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The Effect of Baby Massage on Decline Bilirubin Levels in Icteric Babies

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Abstract: Indirect hyperbilirubinemia is a common condition affecting newborns, particularly 60% of term and 80% of premature infants. This study explores the impact of baby massage on reducing bilirubin levels in jaundiced infants. A quasi-experimental design with pre-test and post-test control groups was used, involving 120 icteric babies in hospitals across Banten and West Java in June 2024. A sample of 92 babies was selected through purposive sampling. The intervention group showed a reduction in bilirubin levels from an average of 16.4 mg/dL to 11.9 mg/dL after massage, while the control group saw a decrease from 17.7 mg/dL to 10.6 mg/dL. Significant differences in bilirubin reduction were observed between babies who were and were not given breast milk in the intervention group (p-Value=0.008 and p-Value=0.000). The study concludes that baby massage significantly lowers bilirubin levels in icteric infants, making it a recommended practice for managing neonatal hyperbilirubinemia, though it should be performed with caution.

Keywords: Hyperbilirubinemia; Jaundice Baby; Massage.

Introduction

Indirect hyperbilirubinemia is one of the conditions that most affects the health of newborns worldwide and occurs in 60% of term newborns and 80% of premature newborns (Doğan et al., 2023). Hyperbilirubinemia develops physiologically, mostly occurring in the first week of life. Hyperbilirubinemia, also known as jaundice, is a common and frequent condition in newborns, but is a major cause of hospitalization in the first week of life. In some infants, jaundice can become severe, progressing to acute bilirubin encephalopathy and kernicterus with a substantial risk of neonatal death and long-term neurodevelopmental disorders (Olusanya et al., 2018).

Jaundice/icteric baby disease (Neonatorum Jaundice) is usually harmless in newborn babies which causes the skin and whites of the eyes to turn yellow. This disorder is reported to occur in more than half of newborns and 80% of premature children. There are several risk factors, but the main ones are premature birth, different blood types of mother and baby, babies of East Asian descent, and breastfeeding. Neonatal jaundice can cause acute bilirubin encephalopathy and kernicterus in severe cases (Shahbazi et al., 2022).

Neonatal hyperbilirubinemia refers to excess bilirubin of more than 5 mg/dl above normal levels (Eghbalian et al., 2017). Another opinion says that neonatal hyperbilirubinemia is defined as excess bilirubin of more than 13 mg/dl (Zhang et al., 2019). Jaundice (jaundice) is caused by the deposition of bilirubin in the skin and mucosa. Unconjugated (indirect) hyperbilirubinemia is usually harmless, but can cause kernicterus in severe cases. Jaundice can occur at birth or at any time during infancy (Zhang et al., 2019). Diagnosis and treatment of neonatal hyperbilirubinemia is essential in the prevention of encephalopathy. Increased bilirubin occurs in babies between 3 and 7 days of age (Eghbalian et al., 2017).

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One type of jaundice is physiological jaundice where this disease is categorized as not dangerous, but if the bilirubin levels are very excessive or can lead to pathology then it must be treated quickly (Wakil et al., 2025). Increased blood bilirubin levels in babies are caused by unconjugated bilirubin because the baby's liver is unable to clear the bilirubin in the blood quickly. Lack of calorie and fluid intake, weight loss or delayed bowel movements increase the risk of the baby experiencing jaundice. Treatments include phototherapy, exchange transfusion and baby massage to prevent this from happening encephalopathy or core jaundice (Krisnanto et al., 2019).

Neonatal mortality remains a significant global issue. It is estimated that every year around 4 million babies die in the first four weeks of life, with 75% of these deaths occurring in the first 7 days of life (Desalew et al., 2020). World Health Organization (WHO) set reducing the mortality rate of children under five years of age, including neonates, as one of the goals Millenium Development Goals (MDGs) which is then continued with Sustainable Development Goals (SDGs), with a focus on solving the main causes of death. The hope of reducing under-five mortality by 67% in 2015 was not achieved, with the infant mortality rate in 2015 still high, namely around 26.2 per 1000 live births. The SDGs target in 2030 is to reduce the under-five mortality rate to 25 per 1000 live births and the neonatal mortality rate to 12 per 1000 live births (Husnah et al., 2024; Tefera & Ayele, 2021).

The causes of neonatal death, hematological disorders / hyperbilirubinemia is the number 5 cause of neonatal morbidity with a prevalence of 5.6% after respiratory disorders, prematurity, sepsis and hypothermia (Heriyanti et al., 2020). There is no multicenter data in Indonesia regarding hyperbilirubinemia. The latest data on the prevalence of severe hyperbilirubinemia (>20mg/dL) is 7%, with acute hyperbilirubinemia encephalopathy at 2 (Ministry of Health of the Republic of Indonesia, 2019).

Statistically, the incidence of babies with hyperbilirubin found in newborns in the first week of life in Indonesia is 51.47%, compared to 65% in America and 75% in Malaysia (Anjani et al., 2023). According to Setyowati (2024) there are several factors that cause hyperbilirubin, including asphyxia 51%, LBW 42.9%, prematurity 33.3%, congenital abnormalities 2.8% and sepsis 12%. Hyperbilirubinemia is one of the most common causes of infant death due to emergencies and complications in neonates. Based on data at Drajat Prawiranegara Regional Hospital, Serang Regency, Banten Province in 2019, hyperbilirubin cases were the highest, namely 757 babies out of a total of 2764 babies treated in the perinatology room (Khotimah & Subagio, 2021).

Treatment of hyperbilirubinemia in babies uses several standard therapies, namely phototherapy, exchange transfusion or a combination of phototherapy and exchange transfusion. The standard therapy used will be more effective if it is supported by the baby's good physical condition. Good nutritional intake, quality sleep, good elimination from the digestive tract and urinary tract will affect the baby's physical condition (Putriyanti et al., 2021). The comfort the baby gets during the massage process greatly influences serotonin levels in the baby, which indirectly affects the function of the digestive tract. Improving the function of the digestive tract will increase nutritional intake and elimination from the digestive and urinary tract. Improving the function of the digestive tract as evidenced by increasing nutritional intake will help the bilirubin conjugation process, while increasing defecation and urine elimination will help excrete conjugated bilirubin. Baby massage will indirectly reduce the serum bilirubin levels of newborn babies (Putriyanti et al., 2021).

There are several interventions that are widely used to prevent severe hyperbilirubinemia, either by reducing enterohepatic bilirubin or inhibiting its production. Baby massage has proven to be an effective method. In many areas of the world, massaging babies is a common practice. There have been many studies on the effects of infant massage over the past few decades that have shown many benefits such as increased weight and length, increased bone mineral density, better sleep, elimination and reduction of colic, it is also associated with reduced infant stress, more physiological and behavioral responses. both, reducing hospital stays and providing interventions that allow parents to take an active role. Based on several clinical investigations, massage increases defecation and thus bilirubin excretion, which may reduce jaundice in newborns (Dalili et al., 2016). Therefore, we conducted research to study the effect of baby massage on reducing bilirubin levels in icteric babies in the provinces of Banten and West Java.

Method

This research is designed as a quantitative study, resembling an experimental approach, with the primary aim of determining the effect of baby massage on reducing bilirubin levels in icteric infants. Specifically, the study utilizes a pre-test and post-test design with a control group, making it a quasi-experimental research design. The population of interest comprises 120 icteric infants who received treatment in hospitals across the Banten and West Java regions during June 2024. From

this population, a sample of 92 infants was selected. The sampling technique employed is non-probability sampling, specifically purposive sampling, which involves selecting participants based on specific criteria relevant to the research objectives. This approach allows for a focused examination of the potential benefits of baby massage on bilirubin reduction in this particular group of infants as seen in Figure 1.

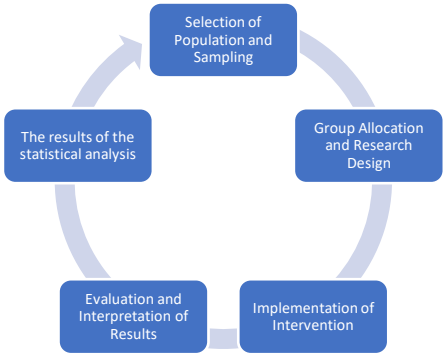

Figure 1. Research Flowchart

Result and Discussion

Result

Univariate Analysis

Table 1. Frequency Distribution of Respondents' Gender n= 92

Gender	Group			
	Intervention		Control	
	N	%	N	%
Man	20	43.5	23	50.0
Woman	26	56.5	23	50.0

Based on Table 1, the characteristics of respondents can be described that the majority of respondents in the intervention group were female respondents (56.5%) and in the control group it was the same for men and women.

Table 2.
Exclusive breastfeeding (n= 92)

Category	Group			
	Intervention		Control	
	N	%	N	%
Exclusive breastfeeding				
• ASI Eclussive	9	19.6	12	26.1
• Not exclusive breastfeeding	37	80.4	34	73.9

Table 2 shows that in the intervention group, the majority of respondents did not receive exclusive breastfeeding, namely 37 babies (80.4%) and in the control group, the majority also did not receive exclusive breastfeeding, namely 34 babies (73.9%).

Table 3. Responden to Bilirubin (n= 92)

Up to Bilirubin	N	Min	Max	Mean
Intervention Group				
• Before Intervention	46	11.4	25.1	16.4
• After Intervention	46	4.3	18.9	11.9
Control Group				
• Before Intervention	46	12.1	25.2	17.7
• After Intervention	46	2.4	24.0	10.6

Table 3 shows that in the intervention group, before the baby massage, the average bilirubin level of the respondents was 16.4 mg/dL and the average after the intervention was 11.9 mg/dL. In the control group, before the baby massage, the average bilirubin level of respondents was 17.7 mg/dL and the average after the intervention was 10.6 mg/dL.

Table 4.
Classification of Respondents' Bilirubin Levels (n= 92)

Up to Bilirubin	F	Percentage %
Intervention Group		
Before Intervention		
- Physiological	19	41.3
- Pathological	27	58.7
After Intervention		
- Physiological	37	80.4
- Pathological	9	19.6
Control Group		
Before Intervention		
- Physiological	9	19.6
- Pathological	37	80.4
After Intervention		
- Physiological	31	67.4
- Pathological	15	32.6

Table 4 shows that in the intervention group before baby massage, the majority of respondents' bilirubin levels were in the pathological category (58.7%) and after the intervention were in the physiological category (80.4%). Meanwhile, in the control group before the intervention, most were in the pathological category, namely 80.4%, after the intervention, most were in the physiological category, namely 67.4%.

Table 5. Decrease in Bilirubin Levels after 4 Days of Intervention (n= 92)

Up to Bilirubin	N	Mean	SD	*P value*
Intervention Group	46	4.5	1.8	0.048°
Control Group	46	3.9	1.7	

And: °*Mann Whitney U Test*

Table 5 shows that in the intervention group the average infant bilirubin level after the intervention was 4.5 mg/dL and in the control group the average bilirubin level after the intervention was 3.9 mg/dL.

Bivariate Analysis

Before conducting an analysis test to see the effect of baby massage on reducing bilirubin levels, a data normality test was first carried out. Test the normality of bilirubin level data before intervention and after intervention in both the intervention and control groups to determine whether the data obtained is normally distributed or not. The normality test is carried out by test *Kolmogorov-Smirnov* by using the program *SPSS 25 for Windows* with a significance level of 0.05.

Table 6. Data Normality Test Results

Up to Bilirubin	Intervention			Control		
	Statistics	df	Say.	Statistics	df	Say.
Before Intervention	0.165	46	0.004	0.262	46	0.000
After Intervention	0.146	46	0.015	0.188	46	0.000

Information : ᶜ *Kolmogorov-Smirnov*

Based on the results of the normality test using the test *Kolmogorov-Smirnov* in Table 5.6 the significance value in the significance column of the bilirubin level data in the intervention group and control group both before and after the intervention is less than 0.05. Because the significance value is less than 0.05, it can be interpreted that the bilirubin level data is not normally distributed.

Because the data is not normally distributed, the data does not meet the requirements for parametric statistical testing *paired sample T Test* nor *Independent sample T Test*. Next, a test is carried out *Wilcoxon Signed Rank Test* to see the effect of baby massage on bilirubin levels before and after intervention in both the intervention and control groups. Test *Wilcoxon* used for interval or ratio type data, but the data does not follow a normal distribution. Test *Wilcoxon Signed Rank Test* is an alternative test to the test *paired sample t test* if it does not meet the normality assumption.

Table 7. Test results *Wilcoxon Signed Rank Test* Bilirubin Levels of Intervention Group Before and After Intervention

WITH	-5.907ᶜ
Asymp. Sig 2 tailed	0.000

Information : ᶜ *Wilcoxon Signed Rank Test*

Based on the results of calculations *Wilcoxon Signed Rank Test*, in table 7, the Z value obtained is -5.907 with *p value* (*Asymp. Sig 2 tailed*) of 0.000. Because *p-Value* 0.000 < 0.05, then it can be concluded that H1 is accepted. Thus, it can be interpreted that there is an effect of baby massage on reducing bilirubin levels in icteric babies in the intervention group.

Table 8. Test results *Wilcoxon Signed Rank Test* Control Group Bilirubin Levels Before and After Intervention

WITH	-5.906ᶜ
Asymp. Sig 2 tailed	0.000

Information : ᶜ *Wilcoxon Signed Rank Test*

Based on the results of calculations *Wilcoxon Signed Rank Test*, in table 8, then the Z value obtained is -5.906 with *p value* (*Asymp. Sig 2 tailed*) of 0.000. Because *p-Value* 0.000 < 0.05, then it can be concluded that H1 is accepted. Thus, it can be interpreted that there is an effect of baby massage on reducing bilirubin levels in icteric babies in the control group.

Table 9. Test results *Wilcoxon Signed Rank Test* Bilirubin Levels of the Intervention Group who were given breast milk Before and After the Intervention

WITH	-2.668ᶜ
Asymp. Sig 2 tailed	0.008

Information: ᶜ *Wilcoxon Signed Rank Test*

Based on the results of calculations *Wilcoxon Signed Rank Test*, in table 9, the Z value obtained is -2.668 with *p value* (*Asymp. Sig 2 tailed*) of 0.008. Because *p-Value* 0.008 < 0.05, then it can be concluded that H1 is accepted. Thus, it can be interpreted that there is a significant difference in reducing the bilirubin levels of icteric babies who were breastfed in the intervention group.

Table 10. Test results *Wilcoxon Signed Rank Test* Bilirubin Levels of the Intervention Group who were not given breast milk Before and After the Intervention

WITH	-5.304ᶜ
Asymp. Sig 2 tailed	0.000

Information : ᶜ *Wilcoxon Signed Rank Test*

Based on the results of calculations *Wilcoxon Signed Rank Test*, in table 10, then the Z value obtained is -5.304 with *p value* (*Asymp. Sig 2 tailed*) of 0.000. Because *p-Value* 0.000 < 0.05, then it can be concluded that H1 is accepted.

Thus, it can be interpreted that there is a significant difference in reducing bilirubin levels in icteric babies who are not breastfed in the intervention group.

Based on table 9 and table 10, it can be concluded that there was a decrease in bilirubin levels in the intervention group, namely icteric babies, whether breastfed or not breastfed.

Table 11. Test results *Wilcoxon Signed Rank Test* Bilirubin Levels of Control Group who were given Breast Milk Before and After Intervention

WITH	-3.062[c]
Asymp. Sig 2 tailed	0.002

Information : [c] *Wilcoxon Signed Rank Test*

Based on the results of calculations *Wilcoxon Signed Rank Test*, in table 11, then the Z value obtained is -3.062 with *p value* (*Asymp. Sig 2 tailed*) of 0.002. Because *p-Value* 0.002 < 0.05, then it can be concluded that H1 is accepted. Thus, it can be interpreted that there is a significant difference in reducing bilirubin levels in icteric babies who were breastfed in the control group.

Table 12. Test results *Wilcoxon Signed Rank Test* Bilirubin Levels of Control Group who were not given breast milk Before and After Intervention

WITH	-5.087[c]
Asymp. Sig 2 tailed	0.000

Information : [c] *Wilcoxon Signed Rank Test*

Based on the results of calculations *Wilcoxon Signed Rank Test*, in table 12, then the Z value obtained is -5.087 with *p value* (*Asymp. Sig 2 tailed*) of 0.000. Because *p-Value* 0.000 < 0.05, then it can be concluded that H1 is accepted. Thus, it can be interpreted that there is a significant difference in reducing bilirubin levels in icteric babies who are not breastfed in the control group. Based on table 11 and table 12, it can be concluded that a decrease in bilirubin levels occurred in the control group, namely icteric babies, both breastfed and not breastfed.

Table 13. Test results *Mann-Whitney U Test* Bilirubin Levels of Icteric Infants who were Breastfed in the Intervention Group and Control Group After Intervention

WITH	-1.919[c]
Asymp. Sig 2 tailed	0.055

Information : [c] *Mann-Whitney U Test*

Based on the results of calculations *Mann-Whitney U Test*, in table 13, then the Z value obtained is -1.919 with *p value* (*Asymp. Sig 2 tailed*) of 0.155. Because *p-Value* 0.055 > 0.05, then it can be concluded that H1 is rejected. Thus, it can be interpreted that there is no difference in the bilirubin levels of icteric babies who were breastfed in the intervention group and the control group after the baby massage intervention.

Table 14.
Test results *Mann-Whitney U Test* Bilirubin Levels of Jaundice Infants Who Are Not Breastfed in the Intervention Group and Control Group After Intervention

WITH	-5.342[c]
Asymp. Sig 2 tailed	0.000

Information : [c] *Mann-Whitney U Test*

Based on the results of calculations *Mann-Whitney U Test*, in table 14, then the Z value obtained is -5.342 with *p value* (*Asymp. Sig 2 tailed*) of 0.000. Because *p-Value* 0.000 < 0.05, then it can be concluded that H1 is accepted. Thus, it can be interpreted that there is a difference in the bilirubin levels of icteric babies who were not breastfed in the intervention group and the control group after the baby massage intervention.

Table 15. Test results *Mann-Whitney U Test* Bilirubin Levels of Intervention Group and Control Group

WITH	-2.355[c]
Asymp. Sig 2 tailed	0.019

Information : [c] *Mann-Whitney U Test*

Based on the results of calculations *Mann-Whitney U Test*, in table 15, then the Z value obtained is -2.355 with *p value* (*Asymp. Sig 2 tailed*) of 0.019. Because *p-Value* 0.019 < 0.05, then it can be concluded that H1 is accepted. Thus, it can be interpreted that there is a difference in the bilirubin levels of icteric babies in the intervention group and the control group. So it can be concluded that there is an effect of baby massage on reducing bilirubin levels in icteric babies.

Table 16. Test results *Mann-Whitney U Test* Decrease in Bilirubin Levels after Intervention in the Intervention Group and Control Group

WITH	-1.978[c]
Asymp. Sig 2 tailed	0.048

Information : [c] *Mann-Whitney U Test*

Based on the results of calculations *Mann-Whitney U Test*, in table 16, shows the Z value obtained is -1.978 with *p value* (*Asymp. Sig 2 tailed*) of 0.048. Because *p-Value* 0.048 < 0.05, then it can be concluded that H1 is accepted. Thus, it can be interpreted that there is a difference in the average reduction in bilirubin levels of icteric babies in the intervention group and the control group. So it can be concluded that there is an effect of baby massage on reducing bilirubin levels in icteric babies.

Discussion

Based on Table 2, it shows that in the intervention group the majority of respondents did not receive exclusive breast milk, namely 37 babies (80.4%) and in the control group the majority also did not receive exclusive breast milk, namely 34 babies (73.9%). Research by Siroosbakht et al. (2020) found a relationship between breastfeeding and the incidence of jaundice in babies, this was caused by inadequate breastfeeding and poor fluid intake causing *starvation* and delayed passage of meconium in neonates thereby improving circulation *from enterohep*. But research by Solihah (2020) shows that there is no significant relationship between breastfeeding and the incidence of jaundice at the Ibrahim Adji Community Health Center, Bandung City (Solihah, 2020).

Based on table 3, it shows that in the intervention group before the baby massage the average bilirubin level of the respondents was 16.4 mg/dL and the average after the intervention was 11.9 mg/dL. In the control group, before the baby massage, the average bilirubin level of respondents was 17.7 mg/dL and the average after the intervention was 10.6 mg/dL. Table 4 shows that in the intervention group before baby massage, the majority of respondents' bilirubin levels were in the pathological category (58.7%) and after the intervention were in the physiological category (80.4%). Meanwhile, in the control group before the intervention, most were in the pathological category, namely 80.4%, after the intervention, most were in the physiological category, namely 67.4%. Table 5 shows that in the intervention group the average infant bilirubin level after the intervention was 4.5 mg/dL and in the control group the average bilirubin level after the intervention was 3.9 mg/dL.

Effect of Baby Massage on Reducing Bilirubin Levels

Based on the results of calculations *Wilcoxon Signed Rank Test*, in table 6, the Z value obtained is -5.907 with *p value* (*Asymp. Sig 2 tailed*) of 0.000. Because *p-Value* 0.000 < 0.05, then it can be concluded that H1 is accepted. Thus, it can be interpreted that there is an effect of baby massage on reducing bilirubin levels in icteric babies in the intervention group. Based on the results of calculations *Wilcoxon Signed Rank Test*, in table 7, the Z value obtained is -5.906 with *p value* (*Asymp. Sig 2 tailed*) of 0.000. Because *p-Value* 0.000 < 0.05, then it can be concluded that H1 is accepted. Thus, it can be interpreted that there is an effect of baby massage on reducing bilirubin levels in icteric babies in the control group. Based on the results of calculations *Mann-Whitney U Test*, in table 8, then the Z value obtained is -2.355 with *p value* (*Asymp. Sig 2 tailed*) of 0.019. Because *p-Value* 0.019 < 0.05, then it can be concluded that H1 is accepted. Thus, it can be interpreted that there is a difference in the bilirubin levels of icteric babies in the intervention group and the control group. So it can be concluded that there is an effect of baby massage on reducing bilirubin levels in icteric babies.

The results of this research are in line with research by Eghbalian et al. (2017) in Iran who found that massage therapy combined with phototherapy was an effective method for reducing total serum bilirubin within 4 days in icteric babies. Infant massage increases the frequency of daily bowel movements and is likely to cause a decrease in serum bilirubin levels. Study by Dalili et al. (2016) investigating the relationship between infant massage and neonatal jaundice also showed significant results in reducing bilirubin levels. Baby massage significantly increases the frequency of defecation which is thought to be the reason for the decrease in bilirubin levels in the blood. Research by Zhang et al. (2019) with *randomized controlled trials*, found that infant massage significantly reduced bilirubin levels within 4 days of treatment compared to the control group. Bilirubin levels in icteric babies decreased significantly after massage therapy on the third day. The results showed that massage therapy was associated with a substantial reduction in serum bilirubin levels and transcutaneous bilirubin levels within 4 days (Zhang et al., 2019).

Defecation is known as a mechanism for removing bilirubin to reduce the possibility of jaundice in babies. Babies who received massage plus phototherapy had a higher frequency of defecation compared to babies who received routine therapy. Study published by Zhang et al. (2019) reported that infant massage therapy can cause a decrease in bilirubin levels which can shorten phototherapy treatment and cause patients to go home early. This decrease in bilirubin levels may be related to stimulation of bowel movements, and increased bowel movements allow the baby to excrete more meconium containing bilirubin. Infant massage therapy can stimulate the vagus nerve through peripheral nerve stimulation, and subsequently increase defecation frequency and bilirubin excretion (Zhang et al., 2019).

The results of this research are not in line with research by Krisnanto et al. (2019) which revealed that there was no significant difference between baby massage in the control group and the intervention group in reducing serum bilirubin levels *p value* (0.146). This lack of difference may be due to differences in the duration of the massage and the length of the massage day. In this study, massage was carried out twice a day with a duration of 10 minutes and was carried out for 2 days (Abdellatif et al., 2020; Jiao, 2023). This is in accordance with hospital procedures where patients are allowed to go home if the bilirubin level is below 10

mg/dl and the length of treatment is around 2 to 3 days (Krisnanto et al., 2019). Research conducted by Seyyedrasooli *et al* (2014) found that there was no significant difference in reducing bilirubin levels between the group that received baby massage intervention and the control group that received phototherapy on the fourth day, with a p value of (0.449). According to Field and Diego (2010), massage can increase vagal stimulation which stimulates digestive tract function. Massage therapy stimulates the motility of the digestive system, which accelerates gastric emptying, as well as increasing gastric and pancreatic acid secretion. This stimulation of the pancreas increases the production of insulin and gastrin. With massage therapy, babies tend to breastfeed more often and more, thereby increasing intake which can bind more bilirubin to be excreted through feces and urine.

Massage or touch therapy stimulates the vagal reflex, which increases the frequency of breastfeeding and accelerates intestinal peristalsis, thereby reducing the enterohepatic circulation of bilirubin and increasing bilirubin excretion. Massage therapy also increases blood flow, increases tissue fluid, and aids the collection and excretion of bilirubin (Khedmat et al., 2021; Olusanya et al., 2018; Song et al., 2015). Touch provides a sedative effect, lowers cortisol levels, and increases enterokinesis which supports the digestive system. Baby massage has many benefits, including increasing body weight, calorie intake, vagal activity, gastric motility, immune system, sleep, reducing bilirubin levels, and shortening the duration of hospital stay (Sukmawati et al., 2024). Based on the results of calculations *Mann-Whitney U Test*, in tables 4 and 9, shows the Z value obtained at -1.978 with *p value* (*Asymp. Sig 2 tailed*) of 0.048. Thus, it can be interpreted that there is a difference in the average reduction in bilirubin levels of icteric babies after the intervention group and the control group. So it can be concluded that there is an effect of baby massage on reducing bilirubin levels in icteric babies (Dalili et al., 2016; Field et al., 2016). The results of this research are in line with the results of Shahbazi et al. (2022), which shows that average bilirubin levels decrease as the level of massage intervention increases (in terms of duration and frequency per minute). These findings confirm the linear relationship between infant massage therapy and treatment of neonatal jaundice. The existence of a dose-response relationship between massage therapy and mean bilirubin in neonates with hyperbilirubinemia may strengthen the scientific background for therapeutic intervention in the newborn intensive care unit (NICU) for the treatment of neonatal jaundice (Radwan et al., 2023).

Conclusion

Based on the research results, most of the respondents in the intervention group were female babies (56.5%) and in the control group it was the same for boys and girls. The average age of respondents in the intervention group was 4.17 and in the control group was 4.13. In the intervention group, the majority of respondents did not receive exclusive breast milk, namely 37 babies (80.4%) and in the control group, the majority also did not receive exclusive breast milk, namely 34 babies (73.9%). In the intervention group, before the baby massage, the average baby bilirubin level was 16.4 mg/dL and the average after the intervention was 11.9 mg/dL. In the control group, before the baby massage, the average baby bilirubin level was 17.7 mg/dL and the average after the intervention was 10.6 mg/dL. There was a significant difference in reducing bilirubin levels in icteric babies who were breastfed in the intervention group (*p-Value* 0.008). There was a significant difference in reducing bilirubin levels in icteric babies who were not breastfed in the intervention group (*p-Value* 0.000). There was no significant difference in the bilirubin levels of icteric babies who were breastfed in the intervention group and the control group after the baby massage intervention (*p-Value* 0.055). There was a difference in the bilirubin levels of icteric babies who were not breastfed in the intervention group and the control group after the baby massage intervention (*p-Value* 0.000). There was an effect of baby massage on reducing bilirubin levels in icteric babies in the intervention group (*p-Value* 0.000). There was an effect of baby massage on reducing bilirubin levels in icteric babies in the control group (*p-Value* 0.000). There was a significant difference in the average reduction in bilirubin levels after intervention between the intervention and control groups *p value* (0.048). There were differences in the bilirubin levels of icteric babies in the intervention group and the control group. So it can be concluded that there is an effect of baby massage on reducing bilirubin levels in icteric babies (*p-Value* 0,019).

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Author Contributions

The following statements should be used Conceptualization DMF, L, ASW, CSF, NH, LFK contributed to the data collection process, data processing, article writing.

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Conflicts of Interest
The authors declare no conflict of interest.

References

Abdellatif, M., Vuong, N. L., Tawfik, G. M., Nhu Nguyen, D. P., Van Thanh, L., Elfaituri, M. K., Mohammed Mansour, M. I., Bich Thoa, L. T., Mohamed Zaki, M. M., Thuy Duong, P. D., El-Qushayri, A. E., Liang, Y., Liu, K., Hirayama, K., & Huy, N. T. (2020). Massage therapy for the treatment of neonatal jaundice: A systematic review and network meta-analysis. *Journal of Neonatal Nursing*, *26*(1), 17–24. https://doi.org/10.1016/j.jnn.2019.09.002

Anjani, S. R., Widyaningsih, T. S., & Rohana, N. (2023). Peran Air Susu Ibu untuk Mengurangi Derajat Ikterik pada Bayi Hiperbilirubinemia Fisiologis di Ruang Peristi RSI Sultan Agung Semarang. *Jurnal Persada Husada Indonesia*, *10*(36), 69–78. https://doi.org/10.56014/jphi.v10i36.364

Dalili, H., Sheikhi, S., Shariat, M., & Haghnazarian, E. (2016). Effects of baby massage on neonatal jaundice in healthy Iranian infants: A pilot study. *Infant Behavior and Development*, *42*, 22–26. https://doi.org/10.1016/j.infbeh.2015.10.009

Desalew, A., Sintayehu, Y., Teferi, N., Amare, F., Geda, B., Worku, T., Abera, K., & Asefaw, A. (2020). Cause and predictors of neonatal mortality among neonates admitted to neonatal intensive care units of public hospitals in eastern Ethiopia: a facility-based prospective follow-up study. *BMC Pediatrics*, *20*, 1–11. https://doi.org/10.1186/s12887-020-02051-7

Doğan, E., Kaya, H. D., & Günaydin, S. (2023). The effect of massage on the bilirubin level in term infants receiving phototherapy. *EXPLORE*, *19*(2), 209–213. https://doi.org/10.1016/j.explore.2022.05.001

Eghbalian, F., Rafienezhad, H., & Farmal, J. (2017). The lowering of bilirubin levels in patients with neonatal jaundice using massage therapy: A randomized, double-blind clinical trial. *Infant Behavior and Development*, *49*(May), 31–36. https://doi.org/10.1016/j.infbeh.2017.05.002

Field, T., Gonzalez, G., Diego, M., & Mindell, J. (2016). Mothers massaging their newborns with lotion versus no lotion enhances mothers' and newborns' sleep. *Infant Behavior and Development*, *45*, 31–37. https://doi.org/10.1016/j.infbeh.2016.08.004

Heriyanti, A., Widiasih, R., & Murtiningsih. (2020). Efektifitas Terapi Caring Support Neobil terhadap Perubahan Kadar Bilirubin Serum Total Hyperbilirubinemia pada Neonatus Di Rumah Sakit Dustira Cimahi. *Health Information: Jurnal Penelitian*, *12*(1), 30–37. https://doi.org/10.36990/hijp.vi.154

Husnah, H., Sakdiah, S., & Andayani, H. (2024). Dampak Inisiasi Menyusui Dini Terhadap Penurunan Angka Kematian Bayi. *Jurnal Kedokteran Nanggroe Medika*, *7*(1), 34–42. https://doi.org/10.35324/jknamed.v7i1.280

Jiao, J. (2023). Effects of comfort care combined with blue-light phototherapy on neonatal jaundice and total bilirubin and high-sensitivity C-reactive protein levels. *Journal of King Saud University - Science*, *35*(2), 102483. https://doi.org/10.1016/j.jksus.2022.102483

Khedmat, L., Mojtahedi, S. Y., & Moienafshar, A. (2021). Recent clinical evidences in the herbal therapy of neonatal jaundice in Iran: A review. *Journal of Herbal Medicine*, *29*, 100457. https://doi.org/10.1016/j.hermed.2021.100457

Khotimah, H., & Subagio, S. U. (2021). Analysis of the Relationship between Gestational Age, Birth Weight, Type of Childbirth and Breastfeeding with Occurrence of Hyperbilirubinemia Analysis of Relationship between Gestational Age, Birth Weight, Type of Childbirth and Breastfeeding with Occurr. *Health Journal*, *8*(2), 115–121. https://doi.org/10.33746/fhj.v8i02.146

Krisnanto, P. D., Retnaningsih, L. N., & Lestiawati, E. (2019). The Effectiveness of Baby Massage/Touch on Bilirubin Levels in Icteric Infants in the Infant Room RS Yogyakarta. *Respati Yogyakarta Nursing Journal*, *6*(1), 548. https://doi.org/10.35842/jkry.v6i1.290

Olusanya, B. O., Kaplan, M., & Hansen, T. W. R. (2018). Neonatal hyperbilirubinaemia: a global perspective. *The Lancet Child & Adolescent Health*, *2*(8), 610–620. https://doi.org/10.1016/S2352-4642(18)30139-1

Putriyanti, C. E., Retnani, C. T., Masruchi, M., & Purnamiasih, D. P. K. (2021). Kejadian Stunting Berhubungan dengan Faktor Ekonomi. *Jurnal Ilmiah Permas: Jurnal Ilmiah STIKES Kendal*, *11*(2), 305–312. Retrieved from http://journal.stikeskendal.ac.id/index.php/PSKM/article/view/1186

Radwan, I. M., Sakr, M. M. A., & Mohamed, S. A. (2023). Is Oral Agar Combined with Phototherapy Superior than Phototherapy in Treatment of Neonatal Indirect Hyperbilirubinemia. *The Scientific Journal of Medical Scholar*, *2*(1), 25–28. https://doi.org/10.55675/sjms.v2i1.56

Setyowati, E. (2024). *Hubungan Pemberian Air Susu Dengan Kejadian Ikterus Neonatorum Di Rumah Sakit*

Tk. Iii Slamet Riyadi Surakarta [Thesis: Universitas Kusuma Husada Surakarta]. Retrieved from https://eprints.ukh.ac.id/id/eprint/5911/1/ARTIKEL ENDANG SETYOWATI.pdf

Shahbazi, M., Khazaei, S., Moslehi, S., & Shahbazi, F. (2022). Effect of Massage Therapy for the Treatment of Neonatal Jaundice: A Systematic Review and Dose-Response Meta-analysis. *International Journal of Pediatrics*. https://doi.org/10.1155/2022/9161074

Siroosbakht, S., Aminian, A. R., & Rezakhaniha, B. (2020). Risk factors of early breastfeeding jaundice: How can gynecologists and nurses be effective in reducing it? *Journal of Comprehensive Pediatrics*, *11*(3). https://doi.org/10.5812/compreped.103578

Solihah, I. A. (2020). The Relationship between Breastfeeding and the Classification of Neonatal Jaundice Based on Integrated Management of Young Babies at the Ibrahim Adji Community Health Center, Bandung City. *JKA Scientific Journal (Aeromedika Health Journal)*, *6*(1), 33–38. https://doi.org/10.58550/jka.v6i1.115

Song, E., Reja, D., Silverberg, N., & Rothe, M. J. (2015). Phototherapy: Kids are not just little people. *Clinics in Dermatology*, *33*(6), 672–680. https://doi.org/10.1016/j.clindermatol.2015.09.009

Sukmawati, C., Mulyanti, S., Nurlina, F., & Badrudin, U. (2024). Penerapan Pijat Bayi Combain Fototerapi Untuk Menurunkan Derajat Ikterik Pada Bayi Usia 0-28 hari di Ruang Perinatologi RSUD Dr. Soekardjo Kota Tasikmalaya. *Journal of Nursing Practice and Science*, *3*(1), 16–22. https://journal.umtas.ac.id/index.php/jnps/article/view/4546

Tefera, Y. G., & Ayele, A. A. (2021). Newborns and under-5 mortality in Ethiopia: the necessity to revitalize partnership in post-COVID-19 era to meet the SDG targets. *Journal of Primary Care \& Community Health*, *12*, 2150132721996889. https://doi.org/10.1177/2150132721996889

Wakil, A., Koneru, G., & Latt, N. L. (2025). Jaundice/cholestasis. In *Hepatology* (pp. 371–397). Elsevier. https://doi.org/10.1016/B978-0-443-26710-9.00013-4

Zhang, M., Wang, L., Wang, Y., & Tang, J. (2019). The influence of massage on neonatal hyperbilirubinemia: a meta-analysis of randomized controlled trials. *Journal of Maternal-Fetal and Neonatal Medicine*, *32*(18), 3109–3114. https://doi.org/10.1080/14767058.2018.1455183