YOBU Sağlık Bilimleri Fakültesi Dergisi
Yıl:2023 Cilt:4 Sayı:3: 212-224

YOBU Faculty of Health Sciences Journal
Year:2023 Volume:4 Issue:3: 212-224

ISSN:2718-0972

Araştırma Makalesi/Research Article

THE RELATIONSHIP BETWEEN NUTRITION STYLE AND LENGTH OF HOSPITAL STAY IN INFANTS ADMITTED TO A NEONATAL INTENSIVE CARE UNIT WITH HYPERBILIRUBINEMIA

HİPERBİLİRUBİNEMİ TANISI İLE YENİDOĞAN YOĞUN BAKIM ÜNİTESİNDE YATAN BEBEKLERİN BESLENME ŞEKİLLERİ İLE HASTANEDE KALIŞ SÜRELERİ ARASINDAKİ İLİŞKİ

Aslı AKKUZU[1], Aysel KÖKCÜ DOĞAN[2]

[1] Istanbul Medipol University, Faculty of Health Sciences, Nursing Department, Istanbul, Turkey, MSc
[2] Istanbul Medipol University, Faculty of Health Sciences, Nursing Department, Istanbul, Turkey, Asst. Prof.

Abstract

Objective: Nutrition is important in the infant period. The nutritional style of infants with hyperbilirubinemia may be effective in their hospital stay.

Aim: This study aimed to determine the relationship between the nutrition styles of infants diagnosed with hyperbilirubinemia and the length of hospital stay.

Method: In this descriptive study, simple random sampling was used, and the sample group consisted of 110 infants who applied to the Neonatal Intensive Care Unit and whose parents volunteered to participate in the study. The data of the study were collected by questionnaire method and laboratory data. Descriptive statistical methods were applied using numbers and percentages to evaluate the data. The number of days remaining was compared using chi-square analysis.

Results: It was found that 56.4% of the infants in the sample group were female and the postnatal age of 33.6% was above 72 hours. It was determined that 91.8% of the infants had a negative direct coombs test, 55.5% received phototherapy treatment for 48 hours or less, 50.9% were discharged after 72 hours or less of hospitalization, 7.3% had Rh incompatibility, 9.1% had ABO incompatibility, 10.9% had a history of jaundice in a sibling, and 98.2% were transferred to the hospital from a different institution. A significant difference was found between the length of hospital stay of the infants in the study group and the age of the mothers, neonatal breastfeeding and nutrition education status of the mothers, nutrition style, direct coombs test, phototherapy treatment durations, Rh incompatibility of infants, ABO incompatibility of infants, total bilirubin level of the infants after 72 hours of hospitalization, and total bilirubin level 49-72 hours after discharge ($p<0.05$).

Conclusion: It was concluded that prenatal breastfeeding and nutrition education provided by nurses for mothers increased breastfeeding rates and shortened the length of hospital stay in infants with hyperbilirubinemia.

Keywords: Infant, Nutrition, Hyperbilirubinemia

Özet

Giriş: Yenidoğan döneminde beslenme önemlidir. Hiperbilirubinemi tanılı yenidoğanların beslenme şekilleri hastanede kalma sürelerinde etkili olabilir.

Amaç: Bu çalışma hiperbilirubinemi tanısı ile yenidoğan yoğun bakım ünitesinde yatan bebeklerin beslenme şekilleri ile hastanede kalış süresi arasında ilişkiyi belirlemek amacıyla yapılmıştır.

Yöntem: Betimleyici araştırmada basit tanımlayıcı örnekleme kullanılmış, Örneklem grubu ebeveynleri çalışmaya gönüllü olan,Yenidoğan Yoğun Bakım Ünitelerine başvuran 110 yenidoğandan oluşmuştur. Araştırmanın verileri anket yöntemi ve laboratuvar verileri ile toplanmıştır. Verileri değerlendirmek için sayı ve yüzde kullanılarak tanımlayıcı istatistiksel yöntemler uygulanmıştır. Kalan gün sayısı ki-kare analizi kullanılarak karşılaştırılmıştır.

Bulgular: Yenidoğanların %56.4' ünün kız, %33.6'sının postnatal yaşının 72 saatin üzerinde olduğu tespit edilmiştir. Yenidoğanların %91.8'inin direct coombs testinin negatif olduğu, %55.5'inin 48 saat veya daha az ışın tedavisi gördüğü, %50.9'unun hastanede kalma süresinin 72 saat veya öncesinde taburcu edildiği, %7.3'ünün Rh uyumsuzluğu olduğu, %9.1'inin ABO uyumsuzluğu olduğu, %10.9'unun kardeşlerinden birinde sarılık hikayesi olduğu ve %98.2'sinin hastaneye farklı bir kurumdan nakledildiği tespit edilmiştir. Araştırma grubundaki yenidoğanların hastanede kalma süreleri ile; annelerinin yaşları, doğum sonrası anne sütüyle beslenme - annelerin beslenme eğitimi durumu, besleme şekli, direct coombs testi ve fototerapi tedavi süreleri ve yenidoğanların Rh uyumsuzlukları, yenidoğanların ABO uyumsuzlukları, hastaneye yatıştan 72 saat sonrasında bebeklerin toplam bilirubin seviyesi ve taburcu olma sonrası 49-72 saatte toplam bilirubin seviyesi ($p<0.05$) arasında anlamlı farklılık tespit edilmiştir.

Sonuç: Doğum sonrası anne sütüyle beslenmenin ve annelere hemşirelerce verilen besle(n)me eğitiminin hiperbilirubinemili yenidoğanlarda hastanede yatma sürelerini azalttığı sonucuna varılmıştır.

Anahtar Kelimeler: Bebek, Beslenme, Hiperbilirubinemi

ORCID ID: A.A. 0000-0002-4703-9709; A.KD 0000-0003-3312-087X
Sorumlu Yazar: *Aysel Kökcü Doğan Istanbul Medipol University Faculty of Health Sciences, Department of Nursing. Istanbul/ Turkey*
E-mail: akdogan@medipol.edu.tr
Geliş tarihi/ Date of receipt: 22.05.2022 **Kabul tarihi / Date of acceptance**: 12.09.2023

INTRODUCTION

Hyperbilirubinemia, in general, is one of the most common clinical conditions that require medical attention in infants who have no other health problems. “Hyperbilirubinemia" refers to the yellow coloration of the skin and sclerae that results from the accumulation of bilirubin in the skin and mucous membranes (1). The term jaundice derives from the French word "jaune," which means yellow (2). Hyperbilirubinemia is evident when the total serum bilirubin level exceeds 5 mg/dl (3). It is observed that at least two-thirds of infants are clinically jaundiced in the first days of life (4). Bilirubin-induced brain injury caused by excessive bilirubin levels that are not diagnosed and treated in time causes significant neurological tissue damage (2, 5). The treatment aims to prevent an excessive increase in bilirubin levels and to eliminate factors that may cause neurological damage, in other words, to eliminate cases of kernicterus (6). Non-pharmacological methods, phototherapy, exchange transfusion and pharmacological agents are used in the treatment of hyperbilirubinemia. During this period, it is important to continue feeding the baby without interruption (7-11). The importance of breastfeeding in the early period should be explained and the regulation of feeding should be recommended. Phototherapy is used as a treatment method to prevent the formation of acute and reversible 'acute bilirubin encephalopathy' and permanent 'kernicterus' that may develop due to bilirubin toxicity in the neonatal period (2, 7, 9, 10, 12). Exchange transfusion is an emergency treatment method used to treat and control jaundice and prevent kernicterus formation. With the change, the bilirubin level is lowered and controlled, while maternal antibodies are also removed. Pharmacological agents include intravenous immunoglobulin (IVIg), acceleration of the normal metabolic pathway of bilirubin clearance, and inhibition of both oxygenase (1).

It is reported that indirect hyperbilirubinemia is more common in infants of mothers who fail to receive appropriate and adequate breastfeeding support. Nurses working in intensive care units should be aware of the importance of breastfeeding, encourage and support breastfeeding, provide breastfeeding education and counseling to the mothers, help mothers understand the importance of early and frequent nutrition, and be able to observe complications. The study presented here aimed to investigate the relationship between the nutrition styles of infants diagnosed with hyperbilirubinemia and the length of hospital stay.

METHODS

Study Design

This study was conducted with a descriptive design. In the study, is there a relationship between the diagnosis of hyperbilirubinemia and the feeding patterns of the infants hospitalized in the neonatal intensive care unit and the length of stay in the hospital? The answer to the question has been sought.

The Research Population and Sample

The research population consisted of infants admitted to the neonatal intensive care unit of a state hospital in Istanbul. Simple random sampling was used in the study, and the sample included 110 infants who applied to the Neonatal Intensive Care Unit and whose parents volunteered to participate in the study. No sample selection was made in the study, and 110 newborns who applied to the Neonatal Intensive Care Units were volunteered to participate in the study and were allowed by their parents. Data were collected from February 2020 to May 2020.

Inclusion Criteria for Research

- Allowed by parents
- Diagnosis of hyperbilirubinemia

Research Exclusion Criteria

- Babies other than the diagnosis of hyperbilirubinemia

Data Collection Tools

This research was carried out after obtaining the necessary permissions from the University Ethics Committee and the hospital where it was conducted. The data for the study

were gathered through surveys and laboratory data. A Literature review and expert opinion were used as data collection tools. The "Data Collection Form" prepared by the researchers was used as the data source. After the necessary explanations about the Data Collection Form were made to the parents in the neonatal intensive care unit of the state hospital located in Istanbul province, it was applied to the infants included in the study.

The blood of the newborns was taken by the neonatal nurse during the research process. In the hospital where the research was conducted, it was controlled with a device with Roche brand features compatible with the Automation system of the Ministry of Health. Bilirubin results were evaluated by the pediatrician. Physiological weight loss after discharge from the hospital and weight at hospitalization were obtained from the hospital records of the baby (SARUS- Hospital Information Management System) and weight loss was determined by the physician/nurse.

Data Collection Tools

A "data collecting form" was created by the researchers to gather information on the correlation between the length of hospital stay and the nutrition styles of infants admitted to the neonatal critical care unit due to hyperbilirubinemia.

The data collection form included descriptive information about the mother and the infant and information about jaundice in the infants. The mother's descriptive information consisted of questions related to education level, age, number of children, mode of delivery, presence of a disease, and prenatal breastfeeding and nutritional education. Descriptive information of the infants included questions related to gender, postnatal age, week of birth, birth weight, pathological weight loss at admission to the unit, nutrition style, direct Coombs test, total serum bilirubin level at hospitalization, total serum bilirubin level at discharge from the hospital, phototherapy duration, length of hospital stay, Rh incompatibility, ABO incompatibility, history of jaundice/phototherapy in a sibling, and place of admission to the hospital.

Data Analysis

The SPSS (Statistical Package for Social Sciences) for Windows 22.0 program was used to analyze the research data. In order to evaluate the data, descriptive statistical methods were applied using the numbers and percentages. The number of days stayed was compared using chi-square analysis. A value of 0.05 was used as the level of significance, and the results were considered statistically significant if $p<0.05$.

Ethical Considerations

The research was conducted after obtaining the necessary permissions from the University Ethics Committee (Date:16.12.2019, Number:10840098-604.01.01-E.65070) and the hospital where it was conducted.

On the patients involved in the research, no procedures were carried out that would violate their rights or be deemed unsuitable by their parents, and statistics on care improvement were evaluated. The consent oral and written of the parents of the infants who agreed to participate in the study was acquired before the data gathering process began.

RESULTS

It was found that 56.4% of the infants in the sample group were female, the postnatal age of 33.6% was above 72 hours, 85.5% had a birth weight above 2501 grams, 50% had a postpartum physiological weight loss of more than 5%, 42.7% were breastfed, and 37.3% were formula-fed. 91.8% of the infants had a negative Dc (direct coombs) test, 55.5% received phototherapy treatment for 48 hours or less, 50.9% were discharged after 72 hours or less of hospitalization, 7.3% had Rh incompatibility, 9.1% had ABO incompatibility, 10.9% had a history of jaundice in a sibling, and 98.2% were transferred to the hospital from a different institution (Table 1).

It was determined that 77.6% of the infants hospitalized within postnatal 24-48 hours had a bilirubin level of 12 mg/dl or

higher, 100% of the infants hospitalized within postnatal 49-72 hours had a bilirubin level of 15 mg/dl or higher, and 91.2% of the infants hospitalized after postnatal 72 hours had a bilirubin level of 18 mg/dl or higher. 93.8% of the infants discharged from the hospital within postnatal 49-72 hours had a bilirubin level of 15 mg/dl or lower, and 87.2% of the infants discharged from the hospital after postnatal 72 hours had a bilirubin level of 18 mg/dl or lower (Table 1).

Table 1. Descriptive characteristics of infants (N=110)

Groups		**(n)**	**(%)**
Gender	Female	62	**56.4**
	Male	48	43.6
Postnatal age	0-24 hours	20	18.2
	25-48 hours	28	25.5
	49-72 hours	25	22.7
	Above 72 hours	37	**33.6**
Birth weight	2001-2500 gr	16	14.5
	>2501 gr	94	**85.5**
Weight loss	Less than 3%	21	19.1
	3%-5%	34	30.9
	>5%	55	**50.0**
Nutrition style	Breast-fed	47	**42.7**
	Mixed-fed	22	20.0
	Formula-fed	41	**37.3**
Dc test	Positive	9	8.2
	Negative	101	**91.8**
Phototherapy duration	48 hours or less	61	**55.5**
	49 hours or more	49	44.5
Length of hospital stay	72 hours or less	56	**50.9**
	73-96 hours	39	35.5
	97-120 hours	15	13.6
Rh incompatibility	Yes	8	7.3
	No	102	**92.7**
ABO incompatibility	Yes	10	9.1
	No	100	**90.9**
History of jaundice in a sibling	Yes	12	10.9
	No	98	**89.1**
Place of admission	Outpatient clinic	2	1.8
	From a different ınstitution	108	**98.2**
Phototherapy threshold at hospitalization 24-48 hours	8 mg/dl or higher	11	22.4
	12 mg/dl or higher	38	**77.6**
Phototherapy threshold at hospitalization 49-72 hours	15 mg/dl or higher	27	**100.0**
Phototherapy threshold at hospitalization after 72 hours	14 mg/dl or higher	3	8.8
	18 mg/dl or higher	31	**91.2**
Phototherapy threshold at discharge 49-72 hours	12 mg/dl or lower	1	6.2
	15 mg/dl or lower	15	**93.8**
Phototherapy threshold at discharge after 72 hours	14 mg/dl or lower	12	12.8
	18 mg/dl or lower	82	**87.2**

A statistically significant relation was found between the age of the mothers of the infants in the sample group and the length of hospital stay (X2=12.502; p=0.014<0.05). Mothers between the ages of 21 and 30 had the longest hospital stays of any group (Table 2).

The length of the infants hospital stays was significantly correlated (X2=10.191; p=0.006<0.05) with the study group mothers' prenatal breastfeeding and nutrition education status. The rate of mothers of infants whose hospital stay was 72 hours or less and between 97-120 hours and who received education was found to be higher than those without education, and the rate of mothers of infants who stayed in the hospital for 73-96 hours and who did not receive education was higher than those who did receive education (Table 2).

The length of hospital stays and the eating habits of infants with hyperbilirubinemia were shown to be significantly related (X2=44.118; p=0.000<0.05). It was determined that the rate of breastfeeding was higher in infants whose hospital stay was 72 hours or less, and the rate of formula-fed infants was higher in those with a hospital stay of 73-96 and 97-120 hours (Table 2).

The difference between the Dc test and the length of hospital stay of the infants in the sample group was found to be statistically significant (X2=10.096; p=0.006<0.05). It was established that 1.8% of the infants with a hospital stay of 72 hours or less, 10.3% of those with a hospital stay of 73-96 hours, and 26.7% of those with a hospital stay of 97-120 hours had a positive Dc test (Table 2).

A statistically significant relationship was found between the phototherapy treatment duration of infants, and the length of hospital stay (X2=91.690; p=0.000<0.05). It was determined that infants with a hospital stay of 72 hours or less (100%) received phototherapy treatment for 48 hours or less, and infants with a hospital stay of 73-96 hours (89.7%) and 97-120 hours (93.3%) received phototherapy treatment for 49 hours or more (Table 2).

In the sample group of infants with hyperbilirubinemia, there was a significant connection between Rh incompatibility and the length of hospital stay (X2=27.606; p=0.000<0.05). Rh incompatibility was found in 1.8% of the infants whose hospital stay was 72 hours or less, in 2.6% of those with a hospital stay of 73-96 hours, and in 40% of those with a hospital stay of 97-120 hours.

A statistically significant difference was found between ABO incompatibility and hospital stay in infants with hyperbilirubinemia (X2=21.048; p=0.000<0.05). ABO incompatibility was observed in 1.8% of the infants who stayed in the hospital for 72 hours or less, in 7.7% of those with a hospital stay of 73-96 hours, and in 40% of those with a hospital stay of 97-120 hours. The rate of ABO incompatibility (40%) was found to be higher in infants with a hospital stay of 97-120 hours (Table 2).

In infants with hyperbilirubinemia, an association between ABO incompatibility and hospital stay was discovered (X2=21.048; p=0.000<0.05). ABO incompatibility was found in 1.8% of neonates who spent less than 72 hours in the hospital, 7.7% of those who spent between 73 and 96 hours in the hospital, and 40% of those who spent between 97 and 120 hours in the hospital. ABO incompatibility was found to be more prevalent (40%) among neonates who spent 97-120 hours in the hospital (Table 2).

The length of hospital stay during postnatal 49-72 hours and the total bilirubin level of neonates with hyperbilirubinemia upon hospital discharge were shown to be significantly correlated (X2=0.000; p=0.000<0.05). A total bilirubin level of 12 mg/dl or less was present in 6.2 percent of neonates who were hospitalized for 72 hours or less, and a total bilirubin level of 15 mg/dl or less was present in 93.8 percent. The total bilirubin level (15 mg/dl or lower) at discharge from the hospital was found to be significantly higher in 93.8% of the infants with a hospital stay of 72 hours or less (Table 2).

Table 2. Comparison of descriptive features according to the length of hospital stay (N=110)

Variable		72 Hours or Less		73-96 Hours		97-120 Hours		p
		n	%	n	%	n	%	
Education level of the mother	Elementary school	29	51.8	27	69.2	5	33.3	X^2=8.642 p=0.071
	High school	20	35.7	11	28.2	9	60.0	
	University	7	12.5	1	2.6	1	6.7	
Age of the mother	15-20	11	19.6	17	43.6	2	13.3	X^2=12.502 **p=0.014**
	21-30	30	53.6	17	43.6	12	80.0	
	31 or older	15	26.8	5	12.8	1	6.7	
Number of children	1	16	28.6	17	43.6	8	53.3	X^2=5.877 p=0.209
	2	30	53.6	17	43.6	7	46.7	
	3 or more	10	17.9	5	12.8	-	-	
Mode of delivery	Natural birth	44	78.6	25	64.1	9	60.0	X^2=3.335 p=0.189
	Caesarean section birth	12	21.4	14	35.9	6	40.0	
Presence of a disease in mother	Hypothyroidism	-	-	1	2.6	-	-	X^2=4.791 p=0.571
	Diabetes	2	3.6	-	-	-	-	
	Sepsis	1	1.8	1	2.6	1	6.7	
	None	53	94.6	37	94.9	14	93.3	
Education status of the mother	Yes	37	66.1	13	33.3	9	60.0	X^2=10.191 **p=0.006**
	No	19	33.9	26	66.7	6	40.0	
Gender of the infants	Female	34	60.7	19	48.7	9	60.0	X^2=1.439 p=0.487
	Male	22	39.3	20	51.3	6	40.0	
Postnatal age	0-24 hours	12	21.4	5	12.8	3	20.0	X^2=3.829 p=0.700
	25-48 hours	13	23.2	9	23.1	6	40.0	
	49-72 hours	12	21.4	11	28.2	2	13.3	
	Above 72 hours	19	33.9	14	35.9	4	26.7	
Week of birth	34-38 weeks	18	32.1	12	30.8	3	20.0	X^2=0.848 p=0.655
	Above 38 weeks	38	67.9	27	69.2	12	80.0	
Birth weight	2001-2500 gr	10	17.9	5	12.8	1	6.7	X^2=1.337 p=0.513
	>2501 gr	46	82.1	34	87.2	14	93.3	
Weight loss	Less than 3%	16	28.6	4	10.3	1	6.7	X^2=9.093 p=0.059
	3%-5%	18	32.1	10	25.6	6	40.0	
	>5%	22	39.3	25	64.1	8	53.3	
Nutrition style	Breast-fed	40	71.4	3	7.7	4	26.7	X^2=44.118 **p=0.000**
	Mixed-fed	9	16.1	9	23.1	4	26.7	
	Formula-fed	7	12.5	27	69.2	7	46.7	
Dc test	Positive	1	1.8	4	10.3	4	26.7	X^2=10.096 **p=0.006**
	Negative	55	98.2	35	89.7	11	73.3	
Phototherapy duration	48 hours or less	56	100.0	4	10.3	1	6.7	X^2=91.690 **p=0.000**
	49 hours or more	-	-	35	89.7	14	93.3	
Rh incompatibility	Yes	1	1.8	1	2.6	6	40.0	X^2=27.606 **p=0.000**
	No	55	98.2	38	97.4	9	60.0	
ABO incompatibility	Yes	1	1.8	3	7.7	6	40.0	X^2=21.048 **p=0.000**
	No	55	98.2	36	92.3	9	60.0	
History of jaundice in a sibling	Yes	6	10.7	5	12.8	1	6.7	X^2=0.427 p=0.808
	No	50	89.3	34	87.2	14	93.3	
Place of admission	Outpatient clinic	2	3.6	-	-	-	-	X^2=1.964 p=0.375
	From a different institution	54	96.4	39	100.0	15	100.0	
Phototherapy threshold at hospitalization 24-48 hours	8 mg/dl or higher	5	19.2	5	35.7	1	11.1	X^2=2.234 p=0.327
	12 mg/dl or higher	21	80.8	9	64.3	8	88.9	

Table 2. continued

Phototherapy threshold at hospitalization 49-72 hours	15 mg/dl or higher	13	100.0	12	100.0	2	100.0	X^2=0.000 **p=0.000**
Phototherapy threshold at hospitalization after 72 hours	14 mg/dl or higher	3	17.6	-	-	-	-	X^2=3.290 p=0.193
	18 mg/dl or higher	14	82.4	13	100.0	4	100.0	
Phototherapy threshold at discharge 49-72 hours	12 mg/dl or lower	1	6.2	-	-	-	-	X^2=0.000 **p=0.000**
	15 mg/dl or lower	15	93.8	-	-	-	-	
Phototherapy threshold at discharge after 72 hours	14 mg/dl or lower	6	15.0	5	12.8	1	7.1	X^2=0.680 p=0.712
	18 mg/dl or lower	34	85.0	34	87.2	14	92.9	

DISCUSSION

It was determined that the majority of the infants in the sample group were girls. In the study conducted by Girgin et al. (13) 60.4% of the infants were found to be female and in the study of Güneş (14) 55.6% of the infants were female. However, according to the literature, neonatal hyperbilirubinemia is more common in male infants, and the male/female ratio varies between 1-1.5. In our study, the number of females was found to be higher than in the other studies. The postnatal age of more than half of the infants in the sample group was over 72 hours, in the study of Kavlu (7) named "Evaluation of Cases of Indirect Hyperbilirubinemia Hospitalized in the Neonatal Unit of Our Clinic" (2006) were within the first 24 hours of life, and the postnatal age of 55.6% of the infants in the study of Güneş (14) was above 96 hours. 85.5% of the infants in the sample group had a birth weight of above 2501 grams. In the study of Gemci (15), it was established that 81.1% of the infants had a birth weight above 2501 grams, and 71.5% of the infants had a birth weight of 2500 grams or above.

It has been determined that half of the infants have postnatal physiological weight loss above 5%. Salas et al (16) found a strong association between excessive weight loss and hyperbilirubinemia in infants. Çayönü et al. (17) reported pathological weight loss in 8% of the infants. Pathological weight loss is a condition that can seriously affect infant health. For this reason, it is important to determine the percentage of weight loss during the follow-up of the infants in the first week after birth. 42.7% of the infants in the sample group were breastfed, and 37.3% were formula-fed. In the study of Öztürk (18), 92.2% of the infants were exclusively breastfed, and 1.8% were exclusively formula-fed. In the study of Çayönü et al (17), 60.2% of the infants were breastfed, 5.3% were exclusively formula-fed, and in the study of Kavlu (7), 62.5% of the infants were breastfed and 1.3% were formula-fed.

Positive Dc test rates of infants in the study group were low. The Antibodies detected by the direct Coombs test were in the IgG structure. Due to the fact that all anti-D antibodies and some anti-A antibodies were also in IgG structure, the direct Coombs test was observed to have a high degree of Rh incompatibility (16). In the study of Ekin (19), it was determined that 30% of the cases hospitalized due to hyperbilirubinemia had a positive direct Coombs test. It was determined that more than half of the infants participating in the study received phototherapy treatment for 48 hours or less. In the study of Özçelik (20), the mean duration of phototherapy was found to be 23.56±10.85 (24) hours. In the study conducted by Sağsak and Zenciroğlu (21), the mean duration of phototherapy was 2.3±0.8 days.

It was determined that half of the infants were discharged 72 hours or less after hospitalization. In the study conducted by Özçelik (20), the average hospital stay was found to be 47.86±33.45 (48) hours.

Rh incompatibility was found to be 6.4% in the study of Bolat et al. (22), 8.75% in the study of Yorulmaz et al (23). Research data

supports our study (%7.3) result. The infants participating in the study had a low ABO incompatibility rate. The rate of ABO incompatibility was reported as 29.2% in the study of Bolat et al. (22). It was determined that the majority of the infants participating in the study did not have a history of jaundice in their siblings. In the study of Bilgin et al. (24), 79% of the infants did not have a history of jaundice in a sibling, and in the study of Ekin (19) 59.2% of the infants did not have a history of jaundice in their sibling (24). It was determined that almost all of the infants in the sample group were transferred to the hospital from a different institution. In the study of Bilgin et al., it was determined that 52% of families noticed jaundice in their infants and applied to the outpatient clinic (24).

In our study, it was observed that as the bilirubin levels of the babies increased, the length of hospital stay was also prolonged. All infants need to be monitored for the development of jaundice. Skin colour should be checked during the first examination after birth. The presence of jaundice should be assessed every 8-12 hours together with the infant's vital signs. During the visual assessment of jaundice, the infants needs to be fully undressed in bright and preferably natural light, and the colour of the skin should be checked after blanching the skin with a finger. Jaundice first appears on the face, and then spreads to the trunk and extremities. The estimation of bilirubin level from the spread of jaundice on the skin is not reliable. The total bilirubin level of the infant whose skin colour appears yellow should be checked, and jaundice that develops in the first 24 hours should be considered pathological until proven otherwise (25, 26). The serum bilirubin levels of these infants should be evaluated and the infants should be investigated in terms of haemolytic disease and other pathological causes (27).

In our study, related to the high rate of families with two children (49.1%), it is believed that the bilirubin level at hospitalization was detected in the early postnatal period due to families' early recognition of signs and symptoms of neonatal hyperbilirubinemia as a result of their experience. In our study, infants who were followed up in terms of hyperbilirubinemia were discharged from the hospital because their general condition was good after the treatment, and they met the discharge criteria.

It was found that almost all of the mothers in the sample group were free of disease. In other studies, when the disease status of the mother was investigated, it was determined that none of the mothers included in the study of Kızılay (28) had been diagnosed with diabetes mellitus and/or had any other health problems. In the study conducted by Yol 77.4% of the mothers stated that they received breastfeeding education during pregnancy (29). Breastfeeding education is very important for neonatal hyperbilirubinemia. In our study, the high rate of mothers who received breastfeeding education shows that nurses have awareness of the issue and they fulfil their professional roles and responsibilities in the best way.

There was a significant relationship between the age of the mothers in the sample group and the infants' length of hospital stay ($p<0.05$). The length of hospital stay for mothers aged between 21-30 years was the highest in all groups. However, there is no data in the literature that indicates the effect of maternal age on the length of hospital stay of infants. In our study, it is believed that the experience mothers gain and the efficient nutrition of the infant in parallel with the nutrition education mothers receive before giving birth are effective in the early discharge of the infants.

A significant relationship was found between the prenatal breastfeeding and nutrition education status of the mothers in the study group and the length of hospital stay of the infants ($p<0.05$). The rates of the infants who stayed in the hospital for 72 hours or less and the rate of those with a hospital stay of 73-92 hours were found to be higher than the other groups. It is known that indirect

hyperbilirubinemia is more common in infants of mothers who fail to receive appropriate and adequate breastfeeding support (30). Doğan et al. (8) stated that prenatal education provided for infant care was effective after childbirth. It is emphasized in the literature that education programs are the most important factor affecting breastfeeding alone, and breastfeeding education and support provided by health personnel will increase breastfeeding rates and duration (31). In this regard, nurses who guide the breastfeeding process of mothers, have important duties and responsibilities. They should emphasize the importance of breastfeeding irrespective of the gender of the infant in the lactation consultations they provide for mothers in the antenatal and postnatal periods (32). When the relationship between hyperbilirubinemia and adequate nutrition of infants is evaluated, it is obvious that supporting the breastfeeding success of mothers is crucial. The incidence or severity of health problems such as hyperbilirubinemia, respiratory system infections, diarrhea, and asthma that may develop in the infant decreases with breastfeeding. Breastfeeding not only affects the health of the infant but also benefits the protection and development of maternal health. When the mother cannot breastfeed her baby effectively and successfully, the baby does not get enough breast milk and calories. Inadequate nutritional intake of the baby causes the delayed passage of meconium and increased reabsorption of bilirubin by enterohepatic circulation, and hyperbilirubinemia develops (33). In the postpartum period, early discharge of the mother and the infant prevents effective breastfeeding behavior from becoming a habit. Hyperbilirubinemia easily occurs in infants who are not breastfed adequately, and they have to be hospitalized again for treatment. It is reported in the literature that providing postpartum breastfeeding education and support to mothers can reduce the incidence of hyperbilirubinemia in infants and, accordingly, the phototherapy and health care costs. In our study, it was determined that providing nutrition education and breastfeeding support to the mother shortened the duration of phototherapy and the length of hospital stay.

A statistically significant relationship was found between the nutrition style of the infants diagnosed with hyperbilirubinemia and the length of hospital stay ($p<0.05$). The length of hospital stay of breastfed infants (72 hours or less) was found to be shorter than mixed-fed and formula-fed infants. In the study of Kavlu (7), it was found that mixed-fed infants and exclusively formula-fed infants were discharged from the hospital one day earlier than the others. In the study by Sağsak and Zenciroğlu (21), it was stated that exclusively breast-fed infants received phototherapy for 2-3 days, and formula-fed infants received phototherapy for 3-7 days. The literature suggests that in the breastfed infant, early onset jaundice may be a result of insufficient intake of breast milk (34). Mothers of infants who develop jaundice are also more likely to stop breastfeeding, even though discontinuation is not necessary (35). In a newborn infant, frequent bowel movements diminish the enterohepatic circulation of bilirubin, thereby increasing bilirubin excretion. In breastfed newborn infants, the frequency of latching on and administration of supplementary feeds are associated with serum bilirubin concentrations. Frequent breast feeding (at least 8 times a day) and fewer supplementary feeds will result in increased breast milk intake, less weight loss, and lower bilirubin concentrations. In the case of a breastfed infant presenting with neonatal hyperbilirubinaemia, the advice should be to breastfeed more frequently and to withhold supplementary feedings (36). The literature and the researches of Sağsak and Zenciroğlu support the results we obtained in our study. Some measures need to be taken to reduce neonatal hyperbilirubinemia, which is very common in our society. These include early and frequent nutrition of the infant, informing families about the importance and benefits of breast milk, closely following infants in the risk group, and raising families' awareness of

the issue. In our study, it was observed that most of the infants with a hospital stay of 72 hours or less were breastfed and breastfeeding had a positive effect on the length of hospital stay. Since the researched hospital was a baby-friendly hospital, breastfeeding was continued even if breast milk jaundice was considered in the etiology of hyperbilirubinemia.

A statistically significant relationship was found between the phototherapy treatment duration of the infants in the sample group and the length of hospital stay ($p<0.05$). The phototherapy threshold at hospitalization was found to be in the range of 49-72, and the total bilirubin level at hospitalization was 15 mg/dl or higher in all infants with a hospital stay of 72 hours or less. The significant decrease in indirect bilirubin values after phototherapy supports the idea that phototherapy is an effective method in the treatment of indirect hyperbilirubinemia (37). In our study, it was found that phototherapy treatment shortened the length of hospital stay in infants, and the findings in the literature support our study.

The difference between the Dc test and the length of hospital stay of the infants in the sample group was found to be statistically significant ($p<0.05$). The rate of the infants with a negative Dc test was found to be higher than the other groups with a positive Dc test. Direct Coombs assessment is very important in monitoring hyperbilirubinemia. Positive Coombs test indicates haemolysis and the severity of jaundice. In the study conducted by Sağsak and Zenciroğlu (21), the rate of positive direct Coomb's test was found to be 6.9%, and values of total bilirubin were found to be higher in infants with positive Coomb's test. In our study, it was found that infants with a positive Dc test had a longer hospital stay.

There was a significant relationship between the Rh incompatibility of the infants diagnosed with hyperbilirubinemia and the length of hospital stay ($p<0.05$). Similarly, in the studies of Kavlu (7), Çayönü et al. (17) the rate of groups with Rh incompatibility was found to be high. In our study, the length of hospital stay of infants with Rh incompatibility was found to be higher compared to other groups. The first 24 hours of life are of great importance in infant monitoring. Mother and infants blood groups should be determined, total bilirubin levels should be monitored, and cases of pathological indirect hyperbilirubinemia should be observed and treated. Minor blood group incompatibilities should also be considered in cases with hemolytic jaundice of unknown aetiology.

A significant relationship was found between ABO incompatibility and the length of hospital stay in infants with hyperbilirubinemia ($p<0.05$). The rate of infants with ABO incompatibility was found to be higher in the studies of Girgin et al. (13) and Çayönü et al. (17) than in the other groups. In our study, the fact that 40% of the infants with ABO incompatibility had a longer hospital stay compared to others indicates that incompatibility is a risk factor for hyperbilirubinemia.

A significant relationship was found between the total bilirubin level of the infants with hyperbilirubinemia at the time of hospital admission and the length of hospital stay within postnatal 49-72 hours ($p<0.05$). In our study, the total bilirubin level (15 mg/dl) of the patients with a phototherapy threshold of 49-72 at hospitalization was found to be higher than the other groups. In the study conducted by Girgin et al. (13), no relationship was found between the total bilirubin levels of the patients at the time of hospital admission and the length of postnatal hospital stay. In the literature review, no information was obtained about the evaluation of total bilirubin level and the length of hospital stay. In our study, it was found that the length of hospital stay decreased along with the bilirubin level.

A significant relationship was found between the total bilirubin level of the infants with hyperbilirubinemia at discharge from the hospital and the length of hospital stay within postnatal 49-72 hours ($p<0.05$). The bilirubin level (15mg/dl) was found to be higher in infants whose hospital stay was 72 hours or less. The highest total bilirubin level usually

occurs 3 to 4 days after birth (14). In the study conducted by Girgin et al. (13) no significant relationship was found between the total bilirubin levels of the patients at discharge from the hospital and the length of postnatal hospital stay. In our study, when the bilirubin level discharged from the hospital and the length of hospital stay were evaluated, the majority of infants with a hospital stay of 72 hours or less had a bilirubin level of 15 mg/dl or less, suggesting that the decrease in total bilirubin level shortened the hospital stay.

CONCLUSION

A statistically significant difference was found between the length of hospital stay of the infants in the sample group and the age of the mothers, prenatal breastfeeding, and nutrition education status of the mothers, nutrition style, Dc test, phototherapy treatment durations, Rh incompatibility of the infants, ABO incompatibility of the infants, total bilirubin level of the infants after 72 hours of hospitalization, and total bilirubin level 49-72 hours after discharge.

The World Health Organization (WHO) recommends that infants be exclusively breastfed for the first six months of life with no additional food. Breastfeeding is an easy-to-apply, health-promoting, and disease-preventing form of nutrition for both mother and infant. Nurses play a significant role in the initiation and maintenance of successful breastfeeding. For this reason, it is important for nurses to receive continuing education about breast milk and nutrition, care of infants with jaundice, phototherapy application methods, and complications of phototherapy through in-service training. After determining that the infant received adequate breast milk and was breastfed, assessing the risk of developing hyperbilirubinemia, and scheduling a close follow-up, the infants should be discharged from the hospital. Infants should be evaluated through home visits by nurses who provide breastfeeding counseling. It is recommended to conduct research with different sample groups on the subject.

Limitations of the Research

This study is limited to 110 infants with hyperbilirubinemia in the neonatal intensive care unit of a state hospital in Istanbul.

Conflict of Interests

The authors declare that they have no conflict of interest.

Funding

No specific grants from funding organizations in the public, private, or non-profit sectors were given to this research.

Author Contribution

Concept: A.A., A.KD., Design: A.A, A.KD., Data Collection or Processing: A.A, A.KD, Analysis or Interpretation: A.A., A.KD., Literature Search: A.A., Posted by A.A.& A.KD.

REFERENCES

1. Çoban A, Türkmen M, Gürsoy T. Türk Neonatoloji Derneği Yenidoğan Sarılıklarında Yaklaşım. İzlem ve Tedavi Rehberi. 2014. http://www.neonatology.org.tr/wp-content/uploads/2016/12/sarilik.pdf .

2. Ansong-Assoku B, Shah SD, Adnan M, Ankola PA. Neonatal Jaundice. 2023 Feb 20. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan–. PMID: 30422525.

3. Hansen TWH, Bratlid D. Physiology of neonatal unconjugated hyperbilirubinemia. In: Stevenson DK, Maisels MJ, Watchko JF, eds. Care of Jaundiced Neonatel. New York: Mc Graw-Hill. 2012;65-95.

4. Schwarz HP, Haberman BE, Ruddy RM. Hyperbilirubinemia current guideline sandemerging therapies. Pediatr Emer Care. 2011;27: 884-889. doi: 10.1097/PEC.0b013e31822c9b4c.

5. Ronald S, Cohen Ronald J, Wong DK. Stevenson. Understanding Neonatal Jaundice: A Perspective on Causation. Pediatr Neonatol. 2010;51(3):143−148.

https://doi.org/10.1016/S1875-9572(10)60027-7.

6. Kaplan M, Bromiker R, Hammerman C. Severe Neonatal Hyperbilirubinemia and Kernicterus: Are These Still Problems in the Third Millennium? Neonatology. 2011; 100:354–362. https://doi.org/10.1159/000330055.

7. Kavlu A. Kliniğimiz yenidoğan ünitesine yatırılan indirekt hiperbilirubinemili olguların değerlendirilmesi (Uzmanlık Tezi). Bakırköy Dr. Sadi Konuk Eğitim ve Araştırma Hastanesi, İstanbul: 2006.

8. Doğan BN, Aydın Ateş N, Ayar Kocatürk A. Hiperbilirubineminin Yenidoğana Etkisi ve Ebelik Yaklaşımı. Cumhuriyet Üniversitesi. Sağlık Bilimleri Enstitüsü Dergisi. 2019; (4)2: 06-1.

9. Kemper AR, Newman TB, Slaughter JL, et al. Clinical Practice Guideline Revision: Management of Hyperbilirubinemia in the Newborn Infant 35 or More Weeks of Gestation. Pediatrics. 2022;e2022058859. doi:10.1542/peds.2022-058859

10. Funmilayo R, Ohaeri B, Ojo IO, Babarımısa O. Neonatal Jaundice: Its Myths and Facts. Euro Afro Studies International Journal (EASIJ). 2022; 4(5)1- 13. ISSN: 2707-8965

11. Sampurna MTA, Liem KD, Pratama DC et al. A review of existing neonatal hyperbilirubinemia guidelines in Indonesia [version 1; peer review: 1 approved with reservations]. F1000Research 2022, 11:1534 https://doi.org/10.12688/f1000research.110550.1

12. Morioka I. Hyperbilirubinemia in preterm infants in Japan: New treatment criteria. Pediatr Int. 2018 Aug;60(8):684-690. doi: 10.1111/ped.13635.

13. Girgin D, Bülbül A, Uslu S, Zübarioğlu U, Dursun M, Baş EK, Arslan S. Anne Bebek Çiftinin Taburcu Edilme Zamanının Bilirubin Düzeyleri Üzerine Etkisi. Şişli Etfal Hastanesi Tıp Bülteni. 2015;49 (3). DOI: 10.5350/SEMB.20150401120317.

14. Güneş A. İndirekt Hiperbilirubinemi Nedeniyle Kan Değişimi Uygulanan Yenidoğanların Retrospektif Analizi. Van Yüzüncü Yıl Üniversitesi, Van: 2019.

15. Gemci M. Yenidoğan Döneminde Hiperbilirubinemi Olgularının Araştırılması (Yüksek Lisans Tezi). İstanbul Medipol Üniversitesi, İstanbul: 2017.

16. Salas AA, Salazar J, Burgoa CV, De-Villegas C., Quevedo V, Soliz A. Significant Weight Loss; In Breastfed Term İnfants Read mitted For Hyperbilirubinemia. BMC Pediatr. 2009; 9:82-85. doi:10.1186/1471-2431-9-82.

17. Çayönü N, Bülbül A, Uslu S, Bolat F, Güran Ö, Nuhoğlu A. Yenidoğan bebeklerde son on yılda indirekt hiperbilirubinemi değişimi. Şişli Etfal Hastanesi Tıp Bülteni. 2011;45(3); 85-93.

18. Öztürk HS. Hiperbilirubinemi ile Takip Edilen Bebeklerin Değerlendirilmesi. Online Türk Sağlık Bilimleri Dergisi. 2019; 4 (3).p. 283-300. https://doi.org/10.26453/otjhs.458911.

19. Ekin RE. Yenidoğan Hiperbilirubinemi Olgularının Değerlendirilmesi (Uzmanlık Tezi). Dicle Üniversitesi, Diyarbakır: 2019.

20. Özçelik E. İndirekt Hiperbilirubinemi Nedeni ile Fototerapi Alan Yenidoğan Bebeklerde Oksidatif Stres Dengesinin Değerlendirilmesi (Uzmanlık Tezi). Dr. Sami Ulus Çocuk Sağlığı ve Hastalıkları Eğitim ve Araştırma Hastanesi, Ankara: 2020.

21. Sağsak E, Zenciroğlu A. Yenidoğan Kliniğinde İndirekt Hiperbilirubinemi Nedeniyle İzlenen Hastaların Epidemiyolojik Özellikleri ve Etiyolojilerinin Değerlendirilmesi. Hitit Med J. 2020;2(2): 42-48.

22. Bolat F, Uslu S, Bülbül A, Cömert S, Güran Ö, Baş EK, Nuhoğlu A. Yenidoğan indirekt hiperbilirubinemisinde ABO ve Rh uygunsuzluğunun karşılaştırılması. Şişli Etfal Hastanesi Tıp Bülteni. 2010;44(4):156-61.

23. Yorulmaz A, Yücel M, Sert S, Özdem S, İstanbullu HA. Yenidoğan Ünitesine Sarılık Nedeniyle Yatırılan Bebeklerin Klinik ve Laboratuvar Özellikleri ve Risk Faktörlerinin Araştırılması. Journal of Contemporary Medicine. 2018; 8(1):7-13.

24. Bilgin B, Gönülal D, Ünal S. Uzamış Sarılıklı Bebeklerin Etiyolojik, Klinik ve Laboratuvar Bulgularının Değerlendirilmesi. Türkiye Çocuk Hastalıkları Dergisi. 2017; s.200-204. DOI: 10.12956/tjpd.2017.320.

25. American Academy of Pediatrics Subcommittee on Hyperbilirubinemia. Management of hyperbilirubinemia in the newborn infant 35 or more weeks of gestation. Pediatrics, 2004;14(1):297. doi: 10.1542/peds.114.1.297.

26. Ekşioğlu A, Çeber TE. Emzirme Akran Danışmanlığının İlk Kez Doğum Yapan Annelerin Emzirme Öz-Yeterliliklerine Etkisi. Hemşirelikte Araştırma Geliştirme Dergisi. 2015;17(2-3). ISSN:1307- 9557 (Basılı), ISSN: 1307-9549 (Online).

27. Bertini G, Dani C, Tronchin M, Rubaltelli FF. Is breast feding really favorin gearly neonatal jaundice? Pediatrics, 2001;107: 41-4. https://doi.org/10.1542/peds.107.3.e41.

28.Kızılay EN. Fototerapi Alan Bebeklerde Anne Sütü Kokusunun Bebeklerin Bilirubin Düzeyine, Fototerapide Kalma Süresine ve Konforlarına Etkisi (Yüksek Lisans Tezi). Osmangazi Üniversitesi, Eskişehir: 2019.

29. Yol E. Bebeği İndirekt Hiperbilirubinemi Tanısı Almış Annelerin Emzirme Öz-Yeterliliği ve Emzirme Başarısının Değerlendirilmesi (Yüksek Lisans Tezi). Ankara Üniversitesi, Ankara: 2017.

30. Ullah S, Rahman K, Hedayati M. Hyperbilirubinemia in Neonates: Types, Causes, Clinical Examinations, Preventive Measures and Treatments: A Narrative Review Article. Iran J Public Health. 2016 May;45(5):558-68. PMID: 27398328; PMCID: PMC4935699.

31. Mc Graw H. Hand Book Of Optics, Third Edition. Volume 2. Radiometry. 2010; 958-965.

32. Madam A, MacMahon JR, Stevenson DK. Neonatal Hyperbilirubinemia. In: Taeusch HW, Ballard RA, Gleason CA, editors. Avery's Diseases Of Newborn. 8th ed. Philadelphia: Elsevier Saunders, 2010;122-1229. DOI:10.1056/NEJM200102223440807.

33.Özdemir S, Yılmaz B. Yenidoğanlarda Hiperbilirubinemi ve Başarılı Emzirme, Hyperbilirubinema and Successful Breastfeed in Newborns. EGE HFD. 2019;35 (2): 69-75.

34. Clark M. Clinical update: understanding jaundice in the breastfed infant. Community Pract. 2013 Jun;86(6):42-4; quiz 45. PMID: 23821885

35. Emma J Par 1, Chase A Hughes 2, Pierce DeRico 3 Neonatal Hyperbilirubinemia: Evaluation and Treatment Am Fam Physician. 2023 May;107(5):525-534.

36. Semmekrot BA, De Vries MC, Gerrits G P J M, Van Wieringen P M V. Optimal breastfeeding to prevent hyperbilirubinaemia in healthy, term newborns. Ned Tijdschr Geneeskd. 2004 Oct 9;148(41):2016-9. PMID: 15553997. https://pubmed.ncbi.nlm.nih.gov/15553997/

37. Torun E, Tanyeri B, Ünsal N, Doğan Demir A, Bayraktar S, Öktem F. İndirek hiperbilirubinemili yenidoğanlarda fototerapinin oksidatif stres üzerine etkisi. The effect of phototherapy on oxidative stress in newborns with indirect hyperbilirubinemia. Dicle Tıp Dergisi, Dicle Medical Journal. 2013;40 (3): 379-383. doi: 10.5798/diclemedj.0921.2013.03.0293.