

THE EFFECT OF STIMULATING MASSAGE IN DECREASING NEONATES’ BILIRUBIN LEVEL AT DR. MOEWARDI HOSPITAL SURAKARTA

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ABSTRACT

Bilirubin is one indicator of the health examined from the function of organs, especially the liver function of neonates. Increased bilirubin physiologically occurs in neonates aged 3-10 days in which the level is less than 10 mg/dl. As a matter of fact, increased bilirubin exceeds physiological limitations as it will cause bilirubin encephalopathy as well as fatality. One of the stimulations can be used to reduce bilirubin level is by performing stimulating massage with the field method massage. This study was carried out to find out the amount of decreased bilirubin levels as influenced by stimulating massage. The study was aimed to determine the effect of stimulating massage in decreasing the bilirubin levels in neonates. This study was a qualitative design with pre and post test. In addition, control group design was applied with the sample of one experiment group in which the treatment of stimulating massage with 15 minutes duration by using the field method. Samples qualified were those with bilirubin levels above 10 mg/dl and had been recorded in the patients’ medical records. Data analysis was made in the form of data description in which the number of total bilirubin levels was measured by using laboratory results and presented in graphical form to be measured in the beginning and the end of the study for each sample. There was an effect of stimulating massage which was indicated by decreased bilirubin level at 4.8 mg/dl in neonates with hyperbilirubinemia after the treatment. Stimulating massage is effective in decreasing the bilirubin levels in neonates.

Keywords: Neonate, Jaundice, Massage, Stimulation, Physiotherapy.

Author’s biography



Adnan Faris Naufal was born in the city of Pontianak on 27 July 1994. He has been completed his undergraduate program of Physiotherapy at Universitas Muhammadiyah Surakarta in 2016 for 3 years and 4 months. In college, he was engaged in a variety of national Olympic-physiotherapy and ever reached the third winner once. He became the leader of Fisiopedi Study Club in 2015 in which he was actively and widely introduced this club to the peers at pediatric science and involved it directly on the public. Currently, his main goal is to promote the achievement of Indonesian Physiotherapy to become an academician.

INTRODUCTION

Neonates aged younger than 10 days is in the phase of increased bilirubin level or Hyperbilirubinemia. The maturity of organ system function is a requirement so as the infant is able to adapt the life outside the womb. This is due to the liver maturity factor so the conjugation of indirect bilirubin into direct bilirubin comes rudimentary. If the bilirubin level is uncontrolled, it can lead to the dysfunction of the central nervous system as well as fatality [1, 2].

Several references have provided scientific facts regarding with therapy of touch in infants which has many benefits in physiological changes. This kind stimulation is well-known as a massage in the society [3].

Based on the observation carried out by the researcher at Dr. Moewardi Hospital in Surakarta, neonates indicated with pathologic hyperbilirubinemia are facilitated with a treatment of stimulation or stimulating massage whose aim is to reduce the bilirubin level into its normal level. The number of births in Dr. Moewardi reached 134 births in July 2015 and 90 births in August 2015. The number of birth cases of neonates with hyperbilirubin problems at the hospital was amounted to 23 cases in July and 3 cases in August. During the period of January to September 2015, it was recorded one of six infants died due to hyperbilirubin problem.

In accordance to the background and the effect of stimulating massage in decreasing the bilirubin level, the researcher was interested to investigate “The Effects of Stimulating Massage in Decreasing Neonates’ Bilirubin Level at Dr. Moewardi Hospital Surakarta” as the theme of the study.

THEORETICAL BASIS

Special treatment for children is an obligation that must be done by all parents in order to prepare their children as healthy future generation. Caring for children has been stated in the Quran *Surah Al-Baqarah* paragraph 233, “Allah SWT commanded mothers to breastfeed their children for whole two years. If wants to wean before 2 years, should be consulted at first and must have a mutually willing” [4].

Neonate is a phase where infants aged 0-28 days after birth. In this phase, the infant’s organ systems are still in the process of establishment and refinement, so they still require a special care from parent and medical services [5, 6].

Indonesia Demographic Health Survey (*Survey Demografi Kesehatan Indonesia/SKDI*) reported the neonatal mortality rate in Indonesia in 2014 reached 32 deaths per 1000 *live births*. However, it is far from the 4th Millennium Development Goals (MDGs) in which by 2020, the target is to reduce the mortality into 24 deaths per 1000 live births. The rate was reported as the effect of infant’s conditions including low birth weight of 26%, jaundice of 9%, hypoglycemia of 0.8%, and neonatal infections of 1.8% [7].

In fact, there is a relationship between neonates with hyperbilirubinemia and physiological changes in the organ systems. It can cause a *yellow discoloration* in infant’s skin and eyes called infant jaundice. The normal level of total bilirubin serum in newborns is 0.3 - 1 mg/dl [8]. Maturity of organ system function is a requirement for infant’s adaptation to live outside the womb. It is the factor of liver maturity so that the conjugation of indirect into direct bilirubin is imperfect [1]. If the bilirubin level is uncontrolled, it can lead to the dysfunction of central nervous system as well as infant death [2].

Massage is one type of therapy to stimulate the organ system to function more optimally. Several references have provided scientific facts related to massage therapy in infant which has many benefits in physiological changes. This stimulation is well-known as massage [3].

The massage has a biochemical effect and positive clinical impact, so it can stimulate digestion and increase metabolism in the body [9]. Mojtaba Kianmehr *et al.*, claimed that massage with field methods can reduce the excess of bilirubin level in neonates. It was due to the stimulating massage is able to stimulate the metabolism so that the toxin in the body can be easily disassembled and removed through feces and urine [10].

Field massage method is a massage on infants or neonates with main focus to give stimulation on the chest and abdomen area. Field *et al.*, reported that massage can also improve the activity of digestion organs and the ingestion process in neonates, thus, it can increase the metabolism system of the body [11].


Dose or step of stimulation used was referred to the research of Kianmehr *et al* [10]. He explained the differences of field massage method and general massage method which rely on the area of stimulation. Field massage is occupied on the area of face, abdomen, and chest. It is aimed primarily to activate the vagus nerve to increase metabolism so the function of the digestive organs will work better.

RESEARCH METHODOLOGY

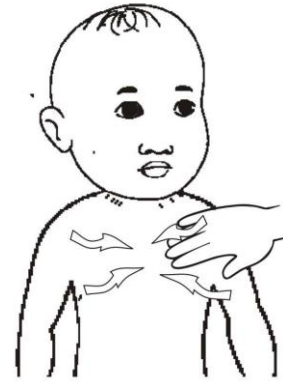
The research was descriptive analytic study. It used one group pre- and post-design as the research design. It was carried out at the Dr. Moewardi Hospital of Surakarta. Sampling was done by using total sampling. The research was conducted in November – December 2015. The subjects of this study were 8 infants in neonatal phase who were included entirely in the experiment group.

The infants in this study were selected based on the criteria. The criteria were divided into two categories: inclusion and exclusion criteria. The inclusion criteria included the neonates’ bilirubin levels of above 10 mg/dL and were the patients in NICU unit Dr. Moewardi Hospital Surakarta. As the exclusion criteria included the consents from the parents/guardians, medical condition of unstable babies and infants were following other studies.

Independent variable in this study was the massage stimulation and the dependent variable was the decrease of bilirubin levels.

Area	Manner & function	Picture
1. Face	The therapist uses both thumbs rubbed on the area under the eyes and cheeks gently. Do seven repetitions.	

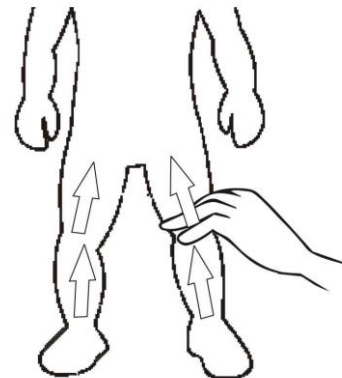
2. Chest Aims to provide stimulation towards the backflow of blood toward the heart. Second hand rub on therapy provides the patient's chest. Movement is done from the outside towards the inside of the body, or towards the heart.



3. Belly Aims to stimulate the intestines and digestive organs, how to encourage a semicircle gentle on the stomach. Movement clockwise direction of the movement.



4. Leg The therapist uses hands pushed from distal to proximal or from the bottom up in the legs.



5. Neck (front) Massage front neck using three fingers under the chin therapist on the patient, this stimulation is aimed at children in order to improve the ability to swallow.

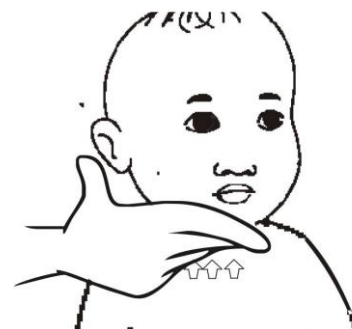


Figure 1. Ways of stimulating massage for neonates [10].

RESEARCH RESULT

This research was implemented on a group by pre- and post- design. The subjects were 8 infants in neonatal phase. This study was carried out at Dr. Moewardi Hospital in

November-December 2015. Respondents were neonates with total bilirubin levels above 10 mg/dl. The average age of neonates in this study was 5-days infant. The data were prepared in a month while the treatment on each subject was given one to two days after the subject was diagnosed with hyperbilirubinemia by the doctor.

The first data retrieval was to categorize infants who fulfilled the inclusion and exclusion criteria. Subsequently, the consents were approved by the parents or guardians. Researchers simply categorized the subjects in a single group. Within this group, bilirubin levels of the subjects were measured before the treatment (pre test) was implemented. In the end of the study, bilirubin levels of the subjects were re-measured to find out the change of bilirubin level (post test).

Table 1. Distribution of subjects based on birth weight

No.	Variable (Birth weight)	Treatment group	
		Frequency	Percentage
1.	<2,500 g	5	62.5%
2.	2,500 – 4,000 gr	3	37.5%
3.	> 4,000 g	0	0%

This study found that the previous theory about low birth weight (LBW) can influence bilirubin levels in neonates was evidenced on the research that has been conducted by researchers. There are several factors that can affect of the bilirubin levels such as low birth weight, premature rupture of membranes, breast-fed infants, neonatal infection, and drugs consumption in conception, the use of aids childbirth, and a history of bleeding in the first trimester of birth [12]. The infants having high risk of increased bilirubin levels or pathological hyperbilirubinemia in this study were at average age of 5 days.

Massage stimulation on the chest and abdomen area will stimulate the vagus nerve. The nerve can increase the production of digestive enzymes so it can maximally absorb the foods. It can decrease bilirubin level into the normal level. The more often the stimulation of massage performed to the infant, the more effect will be gained in association with the digestive process and metabolism.

Based on the results of the study, reduced bilirubin levels in the subjects after stimulation were figured out. Here are the results from the stimulation on the subjects.

Baby A

Baby A is female infant with a history of low birth weight (LBW) of 1,750 grams. At the age of six-days, she was diagnosed with hyperbilirubin with total bilirubin level of 15.66 mg/dl which was classified to be acute pathologic hiperbilirubinemia and required basic medical measures to decrease the bilirubin level in the form of light therapy or phototherapy. On the same day, she gained 40 grams weight gain or became 1,790 grams.

The next day after the baby was treated by stimulating massage combined with light therapy or phototherapy, bilirubin levels was down to 9.70 mg/dl or decreased by 5.96 mg/dl, it was an indicator that the bilirubin level had returned to normal. Nevertheless, the weight of the subject decreased by 240 grams, which was 1,790 grams at the age of 4-days into 1,550 grams in the subsequent day.

Baby B

Baby B is female with birth weight of 2,830 grams. At the age of 4 days, Baby B was diagnosed with hyperbilirubin with total bilirubin level of 16.650 mg/dl, which was classified to be acute pathologic hiperbilirubinemia and required basic medical measures to decrease the bilirubin level in the form of light therapy or phototherapy. On the same day, she had weight loss into 2,730 grams or lost 100 grams from birth weight (BW).

The next day after the baby massage and stimulation combined with light therapy or phototherapy, bilirubin level was down into 12.83 mg/dl or decreased by 3.67 mg/dl. It means that the subject has entered the category of pathologic hyperbilirubin conditions similar to the previous day. But the subject gained the weight as it increased by 90 grams, from birth weight of 2,730 grams at the age of 4 days into 2,820 grams in the subsequent day.

Baby C

Baby C was a female subject with low birth weight equal to 2,000 grams. At the age of 4 days, she was diagnosed with hyperbilirubin with total bilirubin level of 16.00 mg/dl, it was an indicator of where pathologic hyperbilirubin condition occurred in the respective neonate. In this condition, medical measure in the form of phototherapy to prevent increased levels of bilirubin was required. On the same day, she had weight loss into 1,980 grams or lost 20 grams from birth weight (BW).

The next day after the baby was treated by stimulating massage combined with light therapy or phototherapy, bilirubin level decreased into 12.10 mg/dl or declined by 3.90 mg/dl. It means that the subject has entered the category of pathologic hyperbilirubin condition similar to the previous day. But the weight of the subject decreased by 130 grams, which was initially of 1,980 grams at the age of 4-days into 1,850 grams in the subsequent day.

Baby D

Baby D is a male subject with a normal birth weight equal to 2,500 grams. At the age of 4 days, he was diagnosed with hyperbilirubin with total bilirubin level of 12.60 mg/dl, it was an indicator of where the pathologic hyperbilirubin occurred in the respective neonate. In this condition, medical measure in the form of phototherapy to prevent increased levels of bilirubin was required. On the same day, he gained his weight from birth weight into 2,550 grams or gained 50 grams.

The next day after the baby was treated by stimulating massage combined with light therapy or phototherapy, bilirubin level was down to 7.36 mg/dl or decreased by 5.28 mg/dl, it indicated the bilirubin level had decreased and returned to normal level. In addition, the subject obtained weight gain by 10 grams, which was initially 2,550 grams at age 4 days into 2,560 grams in the subsequent day.

Baby E

Baby E is a male subject with low birth weight (LBW) of 1,900 grams. At the age of 5 days, he was diagnosed with hyperbilirubin with total bilirubin level of 21.80 mg/dl, the rate was categorized as severe or critical hyperbilirubin condition, if the child was not promptly provided by medical action as soon as possible, it would lead to death in less than 24 hour. On the same day or at the age of 5 days, the subject gained his weight by 980 grams into 2,880 grams.

The next day after the baby was treated by stimulating massage combined with light therapy or phototherapy, bilirubin level was down into 15.51 mg/dl or decreased by 6.29 mg/dl, this figure was an indicator of where the bilirubin level down or had been classified in pathologic hyperbilirubin condition. However, the subject endured weight loss by 80 grams, initially of 2,880 grams at age 5 days into 2,800 grams in the subsequent day.

Baby F

Baby F is a female subject with normal birth weight equal to 2,700 grams. At the age of 5 days, she was diagnosed with hyperbilirubin with total bilirubin level of 12.82 mg/dl, this figure was an indicator of where the pathologic hyperbilirubin occurred in the respective neonate. In this condition, medical measure in the form of phototherapy to prevent increased levels of bilirubin was required. At the same day, she gained her weight by 210 grams into 2,910 grams.

The next day after the baby was treated by stimulating massage combined with light therapy or phototherapy, bilirubin level was down into 7.21 mg/dl or decreased by 5.64 mg/dl, this figure was an indicator of where the bilirubin levels have returned to normal as a physiologic respondents. But the weight of the subject decreased by 110 grams, which was initially of 2,910 grams at age 5 days into 2,800 grams in the subsequent day.

Baby G

Baby G is a female subject with low birth weight equal to 2,200 grams. At the age of 7 days, she was diagnosed with hyperbilirubin with total bilirubin level of 19.80 mg/dl, this figure was an indicator of where pathologic hyperbilirubin condition had occurred in the respective neonate. In this condition, medical measure in the form of phototherapy to prevent increased levels of bilirubin was required. On the same day, she had weight loss into 2,020 grams or lost 180 grams from birth weight (BW).

The next day after the baby was treated by stimulating massage combined with light therapy or phototherapy, bilirubin level was down into to 12.05 mg/dl or decreased by 7.75 mg/dl. It means that the respondent has entered the category of pathologic hyperbilirubin conditions. In addition, the subject obtained a weight gain by 30 grams, which was initially of 2,020 grams at age 7 days into 2,050 grams in the subsequent day.

Baby H

Baby H is a female subject with low birth weight equal to 2,380 grams. At the age of 4, she was diagnosed with hyperbilirubin with total bilirubin level of 15.50 mg/dl, this figure was an indicator of where pathologic hyperbilirubin condition had occurred in the respective neonate. In this condition, medical measure in the form of phototherapy to prevent increased levels of bilirubin was required. On the same day, she obtained weight gain into 2,460 grams or approximately 80 grams from BW.

The next day after the baby was treated by stimulating massage combined with light therapy or phototherapy, bilirubin level was decreased into 10.31 mg/dl or decreased by 5.19 mg/dl. It means that the subject had entered the category of pathologic hyperbilirubin conditions. But the weight of the subject decreased by 130 grams, which was initially of 2,460 grams at age 4 days into 2,330 grams in the subsequent day.

Table 2. Results of the difference in weight and bilirubin levels after the treatment of stimulating massage (pre- and post- stimulation)

No.	Name	Sex Type	Age (day)	BW (gr)	W (gram)			BL (mg/dl)		
					H1	H2	Difference	H1	H2	Difference
1.	by A	P	6	1750	1790	1550	-240	15.66	9.70	-5.96
2.	by B	P	4	2830	2730	2820	+90	16.50	2.83	-3.67
3.	by C	P	4	2000	1980	1850	-130	16.00	12.10	-3.90
4.	by D	L	4	2500	2550	2560	+10	12.60	7.36	-5.24
5.	by E	L	5	1900	2880	2800	-80	21.80	15.51	-6.29
6.	by F	P	5	2700	2910	2800	-110	12.85	7.21	-5.64
7.	by G	L	7	2200	2020	2050	+30	19.80	12.05	-7.75
8.	by H	P	4	2380	2460	2330	-130	15,50	10.31	-5.19
			4.9	2282	2415	2345	-70	16.33	10.88	-5.48

The decreased level of bilirubin obtained by the entire subjects in the experiment group was approximately 5.48 mg/dl. Infants with bilirubin levels of 10-15 mg/dl or with pathological hyperbilirubinemia category endured a decline of bilirubin level approximately of 5.13 mg/dl, the rate was higher than the infants who had bilirubin levels of 15-20 mg/dl or severe pathological conditions, as 5.13 mg/dl.

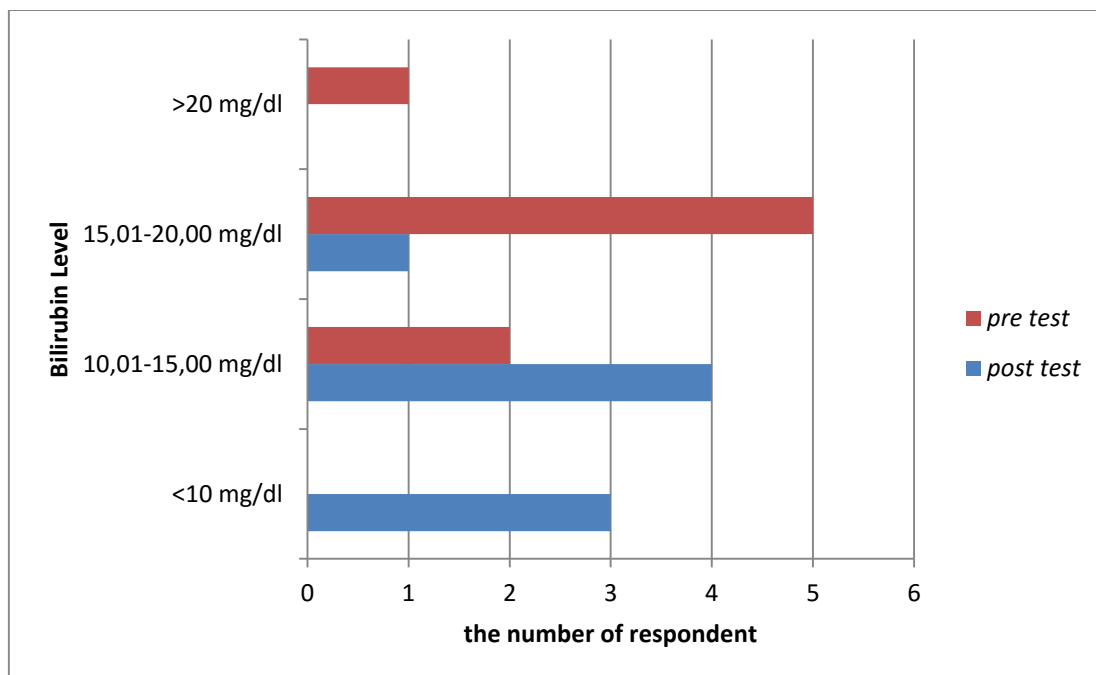


Figure 2. Decreased Bilirubin Level after the Treatment of Stimulating Massage.

The study on the implementation of stimulating massage on the subjects with hyperbilirubinemia at Dr. Moewardi Hospital in November to December 2015, indicated that the highest levels of bilirubin in the subjects was approximately 21.80 mg/dl and the lowest bilirubin level was 12.60 mg/dl. In addition, the lowest bilirubin level after the treatment was 7.75 mg/dl while the lowest bilirubin level was of 3.67 mg/dl.

DISCUSSION

Our findings showed that declined bilirubin levels in neonates with hyperbilirubin conditions were evidenced after the treatment of stimulating massage. The result of this study confirms the theory that low birth weight (LBW) can influence the levels of bilirubin in the neonates. There are several factors can increase the bilirubin levels such as LBW, premature rupture of membrane, breast-fed infants, neonatal infection, and drugs consumption of conception, and experience of bleeding in the first trimester of birth [12]. This study also showed that the infant is risky to have elevated levels of bilirubin classified as pathological hyperbilirubin at the average age of 5 days. In this age, the infant's organ systems are still in the process of establishment and refinement, so they still require a special care from parents and medical services [6].

Stimulation of massage on the chest and abdomen area will stimulate the vagus nerve, the nerve can increase the production of digestive enzymes so that food absorption will be maximized. In fact, it can decrease the bilirubin level into the normal level [9]. The more regular stimulation of massage performed on the infants, it will affect the digestive process as well as to increase the performance of the metabolism of organ system.

However, this research also has some infirmities. Firstly, researchers cannot record the subjects' bilirubin level every day due to the measurement of the bilirubin level which is performed only when the infant's skin turns yellow to minimize the risk of infection of syringe injection. At the beginning, the data collection was based on the subject's criteria of high bilirubin level (> 10 mg/dl) without any consideration on the subject's birth process. Furthermore, it was presumed that the infant with bilirubin level of 16 mg/dl with a recognition of the delivery process, whether premature or mature, as well as previous history during pregnancy. Third, after the treatment, there was an absence of stimulating massage as the follow up in a daily basis to obtain weight gain. Finally, in this study, the researchers did not provide a comparison between the control group and the treatment group, thus, it cannot provide the difference to present the more accurate result.

CONCLUSIONS AND RECOMMENDATIONS

Conclusion

Based on the descriptive results and analysis, it can be concluded that there is the effect of stimulating massage to decrease the bilirubin levels of neonates with the hyperbilirubinemia condition.

Suggestion

1. For the parents with high bilirubin level neonate.

The parents should perform the stimulating massage in daily regular basis at home which can be carried after bathing or before going to bed. It is expected to increase the metabolism of the neonate as well as to improve the strong bond between the parents and the baby.

2. For the physiotherapists and health agencies.

Physiotherapist should have a particular record for the stimulating massage of neonates with hyperbilirubinemia.

3. For the educational institutions.

This study can be the evidence in accordance to the theory on how to stimulate the growth and development of infants and pediatric physiotherapy scientific development.

4. For further researches.

Subsequent studies can use the result of this study as a reference and may develop the findings by performing more comprehensive research with larger number of sample and more literature reviews.

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