Journal of Research in Medical and Dental Science
2018, Volume 6, Issue 1, Page No: 113-117

Available Online at: www.jrmds.in
eISSN No. 2347-2367: pISSN No. 2347-2545

Epidemiologic Study of Jaundice in Newborns with Jaundice in the First 24 hours of Birth in Children's Hospital and Shariati Hospital of Bandar Abbas in 2010-2014

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DOI: 10.24896/jrmds.20186118

ABSTRACT

Neonatal jaundice is the most common cause of hospitalization of term and preterm infants. Although this situation is generally benign, all the jaundices in the first 24 hours of birth are pathologic. High levels of non-conjugated bilirubin can cause nerve damage and create kernicterus. Considering the possibility of preventing the complications of this disease by early diagnosis of the cause of jaundice and proper treatment, and given the limited studies on the epidemiological causes of jaundice in the first 24 hours of birth, we decided to do this study. In this retrospective cross-sectional study, all newborns with jaundice in the first 24 hours of birth who were admitted to Children's Hospital and Shariati Hospital of Bandar Abbas in 2010-2014 were included. Criteria for inclusion in the study; the onset of jaundice under 24 hours and clinical diagnosis of jaundice by neonatologist and exclusion criteria included; severe chromosomal abnormalities and inadequate case records. All cases were examined using census-based method. The data was collected by a researcher-made checklist and then was entered into the SPSS statistical program version 20. It was analyzed by descriptive statistical methods. In this study, 378 cases were investigated and finally, 57 cases were excluded due to incomplete records. Of the 321 neonates, 174 were boys (54.2%) and 147 were girls (45.8%), 237 were terms (73.8%) and 84 were pre-term (26.2%). 172 cases were born by natural delivery (53.6%) and 149 cases by cesarean section (46.4%). 51 (15.9%) of mothers had gestational diabetes mellitus. 309 (96.3%) were born with Apgar more than or equal to 6. The total mean of hemoglobin was 15.20±2.67 mg/dl. The mean bilirubin level was 13.26±4.41 mg/dl, with a minimum of 5.5 and a maximum of 28. For 35 infants, blood transfusion was performed. In all cases, increased non-conjugated bilirubin was observed, except for one case that was suspected to have Down syndrome. 20 cases (6.2%) had RH incompatibility, 124 cases (36.6%) had ABO incompatibility, 99 cases (30.8%) had G6PD deficiency, and 5 (1.6%) had ABO and Rh incompatibilities simultaneously. 27 (8.4%) simultaneously had ABO incompatibility and G6PD deficiency. 5 (1.6%) simultaneously had RH incompatibility and G6PD deficiencies. 4 (1.2%) had concurrent RH and ABO incompatibilities and G6PD deficiency. The results of this study showed that the most common cause of jaundice on the first day in neonates was ABO incompatibility. Also, the highest amount of jaundice on the first day was for male, term, and normal birth weight babies. Most of these cases were born in a natural delivery. The results of this study are consistent with most similar studies.

Keywords: Epidemiologic Factors, Neonatal Jaundice, First 24 Hours of Birth, Early Jaundice

HOW TO CITE THIS ARTICLE: Seyed Hossein Saadat, Salma Naderi, Shahram Zare, Samira Khalili, Behnaz Darban, Rakhshaneh Goodarzi, Epidemiologic Study of Jaundice in Newborns with Jaundice in the First 24 hours of Birth in Children's Hospital and Shariati Hospital of Bandar Abbas in 2010-2014, J Res Med Dent Sci, 2018, 6 (1): 113-117, DOI: 10.24896/jrmds.20186118

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Received: 22/10/2017
Accepted: 15/01/2018

INTRODUCTION

Neonatal Jaundice is the most common cause of admission of term and preterm infants [1, 2]. 60%

of term and 80% of preterm newborn infants suffer from it and 75% of hospitalizations in the first week of birth are due to neonatal jaundice [3]. Neonatal jaundice is defined as increasing the total bilirubin level of the infant beyond 5 mg/dl or 86 mmol/L, which is often due to an increase of non-conjugated bilirubin and is characterized by yellow skin and sclera [1]. Although this situation is generally benign, in some infants, high levels of non-conjugated bilirubin can cause nerve damage and create kernicterus [4]. In a study conducted by Alkhotani and his colleagues in Saudi Arabia, the prevalence of neonatal jaundice was 12% and jaundice at the first 24 hours of birth was 8.8%. The incidence of ABO incompatibility in these infants was 14.3% [5]. The study of Zarinkoob and his colleagues in Tehran in 2007 also reported a prevalence of jaundice in the first day of 5.8%. Early neonatal jaundice risk factors in this study were: ABO incompatibility, infection, decreased activity of G6PD, Cephalohematoma, asphyxia, and RH incompatibility [6]. In a study by Amer Shah and his colleagues in Ahmadabad, Pakistan, the most common causes of pathological jaundice were ABO incompatibility and sepsis [7]. In a study by Sgro and colleagues in Canadian in 2006, the prevalence of hyperbilirubinemia was approximately 1 in every 2480 live births, with the most common causes, including: ABO incompatibility, G6PD deficiency, all other blood incompatibilities, and hereditary spherocytosis [8]. Also, Huang May-Jen and colleagues investigated the risk factors of severe hyperbilirubinemia in a 2001-2003 study, and reported seven major risk factors: breast feeding, ABO incompatibility, premature birth, infection, Cephalohematoma, asphyxia, and G6PD deficiency [9]. In another study by Kuzniewicz and colleagues on admitted cases in California between 1995 and 2011, the total bilirubin level of over 30 was considered as dangerous hyperbilirubinemia. In this study, bilirubin was more than 30 in 44 admitted infants at birth. 4 children had symptoms of acute encephalopathy due to high bilirubin, two of them progressed towards CP and SNHL simultaneously, and 1 child progressed towards SNHL. These three children had G6PD deficiency and their total bilirubin levels were above 40 mg/dl [10]. In a study by Yi-Hao Weng and colleagues in 2007, the clinical symptoms of acute bilirubin encephalopathy of: Apnea (2.4%), tachypnea (6%), fever (1.2%), restlessness (2.4%), lethargy (4.8%), seizure (1.2%) and Poor feeding (19.3%) were reported. In this study, hyperbilirubinemia was higher in infants with RH incompatibility than those with ABO incompatibility [11]. In a study conducted by Hasan Baskabadi and his colleagues in Mashhad in 2010, most neonates who had jaundice were boys, terms, with normal weight, and born with normal birth. Also, the results of this study indicated that the most perinatal complications related to infants whose mothers had hypertension or diabetes [12]. In another study in 2012, Baskabadi showed that in 41% of jaundice cases, there was a history of maternal predisposition; the most common were blood pressure, vaginal bleeding, and gestational diabetes mellitus [13]. In another study in Gonabad in 2011, Ashraf and his colleagues showed that 53.5% of the newborns had jaundice, 53.7% of them were males, and the severity of jaundice in most cases (47.8%) was low and in (15.2%) of cases was high. Most of them (62.6%) were born naturally [14]. In Emailpoor's study, most of early jaundice cases occurred in male neonates that delivered by vaginal delivery [15]. Also In Onyearugha's study, the most common causes of jaundice in the first day were septicemia, prematurity, Cephalohematoma and ABO incompatibility respectively [16]. Garosi's study also demonstrated, factors type of delivery, oxytocin induction and gender of neonate could contribute to jaundice [17]. Considering that few studies have been carried out on the epidemiological causes of neonatal jaundice in the first 24 hours of birth, and on the other hand, since it is possible to prevent the onset of the disease by timely diagnosis of the type of jaundice, the cause and the appropriate treatment, the decision to investigate the epidemiological factors of jaundice in newborns with jaundice in the first 24 hours of birth who were admitted to Children's Hospital and Shariati Hospital of Bandar Abbas in 2010-2014 was taken.

MATERIALS AND METHODS

In this retrospective cross-sectional study, all newborns with jaundice in the first 24 hours of birth who were admitted to Children's Hospital and Shariati Hospital of Bandar Abbas in 2010-2014 were included. The criteria for entering the study included the onset of jaundice below 24 hours after birth and the clinical diagnosis of jaundice by the neonatologists and Exclusion criteria included severe chromosomal abnormalities (such as trisomy 16 and 18), and inadequate case records. All cases were examined

using census-based method and data was collected by a researcher-made checklist which included: Gender, gestational age (presence or absence of prematurity), type of delivery, birth weight, Apgar score, bleeding at birth, history of jaundice in a sister or brother, history of diabetes in mother, history of drug use in mother's pregnancy (except iron, Folic acid and multivitamins) and paraclinical information: maternal and neonatal blood groups, hemoglobin and hematocrit levels, reticulocyte percentage, G6PD activity, direct Coombs test, and total neonatal bilirubin levels. The data was entered into the SPSS statistical program version 20 and analyzed by descriptive statistical tables.

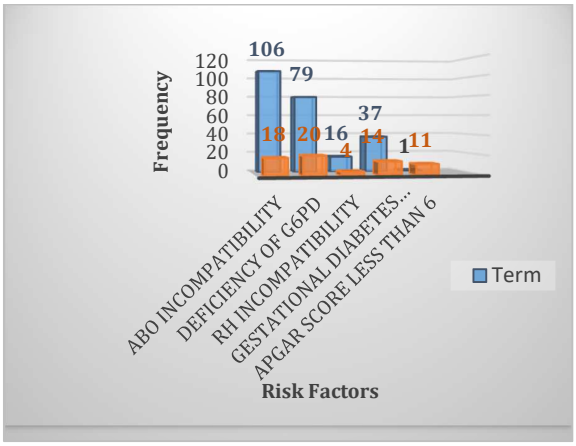

Figure 1: Comparison the Risk factors of early jaundice between term and preterm infants

RESULTS

In this study, 378 cases were investigated and finally, 57 cases were excluded due to incomplete records. Of the 321 neonates, 174 were boys (54.2%) and 147 were girls (45.8%), 237 were terms (73.8%) and 84 were pre-term (26.2%). 172 cases were born by natural delivery (53.6%) and 149 cases by cesarean section (46.4%). Among the term newborns, 223 (94.1%) were more than 2500 gr, 12 (5.1%) were between 1500 and 2500 gr, and 2 (0.8%) weighed less than 1500 gr. Among preterm infants, 21 patients (25%) weighed more than 2500 gr, 48 (57.1%) weighted between 1500 and 2500 gr, and 15 (17.9%) weighed less than 1500 gr. 244 newborns (76%) weighed more than 2500 gr, 60 (18.7%) weighted between 1500 to 2500 gr, and 17 (5.3%) weighed less than 1500 gr. 113 (35.2%) cases had a positive history of jaundice in their siblings. 62 patients (19.3%) had a history of drug use other than iron and folic acid. Of the mothers, 51 cases (15.9%) had gestational diabetes mellitus, 37 of which (72.54%) had termed infants and 14 (27.45%) had preterm infants. There was no statistically significant relationship between gestational diabetes mellitus and prematurity (P >0.05). 309 neonates (96.3%) were born with Apgar score more than or equal to 6, of which 236 (76.37%) were term and 73 (23.62%) were preterm. 122 neonates (38%) had reticulocytes of greater than or equal to 5% and 199 (62%) had less than 5% reticulocytes. In term neonates, 92 (38.8%) had reticulocytes greater than or equal to 5% and 145 (61.2%) had less than 5% reticulocytes. In preterm neonates, 30 (35.7%) had reticulocytes greater than or equal to 5% and 54 (64.3%) had less than 5% reticulocytes. The mean of hemoglobin was 15.20 ± 2.67 mg/dl, which was 15.16 ± 2.70 mg/dl in term and 15.31 ± 2.62 mg/dl in preterm infants, and had no significant relationship with prematurity (P >0.05). The mean bilirubin level was 13.26 ± 4.41 mg/dl, with a minimum of 5.5 and a maximum of 28. The mean of bilirubin level in perm neonates was 14.02 ± 4.44 mg/dl and in pre-term was 11.13 ± 3.54 mg/dl. In all cases, there was an increase in non-conjugated bilirubin, except for one who was suspected to have Down syndrome. In 20 cases (6.2%), RH incompatibility was observed, of which 16 cases (80%) were term infants and 4 cases (20%) were pre-term. In 124 cases (36.6%), ABO incompatibility was observed, of which 106 cases (85.48%) were term infants and 18 cases (14.51%) were pre-term. In 99 cases (30.8%), deficiency of the G6PD enzyme was observed, of which 79 cases (79.79%) were term infants and 20 cases (20.20%) were pre-term. 5 infants (1.6%) had simultaneous incompatibility of ABO and RH, of which 4 (80%) were term infants and one (20%) was a preterm. 27 neonates (8.4%) simultaneously had ABO incompatibility and G6PD deficiency, of which 26 (96.29%) were term and 1 (3.70%) was a preterm. 5 neonates (1.6%) simultaneously had RH incompatibility and G6PD deficiency, of which 4 (80%) were term and 1 (20%) was a preterm. A total of 4 (1.2%) cases had concurrent RH and ABO incompatibility and G6PD deficiency, all of which were termed infants (gestational age greater than 37 weeks). In this study, blood transfusion was performed for 35 infants. One case died due to Hydrops fetalis and 3 cases died because of prematurity. In all cases, indirect Coombs testing was negative. Bleeding,

extensive ecchymosis and Cephalohematoma in infants were not reported. In this study, we could not investigate induction of labor with oxytocin due to cases with incomplete information.

DISCUSSION

The results of this study showed that most neonates with the first day of jaundice were male (54.2% vs. 45.8%), which is consistent with the results of other similar studies [14, 15]. In this study, the most risk factors of jaundice in the first day in neonates were the following respectively: Incompatibility of ABO (36.6%), deficiency of G6PD (30.8%), prematurity (26.2%), gestational diabetes mellitus (15.9%), RH incompatibility (6.2%), and Apgar score less than 6 (3.7%) that approximately is consistent with the results of other similar studies, for example, Zarinkoob's study, the most common causes of jaundice in the first day were ABO incompatibility, premature infection, G6PD deficiency, Cephalohematoma, asphyxia, and RH incompatibility respectively [6]. In the study of Shah's in Pakistan, the most common causes of pathological jaundice were reported to be the ABO incompatibility and sepsis [7]. In the study of Sgro the most common causes of severe jaundice in the first day were ABO incompatibility, G6PD deficiency, all other blood incompatibilities, and hereditary spherocytosis respectively [8]. Also In Onyearugha's study, the most common causes of jaundice in the first day were septicemia, prematurity, Cephalohematoma and ABO incompatibility respectively [16]. In this study, the prevalence of gestational diabetes mellitus was 51 cases (15.9%), 37 (15.6%) in term infants' mothers and 14 (16.7%) in preterm infants' mothers. In the study of Baskabadi and his colleagues, one of the predisposing factors for jaundice was gestational diabetes mellitus, with a 2.78% prevalence [12]. In our study, 172 cases were born by cesarean delivery (53.6%) and 149 cases by natural delivery (66.1%). In the study of Ashraf (62.6%) and Emailpoor (53.5%), as with our study, most neonates with jaundice were born by natural delivery [14, 15]. Althought some of studies such as Garosi's investigation [17] demonstrated oxytocin induction could contribute to jaundice, In this study, we could not investigate induction of labor with oxytocin due to cases with incomplete information. Bleeding, extensive ecchymosis and Cephalohematoma in infants were not reported this may be due to the low number of assisted births using devices such as forceps. In all cases, indirect Coombs testing was negative, which may be due to laboratory error.

CONCLUSION

The results of this study showed that the most common cause of jaundice on the first day in neonates was abnormal ABO blood type. Most of the similar studies have also reported ABO incompatibility as the most common cause of jaundice. Also, most studies have shown that the highest levels of jaundice on the first day were in males, term infants, neonates with normal birth weights, and those who were born by natural delivery. Based on the results of this study, by detecting the risk factors for jaundice in the first day we can track the high-risk cases, and by screening they can facilitate on time diagnosis to prevent the subsequent complications of jaundice. It is suggested that the severity of the jaundice be classified into mild, moderate, and severe groups, in order to take the necessary measures for patients. It is also recommended that further studies on prenatal risk factors and maternal complications be conducted to identify infants who are at risk. Among the limitations of this study were incomplete records, the lack of accurate information on maternal care during pregnancy, lack of follow up of patients, and early discharge of babies with parental consent.

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