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Serum bilirubin concentration in breast-fed newborn babies at Larantuka General Hospital, East Flores

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ABSTRACT Neonatal hyperbilirubinemia is a common problem not only to pediatricians but also to the parents. Breast-feeding is known as one of the factors associated with hyperbilirubinemia. The aim of the study was to determine serum bilirubin concentration and factors related to hyperbilirubinemia in breast-fed newborn babies. A cross sectional study was done on 45 well babies born at Larantuka General Hospital, East Flores, from August to October 1998. Data including personal data, frequency of breast-feeding, frequency of urination, meconium passage, and weight loss, were collected through questionnaires, presented in tables, and analyzed using chi-square test. The prevalence of hyperbilirubinemia in breast-fed babies was 13%. It was correlated significantly with the frequency of breast-feeding ($p<0.01$), meconium passage ($p<0.02$), sufficiency of breast milk ($p<0.05$), and weight loss ($p<0.05$). The significant risk factors for neonatal hyperbilirubinemia were the frequency of breast-feeding, meconium passage, sufficiency of breast milk, and weight loss. Immediate and frequent breast-feeding is recommended for the management of neonatal hyperbilirubinemia. **[Paediatr Indones 2001; 41:284-287]**

Keywords: *neonatal hyperbilirubinemia, bilirubin, breast-feeding*

NEONATAL HYPERBILIRUBINEMIA IS A COMMON PROBLEM NOT only to pediatricians but also to the parents.[1] Breast-feeding is known to be one of the factors associated with the increase of unconjugated bilirubin.[2] The incidence of hyperbilirubinemia related to breast-fed babies is about 10% to 25%.[3] Some factors possibly connected with hyperbilirubinemia in breast-fed newborns are steroid pregnane-3 alpha 20 beta-diol, lipoprotein lipase activity, delayed meconium passage, lack of fluid and calorie intake, weight loss, and intestinal bacterial flora.[4]

We were interested in the study of bilirubin concentration in breast-fed newborn babies because we assumed that hyperbilirubinemia in breast-fed newborn babies can motivate their mothers to stop breast-feeding and encourage them to substitute it with formula-feeding. Certainly, this will be against the government exclusive breast-feeding program which is still found at Larantuka General Hospital East Flores. The aim of this study was to determine serum bilirubin concentrations and factors related to hyperbilirubinemia in breast-fed newborn babies.

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Methods

A cross sectional study was done at Larantuka General Hospital East Flores from August to October 1998. Data were collected through questionnaire including the identity of the babies, frequency of breast-feeding, frequency of urination (reflecting the sufficiency of breast-milk), meconium passage, and weight loss.

We included all babies born spontaneously with Apgar scores at one minute >7, birth weight 2500-

4000 grams, appropriate for gestational age with healthy mothers and gave informed consent to exclusively breast-feed the infants during the first seven days of life. Babies with jaundice appearing before the age of 36 hours, those with direct bilirubin concentration more than 2 mg/dL, babies with congenital defect, anemia, and babies who received formula feeding were excluded. Similarly, babies who had history of prolonged rupture of membrane (>24 hours) and whose mothers used certain medicines (antimalaria, oxytocin, and analgesic) were also excluded.

During the study period there were 57 well babies born at Larantuka General Hospital East Flores from August to October 1998. Twelve babies were excluded from the study because of anemia, sepsis, direct bilirubin of more than 2 mg/dL, severe asphyxia, Down syndrome, given milk formula, and the mothers used antimalaria drugs or had prolonged rupture of membrane. Only 45 babies were included in the study.

Subjects were collected by consecutive sampling. The dependent variables were serum bilirubin concentrations while sex, frequency of breast-feeding, sufficiency of breast-milk, meconium passage, and weight loss were considered as independent variables. The total and direct bilirubin concentration in serum were measured using the method of Jendrassik-Biochem Z while hemoglobin (Hb) level was determined using the method of Sahli.

Anemia was defined as Hb level of less than 14 g/dL. Hyperbilirubinemia was defined as serum bilirubin concentration (SBC) above 12 mg/dL while bilirubin equal or below 12 mg/dL was considered as physiologic.[5] Frequency of breast-feeding was differentiated into two categories i.e., above 8 feedings per 24 hours and 8 feedings or below per 24 hours.[6] Sufficiency of breast-milk was based on urinary frequency per day; it was considered sufficient if the babies urinate more than 6 times per day and insufficient if it was equal or less than 6 times per day.[7] Meconium passage was the time of the first stool and frequency of bowel movement per day; it was differentiated into two categories i.e., more than 4 times and less than 4 times per day. Loss of body weight was defined as percentage of weight reduction from the birth-weight during the first week of life. It was considered physiological if less than 10% and pathological if 10% or more.[8] All data were presented in tables and analyzed using Chi-square test; p value of less than 0.05 was considered as significant.

Results

Serum bilirubin concentration equaled or less than 12 mg/dL was found in 39 babies, while concentration greater than 12 mg/dL was found in 6 babies. When analyzed separately according to several risk factors, it shows that frequency of breastfeeding per day, number of meconium passage per day, and weight loss were associated with level of bilirubin concentration, while sex and frequency of urination were not **(Table 1)**.

TABLE 1. RELATIONSHIP BETWEEN SERUM BILIRUBIN CONCENTRATION AND SEX

	SBC < 12 mg/dL	SBC > 12 mg/dL	Total	
Sex				
Males	19	2	21	p = 0.669
Females	20	4	24	
Freq of breast-feeding				
< 8 x/day	8	5	13	p = 0.07
≥8 x/day	31	1	32	
Freq of urination				
< 6 x/day	32	2	34	p = 0.38
≥ 6 x/day	7	4	11	
Meconium passage				
≥ 4 x/day	29	1	30	p = 0.020
< 4 x/day	10	5	15	
Weight loss				
< 10%	36	3	39	p = 0.028
≥ 10%	3	3	6	

Discussion

Hyperbilirubinemia related to breast-fed babies are differentiated into breast-feeding jaundice and breast-milk jaundice. Breast feeding jaundice is an increase of serum bilirubin level (more than 12 mg/dL) in the first 7 day of life, while breast-milk jaundice is an increase of serum bilirubin level after the first week of life. The later usually develops slowly and its peak is between the second and the third week of life at a level of 10-20 mg/dL.[9,10]

The concentration of bilirubin below 2 mg/dL may not be seen until 1 month of age in both full-term and premature babies.[3] Most neonates develop serum bilirubin concentration over 2 mg/dL in the first week of life.[11] The neonates appear jaundiced when the serum bilirubin concentration is greater than

7 mg/dL.[3] Clinical evidence of jaundice was found in 49% of babies. Cloherty found it in between 25 and 50% of all term neonates[5] and Monintja, found it in 32.1% of term babies.[12]

Usually, serum bilirubin concentration in well-term babies shows a gradual rise to a peak of 6 to 8 mg/dL on the third day of age, rises not exceeding 12 mg/dL on days 3-5 of life and then falls.[2] It is called physiologic hyperbilirubinemia.[1] It occurs in about 60% of full-term babies and 80% of premature babies. Cloherty found serum bilirubin concentration of $\leq$12 mg/dL in more than 50% of full-term babies during the first week of life.[5] In this study, physiologic hyperbilirubinemia was found in 87% of breast-fed babies. It is higher than other studies that maybe caused by different race or genetic factors, definition of physiologic hyperbilirubinemia, and this study included endemic area of malaria. According to Monintja, the different data of jaundice may be caused by different environment, habit of life or feeding, medical service, race, or genetic factors.[13] The increased bilirubin concentrations in the physiologic hyperbilirubinemia is caused by the inability of the liver enzymes to metabolize the lytic red blood cells.[3,10]

Hyperbilirubinemia in breast-fed babies is an increase of bilirubin at a level of more than 12 mg/dL in the first week of full-term babies life.[14] Balint and Balistreri reported the incidence of hyperbilirubinemia in breast-fed babies between 10% to 25%.[1] Oski showed that moderate jaundice (bilirubin >12 mg/dL) occurred in at least 12% of breast-fed babies, and that severe jaundice (>15 mg/dL) occurred in 2% of breast-fed babies.[9] In this study 13% of breast-fed babies showed hyperbilirubinemia. It was significantly correlated with the frequency of breast-feeding. Yamauchi and Yamanouchi found that the incidence of hyperbilirubinemia was significantly decreased on the sixth day after birth in babies who were breast-fed at least nine times or more in the first 24 hours.[3] Abdul Hamid et al found that babies who suckled more than eight times per 24 hours during the first three days after birth had significantly lower serum bilirubin concentrations than those who were breast-fed less than eight times per 24 hours.[15]

Hyperbilirubinemia in breast-fed babies is caused by poor calorie intake and/or dehydration due to insufficient breast milk.[2] It has been postulated that hyperbilirubinemia in breast-fed babies is reduced due to decreased calorie and fluid intake from colostrum and increased enterohepatic circulation resulting from low stool output and beta-glucuronidase production.[10,16] The feeding may stimulate gut motility and reduce the enterohepatic circulation of bilirubin.[1,17] However, infrequent feeding may reduce the intake of breast-fed babies as well as delay the removal of meconium from their gastrointestinal tract.[18]

Delay in passage of the first stool is known to be associated with increased peak serum bilirubin concentrations. It can lead to increased enterohepatic circulation of bilirubin.[10,16] If the babies' meconium did not pass quickly because the babies did not get enough colostrum, the bilirubin in the stool may be reabsorbed into the bloodstream, exacerbating jaundice levels. The colostrum acts as a laxative and helps the babies pass its meconium faster.[12,16] An increase of gastrocolic reflex following frequent breast-feeding may stimulate gut motility and decrease the intestinal reabsorption of bilirubin.[8] There was a significant association between serum bilirubin concentration and delayed meconium passage in this study ($p<0.02$).

Insufficient breast-milk is an etiological factor for lack of fluid or calorie intake in the first 5 days of life, and often accompanied with excessive loss of body weight.[19] It was related to increased bilirubin concentration in breast-fed babies.[4] In this study it was found significantly different. Some researchers found that the lack of fluid and calorie intake is the cause of hyperbilirubinemia with a decrease of the glucuronyl transferase enzyme production.[8,20]

Breast milk jaundice is another cause of increased unconjugated hyperbilirubinemia. It was assumed due to the effect of steroid 3 alpha, 20-beta-pregnanediol and lipoprotein lipase activity. Steroid 3 alpha, 20-beta-pregnanediol could inhibit bilirubin conjugation in incubated liver slices[2,9] and lipoprotein lipase may interfere with the hepatic uptake or conjugation of bilirubin.[11] The occurrence of breast milk jaundice is small (1-2%). Soetjiningsih finds that breast-milk jaundice is very rare,[17] while Martinez et al state that kernicterus has not been reported in breast-milk jaundice.[4]

There are many differences among the characteristics of physiologic jaundice, breast feeding jaundice, and breast milk jaundice. One of them is the onset of hyperbilirubinemia which is >36 hours in physiologic jaundice, 2-4 days in breast-feeding jaun-

dice, and 4-7 days in breast-milk jaundice, with the peak time of 3-4 days in physiologic jaundice, of 3-6 days in breast-feeding jaundice, and 7-15 days in breast-milk jaundice. The other difference is the peak of the total serum bilirubin which is 5-12 mg/dL in physiologic jaundice, >12 mg/dL in breast-feeding jaundice, and >10 mg/dL in breast-milk jaundice. The incidence of jaundice is also different, which is 56% in physiologic jaundice, 12-13% in breast-feeding jaundice, and 2-4% in breast-milk jaundice.[14]

Currently, immediate and frequent breast-feeding is recommended for the management of neonatal hyperbilirubinemia.[11] Babies with frequent breast-feeding will have lower serum bilirubin concentration.[6] Discontinuation of lactation due to hyperbilirubinemia in breast-fed babies will disturb exclusively breast-fed babies.[5,11,12,15] No treatment is necessary for hyperbilirubinemia in breast-fed babies, but if the serum bilirubin concentration exceeds 12 mg/dL, treatment should be started immediately by frequent breast-feeding, phototeraphy and rarely exchange transfusion.[18] If bilirubin concentration exceeds 20 mg/dL, discontinuation of breast-feeding for 24 hours will result in a decrease of bilirubin concentrations. Discontinuation breast-milk is only for the diagnosis of breast-feeding jaundice or breast milk jaundice.[13,18]

In summary we found the prevalence of hyperbilirubinemia in breast-fed babies of 13%. The significant risk factors of hyperbilirubinemia are frequency of breast-feeding, meconium passage, sufficiency of breast-milk and loss of birth weight. Immediate and frequent breast-feeding is recommended for the management of neonatal hyperbilirubinemia. Discontinuing breast-feeding in babies with hyperbilirubinemia is not recommended since it will be against the government's program on exclusive breast-feeding.

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