

## Original Article

# Causes of breast-feeding jaundice and clinical efficacy analysis of nursing intervention

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**Abstract:** Objective: To analyze the causes of breast-feeding jaundice and to explore the clinical efficacy of acupoint massage as a nursing intervention for the breast-feeding. Methods: One hundred children with physiological jaundice and 104 with feeding jaundice who were admitted in Jingzhou Central Hospital between January 2016 to January 2018 were enrolled for the study. The defecation and lactation frequencies in the first 3 days after birth, and the time to occurrence of jaundice were compared between the two groups, and the risk factors for feeding jaundice were analyzed. Infants with feeding jaundice were randomized into the routine group and the acupoint massage group. Infants in the routine group adopted conventional nursing intervention, while acupoint massage group were given Xiehuangtang decoction acupoint massage on the basis of routine nursing intervention. The clinical efficacy and bilirubin content after treatment were compared within the two groups of feeding jaundice. Results: The frequencies of lactation and defecation in infants with feeding jaundice was significantly lower than that in children with physiological jaundice. The frequency of breast-feeding was the main risk factor for feeding jaundice ( $P=0.002$ ,  $OR=1.321$ ). The effective rate of acupoint massage was 83.3%, which was significantly higher than that in the routine group ( $\chi^2=11.776$ ,  $P=0.009$ ). The time needed for the bilirubin in the acupoint massage group to fall below  $102.6 \mu\text{M}$  was  $5.43 \pm 0.54$  days, which was significantly lower than that of the routine group ( $7.92 \pm 0.69$  days) ( $t=20.823$ ,  $P<0.001$ ). Furthermore, the frequencies of breast-feeding and defecation in the acupoint massage group was significantly higher compared with the routine group ( $t=12.432$ ,  $P=0.021$ ;  $t=10.432$ ,  $P=0.042$ ). Conclusion: Breast-feeding frequency is the main risk factor of breast-feeding jaundice. The use of Xiehuangtang decoction acupoint massage has a high clinical value and can significantly improve bilirubin levels in the infants.

**Keywords:** Feeding jaundice, bilirubin, breast-feeding times, acupoint massage

## Introduction

Breast feeding associated jaundice is common in infants, mainly due to the low absorption of breast milk after birth. Since defecation and enterohepatic circulation are impaired in infants, the levels of bilirubin increase in the body leading to jaundice. If this symptom is not treated in time, it can progress to bilirubin encephalopathy, which greatly affect the life safety of infant [1-3]. Therefore, it is necessary to diagnose feeding jaundice in a timely manner and take preventive measures. Effective nursing intervention can reduce the symptoms after a child has been diagnosed with the condition. Feeding jaundice has been treated previously with blue light irradiation which can change the structure of unconjugated bilirubin, discharge free bilirubin and reduce its concen-

tration, and ultimately improve the symptoms of jaundice. However, clinical findings showed that persistent exposure to blue light resulted in adverse reactions of diarrhea and rashes [4-7]. Therefore, finding a safe and effective treatment is particularly critical. In this study, we determined the risk factors and effective nursing intervention methods of feeding jaundice, so as to provide an effective clinical basis for the prevention and treatment of the disease.

## Materials and methods

### Subjects

One hundred children with physiological jaundice (serum bilirubin less than  $95.0 \mu\text{M}$ ) and 104 children with feeding jaundice (serum bilirubin above  $240.0 \mu\text{M}$ ) who were admitted to

## Causes of breast-feeding jaundice and clinical efficacy of nursing intervention

**Table 1.** General clinical data

Group	Control group (n=100)	Observation group (n=104)	t/X <sup>2</sup>	P
Maternal age (year)	31.25±3.87	30.64±3.54	1.175	0.241
Gestational age (week)	39.54±4.10	39.10±4.32	0.764	0.456
Birth weight (g)	3,329.8±338.4	3,275.4±539.5	0.852	0.395
Cesarean section (n, %)	46 (46.0)	50 (48.1)	0.090	0.087
Newborn girl (n, %)	52 (52.0)	54 (51.9)	0.080	0.098
Oxytocin use (n, %)	7 (7.0)	8 (7.7)	0.040	0.087

Jingzhou Central Hospital between January 2016 to January 2018 were enrolled. In the physiological jaundice group, the average age of the parturients was 31.25±3.87 years, the gestational age was 39.54±4.10 weeks and the infants' birth weight was 3,329.8±338.4 g, and included 46 cases of cesarean section (CS) and 7 of oxytocin assisted births. In the feeding jaundice group, the parturients' average age, gestational age and birth weight were 30.64±3.54 years, 39.10±4.32 weeks and 3,275.4±539.5 g respectively and included 50 CS cases and 8 of oxytocin assisted births. Infants with feeding jaundice were randomly divided into the routine group (n=50) and the acupoint massage group (n=54) and were respectively treated with routine therapy and Xiehuangtang decoction acupoint massage.

Diagnostic criteria for feeding jaundice: Neonatal jaundice 3 days after birth was diagnosed as feeding jaundice if serum bilirubin was more than 220.6-256.5 μM and decreased to 50% of its original level after 3-5 days of stopping breast feeding and instead feeding the infant manually [8].

Inclusion criteria: The absence of other metabolic diseases in the infants, and no diabetes and other metabolic diseases in the mothers.

Exclusion criteria: Infants with other liver and intestinal diseases, and with digestive system disorders.

This study was approved by the Ethics Committee of Jingzhou Central Hospital, and all families of infants signed the informed consent.

### Methods

Infants with physiological jaundice were used as the control group and those with feeding

jaundice as the observation group. The latter were further randomized into the routine group and acupoint massage groups based on the treatment. Early breastfeeding initiation, the defecation and lactation frequencies in the first 3 days after birth, and the time of first postnatal stools, time of

occurrence of the first jaundice after birth and bilirubin content in feces within 2 days after birth of control and observation groups were recorded.

Infants in the routine group received conventional nursing intervention. They were placed in a blue light box at regular intervals and irradiated for durations set according to their respective conditions. For the rest of the time, the infants were placed under fluorescent light, and the ambient temperature was maintained at 30°C. The infants' eyes were protected with disposable phototherapy black eye masks. Touch nursing was performed with a formal standard touch action. Gentle finger pressure was applied to the head, neck and back, and the infant's limbs were mildly squeezed. A small amount of lubricant was applied to reduce the friction between the hands and the skin of the infant. Each touch therapy lasted half an hour, twice a day. The puerpera was advised on feeding frequency i.e. feeding the infant every 2 hours, and how breast milk may be replaced by a small amount of formula in case of shortage of the former [9].

Infants in the acupoint massage group was treated with the Xiehuangtang decoction acupoint massage nursing on the basis of routine treatment. When the infant was quiet and relaxed, a small amount of Xiehuangtang decoction was applied to multiple acupoints, such as the Zhiyang, Danshu, Carpal and Yongquan points. Each point was rubbed for about 2 minutes and massaged twice daily [10]. The ingredients of Xiehuangtang decoction included 15 g gypsum, 15 g mountain gardenia, 15 g Agastache rugosus, 10 g Saposhnikovia divaricata, 10 g lithospermum, 20 g radix rehmanniae recen, and 3 g Rheum officinale Baill for water frying.

## Causes of breast-feeding jaundice and clinical efficacy of nursing intervention

**Table 2.** Lactation, defecation and fecal bilirubin content in infants with feeding jaundice and physiological jaundice ( $\bar{x} \pm sd$ )

Index	Control group (n=100)	Observation group (n=104)	t	P
Early breastfeeding initiation (h)	13.34±1.54	13.59±1.86	1.043	0.297
Frequencies of defecation in the first 3 days (n)	5.94±0.76	3.79±0.38	25.704	0.001
Frequencies of breast-feeding in the first 3 days (n)	3.52±0.37	2.24±0.26	6.732	0.028
The first defecation (h)	8.02±0.86	13.63±1.76	8.634	0.023
The first occurrence of jaundice (h)	52.41±5.76	66.72±6.97	2.886	0.038
The total fecal bilirubin content within 2 days after birth (mg/g)	23.25±2.65	9.38±0.98	17.432	0.017

**Table 3.** Analysis of risk factors for feeding jaundice

Factors	P	OR	95% CI
Age (year)	0.432	0.976	(0.286, 1.243)
Infant gender	0.076	0.939	(0.321, 1.543)
Breast-feeding frequency	0.002	1.321	(0.439, 1.976)
Gestational age	0.086	1.021	(0.286, 1.864)
Cesarean section	0.079	1.127	(0.432, 2.432)

### Observation indices and evaluation of curative effect

Primary observation indices: Bilirubin content: percutaneous jaundice tester (China Jinan Biobase Biotech Co., Ltd., JH20-1) was used to determine the bilirubin content in the body. The forehead of the infant was directly aligned to the instrument probe, and the probe was fitted to the skin that 1 cm above the eyebrow to detect bilirubin in the body. Bilirubin was detected thrice each time, and the average value was calculated. Infant stool was collected, dried and stored in the refrigerator for about 24 hours, and total fecal bilirubin content was detected by a chemical method [11].

Lactation related indicators: Early breastfeeding initiation, the defecation and lactation frequencies of the 3 days after birth, time of first postnatal defecation, time of occurrence of the first jaundice after birth and total fecal bilirubin content within 2 days after birth were measured and recorded.

Secondary observation indices: Evaluation of clinical efficacy: The treatment was deemed markedly effective if the yellow stain of the skin disappeared and the serum bilirubin level was less than 136.8  $\mu\text{M}$ . If skin yellowing showed improvement and the blood bilirubin content dropped to 136.8-188.1  $\mu\text{M}$ , the treatment was effective. If the yellow-stained skin persisted or worsened and the serum bilirubin levels

were higher than 205.2  $\mu\text{M}$ , the treatment was ineffective [12]. Effective rate = Number of case (markedly effective + effective)/total number of case \* 100%.

In addition, the times to bilirubin dropping below 102.6  $\mu\text{M}$  were recorded for both acupoint massage group and routine group.

### Statistical analysis

SPSS19.0 software was used to statistically analyze the collected data. The measurement data were represented as mean  $\pm$  standard deviation ( $\bar{x} \pm sd$ ). The measurement data following normal distribution were analyzed by t test and represented by t. The counting data was expressed using rate (%) and analyzed by  $\chi^2$  test and Fisher exact probability method, represented by  $\chi^2$ .  $P < 0.05$  is considered statistically significant.

### Results

#### General clinical data

No significant differences were seen in the maternal age, gestational age, birth weight, cesarean section, infant sex and oxytocin use between the control and observation groups (all  $P > 0.05$ ). See **Table 1**.

#### Lactation, defecation and fecal bilirubin content in infants with feeding jaundice and physiological jaundice

There was no difference in the early breastfeeding initiation between the observation and control groups ( $t=1.043$ ,  $P=0.297$ ). The frequencies of defecation and breast-feeding in the observation group was significantly less than the control group in the first 3 days ( $t=25.704$ ,  $P=0.001$ ;  $t=6.732$ ,  $P=0.028$ ). The

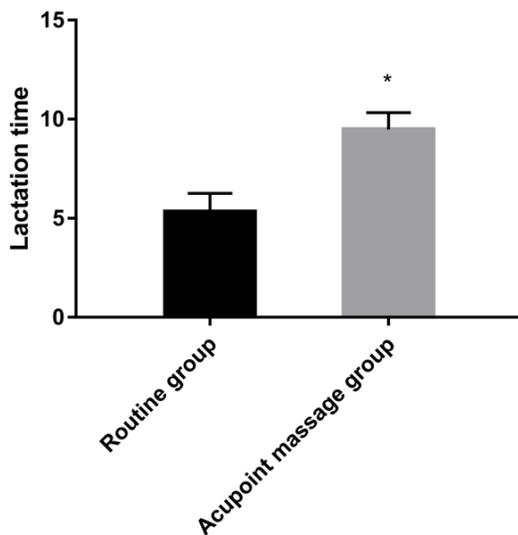
## Causes of breast-feeding jaundice and clinical efficacy of nursing intervention

**Table 4.** Clinical efficacy of routine group and acupoint massage group

Group	Acupoint massage group (n=54)	Routine group (n=50)	$\chi^2$	P
Effective rate (n, %)	45 (83.3)	26 (52.0)	11.776	0.009

**Table 5.** Post-treatment decreases in bilirubin in the routine and acupoint massage groups ( $\bar{x} \pm sd$ )

Group	Acupoint massage group (n=54)	Routine group (n=50)	t	P
Pre-treatment ( $\mu\text{M}$ )	272.34 $\pm$ 27.43	275.92 $\pm$ 28.64	0.642	0.522
Time (<102.6 $\mu\text{M}$ ) (d)	5.43 $\pm$ 0.54	7.92 $\pm$ 0.69	20.823	<0.001



**Figure 1.** Comparison of lactation times of the routine and acupoint massage groups. Compared with routine group, \* $P < 0.05$ .

time of the first defecation was significantly longer in the observation group compared to the control groups (13.63 $\pm$ 1.76 h vs. 8.02 $\pm$ 0.86 h;  $t = 8.634$ ,  $P = 0.023$ ). The time to the first occurrence of jaundice in the observation group was longer than the control group, and the total fecal bilirubin content within 2 days after birth was also significantly lower in the former compared with the control group ( $t = 2.886$ ,  $P = 0.038$ ;  $t = 17.432$ ,  $P = 0.017$ ). See **Table 2**.

### Analysis of risk factors for feeding jaundice

Logistic regression analysis revealed that age, infant gender, gestational age and cesarean section were not risk factors for feeding jaundice. Breast-feeding frequency was the main in-

fluencing factor ( $P = 0.002$ ,  $OR = 1.321$ ) See **Table 3**.

### Comparison of clinical efficacy of routine group and acupoint massage group

The effective rate in the acupoint massage group was significantly higher than that in the routine group (83.3% vs. 52.0%;  $\chi^2 = 11.776$ ,  $P = 0.009$ ). See **Table 4**.

### Post-treatment decrease in bilirubin in the routine and acupoint massage groups

No significant difference was seen in the pre-treatment bilirubin levels between the two groups ( $P > 0.05$ ). The time required to reduce bilirubin below 102.6  $\mu\text{M}$  was significantly shorter in the acupoint massage group compared with the routine group (5.43 $\pm$ 0.54 days vs. 7.92 $\pm$ 0.69 days;  $t = 20.823$ ,  $P < 0.001$ ). See **Table 5**.

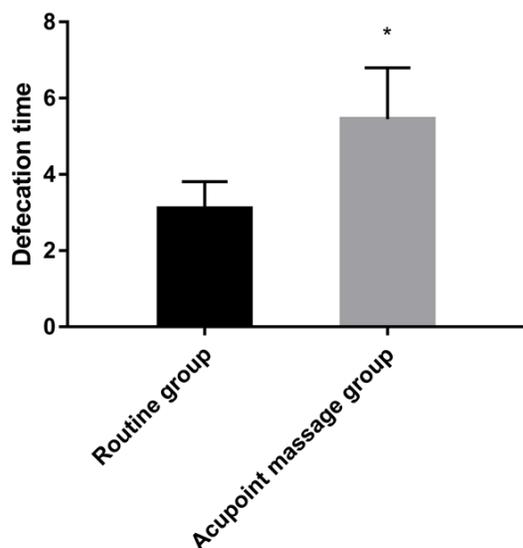
### Lactation and defecation times of the routine and acupoint massage groups

The frequencies of lactation and defecation in the acupoint massage group were both significantly higher than those in the routine group ( $t = 12.432$ ,  $P = 0.021$ ;  $t = 10.432$ ,  $P = 0.042$ ). The acupoint massage group were breast-fed on an average of 9.23 $\pm$ 0.87 times and defecated 5.72 $\pm$ 0.52 times. The routine group had an average of 5.43 $\pm$ 0.49 lactation times and 3.05 $\pm$ 0.39 times of defecation. See **Figures 1 and 2**.

### Discussion

With the recent increase in breast feeding among puerpura, the incidence of feeding related jaundice is also increasing. If the disease is not diagnosed and treated in time, it can proceed to bilirubin encephalopathy which greatly affect the life safety of infant [13, 14]. The treatment and prevention of the disease have recently attracted attention in clinic. However, due to the weak immunity of infants and their strong sensitivity to drugs, nursing interventions have been used more frequently [15]. In this study, we investigated the risk factors of

## Causes of breast-feeding jaundice and clinical efficacy of nursing intervention



**Figure 2.** Comparison of defecation times of the routine and acupoint massage groups. Compared with routine group, \* $P < 0.05$ .

feeding jaundice and the therapeutic effects of acupoint massage.

The frequencies of lactation and defecation in the observation group were significantly less than that in the control group, and the time of first defecation in the observation group was longer compared with control group. Bilirubin is absorbed by the liver and forms conjugated bilirubin, which is not absorbed by the intestinal mucosa and instead excreted. Increased feeding frequency increases intestinal peristalsis, leading to shorter periods of retention of the intestinal contents and faster excretion of conjugated bilirubin. However, less frequent lactation slows intestinal peristalsis, and the conjugated bilirubin stays in the intestine for a long time and is subsequently absorbed leading to a significant increase in the serum bilirubin content. In addition, less breast-feeding and decreased peristalsis also prolongs the time of first defecation [16, 17]. Therefore, lower lactation frequency is hypothesized to be one of the causes of feeding jaundice [18]. We analyzed the possible risk factors of feeding jaundice by logistic regression, and found that the age, sex and other characteristics of the mothers were not associated with the condition while the frequency of breast-feeding was the main risk factor. Therefore, increasing the frequency of lactation can significantly reduce the incidence of the disease. However, since it is important to maintain suitable levels of

serum bilirubin in the infants, suckling times should be increased only on demand and not indiscriminately.

We treated feeding jaundice by either routine nursing or acupoint massage and found that the latter had a higher effective rate indicating higher clinical intervention value. According to Traditional Chinese Medicine, certain acupoints on the surface of the body are closely related to the visceral tissues, and their function can be properly regulated by massaging those specific acupoints. In this study, we massaged the Zhiyang, Danshu, Carpal and Yongquan acupoints, which are critical for the treatment of gallbladder syndrome. Massaging these acupoints can clear heat from the gallbladder, and help in dredging and guiding, and un-obstructing excretion. In addition, the massage was done with Xiehuangtang decoction, which also has the effect of clearing heat and dampness and dredging blood vessels. The aim of the point massage was mainly to stimulate the secretion of gastrointestinal hormones, enhance food absorption, promote gastrointestinal peristalsis, and increase defecation times, thus reducing the retention time of bilirubin in the intestine and lowering the serum bilirubin levels [19, 20]. The limitation of this study was that the correlation between lactation frequency and acupoint massage was not studied in depth.

In conclusion, lactation frequency is the main influencing factor of feeding jaundice, and suckling times should be increased to reduce the occurrence of the disease. Xiehuangtang acupoint massage has a good therapeutic effect on infants with feeding jaundice and is worthy of further investigation and clinical application.

### Disclosure of conflict of interest

None.

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