The Association of Breastfeeding Practices with Neonatal Jaundice

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Background: Neonatal jaundice is a common problem in newborns. Inadequate breastfeeding jaundice is an important consideration for the neonatal jaundice. Early breastfeeding initiation and good breastfeeding practices may help to prevent neonatal jaundice.

Objective: To find the association of breastfeeding practices, the time to initiate breastfeeding, the breastfeeding frequency, breast milk volume, and appropriate latching with neonatal jaundice at the early postpartum.

Material and Method: The subjects were postpartum women and newborns who had normal deliveries without complications at the HRH Princess Maha Chakri Sirindhorn Medical Center in the Nakhon Nayok province between July 2013 and June 2014. During postpartum period, the time of the first neonatal suckling, the breastfeeding frequency per day, the breastfeeding duration for each instance, the breast milk volume, and appropriate latching were assessed. The newborns had routine microbilirubin evaluation done at 48 hours postpartum. The data of newborn with neonatal jaundice was collected, analyzed, and compared with no jaundice newborn. The demographic data and breastfeeding factors were analyzed by Chi-square, t-test, and the Fisher's exact test.

Results: The data of 176 newborns (neonatal jaundice 88 cases and no jaundice newborn 88 cases) and mothers were analyzed. It had shown that the mean time for the initiation of breastfeeding was 1.57±0.6 hours in the no jaundice newborn group and 5.56±3.1 hours in the neonatal jaundice group. The percentages of 'breastfeeding frequency less than eight times per day' in the neonatal jaundice and no jaundice newborn groups were 92.0% and 1.1% at day 1 postpartum, and 42.0% and 0.0% at day 2 postpartum, respectively. The percentages of 'breastfeeding duration less than 10 minutes' per feeding in the neonatal jaundice group were 35.2% and 13.6% at day 1 and day 2 postpartum. No one in the no jaundice newborn group had breastfeeding durations of less than 10 minutes for each feeding. The percentages of mothers in the neonatal jaundice and no jaundice newborn groups having no milk were 84.1% and 1.1% at day 1, and 4.5% and 0.0% at day 2 postpartum, respectively. The percentages of 'latch scores greater than 8' in the neonatal jaundice and no jaundice newborn groups were at 15.9% and 50.0% at day 1, and 31.8% and 95.5% at day 2 postpartum. There were statistically significant differences in the breastfeeding parameters.

Conclusion: The factors of the time of the initiation of breastfeeding, breastfeeding frequency, duration, breast milk volume, and appropriate latching are associated with neonatal jaundice at the second day postpartum.

Keywords: Breastfeeding practices, Time of the initiation of breastfeeding, Breastfeeding frequency and duration, Latch score, Neonatal jaundice

Breastfeeding is the most appropriate infant feeding. In Thailand, the rates for exclusive breastfeeding are comparably low at 5.4 to 15.2%[1,2]. Campaigns from the government and non-profit organizations are currently in development. Neonatal jaundice of breastfeeding infants is a frequent problem for the management of breastfeeding support. In cases of

neonatal jaundice that had high bilirubin levels, which the medical staff is concerned, cessation of breastfeeding may be advised.

There are many reasons for developing Neonatal jaundice, e.g., ABO incompatibility, glucose-6-phosphate dehydrogenase deficiency (G6PD), pyruvate kinase deficiency, congenital erythropoietic porphyria, Crigler-Najjar syndrome types I and II, Gilbert syndrome, genetic factors, breast milk, and inadequate breastfeeding jaundice[3-7]. Neonatal jaundice associated with breastfeeding has two different mechanisms, 1) direct effect of mature human milk inducing increased intestinal reabsorption of bilirubin,

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and 2) starvation jaundice resulting from inadequate intake of human milk[8,9]. We are interested in the second type because early breastfeeding initiation and good breastfeeding technique may prevent jaundice that results from inadequate breastfeeding at the early postpartum. In Thailand, the slogan for the campaign for neonatal jaundice prevention is "early, frequent, long, and proper breastfeeding with sufficient amounts of breast milk". Thus, we are interested in the association of the time of the initiation of breastfeeding, breastfeeding frequency, duration, breast milk volume, and appropriate latching with neonatal jaundice in the present study.

Material and Method
Design
The present study was a prospective cohort study. Post-delivery, the mothers were encouraged to breastfeed and taught latching techniques. The first neonatal suckling was recorded as the time of the initiation of breastfeeding. The breastfeeding frequency, duration, volume, and latching data were recorded at the first and second days postpartum. Appropriate latching was assessed by latch score. The newborns had routine microbilirubin evaluations at 48 hours postpartum. If neonatal jaundice was diagnosed and the exclusion criteria were not met, the data on the next mother who delivered her newborn that had no neonatal jaundice was used for comparison and analyzed.

Setting
The study was performed in the Nakhon Nayok province, a rural area in the central part of Thailand. The data were collected between July 2013 and June 2014 at the HRH Princess Maha Chakri Sirindhorn Medical Center. A routine practice in the postpartum ward is breastfeeding education. The one-hour course in breastfeeding included latching. It was taught on the first day postpartum. One nurse taught a group of three to five mothers. The mothers were encouraged to stimulate their newborns for breastfeeding every two to three hours.

Inclusion criteria
Women who had normal deliveries without complications (i.e., multiple pregnancies, preeclampsia, antepartum hemorrhage, and preterm labor) and intended to breastfeed for at least six months were recruited. Their newborns had birth weights of more than 2,500 grams and were without complications. The mothers had no postpartum hemorrhages or had no

contraindications to breastfeeding. These included mothers who were HIV positive and/or babies with galactosemia.

Exclusion criteria
The newborns diagnosed with neonatal jaundice from ABO incompatibilities or G6PD were excluded.

Sample size
The sample size was based on 0.05 of α error and 0.95 of power. The ratio of variance between the jaundiced and not jaundiced group was 1.5 (calculated by 40 cases in the pilot study). The calculated sample size was 159. The subjects were summed up with 10% added for data loss. The total samples collected were 176.

Latch score
Latch scores were assessed by latching on, audible swallowing, the type of nipples, comfort, and assistance requirement parameters. The criteria of 'latching on' scores are, two, for the baby grasps the breast, tongue positioned down and forward, lips are flanged, and the baby has rhythmic suckling, one, for the baby's repeated attempts, the mother must hold her nipple in the baby's mouth or must stimulate the baby to suck, and zero when the baby is too sleepy, reluctant, or no latch is obtained. The criteria of 'audible swallowing' scores are summed up as two for spontaneous or frequent audible swallowing, one for a few audible swallowing with stimulation, and zero for none. The criteria of 'type of nipples' scores are two for everted (after stimulation), one for flat, and zero for inverted nipples. The criteria of 'comfort' scores are, two for soft, tender, and intact nipples (no damage), and one for filling, small blisters, or bruises of the breasts or the mother complains of pinching or mild to moderate discomfort of her nipples or breasts. The criteria of 'assistance requirement' scores are, two for no assistance require from the staff or the mother can position or hold the baby, one, for minimal assistance, teach on one side and the mother utilizes the other breast or the staff helps and the mother takes over the feeding independently, and zero for full assistance or the staff holds the infant at the breast[10].

Procedure and collection of material
The initial neonatal suckling was recorded as the time of the start of breastfeeding. The breastfeeding frequency was recorded daily. The breastfeeding

duration in each instance was recorded and calculated for the mean duration per day. The breast milk volume was assessed at 24 and 48 hours postpartum. The breast milk volume was categorized by manual milk expression into three groups, the first group was 'no breast milk', the second was 'milk drop', and the third was 'milk ejection'. Appropriate latching was assessed by latch scores. The newborns had clinical neonatal jaundice. The jaundice workup, including mother's and infant's blood type and Rh determination, total bilirubin, direct bilirubin, direct and indirect Coombs test, G6PD, peripheral blood smear, and reticulocyte, was investigated. The newborns with no clinical jaundice by visual assessment had routine microbilirubin evaluations at 48 hours postpartum. If the microbilirubin was in what was considered the high-risk zone, neonatal jaundice was diagnosed and managed by the guidelines established by the American Academy of Pediatrics Subcommittee on hyperbilirubinemia[11].

Ethical considerations

The present study was approved by the Ethics Committee of the Srinakharinwirot University, Faculty of Medicine.

Statistical analysis

Demographic data were reported in means and percentages. We used the t-test to compare the means of maternal age, gestational age, birth weight, and time of the initiation of breastfeeding between the jaundiced and not jaundiced groups. The data of parity, infants' gender, breastfeeding frequency greater than eight times per day, breastfeeding duration less than 10 minutes, breastfeeding volume (as categorized earlier), and latch scores greater than 8 were analyzed by Chi-square and the Fisher's exact test. A p-value less than 0.05 was considered statistical significant. Statistical analysis was performed using SPSS IBM Singapore Pte Ltd (Registration No.1975-01566-C).

Results

Two hundred thirty four postpartum women enrolled in our research project. Fifty-eight cases were excluded due to G6PD and ABO incompatibility diagnosis of newborns (15 and 43 cases, respectively). The data of 176 remaining cases including 88 mothers who had infants with neonatal jaundice (defined as jaundice group) and 88 mothers with no jaundice newborn (defined as no jaundice group) were analyzed. The details of the demographic data were shown in Table 1.

The percentages of 'time to start breastfeeding' in the first hour, one to six hours, and more than six hours were 15.9% (28 cases), 70.5% (124 cases), and 13.6% (24 cases), respectively. The percentages of 'breastfeeding frequency less than eight times per day' in the jaundice and no jaundice groups were 92.0% and 1.1% at day 1, and 42.0% and 0.0% at day 2 postpartum. The percentages of 'breastfeeding duration less than 10 minutes' per feeding in the jaundice group were at 35.2% and 13.6% at day 1 and day 2 postpartum. No one in the no jaundice group had breastfeeding duration of less than 10 minutes for each feeding. The breastfeeding volume was divided into the no milk, milk drop, and milk ejection categories by manual milk expression. The percentages of mothers in the jaundice and no jaundice groups having no milk were 84.1% and 1.1% at day 1, and 4.5% and 0.0% at day 2 postpartum, respectively. The percentages of 'latch scores greater than 8' in the jaundice and no jaundice groups were at 15.9% and 50.0% at day 1, and 31.8% and 95.5% at day 2 postpartum. The details of the breastfeeding parameters in the jaundice and no jaundice groups were shown in Table 2. There were significant differences in the breastfeeding parameters. These included; the time of the initiation of breastfeeding, breastfeeding frequency, breastfeeding duration, breastfeeding volume, and latch scores between the jaundice and no jaundice groups.

Table 1. Demographic data of jaundice and no jaundice groups

Mother and newborn's data	Jaundice group (n = 88)	No jaundice group (n = 88)	p-value
Mother's age (years), mean ± SD	26.1±6.0	26.8±5.5	0.410
Gestational age (week), mean ± SD	38.8±1.3	38.9±1.4	0.625
Primipara, n (%)	43 (48.9)	49 (55.7)	0.241
Multipara, n (%)	45 (51.1)	39 (44.3)	
Infant gender, n (%)			0.482
Male	52 (59.1)	51 (58.0)	
Female	36 (40.9)	37 (42.0)	
Birth weight (gram), mean ± SD	3,001.2±314.6	3,010.3±322.8	0.424

Table 2. Comparison of the breastfeeding parameter in jaundice and no jaundice groups

Breastfeeding parameter	Jaundice group (n = 88)	No jaundice group (n = 88)	*p*-value
Time to start breastfeeding (hour), mean ± SD	5.6±3.1	1.6±0.6	<0.001*
Breastfeeding frequency <8 times/day, n (%)			
Day 1	81 (92.0)	1 (1.1)	<0.001*
Day 2	37 (42.0)	0 (0.0)	<0.001*
Breastfeeding duration <10 minutes, n (%)			
Day 1	31 (35.2)	0 (0.0)	<0.001*
Day 2	12 (13.6)	0 (0.0)	<0.001*
Breastfeeding volume, n (%)			
Day 1			<0.001*
- No milk	74 (84.1)	1 (1.1)	
- Milk drop	14 (15.9)	87 (98.9)	
- Milk ejection	0 (0.0)	0 (0.0)	
Day 2			<0.001*
- No milk	4 (4.5)	0 (0.0)	
- Milk drop	82 (93.2)	56 (63.6)	
- Milk ejection	2 (2.3)	32 (36.4)	
Latch score >8, n (%)			
Day 1	14 (15.9)	44 (50.0)	<0.001*
Day 2	28 (31.8)	84 (95.5)	<0.001*

* The significant differences were indicated as *p*<0.05

Discussion

The demographic data between the two groups; including the mothers' ages, gestational age, parity, infant gender, and birth weight had no statistical significant differences. In the present study, the prevalence of the time for the initiation of breast-feeding in the first hour was low (15.9%). The time of breastfeeding initiation in the jaundice group was later than the no jaundice group (*p*<0.001). From the study of Tang et al, breastfeeding that was initiated early is highly associated with total breastfeeding after discharge[12]. Thus, the earlier start to breastfeeding was likely to help the infant receive more adequate feedings and a lower incidence of jaundice from inadequate feedings. Furthermore, breastfeeding that was delayed for more than six hours had shown a negative relationship with the duration of exclusive breastfeeding[13]. We found that the prevalence of the time of initiating breastfeeding to be more than six hours in the present study was present in 13.6% of the subjects. The health professional should closely monitor the mother who delayed the initiation of breastfeeding in an attempt to prevent this problem.

The breastfeeding frequency should be 8 to 12 feedings every 24 hours[14]. We used the lower limit of eight feedings per day as the cut-off point as less frequent feedings could be associated with inadequate feeding jaundice. The results had shown that the number of newborns who had feeding frequency of less than eight in the jaundiced group were more than the number of newborns who had feeding frequency of less than eight in the no jaundice group at day 1 and day 2 postpartum (*p*<0.001). The frequency of breastfeeding, less than eight times in a 24-hour period, was likely associated with neonatal jaundice. However, the frequency of milk removal may not directly affect the rate of milk synthesis except in the function of the mother's ability to store milk[15].

The breastfeeding duration for each feeding varies widely[16]. The results from a previous study had shown that the prevalence of breastfeeding duration of less than 10 minutes per feeding, was about five percent in the first postpartum month[17]. We hypothesize that the breastfeeding duration of less than 10 minutes per feeding is associated with inadequate feeding. Thus, we have used a breastfeeding time of less than 10 minutes as a cut-off point. In the present study, we found that the percentages of mothers with the breastfeeding duration of less than 10 minutes for each feeding in the jaundiced group were 35.2% and 13.6% at day 1 and day 2 postpartum, respectively. Breastfeeding duration of less than 10 minutes for each feeding has not been found in the group without jaundice. As a result, the breastfeeding duration for each feeding of less than 10 minutes had been associated with neonatal jaundice.

In the present study, the breastfeeding volumes were categorized into three groups, 1) no milk,

2) milk drop, and 3) milk ejection groups as this simplified the evaluation of breastfeeding volume that can be done at bedside by all levels of health professionals. We found that there were statistically significant differences of volume between the jaundiced and not jaundiced groups. The percentages of mothers who had no milk at day 1 were 1.1 for the no jaundice group. The mothers with no milk in this group had successfully produced milk at day 2 postpartum. Breastfeeding volume is associated with neonatal jaundice. If the heath professional found mothers with no milk by manual expression at day 1 postpartum, great care and attention would be considered. However, test weighing is a more accurate method of evaluating breast milk intake[18]. This method is usually used for preterm and high-risk hospitalized infants. However, the test weighing had limitations as it requires high-precision scales to weigh the newborns and this is not available in community hospitals.

Proper breastfeeding requires appropriate latching. We used latch scores greater than 8 to represent proper latching as these latch scores are associated with breastfeeding at six weeks postpartum[19]. We found that latch scores greater than 8 in the jaundiced group were less than those in the no jaundice group at day 1 and day 2 postpartum ($p<0.001$). Inappropriate latching has been associated with neonatal jaundice. In Thailand, latch scores are commonly used to evaluate breastfeeding and health professionals are familiar with this process. It has been deemed possible to use breastfeeding factors and latch scores in neonatal jaundice prevention before breastfeeding assessment. However, the effect of the breastfeeding factors and latching on neonatal jaundice needs to be evaluated with further studies.

The strength of the present study is that the breastfeeding factors which we used for evaluation are normally recorded during routine care in HRH Princess Maha Chakri Sirindhorn Medical Center. This makes the availability of the data more beneficial. However, we could not conclude that the breastfeeding factors and appropriate latching are associated with inadequate breastfeeding jaundice. Neonatal jaundice at the early postpartum may have other causes beyond inadequate breastfeeding. The definitive cause of neonatal jaundice could be further studied and collected in future studies.

Conclusion

Neonatal jaundice found at the early postpartum is associated with: the time of the initiation of breastfeeding, frequency greater than eight times per day, duration less than 10 minutes for each feed, volume, and appropriate latching. The use of these factors might help the health professional to categorize high risk mothers and newborns with neonatal jaundice and more intensive breastfeeding support should be given for this group.

What is already known on this topic?

Neonatal jaundice of breastfeeding infants is a frequent problem for the management of breastfeeding support. Neonatal jaundice associated with breastfeeding has two different mechanisms, 1) direct effect of mature human milk inducing increased intestinal reabsorption of bilirubin, and 2) starvation jaundice resulting from inadequate intake of human milk.

What this study adds?

The factors of the breastfeeding practices are associated with neonatal jaundice at the early postpartum. The use of the factors, delayed initiation of breastfeeding, frequency less than eight per day, duration less than 10 minutes for each feeding, no breast milk volume, and inappropriate latching (latch score smaller than 8) might help the health professional to categorize high-risk mothers and newborns with neonatal jaundice and more intensive breastfeeding support would be given for this group.

Potential conflicts of interest

None.

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ความสัมพันธ์ของการดูแลการให้ลูกกินนมแม่กับภาวะตัวเหลืองในทารกแรกเกิด

สุขวดี เกษสุวรรณ, นงเยาว์ ใบยา, เกศสุดา แม่หละเจริญพร, ภาวิน พัวพรพงษ์

ภูมิหลัง: *ภาวะตัวเหลืองเป็นภาวะแทรกซ้อนที่พบได้บ่อยในทารกแรกเกิด ภาวะตัวเหลืองที่เกิดจากการกินนมแม่ไม่เพียงพอยังพบ เป็นปัญหาที่สำคัญ การเริ่มต้นการให้ทารกได้กินนมแม่ตั้งแต่ในระยะแรกและการดูแลการให้นมลูกอย่างเหมาะสมน่าจะช่วยป้องกัน การเกิดภาวะตัวเหลืองในทารกแรกเกิดได้*

วัตถุประสงค์: *ศึกษาความสัมพันธ์ของการเริ่มดูดนมเร็ว ดูดบ่อย ดูดนาน และดูดถูกวิธีกับทารกแรกเกิดตัวเหลือง*

วัสดุและวิธีการ: *ศึกษามารดาครรภ์หลังคลอดที่ไม่มีภาวะแทรกซ้อนและทารกแรกเกิดที่โรงพยาบาลศูนย์การแพทย์สมเด็จพระเทพ รัตนราชสุดา ฯ สยามบรมราชกุมารี อำเภอองครักษ์ จังหวัดนครนายก ตั้งแต่เดือนกรกฎาคม พ.ศ. 2556 ถึง มิถุนายน พ.ศ. 2557 โดยหลังคลอดมารดาจะได้รับการกระตุ้นให้เลี้ยงลูกด้วยนมแม่และสอนการเข้าเต้า จดบันทึกข้อมูลการกินนมแม่ โดยจดเวลาที่ทารก เริ่มดูดนมแม่ ข้อมูลการดูดบ่อยบันทึกข้อมูลเป็นจำนวนครั้งต่อวัน ข้อมูลการดูดนานบันทึกเป็นเวลาในแต่ละครั้งและคำนวณเป็น ค่าเฉลี่ยต่อครั้งและบันทึกปริมาณน้ำนม โดยแบ่งมารดาจากปริมาณน้ำนมที่ประเมินจากการบีบน้ำนมด้วยมือเป็น 3 กลุ่ม คือ กลุ่ม ที่ไม่มีน้ำนม กลุ่มที่มีน้ำนมหยด และกลุ่มที่มีน้ำนมไหลพุ่งเมื่อทำการบีบน้ำนมด้วยมือ สำหรับข้อมูลการดูดใช้วิธีการประเมินโดย คะแนนการเข้าเต้า (latch score) เมื่อทารกอายุครบ 48 ชั่วโมง ทารกทุกรายจะได้รับการตรวจ microbilirubin หากทารกตัวเหลือง ข้อมูลของมารดาที่คลอดในลำดับถัดไปที่ทารกไม่มีภาวะตัวเหลืองจะใช้นำมาเปรียบเทียบและวิเคราะห์ผล*

ผลการศึกษา: *มีมารดาจำนวน 176 รายเข้าตามเงื่อนไขของการศึกษา โดยมีมารดากลุ่มที่ทารกตัวเหลือง 88 รายและมารดากลุ่ม ที่ทารกไม่มีภาวะตัวเหลือง 88 ราย เวลาเฉลี่ยที่เริ่มดูดนมแม่ 5.56±3.1 ชั่วโมงในทารกกลุ่มตัวเหลือง และ 1.57±0.6 ชั่วโมงใน กลุ่มทารกที่ไม่มีภาวะตัวเหลือง การดูดบ่อยน้อยกว่า 8 ครั้งต่อวันในทารกกลุ่มตัวเหลืองพบร้อยละ 92.0 ในทารกที่ไม่มีภาวะตัวเหลือง พบร้อยละ 1.1 ในวันแรกหลังคลอด การดูดบ่อยน้อยกว่า 8 ครั้งต่อวันในทารกกลุ่มตัวเหลืองพบร้อยละ 42.0 ขณะที่ในทารกที่ไม่มี ภาวะตัวเหลืองไม่พบการดูดนมน้อยกว่า 8 ครั้งในวันที่สองหลังคลอด ระยะเวลาการดูดนมที่น้อยกว่า 10 นาทีในกลุ่มทารกตัวเหลือง พบร้อยละ 35.2 และ 13.6 ในวันแรกหลังคลอด และไม่พบระยะเวลาในการดูดนมที่น้อยกว่า 10 นาทีในกลุ่มทารกที่ไม่มีภาวะ ตัวเหลือง ข้อมูลปริมาณน้ำนมพบในกลุ่มทารกตัวเหลือง มารดาไม่มีน้ำนมร้อยละ 84.1 ในวันแรก และร้อยละ 4.5 ในวันที่สอง ส่วนในกลุ่มที่ทารกไม่มีภาวะตัวเหลืองพบร้อยละ 1.1 ในวันแรก และไม่พบเลยในวันที่สอง คะแนนการเข้าเต้าที่มากกว่า 8 พบใน กลุ่มทารกตัวเหลืองร้อยละ 15.9 ในวันแรก และร้อยละ 31.8 ในวันที่สอง คะแนนการเข้าเต้าที่มากกว่า 8 พบในกลุ่มที่ทารกไม่มี ภาวะตัวเหลืองร้อยละ 50 ในวันแรก และร้อยละ 95.5 ในวันที่สอง โดยมีความแตกต่างอย่างมีนัยสำคัญทางสถิติของตัวแปรในการ ให้ลูกกินนมแม่ในมารดากลุ่มทารกตัวเหลืองและกลุ่มที่ทารกไม่มีภาวะตัวเหลือง*

สรุป: *ทารกที่เริ่มดูดนมช้า ดูดบ่อยน้อยกว่า 8 ครั้งต่อวัน ดูดนานน้อยกว่า 10 นาทีต่อครั้ง มารดาที่ยังไม่มีน้ำนมมา และคะแนน การเข้าเต้าที่น้อยกว่า 8 มีความสัมพันธ์กับทารกแรกเกิดตัวเหลืองในระยะแรกหลังคลอด*