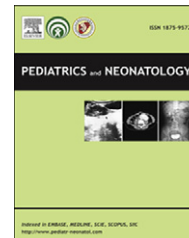




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ORIGINAL ARTICLE

Influence of Breast-feeding on Weight Loss, Jaundice, and Waste Elimination in Neonates

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Key Words

breast-feeding;
jaundice;
stool;
urination;
weight loss

Background: The Baby-Friendly Hospital Initiative began promoting exclusive breast-feeding in 2001 in Taiwan; however, few studies have investigated its impact. This study evaluated the influence of breast-feeding on Taiwanese neonates with regard to the frequency of jaundice, body weight loss (BWL), and elimination of both urine and stool.

Methods: The medical records of 313 healthy mother-neonate pairs admitted at our hospital were reviewed retrospectively and divided into three groups: exclusively breast-feeding ($n = 161$), mixed (breast/formula) feeding ($n = 80$), and exclusively formula feeding ($n = 72$). **Results:** Compared with the exclusively formula feeding group, in the exclusively breast-fed neonates, the average total serum bilirubin level at 3 days after birth ($p < 0.001$) and the rate of significant hyperbilirubinemia ≥ 15 mg/dL ($p < 0.05$) were significantly higher; the average BWLs at 2 and 3 days after birth ($p < 0.001$, $p < 0.001$) and the rate of BWL $\geq 10\%$ ($p < 0.05$) were significantly higher; the average frequency of stool passage at 2 and 3 days after birth ($p < 0.001$, $p < 0.001$) and urination at 1, 2, and 3 days after birth ($p < 0.001$, $p < 0.001$, $p < 0.001$) were significantly less. The factors associated with a mother's choice of infant feeding type include maternal age and delivery method.

Conclusion: Breast-feeding during the initial days of life has a significant influence on the degree of jaundice, amount of BWL, and the frequency of stool passage and urination.

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1. Introduction

To improve the nutritional status, growth, and overall health of children, the World Health Organization and the United Nations Children's Fund promote a global strategy for infant and young child feeding, which include the Baby-Friendly Hospital Initiative and 10 steps for successful breast-feeding. The optimal breast-feeding for infants is early and exclusive during the first 6 months of life and continues for 2 years or longer.^{1,2} In Taiwan, the Department of Health began promoting a breast-feeding project in 1992. They have supported exclusive breast-feeding and the Baby-Friendly Hospital Initiative since 2001. A nationwide follow-up survey revealed that the prevalences of exclusive and partial breast-feeding at 1 month after delivery in Taiwan increased from 5.8% and 25% in 1989 to 5% and 35.9% in 1996 and to 22.3% and 48.4% in 2004, respectively.^{3–5}

Despite the many advantages of breast-feeding, previous medical reports revealed that dehydration, poor body weight gain, and hyperbilirubinemia in breast-fed infants are more common. These problems were often preventable and generally did not result in long-term harm to the infants; however, in recent years, serious consequences, such as hypernatremic dehydration and kernicterus have been reported in exclusively breast-fed infants.^{6–8} The causes may be attributed to inappropriate breast-feeding and to early discharge practices.^{6,7,9} Currently, almost all hospitals in Taiwan promote exclusive breast-feeding, yet few studies have investigated the influence of this practice on Taiwanese neonates.

Since 2001, our hospital has been promoting the Baby-Friendly Hospital Initiative, which includes breast-feeding classes, 24-hour rooming-in, and exclusive breast-feeding. In our experience, many mothers have concerns about breast-feeding, including breast-milk insufficiency, decreased infant urination, poor body weight gain, and jaundice. This study evaluated the influence of breast-feeding in the first week of life on Taiwanese neonates with respect to jaundice development, body weight loss (BWL), and the frequency of stool passage and urination. The secondary goal was to identify any factor(s) associated with a mother's choice of infant feeding type.

2. Methods

2.1 Study design

The medical records of healthy neonates in the initial days of life at the Buddhist Tzu Chi Dalin General Hospital from July to December of 2008 were reviewed retrospectively. Apgar score, birth body weight, gender, feeding type, BWL, total serum bilirubin (TSB) level, and the frequency of stool passage and urination were recorded. TSB level was determined by the microbilirubin method. Furthermore, the medical records of the women who gave birth to these healthy neonates were reviewed. The method of delivery (normal spontaneous delivery [NSD] or caesarean section [CS]), parity (primiparous or multiparous), maternal age, and presence of maternal disease(s) were recorded.

Our study population was divided into three groups: exclusively breast-feeding, mixed feeding (partial breast-feeding), and exclusively formula feeding. Exclusive breast-feeding was defined as feeding only breast milk. Mixed feeding (partial breast-feeding) was defined as feeding with breast milk and formula. Neonates with any indication of disease, such as hemolysis, tachypnea, infection, or heart murmur, as well as mothers with obstetric complications were excluded from the study.

After promoting exclusive breast-feeding, we identified very few cases of exclusive formula feeding. To enroll more cases into this group, we included the mother-neonate pairs choosing exclusive formula feeding during the initial period of promoting breast-feeding from January to December of 2001.

The study was performed with approval of the hospital's institutional review board and conducted in accordance with the guiding principles of the Declaration of Helsinki.

2.2 Statistical analysis

The *t* test, one-way Analysis of variance test with Scheffé's method, Kruskal-Wallis test, Mann-Whitney U test, and χ^2 test with posteriori comparison (simultaneous confidence intervals), and product-moment correlation were used for statistical analysis of the data. A *p* value less than 0.05 was considered statistically significant. All statistical analyses were performed using commercially available computer software programs (SPSS for Windows, version 17.0; SPSS Inc., Chicago, IL, USA).

3. Results

Three hundred thirteen healthy mother-neonate pairs were enrolled and divided into three groups: exclusively breast-feeding ($n = 161$), mixed (breast/formula) feeding ($n = 80$), and exclusively formula feeding ($n = 72$). The characteristics of the study subjects are listed in Table 1. There were significant differences among all three groups in the following variables: maternal age, delivery method, and Apgar score.

All neonates were routinely checked for TSB level at least once during hospitalization, most at 3–4 days after birth and received follow-up if jaundice was suspected. The peak TSB level of the exclusively breast-feeding group occurred 3–5 days after birth and was comparable with those of both the mixed feeding and exclusively formula feeding groups. The average TSB levels at 3 days (48–72 hours) and 4 days (72–96 hours) after birth were 11.4 ± 3.1 mg/dL ($n = 146$) and 13.2 ± 3.0 mg/dL ($n = 30$) in the exclusively breast-fed group; 10.0 ± 2.6 mg/dL ($n = 67$) and 10.8 ± 2.4 mg/dL ($n = 24$) in the mixed feeding group; and 8.7 ± 2.3 mg/dL ($n = 52$) and 9.8 ± 3.2 mg/dL ($n = 22$) in the formula-fed group, which were significantly different among these three groups ($F = 19.356$, $p < 0.001$; $F = 9.825$, $p < 0.001$) (figure not shown). Visible jaundice (TSB level ≥ 8 mg/dL) and hyperbilirubinemia (TSB level ≥ 15 mg/dL) occurred in 93.1% and 22.0% of the exclusively breast-fed infants, respectively. The rates dropped to 88.5% and 9.0% in the mixed feeding group and further declined to only 66.2% and 4.4% in the

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