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Prevalence and Associated Factors of Neonatal Hyperbilirubinemia among NICU Cases in Abshway Central Hospital

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Abstract

Introduction: Neonatal hyperbilirubinemia, with its different etiologies, is one of the most common diseases in the neonatal period. It might lead to neonatal intensive care unit (NICU) admission with hazardous complications, if not adequately treated.

Aim of the study: The current study aimed to determine the prevalence and associated factors of neonatal jaundice in neonates admitted to the NICU of Abshway Central Hospital in the last five years (from January 2014 to December 2018).

Subjects and Methods: This retrospective cross-sectional study was conducted on all neonates admitted due to different etiologies in the NICU department of Abshway Central Hospital from January 2014 to December 2018, excluding neonates with major congenital anomalies. Data were collected from hospital records in a data collection sheet, including demographic characters, maternal characters, and data on jaundice history, clinical findings, associated risk factors, and associated diseases.

Results: The study illustrated that the prevalence of jaundice was 59.8% of neonates admitted to NICU,

46.9% of jaundiced cases were diagnosed as jaundice due to breastfeeding, and 27.5% were diagnosed as jaundice due to inadequate caloric intake. All patients with risk factors, prematurity, septicemia, and Caesarian section (CS) deliveries had the higher percentage among cases.

Conclusion: The high prevalence of jaundice was found to be due to breastfeeding, inadequate caloric intake, prematurity, septicemia, and CS deliveries. Early and proper management and follow-up of cases with significant neonatal jaundice for early detection and proper management of complications and avoiding severe complications.

Keywords: Neonates; Jaundice; Breast-feeding

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1. Introduction

Jaundice in the newborn is the most common clinical problem that requires close attention, evaluation, and treatment, as it is the most common cause of neonatal readmission during the neonatal period [1].

Jaundice is caused by an increase in serum bilirubin levels, largely as a result of the breakdown of red blood cells. Bilirubin is conveyed in the blood as 'unconjugated' bilirubin, bound to albumin. The liver converts bilirubin into a conjugated form which is excreted in the bile. High levels of unconjugated bilirubin are neurotoxic [2]. A newborn's immature liver mostly cannot remove bilirubin quickly enough, causing hyperbilirubinemia [3]. Several types of hyperbilirubinemia have been reported in neonates, including physiological Jaundice, pathological Jaundice, Jaundice due to breastfeeding or breast milk, and hemolytic jaundice, including three subtypes due to Rhesus (Rh) incompatibility, ABO blood group incompatibility, and jaundice associated with glucose -6- phosphate dehydrogenase deficiency (G6PD) [4].

Pathologic unconjugated hyper-bilirubinemia includes jaundice appearing within the first day of life or a rate of rise of serum bilirubin level exceeding 0.2 mg/dL/hour [5]. The most common causes of early neonatal jaundice (onset less than 24 hours) are hemolytic disease: e.g., hemolytic disease of the newborn (rhesus), ABO incompatibility, glucose-6-phosphate dehydrogenase deficiency, spherocytosis, infection: congenital (e.g., toxoplasmosis, rubella, cytomegalovirus (CMV), herpes simplex, syphilis) or postnatal infection [6].

While neonatal jaundice is mostly benign but excessively high levels of serum bilirubin in a small percentage of newborns can cause bilirubin-induced neurologic dysfunction (BIND), potentially leading to permanent brain damage, a condition known as kernicterus [7]. According to serum levels of bilirubin, phototherapy, intravenous immune globulin (IVIG), and exchange transfusion are the most widely used therapeutic modalities in infants with neonatal jaundice [8].

2. Subjects and methods

2.1. Subjects

The study was conducted as a retrospective cross-sectional study on all neonates, aged from 0 – 28 days old, who were admitted due to different etiologies in the NICU department of Abshway Central Hospital from January 2014 to December 2018 (five years).

Patients having major congenital anomalies and surgical problems were not included in that study.

2.2. Study design

We collected all available data about history taking, including gender, gestational age, mode of delivery, the onset of jaundice,

age at admission, maternal age, maternal illness, history of maternal drug intake, and if there is an associated illness such as sepsis or respiratory distress. Also, examination of the newborns, including weight, general appearance, alertness, the extent of jaundice, pallor, muscle tone, reflexes, and abdominal examination. Also, we collected all investigations that were done for neonates in the form of total and direct bilirubin level, complete blood count and reticulocyte count, C-reactive protein, maternal and infant blood groups (ABO and Rh), and other investigations, if available, as Coombs test, G6PD activity assay, Liver function, liver enzymes, and abdominal ultrasound.

In addition, we collected data about applied management: either phototherapy, exchange transfusion, intravenous immunoglobulin, or otherwise.

3. Results

The study showed that the mean age of neonatal admission was (5.7 ±6.5) days, ranging between 1 and 28 days, with a mean weight of (2676.9± 578.9) grams. It also showed that 63.1% of the studied group were males versus 36.9% were females. We found that 59.8% of cases had jaundice, and 40.2% had other diseases. The mean age for the onset of jaundice was 4±1.4 days. Most jaundiced neonates were born by the caesarian section (76%), and 92% of the jaundiced group were full-term (Table 1).

Table 1: Prevalence of Jaundice among the Studied Group.

Parameters	Disease duration (m.)
Neonates with Jaundice	1299 (59.8%)
Neonates did not develop Jaundice	872 (40.2%)
The onset of jaundice (days)	4±1.4

Among the jaundiced group, 46.6% of neonates were documented for being sick, 89% were alert, 8.9% had pallor, 93.8% had good muscle tone, 94.8% had normal reflexes, and no documented cases of organomegaly. Regarding the associated illness, 27.2% had RD, 1.7% had sepsis, 2.1% were admitted for prematurity, and 11.1% had multiple diseases in association with jaundice (Table 2).

Table 2: Frequency of Different Clinical Assessment among Jaundiced Group.

Variables		Clinical assessment (n=1299)
General Appearance	Good	694 (53.4%)
	Sick	605 (46.6%)
Alertness	Alert	1158 (89%)
	Apathetic	141 (11%)
Pallor	Yes	115 (8.9%)
	No	1184 (91.1%)
Muscle tone	Good	1219 (93.8%)
	Hypotonic	80 (6.2%)
Muscle reflexes	Good	1232 (94.8%)
	Hyporeflexia	67 (5.2%)
Organomegaly	Yes	0
	No	1299 (100%)
Associated illness	No	730 (56.2%)
	RD	353 (27.2%)
	Sepsis	22 (1.7%)
	Prematurity	28 (2.1%)
	Hypoglycemia (IDM)	22 (1.7%)
	Multiple illnesses (RD, sepsis, prematurity, or IDM)	144 (11.1%)

The previous table showed that the mean hemoglobin level among the studied group was (12.7±3.4 g/dl), the mean PLTs count was (248.1±82.2 $\times 10^3$/µl), the mean WBCs was (12.8±5.8 $\times 10^9$/l), and the mean Reticulocyte count was (3.4±2.5 %). As regards liver function, the mean total bilirubin was (14.7±4.9 µmol/l), the mean direct bilirubin was (0.6±0.2 mg/dl), the mean AST was (33.4±20.6 U/l), and the mean ALT was (38.4±24.7 U/l) (Table 3).

Table 3: Description of Routine Investigations among the Studied Group.

Parameters		Range	Mean ±SD
Complete blood count	HB (g/dl)	4.5-18	12.7 ±3.4
	PLTs ($\times 10^3$/µl)	145-414	248.1 ±82.2
	WBCs ($\times 10^9$/l)	3.7-27.9	12.8 ±5.8
	Reticulocyte count (%)	0.2-9.7	3.4 ±2.5
Liver function	Total bilirubin (µmol/l)	5-38	14.7 ±4.9
	Direct bilirubin (mg/dl)	0.1-0.8	0.6 ±0.2
	AST (U/l)	14-92	33.4 ±20.6
	ALT (U/l)	12-84	38.4 ±24.7

As shown in Table 4, 33.6% of cases were mainly diagnosed as jaundice, 26.2% were diagnosed as jaundice associated with another disease, and 40.2 % had other diseases. Among the jaundiced group, 46.9% were diagnosed with breastfeeding jaundice, 27.5% Jaundice due to inadequate caloric intake, 8.4% Jaundice due to prematurity, 5.7% Jaundice due to septicemia, 4.1% Rh incompatibility, 2.2% as ABO incompatibility, while 5.2% did not reach a diagnosis at the time of admission.

Table 4: Frequency of Different Diagnoses among Studied Group.

Variables (n=2171)		Diagnosis
Jaundice only n=730 (33.6%)	Breastfeeding jaundice	609 (28%)
	ABO incompatibility	25 (1.2%)
	Rh incompatibility	52 (2.4%)
	No available determined cause	44 (2%)
Jaundice with other diseases n=569 (26.2%)	RD	353 (16.3%)
	Sepsis	22 (1%)
	Prematurity	28 (1.3%)
	Hypoglycemia (IDM)	22 (1%)
	Multiple illnesses (RD + sepsis, RD +prematurity, RD + hypoglycemia (IDM), Sepsis + prematurity or RD + sepsis + prematurity)	144 (6.6%)
Other diseases not associated with jaundice n=872 (40.2%)	RD	600 (27.6%)
	Septicemia	44 (2%)
	Prematurity	19 (0.9%)
	Hypoglycemia (Infant with diabetic mother)	15 (0.7%)
	Multiple illnesses	194 (8.9%)

The results showed a statistical significance difference with ($P<0.05$) between neonates with and without jaundice as regards maternal age and maternal illness, which indicated that neonates with jaundice were born to mothers younger in age and with no associated comorbidities (Table 5).

Table 5: Comparisons of Maternal Risk Factors in Different Studied Groups.

Variables		No neonatal jaundice	Neonatal Jaundice	*P-Value*
Maternal age (years)		27.2 ±5.6	25.4 ±4.6	<0.001*
Maternal illness (n=2171)	No	830 (39.6%)	1268 (60.4%)	0.002*
	Yes	42 (57.5%)	31 (42.5%)	
Types of maternal diseases	No	830 (39.6%)	1268 (60.4%)	0.07
	DM	38 (58.5%)	27 (41.5%)	
	HTN	1 (20%)	4 (80%)	
	HBV	3 (100%)	0	

* Significant *P-value*.

Also, the results showed that most jaundiced neonates were treated by phototherapy (77.4%). 16% did not require treatment for jaundice. 4.5% were treated with intensive phototherapy and 2.2% had exchange transfusion combined with phototherapy (Table 6).

Table 6: Frequency of ways of management among the jaundiced group.

Ways of management (n= 1299)	Frequency
No treatment for Jaundice	207 (16%)
Phototherapy	1006 (77.4%)
Intensive photo	58 (4.5%)
Exchange transfusion and photo	28 (2.2%)

4. Discussion

Out of 2171 neonates admitted to NICU in the previously mentioned period, the prevalence of neonatal jaundice was 59.8%, as 1299 neonates had clinically evident jaundice.

In comparison, the proportion of neonatal jaundice was found to be 37.3 %, 44,9%, 48.57%, and 36.54% in a study conducted in Neonatal Intensive Care Units of Mekelle City Public Hospitals (Northern Ethiopia), Tikur Anbessa Specialized Hospital (Ethiopia), Jawahar Lal Nehru Medical College Hospital (Bhagalpur, Bihar) and neonatal unit of Saidu group of Teaching Hospital (Swat, Pakistan), respectively [1, 3-9].

Our study revealed that the age of neonates admitted ranged from 1-28 days with mean age (of 5.7 ± 6.5) days), Similarly, the mean age of neonates at admission with hyperbilirubinemia was 5.29 days, 4.25 ± 2.75 days, 2.64 ± 1.22 days in

studies carried out in Ethiopia, Pakistan, and Cairo University Pediatric Hospital, respectively [3, 9-10].

Our work showed that the mean age for the onset of jaundice was 4 ±1.4 days. The same result was observed in the study conducted at Federal Medical Centre Abakaliki, Southeast Nigeria [11].

In comparison to our results about laboratory investigation, another study conducted at Al-Azhar university, Assuit, Egypt, in January 2019 showed that mean TSB was 26.01 ± 4.85 mg/ dl, mean direct bilirubin 0.93 ± 0.09 mg/ dl, mean hemoglobin 15.32 ± 1.87 gm/ dl and mean level of reticulocytes was 3.19 ± 0.99 among cases with non -hemolytic jaundice in contrast to 27.1 ± 5.0 mg /dl for mean TSB, 1.10 ± 0.17 mg/dl for direct bilirubin, 11.4 ± 2.5gm/dl for hemoglobin and 10.22 ± 2.04 for reticulocyte count in cases with hemolytic jaundice [12].

Comparing our results about causes of jaundice with results of another study conducted at Tikur Anbessa Specialized Hospital, Ethiopia, it was found that ABO incompatibility (35.6%), sepsis (18.8%), breastfeeding (10%) and prematurity (8.1%) were the most etiologic factors [3].

In another study in India, out of 520 jaundiced neonates, exaggerated physiological jaundice was seen in 43.07% of babies, and pathological jaundice was seen in 56.93% of babies. Among the various etiologies causing neonatal hyperbilirubinemia, the most common causes were physiological jaundice at 43.07%, ABO incompatibility at 20.76%, Idiopathic 10.43%, neonatal sepsis at 6.92%, G6PD deficiency at 6.73% and Rh Incompatibility 5.96% [13]. In a more recent study, out of 136 newborns with clinical jaundice, 61% of newborns developed physiological jaundice and 39% developed pathological jaundice, 48% had breastfeeding jaundice, 15% had ABO incompatibility, 5.6% had Rh incompatibility, 1.88% had sepsis [14].

For treatment, 77.4% of jaundiced neonates were treated with phototherapy in our study. While Roza *et al.*, 2018, found that among jaundiced neonates, 86.9% of them were treated by phototherapy alone, and the rest, 13.1%, were treated with exchange blood transfusion combined with phototherapy in Tikur Anbessa Specialized Hospital [3].

The main limitations of our study were the long duration involved in the study (5 years) and the very large number of the studied group making it hard to collect all data, as some data were not found in records and no available follow-up of cases. In addition, neonates with direct hyperbilirubinemia are not admitted to Abshway Central Hospital due to a lack of the specialty of pediatric surgery and pediatric hepatology, so this category was not involved in the study.

Ethical approval and consent to participate: The study was approved by the institutional ethics committee of Fayoum University and all patient provided written informed consent to participate in this study.

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Conflicts of Interest: All authors declare no conflict of interest.

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