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Etiological Evaluation of Term Neonates with Indirect Hyperbilirubinaemia

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Abstract

Aim: Indirect hyperbilirubinemia is a common disease in newborns with many risk factors. In our study, we aimed to investigate the effects of history, physical examination and investigations on treatment and follow-up of patients admitted to our neonatal intensive care unit with the diagnosis of indirect hyperbilirubinemia.

Methods: In our cross-sectional and retrospective study, 226 patients who were born at term and hospitalized with the diagnosis of indirect hyperbilirubinemia were included. History, physical examination and examination data were evaluated from the patient files.

Results: Of 226 patients included in the study, 126 (55.8%) were boys and 100 (44.2%) were girls. The mean gestational age was 38.3±0.4 weeks and the mean birth weight was 3146±32 grams. The mean postnatal days at the time of hospitalization were 4.1±0.1 days, hospitalization bilirubin was 17.1±0.2 mg/dl, duration of phototherapy was 38.2±1 hours, and weight loss during hospitalization was 3.7±0.3%. The most common diagnosis was ABO incompatibility (27.9%). Bilirubin levels were statistically significantly higher in patients with weight loss. When blood incompatibility and other diagnoses were compared, bilirubin and hemoglobin levels and postnatal age at the time of hospitalization were statistically significantly lower and length of hospitalization was statistically significantly higher in patients with blood incompatibility.

Conclusion: Gender and mode of delivery were not significantly associated with hospitalization total bilirubin and duration of phototherapy. Patients with weight loss had statistically higher hospitalization total bilirubin than those without weight loss. In addition, the length of hospitalization of patients with ABO incompatibility was statistically significantly longer than patients hospitalized with other diagnoses.

Key words: Neonate, Indirect hyperbilirubinemia, Risk factors

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İndirekt Hiperbilirubinemili Term Yenidoğanların Etiyolojik Değerlendirmesi

Öz

Amaç: İndirekt hiperbilirubinemi, yenidoğanlarda sık görülen birçok risk faktörü olan bir hastalıktır. Çalışmamızda, yenidoğan yoğun bakım ünitemize indirekt hiperbilirubinemi tanısı ile yatırılan hastaların öykü, fizik muayene ve tetkiklerinin, hastaların tedavi ve takipleri üzerine olan etkileri incelenmesi amaçlandı.

Yöntemler: Kesitsel ve retrospektif olarak yapılan çalışmamıza, miadında doğan, indirekt hiperbilirunemi tanısıyla yatırılan 226 hasta alındı. Hasta dosyalarından öyküleri, fizik muayene ve tetkik verileri değerlendirildi.

Bulgular: Çalışmaya alınan 226 hastanın 126'sı (%55,8) erkek, 100'ü (%44,2) kızdı. Gestasyon haftaları ortalama 38,3±0,4 hafta, ortalama doğum ağırlıkları 3146±32 gramdı. Hastaların yatış anındaki ortalama postnatal günleri 4,1±0,1 gün, yatış bilirubinleri 17,1±0,2 mg/dl, fototerapi alma süreleri ise 38,2±1 saat, yatış sırasında tartı kaybı ise %3,7±0,3 olarak görüldü. Hastalardaki en sık tanının ABO uygunsuzluğu (%27,9) olduğu görüldü. Tartı kaybı olan hastaların bilirubin düzeyleri istatiksel açıdan anlamlı yüksekti. Kan uyuşmazlığı ve diğer tanılar karşılaştırıldığında; kan uyuşmazlığı olan hastalarda bilirübin ve hemoglobin düzeyi ve yatış anındaki postnatal yaş istatistiksel açıdan anlamlı daha düşük, yatış süresi ise istatistiksel açıdan anlamlı daha yüksekti.

Sonuç: Cinsiyet ve doğum şekli ile yatış total bilirübin ve fototerapi alma süresi arasında anlamlı ilişki görülmedi. Tartı kaybı olan hastaların olmayanlara göre yatış total bilirübin istatistiksel olarak daha yüksekti. Ek olarak ABO uygunsuzluğu olan hastaların yatış sürelerinin de diğer tanılarla yatan hastalara göre istatistiksel açıdan anlamlı daha uzun olduğu görüldü.

Anahtar kelimeler: Yenidoğan, İndirekt hiperbilirübinemi, Risk faktörleri.

INTRODUCTION

Indirect hyperbilirubinemia (IHB) is a primarily normal condition that can be seen in almost all newborns. Clinically, IHB manifests as yellowing of the skin and sclera. Biochemically, IHB is defined as an increase in serum bilirubin level[1]. Although IHB is a physiologic and benign condition that is normal in most newborns, it may cause serious problems requiring treatment in some patients[2].

IHB in newborn babies may be related to inadequacy in the reuptake and conjugation of bilirubin to the liver, decreased intestinal motility, delay in meconium passage, and increased enterohepatic circulation[3].

The most common causes of IHB include delayed breastfeeding and problems with breastfeeding technique, breast milk jaundice, infections, some metabolic diseases, hematoma, ABO, and Rh incompatibility. Other risk factors thought to be associated with the development of severe jaundice include jaundice occurring in the first 24 hours, history of a jaundiced sibling receiving phototherapy or exchange transfusion treatment, being late preterm, white race, hematoma, and extensive ecchymosis[4,5]. The severity of neonatal jaundice was mild to moderate with infectious causes, endocrine disorders, and dehydration. Excessive bilirubin production, however, has been identified as the most common cause of jaundice in cases with bilirubin levels >25 mg/dl[6].

The most critical problem caused by IHB is kernicterus[7]. Bilirubin encephalopathy or kernicterus is an avoidable neurological syndrome with adverse effects resulting from the deposition of unconjugated bilirubin in the cortical nuclei and brainstem. Babies with high bilirubin levels should be monitored and treated appropriately for sensorineural hearing impairment, developmental status, and eye condition[6]. This can be prevented with early and correct treatment. The most commonly used treatment options include phototherapy and blood exchange[7]. This study aimed to retrospectively analyze the short-term outcomes of neonatal jaundice patients with

indirect hyperbilirubinemia during diagnosis, follow-up and hospitalization in a university hospital in the east of our country over one year.

METHOD

Our study was conducted between May 2019 and May 2020 in neonatal patients hospitalized in our Neonatal Intensive Care Unit diagnosed with IHB. The study included 226 term newborns (37-42 gestational weeks). Patients with congenital anomalies, bleeding diathesis, chromosomal abnormalities, asphyxia, direct hyperbilirubinemia, and prolonged jaundice were excluded. Serum bilirubin was measured by a spectrometric method in capillary blood or venous blood.

The early onset of jaundice may be the result of an inadequate intake of breast milk[8,9]. Polycythemia was denoted as hematocrit 65%[10].

The retrospective and cross-sectional study data were obtained by examining the hospital records of the patients. Data on prenatal, natal, and postnatal histories, presenting complaints, physical examination findings, and diagnoses were recorded for each patient. Hemograms, biochemical parameters, direct coombs, maternal and infant blood groups and subgroups, thyroid function tests, glucose six phosphate dehydrogenase, urine culture, complete urine analysis, and tandem mass results were analyzed. The diagnosis and treatment of the patients were determined according to the American Academy of Pediatrics guidelines, taking into account gestational age and risk factors. Approval for the study was obtained from the Ethics Committee of Van Yüzüncü Yıl University Faculty of Medicine (Ethical Approval Date 15/11/2023, Number 08).

Statistical Analysis

Descriptive statistics for continuous variables are expressed as mean, standard error, median, minimum, and maximum values, while categorical variables are expressed as numbers and percentages. After testing whether the data showed normal distribution, the One-Way Analysis of Variance or Kruskal Wallis test, Mann Whitney U test, or T-test were used to compare continuous variables according to categorical variables. Spearman correlation coefficients were calculated to determine the relationship between non-continuous variables. When necessary, the chi-square test and ratio comparison were used to determine the relationship between categorical variables. The statistical significance level was calculated as 0.05. SPSS (IBM SPSS Statistics for Windows, Version 26.0. Armonk, NY: IBM Corp) statistical package program was used for calculations.

RESULTS

Of the 226 patients who participated in the study, 126 (55.8%) were male. 120 (53.1%) of the patients were born in our hospital. 119 (52.7%) of the cases were normal spontaneous vaginal delivery (NSVD). The mean maternal age was 27.7±0.4 years. The mean gestational week was 38.3 weeks. The mean birth weight of the cases was 3146±32 grams. There was no consanguinity between the parents in 190 (84.1%) of the patients. There was a history of phototherapy in 9 (4%) siblings. The most common complaint accompanying jaundice was decreased sucking in 30 cases (13.3%). Additional complaints other than jaundice were present in 37 patients (16.4%). Of the patients, 196 (86.7%) were exclusively breastfed. The mean postnatal age was 4.15±0.1 days. The mean hospitalization weight was 3024±31 grams, and the mean weight loss was 3.79% compared to birth weight. Bilirubin-induced neurologic dysfunction (BIND) was present in 8 (3.5%) patients. The mean hospitalization hemoglobin (Hgb) was 17.3±0.1 g/dl, the mean total bilirubin was 17.1±0.2 mg/dl, and the mean discharge bilirubin was 10.2±0.1 mg/dl. Direct Coombs test was positive in 37 (16.3%) patients. The mean duration of phototherapy was 38.2±1.4 hours, and the mean duration of hospitalization was 3.67±0.1 days. The number of patients who received intravenous immunoglobulin (IVIG) treatment was 2 (0.9%) and the number of patients who received exchange transfusion was 24 (10.6%) (Tables 1, 2).

Table I: Descriptive statistical analysis of patients with indirect hyperbilirubinemia

Characteristics	Mean±Stder	Median (min-max)
Age of mother (years)	27.73±0.42	27 (16-45)
Week of gestation	38.31±0.04	38 (37-40)
Birth weight (g)	3146.76±32.10	3100 (2100-4480)
Weight loss (%)	3.79±0.33	1.55 (0-25)
Hospitalization weight (g)	3024.64±31.2	3000 (2000-4400)
Age at diagnosis (days)	4.15±0.19	3 (1-14)
Initial Hgb (g/dl)	17.33±0.17	17.4 (7.8-25)
Initial Hct (%)	51.07±0.54	51 (17.7-80)
Initial total bilirubin (mg/dl)	17.11±0.29	17.05 (6.7-36.3)
Initial direct bilirubin (mg/dl)	0.52±0.01	0.5 (0.1-1.2)
Discharge total bilirubin (mg/dl)	10.2±0.14	10.5 (2.4-16)
Duration of phototherapy (hours)	38.25±1.45	36 (10-120)
Length of hospitalization (days)	3.67±0.13	3 (1-14)

Table II: Characteristics of patients with indirect hyperbilirubinemia

Gender	Girl	100 (44.2%)
	Boy	126 (55.8%)
Place of birth	Our hospital	120 (53.1%)
	Outer center	106 (46.9%)
Mode of delivery	NSVD	119 (52.7%)
	Cesarean section	107 (47.3%)
Consanguineous marriage	Yes	36 (15.9%)
	No	190 (84.1%)
Additional complaints other than jaundice	Decreased suckling	30 (13.3%)
	Restlessness	3 (1,3%)
	Napping	2 (0.9%)
	Decreased sucking + napping	2 (0.9%)
	No	189 (83.6%)
Sibling phototherapy story	Yes	9 (4%)
	No	217 (96%)
Direct coombs test	1+	17 (7.5%)
	2+	5 (2.2%)
	3+	9 (4%)
	4+	4 (1.8%)
	Weak positive	2 (0.9%)
	Negative	189 (83.6%)
Use of IVIG	Yes	2 (0.9%)
	No	224 (99.1%)
Exchange	Yes	24 (10.6%)
	No	202 (89.4%)
BIND	Yes	8 (3.5%)
	No	218 (96.5%)
Dietary pattern	Breast milk	196 (86.7%)
	Formula + Breast milk	28 (12.4%)
	Formula	2 (0.9%)

No statistically significant difference was found in gender, mode of delivery, hospitalization bilirubin level, hospitalization hemoglobin, age at diagnosis, weight loss, duration of phototherapy, and hospitalization (p>0.05). There was no statistically significant difference between total bilirubin levels of newborns in terms of weight loss percentages (1-5%, 6-10%, 11-15%, 16-20%, and 21-25%) at hospitalization (p=0.48). According to birth weight at hospitalization, total bilirubin levels at the first hospitalization of babies without weight loss (15.46±0.35) were statistically significantly lower than total bilirubin levels at the first hospitalization of babies with weight loss (18.29±0.4) (p=0.0001). Eighty-seven (38.5%) of the mothers of infants hospitalized in the neonatal unit for jaundice were primiparous. Although the bilirubin level of babies of primiparous mothers at hospitalization (17.57±0.49) was higher than the bilirubin level of non-primiparous babies (16.83±0.36), there was no statistically significant difference between them (p=0.22). When the diagnoses of the patients were analyzed, 63 (27.9%) had ABO incompatibility, 23 (10.2%) had Rh incompatibility, 5 (2.2%) had ABO + Rh incompatibility, 26 (11.5%) had subgroup incompatibility and 28 (12.4%) had breast milk jaundice. The etiology of jaundice could not be determined in 68 (30%) patients (Table 3).

Table III: Causes of indirect hyperbilirubinemia (n=226)

ABO incompatibility	63(27.9%)
Rh incompatibility	23(10.2%)
Early breast milk jaundice	28(12.4%)
Subgroup c incompatibility	17(7.5%)
ABO+Rh incompatibility	5(2.2%)
Subgroup E incompatibility	5(2.2%)
Cephal hematoma	4(1.8%)
Diabetic mother's baby	3(1.3%)
Polycythemia	3(1.3%)
Subgroup c and e incompatibility	2(0.9%)
Subgroup e incompatibility	1(0.4%)
Kell incompatibility	1(0.4%)
Dehydration	1(0.4%)
Sepsis	1(0.4%)
Glucose 6 phosphate dehydrogenase deficiency	1(0.4%)
Congenital hypothyroidism	1(0.4%)
Galactosemia	1(0.4%)
Urinary tract infection	1(0.4%)
Undetermined	65(28.8%)

In the etiology of the patients who underwent exchange transfusion (n=24), ABO incompatibility was found in 5 patients, Rh incompatibility in 3 patients, subgroup incompatibility in 6 patients, Rh+ABO incompatibility, galactosemia, and cephalic hematoma in one patient each. No etiology was found in 7 cases. The bilirubin levels of the babies who underwent exchange transfusion (24.4±1.12) were statistically significantly higher than the bilirubin levels of the babies who did not undergo exchange transfusion (n=202) (16.25±0.23) (p=0.0001). There was no statistically significant difference between the hemoglobin level (16.53±0.64) of the babies who underwent exchange transfusion and the hemoglobin level (17.43±0.17) of the babies who did not undergo exchange transfusion (n=202) (p=0.26). The length of hospital stay was statistically significantly longer in patients with ABO, Rh and/or subgroup incompatibility compared with patients with other etiologies and patients of unknown etiology (p=0.014). When evaluated in terms of the presence of any of the ABO, Rh and/or subgroup incompatibilities in the etiology, the presence of an etiology other than incompatibility and the duration of phototherapy in infants with indirect hyperbilirubinemia with unclear etiology, although the duration of phototherapy in newborns with unclear etiology of indirect hyperbilirubinemia was found to be shorter than in infants with indirect hyperbilirubinemia with an etiology other than incompatibility or incompatibility, this difference was not statistically significant (p>0.05). The hospitalization total bilirubin values of infants with indirect hyperbilirubinemia with unclear etiology were statistically significantly higher in infants with an etiology other than ABO, Rh and/or subgroup incompatibility or incompatibility (p<0.05) The age at diagnosis was statistically significantly higher in infants with indirect hyperbilirubinemia of undetermined etiology than in infants with ABO, Rh and/or Subgroup incompatibility or with an etiology other than incompatibility (p<0.05). The hospitalization hemoglobin values of infants with indirect hyperbilirubinemia with unclear etiology and infants with an etiology other than incompatibility were statistically significantly higher than those with any of the ABO, Rh and/or Subgroup incompatibilities in the etiology (Table 4).

Table IV: Comparative data of patients with and without ABO, Rh, and/or subgroup incompatibilities in their etiology

Features	Etiology	N	Mean±Stder	P
Week of gestation	Incompatibility	117	38.39±0.06	0.13
	Out of incompatibility	44	38.15±0.09	
	Undetermined	65	38.29±0.09	
Hospitalization bilirubin (mg/dl)	Incompatibility	117	16.14±0.39	0.0001
	Out of incompatibility	44	16.78±0.7	
	Undetermined	65	19.08±0.47	
Postnatal age at diagnosis (days)	Incompatibility	117	3.25±0.23	0.0001
	Out of incompatibility	44	3.13±0.27	
	Undetermined	65	6.26±0.39	
Hospitalization Hgb (g/dl)	Incompatibility	117	16.92±0.25	0.004
	Out of incompatibility	44	18.45±0.37	
	Undetermined	65	17.32±0.27	
Duration of phototherapy (hours)	Incompatibility	117	40.73±2.2	0.19
	Out of incompatibility	44	39.27±3.4	
	Undetermined	65	33.09±1.9	
Length of hospitalization (days)	Incompatibility	117	3.98±0.19	0.014
	Out of incompatibility	44	3.72±0.34	
	Undetermined	65	3.09±0.18	

*Kruskal - Wallis test**

Among the patients with positive direct Coombs test (n=37), Rh incompatibility was detected in 7 (18.9%), ABO incompatibility in 24 (64.8%), Rh+ABO incompatibility in 3 (8.1%), and subgroup incompatibility in 3 (8.1%).

DISCUSSION

Neonatal jaundice is one of the common problems in the neonatal period. In delayed diagnosis and treatment cases, severe sequelae may be observed, including bilirubin encephalopathy and kernicterus[11]. It is known

that male gender is a risk factor in the etiology of IHB. Bülbül A. et al. reported that IHB was observed more frequently in male newborns[12]. Regarding sex, jaundice was more common in male newborns at all bilirubin levels >20, except at bilirubin levels 5-156. In our study, IHB was observed more frequently in the male gender. In the Hegyi T. et al. study, no relation was observed between gender and bilirubin levels[13]. The relationship between gender and bilirubin levels was not observed in our study, which is similar to the survey by Hegyi et al. In addition, our study also showed no relationship between gender duration of hospitalization and duration of phototherapy (p>0.05).

Aslan Y. et al. 2023, no significant relationship was observed between mode of delivery and bilirubin levels[14]. When the relationship between mode of delivery and total serum bilirubin values was investigated, the mean total serum bilirubin level was the highest in babies born by vacuum delivery, but no significant difference was found between spontaneous vaginal delivery, vacuum delivery and cesarean section to constitute a risk factor[12]. In our study, no statistically significant difference was observed between mode of delivery and hospitalization bilirubin levels, phototherapy, and length of hospitalization (p>0.05).

Weight loss and dehydration are among the factors that contribute to the etiology of IBD[15]. In a 2009 study published by Salas A.A. et al., a significant relationship between weight loss and total bilirubin levels was shown[16]. When the infants were divided into two groups those with physiological weight loss (< 10% according to birth weight) and those with pathological weight loss (≥ 10%), the total serum bilirubin values of the infants with pathological weight loss were found to be significantly higher. In 14 of those with weight loss (n: 62), the TSB value was ≥ 25 mg/dl. The duration of phototherapy was significantly longer in patients with weight loss[12]. According to birth weight, the hospitalization bilirubin levels of babies with weight loss (18.29±0.4) were statistically significantly higher than the hospitalization bilirubin levels of babies without weight loss (15.46±0.35) (p=0.0001). This is due to delayed meconium passage and increased enterohepatic circulation.

Some studies have shown that bilirubin levels are high in infants of primiparous mothers. A survey conducted by Tavakolizadeh R. et al. in Iran examined whether the mothers of 163 newborns were first-time mothers or not. Bilirubin levels were statistically significantly higher in newborns of mothers who gave birth for the first time[17]. Although jaundice was more common in the first child, the birth order of the child was not found to be associated with the total serum bilirubin value[12]. According to our data, the hospitalization bilirubin level of infants of primiparous mothers (17.57±0.49) was higher than that of non-primiparous infants (16.83±0.36). However, there was no statistically significant difference (p=0.22). This showed that more studies are needed to show the relationship between parity and hyperbilirubinemia.

Blood incompatibilities are one of the most common etiologies of IHB. Yu C. et al., in a study conducted with 614 newborns between 2001 and 2011, the most common cause of IHB was ABO incompatibility (53.5%), and the rate of unexplained IHB was found to be 16.8%[18]. The cases with AB0 incompatibility were reported to be 42.4%, those with AB0 incompatibility alone were 15.2%, and those with AB0 and subgroup incompatibility were 10%. The patients with Rh incompatibility was 18.4%, those with Rh incompatibility isolated was 0.8%, and those with Rh and subgroup incompatibility was 10.4%[19]. In our study, ABO incompatibility was the most common etiologic factor, with a rate of 27.9%, while the cause of IHB could not be found in 28.8% of the cases.

Blood exchange is one of the most common treatment modalities after phototherapy. In studies, the rate of exchange transfusion varies between 1% and 19.6%[11]. According to information published by the American Academy of Pediatrics in 2004, exchange transfusion should be performed in patients whose bilirubin could not be decreased with phototherapy or whose bilirubin level was above a certain level. It was shown that patients who underwent exchange transfusion had higher bilirubin levels than those who underwent phototherapy[20]. In our study, ABO incompatibility was found in 5 patients, Rh incompatibility in 3 patients, subgroup incompatibility in 6 patients, Rh+ABO incompatibility, galactosemia, and cephalic hematoma in one patient each in the etiology of the patients who underwent exchange transfusion (n=24). No etiology was found in 7 patients. Consistent with the literature, bilirubin levels of babies who underwent exchange transfusion (24.4±1.12) were statistically significantly higher than bilirubin levels of babies who did not undergo exchange transfusion (n=202, 16.25±0.23) (p=0.0001).

Although IHB in newborns may occur due to many causes, the most crucial reason is still blood group incompatibility, and these are ABO, Rh, and subgroup incompatibility. Jaundice observed in the first 24 hours, direct Coombs positivity, blood group incompatibility, other known hemolytic disorders such as G6PD deficiency, 35-36 weeks gestation, East Asian race, and previous sibling phototherapy history are reported to be major risk factors[20]. When etiologic factors are examined, Olusanya B.O. et al. 2015 in underdeveloped countries found the risk factors in IHB as ABO, Rh incompatibility, low birth weight, sepsis, UGT1A1 polymorphism, being primiparous, out-of-hospital delivery and low birth week. However, the relation of etiologic factors with phototherapy durations was not examined[21]. The duration of phototherapy was longer in newborns with blood incompatibility in the etiology compared to those without incompatibility, but this difference was not statistically significant (p=0.19). Therefore, more studies are needed to show the relationship between etiologic factors and the duration of phototherapy.

Stevenson K. D. et al. 1994, which examined the relationship between end-tidal carbon dioxide and bilirubin levels, found that bilirubin levels were higher in patients with ABO and/or Rh incompatibility[22]. When Rh, ABO, and subgroup incompatibilities were analyzed, the mean total bilirubin level ranged between 19-22 mg/dl in a recent study[19]. In our study, bilirubin levels of newborns with undetermined etiology were statistically significantly higher than those with blood incompatibility (p=0.0001). The reason for the results of our research, which were contradictory to the study by Stevenson K. D. et al., may be attributed to the fact that healthcare workers raised awareness of the patient's relatives because of the risk of reaching higher bilirubin levels in blood incompatibilities.

Lifshitz Y.M. et al. in a study comparing ABO incompatibility with other factors, no statistically significant relationship was found between blood incompatibility and gestational week and hospitalization hematocrit levels[23]. Our study observed no statistically significant difference between patients with and without blood incompatibility regarding gestational week. However, hospitalization Hgb levels were statistically significantly lower between patients with and without blood incompatibility in our study (p=0.004). This was attributed to a decrease in Hgb secondary to hemolysis.

Direct Coombs test may be positive with varying rates of blood incompatibilities. Kristinsdottir T. et al. investigated the relationship between Coombs positivity and ABO incompatibility and found ABO incompatibility in 73.6% of 383 coombs-positive newborns[24]. 30% of the

newborns hospitalized for hyperbilirubinemia were direct Coombs test positive, 29.3% of them had Rh and subgroup incompatibility, and 29.3% had AB0 incompatibility[19]. In our study, ABO incompatibility was found in 24 (64.8%) of 37 patients with positive direct Coombs test. This rate is similar to the rate in our study.

BIND is a clinical entity observed in newborns whose diagnosis and treatment are delayed for any reason. Hameed N.N. et al. found gestational age of 36.7 weeks and mean bilirubin levels of 29.5 mg/dl in patients with positive BIND scores[25]. In our study, the mean gestational age was 38.5±0.2 weeks, the mean bilirubin level was 29.17±1.5 mg/dl, the mean hospitalized Hgb was 18.51±0.7 g/dl, the mean duration of phototherapy was 68.7±7.2 hours and the mean duration of hospitalization was 5.5±0.9 days in 8 (3.5%) infants with BIND findings. Consistent with the literature, bilirubin levels were higher in infants with BIND findings.

CONCLUSION

Neonatal hyperbilirubinemia has high morbidity and mortality if not diagnosed and treated early. Early identification of the risk factors involved in the etiology, follow-up of the patients, and early initiation of treatment are essential in reducing mortality and morbidity in these patients.

Ethics Committee Approval: Approval for the study was obtained from the Ethics Committee of Van Yüzüncü Yıl University Faculty of Medicine (Ethical Approval Date 15/11/2023, Number 08).

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