THE EFFECT OF MASSAGE ON SERUM BILIRUBIN LEVELS AND NEONATUS BODY WEIGHT WITH PHOTOTHERAPY

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Abstract

Approximately 25-50% of newborns experience physiological hyperbilirubinemia in the first week of life, 80% occur in premature babies and 60% in full-term babies. Hyperbilirubinemia can be toxic and dangerous, such as encephalopathy. At Ummi Hospital, Bogor, the number of babies born from January to April 2021 was 704, and 11.4% had hyperbilirubinemia and no baby massage intervention had been carried out. Massage for newborns with hyperbilirubinemia reduces bilirubin levels and increases the baby's weight. This study aims to find out whether massage can reduce serum bilirubin levels and increase the weight of hyperbilirubinemia babies who receive phototherapy. This research was conducted in the perinatology room at Ummi Hospital, Bogor, Indonesia with ethical permit no. 02/KEPK/X/2021. The research design used a quasi-experimental pretest-posttest with a control group design, with a sample of 40 hyperbilirubinemia babies. After analysis using the dependent t-test and independent t-test, the results of the study showed that there was no significant difference between body weight before the intervention and after the intervention with $p > 0.05$ in the intervention group ($p=0.054$) and the control group ($p =0.286$). There was a significant difference in bilirubin levels ($p<0.05$) before and after the intervention in both the intervention group and the control group ($p=0.001$). Conclusion: Phototherapy alone or combined with massage can reduce serum bilirubin levels in babies. Adding massage to provide comfort to the baby and other benefits.

Keywords: Bilirubin, body weight, massage, weight loss.

INTRODUCTION

Newborns with hyperbilirubinemia are one of the most common reasons newborns need to be hospitalized. Approximately 25-50% of newborns develop physiologic hyperbilirubinemia in the first week of life, 80% occur in premature infants and 60% in term infants. Di Indonesia menunjukkan 7% kejadian hyperbilirubinemia dimana kadar bilirubin serum > 340 μmol/L (20 mg/dL), pada semua bayi baru lahir (Greco C, et al., 2016).

Serum total bilirubin levels of more than 5 mg/dL occur because unconjugated bilirubin accumulates in the skin, mucous membranes, sclera and other organs (Ricci, S.S. 2017). If the serum bilirubin concentration reaches a toxic level, brain damage or bilirubin encephalopathy can occur, which is a syndrome of severe brain damage caused by the deposition of unconjugated bilirubin in brain cells. Kernicterus is described as yellow staining of brain cells caused by bilirubin encephalopathy (Hockenberry, M. J., & Wilson, D., 2013). Brain damage occurs when the serum bilirubin concentration reaches a toxic level, regardless of the cause.

Nursing management of newborns with hyperbilirubinemia is carried out with a comprehensive approach. As professional health workers, nurses are responsible for providing quality nursing care for newborns with hyperbilirubinemia and carrying out follow-ups on mothers and babies. Nurses need to carry out nursing interventions that support reducing bilirubin levels in addition to programmed phototherapy.

Massage in newborns with hyperbilirubinemia can reduce bilirubin levels and increase baby's weight. Massage on babies can be done to stimulate baby's comfort. Roesli, U. (2008) explained that massage has a positive biochemical effect and clinical impact, so it can stimulate digestive function and increase metabolism in the body so that bilirubin in the body can be easily decomposed and excreted through feces and urine.

Massage with tactile soothing – still gentle touch by placing his hands on the head and abdomen or the back of the neonate will make him feel comfortable (The Royal Children's Melbourne Hospital, http://www.rch.org.au downloaded on March 25, 2017). Baby massage can also increase baby's growth and development by stimulating beta endorphins. Infants who were massaged with moderate pressure had increased vagus nerve tone, gastric motility, insulin and IGF-1 levels. This increased activity of the vagus nerve causes the baby to be hungry quickly so that the baby will feed frequently and the absorption of food will be better and eventually the weight will increase (Field, T., Diego,

M., & Hernandez-Reif, M. (2010).

The results of a preliminary study at a hospital in Bogor, Indonesia, jumlah bayi yang dilahirkan dengan persalinan spontan dan tindakan dari Januari sampai April 2021 sebanyak 704 dengan rata-rata kelahiran 176 births per month and 11.4% of them experienced hyperbilirubinemia. Hiperbilirubin termasuk dalam 2 besar kasus yang ditemui dan hyperbilirubinemia fisiologis banyak terjadi pada bayi matur usia 2-4 hari (Syam, 2021). This prompted researchers to conduct research with the aim of knowing the effectiveness of massage on reducing serum bilirubin levels and increasing body weight of hyperbilirubinemia infantswho are receiving phototherapy.

METHODS

This research was conducted in the perinatology room at Ummi Hospital, Bogor in 2021, which is a city located in the province of West Java, Indonesia. The city is located 59 km south of Jakarta. At the end of 2021, the population of the city of Bogor is1,091,396 people, with a density of 9,210 people/km2 with a number of births 109,561 district-city-in-west-java).

The research design that will be used is a quasi-experimental pretest-posttest with a control group design. The sampling technique used is the Purposive Sampling Technique. The number of samples in the study was 20 respondents for each control group and intervention group, with inclusion criteria: newborns (neonates) with a gestational age of 37-42 weeks, hyperbilirubinemia undergoing phototherapy, treated for at least 3 days with phototherapy, no complications kernicterus or bilirubin encephalopathy, babies do not fasted, babies can get oral drinks, babies have no contraindications for massage. The study design and procedures were approved by the Health Research Ethics Committee Jenderal Achmad Yani University with the number 02/KEPK/X/2021.

Parents of research subjects who met the inclusion criteria were given an explanation of the aims, and objectives of the study, the benefits of massage intervention on newborns with hyperbilirubinemia, and the research procedures to be carried out, as well as the possible risk of discomfort. If parents agree to participate and voluntarily allow their babies to be research subjects, then parents fill out an informed consent form, and sign the research consent form, in this case, there is no coercion. Parents are also given full rights if at any time they withdraw from this study, then the intervention on the baby is stopped.

The research subjects were massaged according to the standard of procedure. Prior to baby massage, initial measurements were taken, namely checking serum bilirubin levels and weighing. To minimize risk, prior to the massage intervention, observations were made of the baby's general condition, vital signs, baby's activity, skin condition and baby's nutritional consumption. The massage action is carried out on the action table by paying attention to the baby's temperature, the ambient temperature and the baby's safety and comfort. Massage is done using the hands and fingers in the form of soft strokes, and movements with light and medium pressure on the baby's face, chest, arms, legs and back area. After the massage intervention 2 days later, the final measurement of serum bilirubin levels and weighing of the baby's weight were carried out. After data collection, univariate and bivariate data analysis was carried out using t-dependent and t-independent statistical tests.

RESULTS

Univariate descriptive analysis to describe the characteristics of respondents including maternal age, gestation, infant age, infant weight and total bilirubin in Tables 1.1 and 1.2. While table 1.3 contains the distribution of respondents according to maternal parity, type of delivery, type of nutrition, frequency of bowel movements, and color of baby's stool.

Table 1. Distribution of Maternal and Infant Characteristics Intervention & Control Group

Variable	Mean		Median		SD		Min-Mak	
	Ctl	Int	Ctl	Int	Ctl	Int	Ctl	Int
Mother's Age	30	33	28	32	4.44	4.48	23-39	27-45
Gestational Age	38.65	38.7	38.5	39	1.62	1.22	36-43	36.5-40
Baby Age	5	11	4	7.5	3.02	7.09	1-13	4-28
Baby Weight	2912.5	2971.5	3000	2880	412.5	520.9	1930-3800	2100-4560
Total Bilirubin	14.71	15.88	13.15	15.14	4.53	2.90	8.63-24.7	12-22.5

Table 3. Distribution of Respondents by Mother's Parity, Type of Delivery, Type of Nutrition, Frequency of Defecation and Color of Infant Feces Intervention and Control Group

Variable	Intervention	%	Control	%
Mother's Parity				
- P1-3	17	85	18	90
- P4-5	3	15	2	10
Type of Delivery				
- Spontaneous	6	30	3	15
- SC	14	70	17	85
Nutrition				
- Breast milk	7	35	3	15
- Mix	5	25	1	5
- Formula milk	8	40	15	80
Frequency				
- 3-4 times/day	20	100	20	100
Stool Color				
- Yellow	20	100	20	100
Total	20	100	20	100

The results of the study of baby weight before and after the intervention in the phototherapy and massage intervention groups obtained p value = 0.054, and similarly in the phototherapy control group, p value = 0.286 both showed p> 0.05, so it can be concluded that there is no significant difference. significant difference between body weight before intervention and after intervention.

Table 4. Distribution of Average Baby Weight Before and After Phototherapy andMassage in the Intervention Group

Variable	Mean	SD	Mean Rank	P value	N
Baby Weight					
- Pre-intervention	2971.5	520.9	8.36	0.054	20
- Post-intervention	3000.0	523.0	12.0		

Table 5. Distribution of Average Baby Weight Before and After Phototherapy in the Control Group

Variable	Mean	SD	SE	P value	N
Baby Weight					
- Pre-phototherapy	2912.5	412.47	92.2	0.286	20

- Post-phototherapy	2932.5	445.0	99.5

While the results of the study of total bilirubin levels of infants before and after the intervention, both in the phototherapy and massage intervention groups, p value = 0.001, and also in the phototherapy control group, p value = 0.001. These both show $p < 0.05$, it can be concluded that there is a significant difference between total bilirubin levels before intervention and after intervention.

Table 5. Distribution of Average Total Bilirubin Levels Before and After Phototherapy and Massage in the Control and Intervention Group

Variable	Mean		SD		Mean Rank	SE	P value		N
	Ctl	Int	Ctl	Int	Ctl	Int	Ctl	Int	
Total Billirubin									
- Pre-intervention	14.71	15.88	4.53	2.90	0.00	0.65	0.001	0.001	20
- Post-intervention	8.08	7.10	1.46	1.76	10.50	0.39			

DISCUSSION

The results of the statistical test showed that there was no significant difference between body weight before the intervention and after the intervention. This is possible because the measurements were taken after two days, so the baby's weight did not increase significantly, but actually, the baby's weight increased within normal limits. Theoretically that the weight of a term baby will return at the age of 10 days. Weight will increase by 15-60 grams, an average of 25 grams per day (Hockenberry, M. J., & Wilson, D., 2013). The results of this study were in accordance with the theory, but the average increase in infant weight was greater in the intervention group, which was 28.5 grams. Meanwhile, in the control group, the average weight gain was 20 grams. The results of this study are the same as previous studies where the average increase in infant weight 0-3 months after the massage was 0.916 kg (SD 0.1214kg), and there was an effect of infant massage on weight gain in infants aged 0-3 months (p = 0.000). This proves that baby massage can

be an intervention to increase a baby's weight. So it is necessary to programmatically socialize baby massage to the wider community (Elya, D., Ridwan, M., & Anggraeni, Y., 2018).

Baby massage can increase a baby's growth and development by stimulating beta-endorphins, including in infants' weight gain with a history of low birth weight (Lestari, K. P., Nurbadlina, F. R., Wagiyo, W., & Jauhar, M. (2021). Infants who were massaged with moderate pressure had increased vagus nerve tone (10^{th} brain nerve), gastric motility, insulin and, IGF-1 levels. This increased activity of the vagus nerve causes the baby to be hungry faster so that the baby will often feed and absorb food better and ultimately increase body weight (Field, T., Diego, M., & Hernandez-Reif, M. (2010). Impact Another positive thing is that frequent breastfeeding will stimulate the prolactin reflex so that the production and volume of breast milk will increase (Robert, A., Princely Jeyaraj, R., & Kanchana, S., 2015).

Meanwhile, the results of the study of total bilirubin levels of infants before and after the intervention, both in the intervention group and the control group, obtained p-value = 0.001, indicating $p < 0.05$. So it can be concluded that there is a significant difference between total bilirubin levels before and after the intervention in the two groups. This means that phototherapy alone or coupled with massage can both reduce serum bilirubin levels. However, judging from the decrease in serum bilirubin levels, the decrease was more in the group of infants who received phototherapy and massage, with an average decrease of 8.77 g%. Meanwhile, in infants who only received phototherapy, the average decrease was 6.64 gr%.

The results of this study are the same as previous studies which showed that newborn massage can lower bilirubin levels in healthy newborns (Dalili, H., Sheikhi, S., Syariah, M., & Haghnazarian, E., 2016). The results showed that massage therapy had a significant effect in decreasing serum total bilirubin and percutaneous bilirubin levels and increasing defecation frequency (Lei, M., Liu, T., Li, Y., Liu, Y., Meng, L., & Jin, C., 2018). Transcutaneous bilirubin levels on the second to fifth day and total serum bilirubin levels on the fourth day were significantly decreased in the massage group, compared to the control group. In conclusion, infant massage in the early stages after birth can reduce neonatal bilirubin levels. We suggest that infant massage is useful for improving jaundice (Chen, J., Sadakata, M., Ishida, M., Sekizuka, N., & Sayama, M., 2011).

Massage therapy uses hands and skin-to-skin manipulation of the skin gently

including gentle effleurage (rhythmic, gliding strokes confirming the contours of the body), light petrissage (lifting, rolling, kneading strokes done slowly), and compression (light compressions) in certain areas) and nerve stroke (very light brushing of the skin). This will increase vagal activity, modulating insulin, and insulin-like growth factors will decrease cortisol and epinephrine levels. Tactile soothing - still gentle touch can be given by the caregiver by placing his hand on the newborn's head and abdomen or baby's back. In containment holding, the caregiver can use both hands to hold the baby and make the baby feel safe (one hand on the baby's head, the other on the baby's feet) (The Royal Children's Melbourne Hospital, (http://www.rch.org.au download date) March 25, 2017).

CONCLUSION

Phototherapy alone or coupled with massage can both reduce serum bilirubin levels in infants. Phototherapy and massage are recommended to reduce the serum bilirubin level in neonates because it provides the added advantage of providing comfort to the baby. It is recommended that for further research, massage intervention can be combined with other interventions to increase the baby's weight in addition to reducing bilirubin levels.

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