilirubin execration **(Kenaria at al 2020).**

Significance of the study

Hospitalizations due to hyperbilirubinemia account for 75% of neonatal admission. It is estimated that approximately 10% of newborns were experience clinically significant jaundice. Severe hyperbilirubinemia causes irreversible neurotoxicity or kernicterus **Olusanya et al (2018) & Noviati et al (2017)** . The primary treatment for increased unconjugated bilirubin in newborns is phototherapy. However, it has a negative short- and long-term adverse effects.

On the other hand massage treatment has been utilized to promote health and treat the medical problems of neonates. Massage therapy has been shown in trials to decrease the enter hepatic bilirubin cycle, improving jaundice in newborns **(Abdel hamid 2019).** According to certain clinical studies, massage promotes bowel movement and defecation, which in turn helps to decrease bilirubin level.

Aim of the study

Evaluate effects of applying vimala massage on neonates with exaggerated physiological jaundice on their clinical outcomes.

Research hypothesis

-Clinical outcomes of the neonates who receive vimala massage are expected to be improved than neonates in control group.

Subjects and method

Research design:

A randomized control experimental design was employed in the present study. Based on the serial numbers of their cases. The odd-number of newborns were assigned to the intervention group, and even -number newborns were assigned to the control group.

Setting

The study was carried out at El-Menshawy Hospital, which is affiliated to Ministry of Health and Population and the Neonatal Intensive Care Unit (NICU) at Tanta Main University Hospital, which is affiliated to the ministry of Higher Education and Scientific Research. Five rooms made up the NICU at Tanta University Hospital. The first room is a resuscitation room with three servo devices. Thirty-four incubators were located in the other four rooms. The first room of the NICU at El-Menshawy Hospital is used for resuscitation, and the examination room has two servo devices. The remaining three rooms had three servo devices and eighteen incubators.

Subjects:

A purposive sampling of 60 neonates,30 in vimala and 30 in control group with the following **Inclusion criteria:**

- Gestational age of neonates range from 36-38 weeks
- Neonates with exaggerated physiological jaundice under phototherapy according to bilirubin curve

Exclusion criteria:

- Early preterm neonate on mechanical ventilation
- Neonate with ABO and Rh incompatibility, umbilical venous catheter, congenital anomalies, neonatal sepsis, Aglucose-6-phosphate dehydrogenase deficiency, gastrointestinal obstruction and biliary atresia.

The size of sample was based on the following equation

n= M/({(S^2 X (M-1)) ÷ pq} + 1)

(n) sample size ,(M) population size ,(S) desired confidence level equal 1.69 ,(P) the desired level of precision equal 0.5 , (q) the estimated proportion of an attribute that is present in the population and equal 1 - p

Data Collection Tools:

Two tools were used for data collections.

Tool I: Neonates bio-socio-demographic characteristics. It was developed by the researchers after review of the related and recent literatures **Hockenberry (2022)**&**Blackburn (2018**) which included the following data: gestational age, current age, birth weight, sex current weight and type of delivery, method of feeding and type of formula.

Tool II: Neonates' clinical outcomes: it was developed by the researchers after reviewing of related and recent literature **Shahbazi et al (2022)**.This tool was used to assess neonatal clinical outcomes as daily serum bilirubin levels, numbers of defection and daily feeding amount for consecutive five days from the first day of phototherapy . Body weight was monitored at discharge. It was used for neonates in study group who received vimala massage and neonates who receive routine care.

Method

An official permission was obtained from the director of Tanta Main University and El-Menshawy hospital after clarifying the purpose of the study, setting the time for beginning the study.

Ethical approval was obtained from the Research Ethics Committee of the Faculty of Nursing, Tanta University with the code number **92-9-2022**

Consent was taken from the parents of neonates to participate in the study after explaining the aim of the study and their right to withdraw from the study at any time without providing a reason and without affecting the care that their neonates are receiving.

Tool Validity and reliability: The tools of the study were tested for content validity by the experts in the field of Pediatrics Nursing. Content validity index was 96%, reliability of the developed tools was tested through the

internal consistency and the value of Cronbach's alpha coefficient was 0.960.

A pilot study was initially carried out prior to actual data collection phase on (10%) of neonates to test the tool for its clarity, applicability, feasibility and identify obstacles that may be found during the data collection process.

Data collection was gathered through a period of three months from October 2022 to January 2023.

- **The study was carried out through four phases:**
- **Phase of Assessment:** The researcher conducted an assessment of all the study neonates to gather baseline data regarding their characteristics, including gestational age, postnatal age, birth weight, sex and current weight, method of delivery, feeding technique, and formula type. Tool I was used to gather this data prior to the intervention.
- **Phase of planning:** the researcher reviewed relevant literatures and demonstrated the steps of massage technique in accordance with International Association of Infant Massage guidelines.

Phase of Intervention:

-The researcher was been twice a day from 7:00 am to 9:00 am at the morning and 7.00 pm to 9.00 pm at the afternoon shift for five days per week in NICU. Before the staff nurse fed the newborns, the researcher arrived the neonatal critical care unit at 7:00 a.m. and beginning from the first day of phototherapy, each massage therapy session lasted 15 to 20 minutes and was conducted twice a day for five consecutive days.

- The researcher started by cleaning his hands for one to three minutes with soap and water followed by disinfectant before beginning the massage. Before contacting the newborns, the researcher took an additional five minutes to dry, warm, and lubricate their hands. The researcher put on an apron and mask before opening the incubators containing the newborns.

First, the researcher placed the newborns in a supine position and ensure their diapers were dry from stool. The neonate receive massage therapy by the researcher for fifteen to twenty minutes, while phototherapy and air conditioning were turned off.

. The researcher performed massage techniques in accordance with International Association of Infant Massage guidelines.

-The researcher started to lubricate hands and started the massage with circular and slowly movements for 3 minutes in each areas of the following sequences (forehead, upper extremities, chest, abdomen, lower extremities and back). The researcher provided massage therapy to all neonates in the intervention group. The room temperature was maintained between 26 °C and 28 °C.

Phase of Evaluation:

The researcher evaluated the effect of vimala massage on the clinical outcomes

as daily numbers of defection, daily total serum bilirubin, type of phototherapy and discharge weight and documented daily from beginning of the intervention and for 5 days for massage group **.**Also, all these items are evaluated for the control group receiving routine care for five consecutive days from first day of phototherapy.

Statistical Analysis:

The collected data were cleaned, organized, tabulated. SPSS software version 26 was used to analyze the data .For quantitative variables, the mean, range, and standard deviation were calculated. Comparison between two groups and more was done using Chi-square test ($\chi 2$). For comparison between means of two different groups of parametric data of Independent Samples t-test was used. For comparison between more than two means of parametric data, F value of ANOVA test was calculated. Correlation between variables was evaluated using Pearson's correlation coefficient (r). A significance was adopted at $P<0.05$ for interpretation of results of tests of significance (*). Also, a highly significance was adopted at $P< 0.01$ for interpretation of results of tests of significance **(White 2019)**

Results: Table (1): shows percentage distribution of the studied neonates according to their demographic characteristics. Regarding to gestational age, it was observed that 66.7% of both studied groups were full term. It was found that 73.3% and 76.7% of the study and control group respectively their jaundice had appeared in the second to fourth day after delivery. This table also illustrates that 66.7% and 60% of the study and control groups respectively their current age ranged between one to seven days. Regarding to birth weight of neonates, it was found that 50% and 63.3% had normal birth weight while 46.7% and 70% their current weight ranged between 2000 to less than 2500 gram of both study and control group respectively. It was observed that 73.3% of study group and 96.7% of control group delivered through cesarean section. Slightly more than two third(66.7% and 69.7%) of the study and control group their formula was prepared from powdered milk and 86.7% and 63.3% fed through bottle feeding of both study and control group respectively.

Table (2) shows percentage distribution of the studied neonates' clinical outcomes regarding to type of phototherapy during pereiod of the study. It was observed that 36.7% of the studied group was on single phototherapy in the first day and 93.4% of them was on single phototherapy in fifth day after vimala massage. This table illustrates that 60% of the control group was on single phototherapy in the first and fifth day of the intervention. It was observed that there was statistically significant difference between intervention and control group at third day of study ($p= 0.034$) and highly

statistically significant difference in the fourth and fifth day (p= 0.006, p= 0.014) respectively.

Table (3): shows percentage distribution and mean scores of studied neonates' clinical outcomes regarding total serum bilirubin level during days of the intervention. It was noticed that the mean score of total serum bilirubin of the study group was (12.59 ± 2.38 , 10.19 ± 2.41, 8.42 ± 2.12) mg/dl in the first ,second, third day after vimala massage respectively.

On the other hand the total serum bilirubin mean score was (11.80 ± 4.99 , 11.18 ± 3.95, 10.07 ± 2.39) mg/dl in the first ,second, third day for the control group respectively . This table also illustrates that mean score of total serum bilirubin of intervention group was (6.78 ± 1.95, 5.25 ± 1.94) mg/dl while mean score of TSB for the control group was (8.80 ± 2.22, 8.15 ± 2.66) mg/dl in the fourth and fifth day after intervention respectively. There was highly statistically significant difference between both intervention and control group in the third, fourth and fifth day after study respectively (p=.0.006, p=0.001, p=0.001).

Table (4) shows percentage distribution and mean scores of the studied neonates' clinical outcomes regarding frequency of daily defecations during period of the study. It was evident that he mean score of frequencies of daily defecation of study group was (3.76 ± 1.30, 4.70 ± 1.48, 5.60 ± 1.49, 6.23 ± 1.81, 6.86 ± 1.87) while the mean score of frequencies of control group was (3.30 ± 1.36, 2.83 ±1.82, 2.30 ± 0.79, 2.16 ± 1.36, 1.73 ± 1.28) in the first, second, third, fourth and fifth day after respectively. There were highly statistically significant difference between intervention and control group in the third, fourth and fifth day after intervention(p=0.001).

Table (5) shows percentage distribution and mean scores of studied neonates' clinical outcomes regarding daily amount of feeding during study period. It was observed that mean score of the study group daily amount of feeding was (278.20 ± 62.85, 307.56 ± 71.41, 340.53 ± 71.57, 373.66 ± 72.47, 395.33 ± 75.07) ml at first, second, third, fourth and fifth day after vimala massage respectively. This table also shows that mean score of control group daily amount of feeding was (289.33 ± 110.59,306.66 ± 110.14,328.00 ± 113.48,337.00 ± 107.64,344.00 ± 111.68) ml at first second, third, fourth and fifth day after routine care respectively. There were highly statistically significant difference between intervention and control group in the second, third, fourth and fifth day after intervention (p=0.001).

Table (6) shows percentage distribution and mean scores of studied neonates' clinical outcomes regarding body weight at discharge. This table illustrates that 43.3% of the intervention group their weight at discharge ranged from 2500 - < 300 gram while 53.3% of the control

group their weight at discharge ranged from 2000 - < 2500 gram. There were highly statistically significant difference between intervention and control group (P = 0.001).

Table (1): Percentage distribution of the studied neonates according to their demographic characteristics. (n=60)

Demographic characteristics	Study group (n=30)		Control group (n=30)		χ^2 P
	No.	%	No.	%	
Gestational age					
Full-term	20	66.7	20	66.7	0.000
Late preterm	10	33.3	10	33.3	1.000
Day of appearance for jaundice after birth					
2 – 4	22	73.3	23	76.7	0.089
5 – 7	8	26.7	7	23.3	0.766
Post- natal or current age (days)					
1 - <7	20	66.7	18	60.0	
7 - <14	10	33.3	11	36.7	1.153
14 - <21	0	0.0	1	3.3	0.562
Sex					
Male	18	60.0	14	46.7	1.071
Female	12	40.0	16	53.3	0.301
Birth weight					
Normal birth weight	15	50.0	19	63.3	
Low birth weight	15	50.0	9	30.0	2.749
Very low birth weight	0	0.0	2	6.7	0.253
Current weight (gram)					
1000 - < 1500	0	0.0	1	3.3	
1500 - < 2000	2	6.7	1	3.3	
2000 - < 2500	13	43.3	7	23.4	5.533
2500 - < 3000	14	46.7	21	70.0	0.237
≥ 3000	1	3.3	0	0.0	
Delivery type					
Normal vaginal delivery	8	26.7	6	20	0.373
Cesarean section	22	73.3	24	80	0.542
Type of formula					
Breast milk	7	23.3	3	10.0	2.356
Powdered milk	20	66.7	25	83.3	0.308
Breast and powdered milk	3	10.0	2	6.7	
Type of feeding					
Bottle feeding	26	86.7	19	63.3	
Gavage feeding	4	13.3	10	33.3	4.660
Gavage feeding bottle and gavage feeding	0	0.0	1	3.4	0.097

***Statistically Significant difference at (P<0.05)**

**** Highly Statistically Significant difference at (P<0.01)**

Table (2): Percentage distribution of the studied neonates' clinical outcomes regarding to type of phototherapy during period of the study (n=60)

Type of phototherapy for 5 days	Study group (n=30)		Control group (n=30)		$\chi 2$ P
	No.	%	No.	%	
First day					
Capsule	1	3.3	0	0.0	
Triple	10	33.3	9	30.0	5.015
Double	8	26.7	3	10.0	0.171
Single	11	36.7	18	60.0	
Second day					
Capsule	0	0.0	1	3.3	
Triple	6	20.0	7	23.3	1.709
Double	9	30.0	6	20.0	0.635
Single	15	50.0	16	53.3	
Third day					
Triple	2	6.7	5	16.7	
Double	7	23.3	14	46.7	6.744
Single	21	70.0	11	36.6	0.034*
Fourth day					
Capsule	0	0.0	2	6.7	
Triple	0	0.0	8	26.7	12.632
Double	6	20.0	6	20.0	0.006**
Single	24	80.0	14	46.6	
Fifth day					
Capsule	0	0.0	2	6.7	
Double	1	3.3	9	30.0	10.574
Single	28	93.4	18	60.0	0.014**
Off photo	1	3.3	1	3.3	

***Statistically Significant difference at (P<0.05)**

**** Highly Statistically Significant difference at (P<0.01)**

Table (3): Percentage distribution and mean scores of studied neonates' clinical outcomes regarding total serum bilirubin levels during days of the intervention (n=60)

Total serum bilirubin levels	intervention group (n=30)		Control group (n=30)		$\chi 2$ P
	No.	%	No.	%	
First day					
< 7 mg/dl	1	3.3	4	13.3	1.964
≥ 7 mg/dl	29	96.7	26	86.7	0.161
Range	6.7 – 16.07		3.7 – 22		t-test = 0.781
Mean ± SD	12.59 ± 2.38		11.80 ± 4.99		P = 0.440
Second day					
< 7 mg/dl	2	6.7	3	10.0	0.218
≥ 7 mg/dl	28	93.3	27	90.0	0.640
Range	2.3 – 14		3.12 – 19.6		t-test = 1.179
Mean ± SD	10.19 ± 2.41		11.18 ± 3.95		P =0.243
Third day					
< 7 mg/dl	7	23.3	1	3.3	5.192
≥ 7 mg/dl	23	76.7	29	96.7	0.023*
Range	2 – 11.30		6 – 18		t-test = 2.828
Mean ± SD	8.42 ± 2.12		10.07 ± 2.39		P =0.006**
Fourth day					
< 7 mg/dl	14	46.7	4	13.3	7.937
≥ 7 mg/dl	16	53.3	26	86.7	0.005**
Range	2.4 – 10.7		6 – 16		t-test = 3.735
Mean ± SD	6.78 ± 1.95		8.80 ± 2.22		P =0.0001**
Fifth day					
< 7 mg/dl	24	80.0	7	23.3	19.288
≥ 7 mg/dl	6	20.0	23	76.7	0.0001**
Range	1.5 – 9.8		4 – 14.7		t-test = 4.827
Mean ± SD	5.25 ± 1.94		8.15 ± 2.66		P = 0.0001**

***Statistically Significant difference at (P<0.05)**

Table (4): Percentage distribution and mean scores of studied neonates' clinical outcomes regarding frequency of daily defecations (n=60)

Frequency of daily defecations	Intervention group (n=30)		Control group (n=30)		$\chi 2$ P
	No.	%	No.	%	
First day					
0 – 3	10	33.3	14	46.7	0.008
4 – 6	20	66.7	16	53.3	0.931
Range	0 – 6		0 – 5		t-test = 1.352
Mean ± SD	3.76 ± 1.30		3.30 ± 1.36		P = 0.182
Second day					
0 – 3	5	16.7	18	60.0	11.915
4 – 6	25	83.3	12	40.0	0.001**
Range	1 – 6		0 – 6		t-test = 4.346
Mean ± SD	4.70 ± 1.48		2.83 ±1.82		P =0.0001**
Third day					
0 – 3	3	10.0	30	100.0	49.091
4 – 6	17	56.7	0	0.0	0.0001**
7 – 9	10	33.3	0	0.0	
Range	2 – 7		1 – 3		t-test = 10.652
Mean ± SD	5.60 ± 1.49		2.30 ± 0.79		P =0.0001**
Fourth day					
0 – 3	2	6.7	23	76.7	34.440
4 – 6	13	43.3	7	23.3	0.0001**
7 – 9	15	50.0	0	0.0	
Range	2 – 9		0 – 4		t-test = 9.809
Mean ± SD	6.23 ± 1.81		2.16 ± 1.36		P =0.0001**
Fifth day					
0 – 3	**2**	**6.7**	**26**	**86.7**	
4 – 6	**7**	**23.3**	**4**	**13.3**	**42.390**
7 – 9	**20**	**66.7**	**0**	**0.0**	**0.0001****
> 9	**1**	**3.3**	**0**	**0.0**	
Range	**3 – 10**		**0 – 4**		**t-test = 12.390**
Mean ± SD	**6.86 ± 1.87**		**1.73 ± 1.28**		**P = 0.0001****

Table (5): Percentage distribution and mean scores of studied neonates' clinical outcomes regarding daily amount of feeding during study period (n=60)

Daily amount of feeding	Intervention group (n=30)		Control group (n=30)		$\chi 2$ P
	No.	%	No.	%	
First day ml/day					
< 150	1	3.3	3	10.0	
150 - < 300	17	56.7	15	50.0	5.925
300 - < 450	12	40.0	8	26.7	0.115
≥ 450	0	0.0	4	13.3	
Range	96 – 390		126 – 490		t-test = 1.352
Mean ± SD	278.20 ± 62.85		289.33 ± 110.59		P = 0.182
Second day ml/day					
< 150	1	3.3	1	3.3	
150 - < 300	9	30.0	17	56.7	10.667
300 - < 450	19	63.4	7	23.3	0.014*
≥ 450	1	3.3	5	16.7	
Range	80 – 460		135 – 500		t-test = 4.346
Mean ± SD	307.56 ± 71.41		306.66 ± 110.14		P =0.0001**
Third day ml/day					
< 150	1	3.3	1	3.3	
150 - < 300	2	6.7	14	46.7	25.100
300 - < 450	25	83.3	6	20.0	0.0001**
≥ 450	2	6.7	9	30.0	
Range	96 – 500		145 – 500		t-test =
Mean ± SD	340.53 ± 71.57		328.00 ± 113.48		10.652 P =0.0001**
Fourth day ml/day					
< 150	1	3.3	0	0.0	
150 - < 300	2	6.7	15	50.0	22.830
300 - < 450	23	76.7	6	20.0	0.0001**
≥ 450	4	13.3	9	30.0	
Range	120 – 500		160 – 500		t-test = 9.809
Mean ± SD	373.66 ± 72.47		337.00 ± 107.64		P =0.0001**
Fifth day ml/day					
150 - < 300	2	6.7	13	43.3	14.144
300 - < 450	21	70.0	8	26.7	0.001**
≥ 450	7	23.3	9	30.0	
Range	150 – 520		160 – 520		t-test =
Mean ± SD	395.33 ± 75.07		344.00 ± 111.68		12.390 P = 0.0001**

***Statistically Significant difference at (P<0.05)**

**** Highly Statistically Significant difference at (P<0.01)**

Table (6): Percentage distribution and mean scores of studied neonates' clinical outcomes regarding body weight at discharge (n=60)

Discharge body weight (gram)	Intervention group (n=30)		Control group (n=30)		$\chi 2$ P
	No.	%	No.	%	
1500 - < 2000	1	3.3	1	3.3	
2000 - < 2500	5	16.7	16	53.3	12.159
2500 - < 3000	13	43.3	11	36.7	0.007**
≥ 3000	11	36.7	2	6.7	
Range	1800 – 3350		1700 – 3400		t-test = 3.424
Mean ± SD	2693.66 ± 364.50		2358.33 ± 393.49		P = 0.001**

** Highly Statistically Significant difference at (P<0.01)

Discussion:

Unconjugated bilirubin is very toxic to neurons, it can cause irreversible brain damage. The most widely used treatment for newborns with unconjugated hyperbilrubinemia is phototherapy **wong (2022)**. Since phototherapy may have negative effects on newborns, bilirubin execution might be aided by employing vimala massage in conjunction with it **Ibrahim et al (2023)**. Vimila massage has gained a significant importance over recent years as adjunctive therapy for the management of neonatal hyperbilirubinemia **Abdelatif etal (2020).**

Regarding the total serum bilirubin level (TSB), it was found that on the third, fourth, and fifth day of the study neonates who received vimala massage had a lower mean score of TSB than the neonates in the control group. This difference was highly statistically significant. (table 3). This drop in TSB may be explained by the fact that massage therapy promotes bowel movement and meconium execration, which in turn reduces bilirubin's entrohepatic circulation and bilirubin's execration by increasing bilirubin .reabsorption. Additionally, massage improves blood circulation and lymph flow leading to acceleration of excretion of bilirubin into faces.

The present study's findings in agreement with **Ibrahim et al (2023),** who found a reduction in the total serum bilirubin levels of neonates receeiving vimala massageompared to the control group. This result was consistent with **Dogan et al (2023)** who examined the impact of massage on bilirubin levels in term infants receiving phototherapy, and discovered a statistically significant drop in bilirubin levels in the experimental group beginning on the third day of the intervention.

Furthermore, the results of the current study were consistent with those of **Korkmaz and Isik (2020),** who evaluated the impact of massage treatment on indirect hyperbilrubinemia and found that the study group's total blood bilirubin levels were lower. The present findings were also, consistent with those of **Dalili et al., (2016),** who discovered a significant difference in the TSB levels between the two groups and reduced bilirubin levels in the newborns in the massage group. Another study was in agreement with the present study **Shahabazi et al (2022)** who found in their study that there were significant dose response between massage therapy and the mean difference of bilirubin level confirming that increasing in the time of massage leads to decrease in the level of bilirubin.

As regards the frequencies of the daily defecations, it was observed that neonates exposed to vimala massage exhibited elevation in mean score of frequencies of daily bowel movement than the neonates in the control group and there were highly statistically significant difference between both groups in the second, third, fourth and fifth day of the study (table 4). This increase in number of daily bowel movement can be explained by massage therapy stimulates the vagus nerve which will increase the frequency of bowel movement. Moreover massage increases the blood circulation leading to increase in intestinal peristalsis which in turn causes increased number of defecations and volume of meconium.

The result of the present study was congurant with **(Ibrahim et al 2023)**who found that during the entire study period, the mean frequency of stools in the neonates in the vimila massage group was higher than in the control group. and the difference were statically significant in four days.Also the finding of **Dagan et al (2023)** was in the accordance with present study who found that the frequency of defecation on the second and third days increased significantly in the massage group (p=0.00).

The result of the current study was in the same line with **Mini et al (2017)** who found in their study that defecation frequency of the vimila massage group was significantly higher in the intervention group than in the control group. Moreover ,The finding of present study was in the same line with **Eghbalian et al (2017)** who found that there were significant relation between massage and daily frequency of bowel movement in the third and fourth day of intervention.

On the other hand, the finding of the present study was contradicted with **Dalili et al (2016)** who found that there was significant difference in two groups on the first day showing increased frequency of defecation in the control group which in the consequent days wasn't significant and frequencies was almost similar. Another study **Dabour (2020)** wasn't in agreement with the current finding who stated that defecation frequency increased by time in control and massage groups and no significant difference were found in daily frequency of bowel movement between studied groups.

As regards the daily amount of feeding, it was observed that neonates exposed to vimila massage exhibited elevation in mean score of daily amount of feeding than the neonates in the control group and there were highly statistically significant difference between both groups in the second, third, fourth and fifth day of the study (table5). This may be due to the effect intestine movement stimulation with vimila massage. This will therefore enable the newborn to pass more meconium and increase the frequency of feces. This effect will lead to empty stomach and feeling more hunger so increasing amount of feeding

The finding of the current study was in accordance with **Korkmaz et al (2020)** who found that the group receiving massage therapy fed more frequently than the control group. Also the finding of the current study was in the same line with **Mini et al (2017)** who found that the feeding frequency was higher in the massage group compared to control group. Moreover the finding of the present study was in the same line with **Ibrahim et al (2023)** who found that the mean amount of feeding began to increase in the second ,third and fourth days of the study compared to those in the control group and the difference were not statistically significant.

The finding of the present study revealed that one third of study group was in single phototherapy in the first day of application of vimila massage increased to reach almost all of them in the fourth day of the study. On the other hand the current study revealed that nearly two third of group receiving routine care was in single

phototherapy in the fourth day of the study (table 2). This can be attributed to the lowering level of the bilirubin in the intervention group than control group with statistically significant difference between both groups.

The finding of the present study was in the same line with **Boskabadi et al (2020)** who found significant difference was seen in bilirubin reduction per hour in the first 8 hour after start phototherapy (p=0.043) and second 24 hour (p=0.008) measurements times between two groups. Also the finding of the current study was congruent with **Dogan et al (2023)** who found that there was significant decrease in bilirubin levels in experimental group starting from third day (p=0.00). Moreover the finding of**(Karuniawati et al (2022)** revealed that the average decrease in bilirubin level in treatment group was 9.55 mg/ dl and in control group was 7.29 mg/dl and the decrease between two group showed significant difference (p=0.05).

Conclusion

Based on the results of the current study: it can be concluded that there was a statistically significant improvement in relation to total serum bilirubin, frequencies of daily defecation, and amount of daily feeding among vimila massage than control group at second until fifth day of intervention

Recommendations

- Regular in-service training programs for nurses regarding the application of vimila massage should be provided.
- Vimila massage should be integrated as adjacent to phototherapy into the practice of nursing care for neonates suffering from hyperbilirubinemia.
- Further studies are needed and replication to a large sample size for generalization of the results.

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