MEDISAINS
Jurnal Ilmiah Ilmu - Ilmu Kesehatan

Original Article

Early initiation of breastfeeding and immediate skin-to-skin contact are associated with lower hyperbilirubinemia risk in newborns from multifetal pregnancies

Miftahul Khairoh [1]✉, *Cityta Putri Kwarta* [2]

[1] *Midwifery, Faculty of Health Sciences, Dr. Soetomo University, Surabaya, East Java, Indonesia*
[2] *Blood Bank Technology, Faculty of Health Sciences, Dr. Soetomo University, Surabaya, East Java, Indonesia*

ARTICLE INFORMATION

Received: November 18,2025
Revised: January 07, 2026
Accepted: January 26, 2026

KEYWORDS

Breast Feeding; Infant, Newborn; Pregnancy; Hyperbilirubinemia, Neonatal; Infant, Low Birth Weight

CORRESPONDENCE

Phone: +6281271717349

E-mail: miftahul.khairoh@unitomo.ac.id

A B S T R A C T

Background: Neonatal hyperbilirubinemia is a common condition and a major contributor to neonatal morbidity, particularly among infants from multifetal pregnancies who are at increased risk due to prematurity and low birth weight. Early initiation of breastfeeding, supported by immediate skin-to-skin contact, may improve neonatal adaptation; however, evidence in multifetal populations within primary healthcare settings remains limited.

Purpose: This study aimed to examine the association between early initiation of breastfeeding, supported by skin-to-skin contact, and the incidence of pathological hyperbilirubinemia among newborns from multifetal pregnancies.

Methods: An analytic observational study with a cross-sectional design was conducted among 90 newborns from multifetal pregnancies at the Pasean Community Health Center, Pamekasan, between January and September 2025. Early breastfeeding initiation was assessed through direct observation, and total serum bilirubin levels were measured within the first 72 hours using spectrophotometry. Data were analyzed using the Chi-square test and multivariate logistic regression to estimate adjusted odds ratios (ORs) with 95% confidence intervals (CIs).

Results: Early breastfeeding initiation was implemented in 58.9% of newborns, and pathological hyperbilirubinemia occurred in 31.1%. A significant association was observed between early breastfeeding initiation and hyperbilirubinemia ($p = 0.003$). Newborns who did not receive early breastfeeding initiation had higher odds of developing hyperbilirubinemia compared with those who received it (adjusted OR 6.52; 95% CI: 1.98–21.47), after adjusting for birth weight, gestational age, and mode of delivery.

Conclusion: Early initiation of breastfeeding is associated with a reduced risk of pathological hyperbilirubinemia in newborns from multifetal pregnancies. Strengthening its implementation may provide a simple and effective strategy to improve neonatal outcomes, particularly in primary healthcare settings.

INTRODUCTION

Neonatal hyperbilirubinemia is a common clinical condition and remains a significant contributor to neonatal morbidity worldwide. Excessive bilirubin accumulation can lead to severe neurological complications, including kernicterus, if not promptly managed.[1] The risk is particularly elevated among infants from multifetal pregnancies, such as twins, due to higher rates of prematurity, low birth weight, and delayed physiological adaptation during the early postnatal period.[2]

Beyond biological vulnerability, early postnatal care practices play a crucial role in bilirubin metabolism. Early initiation of breastfeeding is recognized as an important non-pharmacological intervention to reduce the risk of hyperbilirubinemia.[3] Colostrum exerts a natural laxative effect that accelerates meconium excretion, the primary pathway for bilirubin elimination, while increased intestinal motility helps reduce enterohepatic circulation.[4]

This early feeding process is commonly facilitated through immediate skin-to-skin contact between mother and newborn. In addition to promoting maternal–infant bonding, this practice stabilizes neonatal physiological parameters,

https://doi.org/10.30595/medisains.v24i1.28781

including body temperature, respiration, and glucose levels, and supports breastfeeding within the first hour of life.[5] The associated oxytocin release enhances colostrum production and feeding frequency, which may further promote bilirubin clearance.[6]

However, implementing early breastfeeding initiation in multifetal births remains challenging. These deliveries are frequently associated with cesarean section, increased need for neonatal monitoring, and early mother–infant separation, all of which may delay breastfeeding initiation.[7] Such challenges are further amplified in primary healthcare settings, where limited resources and high workloads may restrict optimal postnatal care practices.[8]

Despite the well-established benefits of early breastfeeding, its protective role against hyperbilirubinemia in multifetal newborns remains insufficiently explored. Most previous studies have focused on singleton infants and were conducted in tertiary hospital settings, leaving limited evidence regarding its effectiveness in high-risk multifetal populations within primary care contexts. Local data from the Pasean Community Health Center indicate that 35% of multifetal newborns experienced neonatal jaundice, while approximately 70% did not receive optimal early breastfeeding, underscoring the gap between recommended and actual practices.

This study offers novelty by examining the combined physiological and behavioral effects of early initiation of breastfeeding and immediate skin-to-skin contact as protective factors against pathological hyperbilirubinemia in multifetal newborns within a community-based healthcare setting. Therefore, this study aims to evaluate and quantify the protective effect of early breastfeeding initiation on the incidence of pathological hyperbilirubinemia among newborns from multifetal pregnancies in the Pasean Community Health Center, Pamekasan.

METHOD

Study Design

This study employed an analytic observational design with a cross-sectional approach to examine the association between early initiation of breastfeeding and pathological hyperbilirubinemia in newborns from multifetal pregnancies.[9]

Setting and Participants

The study was conducted from January to September 2025 in the Pasean Community Health Center, including delivery rooms, maternity wards, and postnatal observation units. The study population consisted of newborns from multifetal pregnancies and their mothers receiving care at the facility.

Newborns were eligible if they were delivered at the study site, assessed within the first 72 hours of life, and had maternal consent. Exclusion criteria included congenital anomalies, referral before bilirubin assessment, or incomplete data. A consecutive sampling technique was applied, including all eligible subjects during the study period, resulting in a total of 90 newborns. Sample size was determined based on the rule of at least 10 outcome events per predictor variable in logistic regression analysis to ensure model stability.

Variable, Instrument, and Measurement

The primary exposure was early initiation of breastfeeding, defined as immediate skin-to-skin contact followed by breastfeeding within the first hour after birth. Exposure status was assessed through direct observation by trained healthcare personnel and verified through maternal report, and categorized as performed or not performed. The outcome variable was pathological hyperbilirubinemia, defined as total serum bilirubin ≥12 mg/dL measured within the first 72 hours using spectrophotometry. Potential confounders included gestational age, birth weight, infant sex, mode of delivery, and maternal parity, obtained from medical records.

Data Analysis

Data were analyzed using JASP statistical software (please verify version). Descriptive statistics summarized maternal and neonatal characteristics. Associations between early breastfeeding initiation and hyperbilirubinemia were analyzed using the Chi-square test. Variables with clinical relevance and/or p-value < 0.25 were included in multivariate logistic regression to estimate adjusted odds ratios. Model adequacy was evaluated using goodness-of-fit testing, and multicollinearity was assessed before final interpretation. Results were presented as odds ratios (ORs) with 95% confidence intervals (CIs), with statistical significance set at $p < 0.05$.

Ethical Considerations

Ethical approval was obtained from the Ethics Committee of the Institute of Health Sciences Bhakti Wiyata Kediri (No. 09/FKes/TK/IX/2025). Written informed consent was obtained from all participants prior to data collection.

RESULTS

Characteristics of Mothers and Newborns

A total of 90 newborns from multifetal pregnancies were included, of whom 28 (31.1%) developed hyperbilirubinemia. Most mothers were aged 20–35 years (66.7%) and multiparous (55.6%). Cesarean section was the predominant mode of delivery (57.8%). Regarding neonatal characteristics, most newborns were delivered at term (38–40 weeks) (60.0%) and had a birth weight ≥2500 g (71.1%). Infant sex distribution was balanced (male 48.9%, female 51.1%). Early breastfeeding initiation was implemented in 58.9% of cases. Detailed characteristics are presented in Table 1.

Association Between Early Breastfeeding Initiation and Hyperbilirubinemia

A significant association was observed between early breastfeeding initiation and hyperbilirubinemia ($p = 0.003$).

The proportion of hyperbilirubinemia was higher among newborns who did not receive early breastfeeding initiation (51.4%) compared with those who received it (17.0%) (Table 2).

Table 1. Characteristics of Mothers and Newborns from Multifetal Pregnancies

Characteristics	n (%)
Maternal age (years)	
<20	12 (13.3%)
20–35	60 (66.7%)
>35	18 (20.0%)
Maternal parity	
Primiparous	40 (44.4%)
Multiparous	50 (55.6%)
Mode of delivery	
Vaginal delivery	38 (42.2%)
Cesarean section	52 (57.8%)
Gestational age (weeks)	
36–37	28 (31.1%)
38–40	54 (60.0%)
>40	8 (8.9%)
Birth weight (g)	
<2500	26 (28.9%)
≥2500	64 (71.1%)
Infant sex	
Male	44 (48.9%)
Female	46 (51.1%)
Early breastfeeding initiation	
Yes	53 (58.9%)
No	37 (41.1%)
Hyperbilirubinemia	
Yes	28 (31.1%)
No	62 (68.9%)

Table 2. Association between early breastfeeding initiation and hyperbilirubinemia

EBI implementation	Hyperbilirubinemia		Total	*p-value*
	Yes	No		
Implemented	9 (17.0%)	44 (83.0%)	53 (100%)	
Not implemented	19 (51.4%)	18 (48.6%)	37 (100%)	0.003
Total	28 (31.1%)	62 (68.9%)	90 (100%)	

Multivariate Analysis of Factors Associated with Hyperbilirubinemia

Multivariate logistic regression analysis was performed to identify independent predictors of hyperbilirubinemia. After adjustment for birth weight, gestational age, and mode of delivery, early breastfeeding initiation remained significantly associated with hyperbilirubinemia. Newborns without early breastfeeding initiation had 6.52 times higher odds of developing hyperbilirubinemia compared with those who received it (adjusted OR 6.52; 95% CI: 1.98–21.47; p = 0.002).

Low birth weight (<2500 g) showed a borderline association (adjusted OR 2.84; 95% CI: 0.99–8.16; p = 0.050), whereas gestational age and mode of delivery were not significantly associated with the outcome. Parity and infant sex were excluded from the final model due to lack of statistical significance and minimal contribution to model fit. Model diagnostics indicated adequate fit, with no evidence of multicollinearity among predictors (Table 3).

DISCUSSION

This study demonstrates that early initiation of breastfeeding is significantly associated with a reduced risk of pathological hyperbilirubinemia among newborns from multifetal pregnancies, a population inherently vulnerable to impaired metabolic adaptation. Neonates who did not receive early breastfeeding initiation had substantially higher odds of developing hyperbilirubinemia, even after adjusting for key perinatal factors. These findings highlight the critical role of early postnatal feeding practices in maintaining bilirubin homeostasis during the first days of life.

The present results are consistent with previous studies showing that early breastfeeding enhances bilirubin clearance through improved neonatal adaptation.[6,12] However, most prior research has focused on singleton populations in hospital settings. By examining multifetal newborns within a primary healthcare context, this study extends existing evidence and underscores the relevance of early breastfeeding practices in high-risk and resource-limited environments.

From a physiological perspective, the protective effect of early breastfeeding can be explained by enhanced gastrointestinal activity and reduced enterohepatic circulation.[8] Colostrum promotes early meconium passage, facilitating bilirubin elimination and limiting its reabsorption.[13-15] In addition, early feeding stimulates intestinal motility and supports efficient bilirubin excretion.[10]

Beyond gastrointestinal mechanisms, early breastfeeding is closely linked to immediate skin-to-skin contact, which contributes to neonatal physiological stability.[16,17] This practice supports thermoregulation, cardiorespiratory function, and glucose homeostasis—key factors in metabolic regulation.[18,19] Disruption of these processes may increase metabolic stress and impair hepatic bilirubin conjugation.[4,19,24] By promoting physiological stability and effective lactation through oxytocin release, early breastfeeding may indirectly enhance hepatic bilirubin metabolism.[16,20,21]

Despite these benefits, implementing early breastfeeding in multifetal births remains challenging. High rates of cesarean delivery and the need for neonatal monitoring often delay mother–infant contact.[2,22] In primary healthcare settings, limited resources and high workloads may further constrain optimal postnatal practices.[8,23] These findings highlight the need to strengthen early breastfeeding protocols as a standard component of neonatal care, even in high-risk deliveries.

Table 3. Multivariate logistic regression analysis of factors associated with hyperbilirubinemia

Variables	B	SE	Wald	*p-value*	Adjusted OR	95% CI
EBI not implemented	1.876	0.601	9.723	0.002	6.52	1.98–21.47
Birth weight <2500 g	1.042	0.533	3.826	0.050	2.84	0.99–8.16
Gestational age <38 weeks	0.812	0.564	2.071	0.150	2.25	0.75–6.74
Cesarean section	0.689	0.598	1.326	0.250	1.99	0.62–6.38
Constant	−2.314	0.733	9.987	0.002	–	–

Note: OR = odds ratio; CI = confidence interval.

From a clinical and public health perspective, early breastfeeding is a low-cost, non-invasive intervention that can be readily implemented at the primary care level. Strengthening its implementation may help reduce the burden of neonatal hyperbilirubinemia and prevent avoidable complications, particularly in resource-limited settings, in alignment with global recommendations on maternal and newborn care.[25]

Several limitations should be acknowledged. The cross-sectional design limits causal inference, and simultaneous measurement of exposure and outcome may introduce temporal ambiguity. Bilirubin measurements were limited to the first 72 hours of life, potentially missing peak levels in some neonates. In addition, reliance on observational assessment and maternal reporting may introduce measurement bias. Other relevant factors, such as maternal nutritional status, neonatal albumin levels, and gut microbiota composition, were not evaluated.

Future studies should employ prospective cohort designs with serial bilirubin measurements to better characterize temporal patterns and strengthen causal inference. Incorporating broader biological and contextual variables would further enhance understanding and support the development of evidence-based postnatal care strategies in primary healthcare settings.

CONCLUSIONS AND RECOMMENDATION

Early initiation of breastfeeding is significantly associated with a reduced risk of pathological hyperbilirubinemia among newborns from multifetal pregnancies. Newborns who do not receive early breastfeeding initiation have substantially higher odds of developing hyperbilirubinemia, highlighting its protective role in early neonatal adaptation. These findings support integrating early breastfeeding practices as a key component of postnatal care, particularly in high-risk multifetal deliveries and primary healthcare settings. Future prospective studies are needed to strengthen causal inference and optimize implementation strategies.

REFERENCES

1. Hansen TWR. The epidemiology of neonatal jaundice. *Pediatr Med.* 2021;4. https://doi.org/10.21037/pm-21-4
2. Lin Q, Zhu D, Chen C, Feng Y, Shen F, Wu Z. Risk factors for neonatal hyperbilirubinemia: a systematic review and meta-analysis. *Transl Pediatr.* 2022;11(6):1001-1009. https://doi.org/10.21037/tp-22-229
3. Su H, Yang S, Chen S, et al. Gut microbiota in neonatal jaundice formation. *Int J Mol Sci.* 2024;25(16). https://doi.org/10.3390/ijms25168582
4. Zhang Y, Li X, Zhang Z, Wu H. Maternal glycemic profiles and neonatal jaundice risk. *Transl Pediatr.* 2024;13(11):2012-2025. https://doi.org/10.21037/tp-24-356
5. Kementerian Kesehatan Republik Indonesia. *Peraturan Menteri Kesehatan Republik Indonesia.* 2015.
6. Awad KJ. Neonatal jaundice and breastfeeding: a narrative review. *Indones J Health Sci Med.* 2024;1(1). https://doi.org/10.21070/ijhsm.v1i1.66
7. Bauer SH, Abele H, Graf J. Breastfeeding challenges in healthy and preterm infants. *Healthcare (Basel).* 2024;12(23). https://doi.org/10.3390/healthcare12232418
8. Mituki-Mungiria D, Tuitoek P, Varpolatai A, et al. Community health workers and breastfeeding outcomes. *Food Sci Nutr.* 2020;8(6):2719-2727. https://doi.org/10.1002/fsn3.1559
9. Rani U, Singh M, Kashyotia SS. Breastfeeding and immune system development. *J Commun Dis.* 2022;54(2):107-109. https://doi.org/10.24321/0019.5138.202280
10. Firdaus F, Hasina SN, Windarti Y, Wulandari DD. Breast milk management and bilirubin reduction. *Open Access Maced J Med Sci.* 2021;9(G):300-305. https://doi.org/10.3889/oamjms.2021.7776
11. Utami Ekasari W, Nany Wigati D, Sapta Wati D. Early initiation of breastfeeding and neonatal jaundice. *J Profesi Bidan Indones.* 2022;2.
12. Septiana E, et al. Exclusive breastfeeding and neonatal jaundice. *J Kebidanan Malahayati.* 2025;11(1):69-77. https://doi.org/10.33024
13. Akhter H, Aziz F, Ullah FR, et al. Immunoglobulin content in breast milk. *J Mother Child.* 2021;24(3):8-15. https://doi.org/10.34763/jmotherandchild.20202403.2032.d-20-00001
14. Davis EC, Castagna VP, Sela DA, et al. Gut microbiome and breastfeeding. *J Allergy Clin Immunol.* 2022;150(3):523-534. https://doi.org/10.1016/j.jaci.2022.07.014
15. Kipp ZA, Pauss SN, Martinez GJ, Hinds TD, Lee WH. Bilirubin metabolism and transport. *Antioxidants.* 2025;14(11). https://doi.org/10.3390/antiox14111326
16. Widström AM, Brimdyr K, Svensson K, et al. Skin-to-skin contact after birth. *Acta Paediatr.* 2019;108(7):1192-1204. https://doi.org/10.1111/apa.14754
17. Faizah AU, Fatkuriyah L, Sukowati U. Breastfeeding frequency and neonatal jaundice. *J Nurs Periodic.*

2021;2:60-68. http://journal.uds.ac.id/index.php/JNP.
18. Pan S, Worker CJ, Earley YF. Hypothalamus and glucose homeostasis. *Am J Physiol Cell Physiol.* 2023;325(1):C141-C154. https://doi.org/10.1152/ajpcell.00533.2022
19. Lee ML, Chang CP, Toda C, et al. Body temperature and glucose metabolism. *Nat Commun.* 2025;16(1). https://doi.org/10.1038/s41467-025-61499-2
20. Kociszewska-Najman B, Sibanda E, Radomska-Leśniewska DM, et al. TGF-β2 in colostrum and delivery mode. *Nutrients.* 2020;12(4). https://doi.org/10.3390/nu12041095
21. Mazur NI, Horsley NM, Englund JA, et al. Breast milk IgG and RSV protection. *J Infect Dis.* 2019;219(1):59-67. https://doi.org/10.1093/infdis/jiy477
22. Jonsdottir RB, Flacking R, Jonsdottir H. Breastfeeding in late preterm twins. *Int Breastfeed J.* 2022;17(1). https://doi.org/10.1186/s13006-022-00507-3
23. Nainggolan L, Wahyuni TS, Rahayu TP, Ngestiningrum AH. Prevention of neonatal jaundice. *J Promkes.* 2025;13(1):18-26. https://doi.org/10.20473/jpk.v13.i1.2025.18-26
24. Countouris M, Mahmoud Z, Cohen JB, et al. Hypertension in pregnancy and postpartum. *Circulation.* 2025;151(7):490-507. https://doi.org/10.1161/CIRCULATIONAHA.124.073302
25. World Health Organization. *WHO Recommendations on Maternal and Newborn Care for a Positive Postnatal Experience.* WHO; 2022.