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**An investigation into serological method in the diagnosis
of neonatal hyperbilirubinemia**

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Abstract

Introduction: Hyperbilirubinemia (bilirubin) mainly emerges when the heme of worn-out red blood cells is destroyed during enzymatic reactions and is excreted through the bile after it has been conjugated in the liver cells by the glucuronidase transferase enzyme. Hyperbilirubinemia is classified into two types: unconjugated (indirect) and conjugated (direct). Based on the results of the studies conducted in different parts of the world, the present study was carried out in order to determine the serum method of bilirubin in neonates.

Method: The present descriptive analytical study was carried out on neonates with hyperbilirubinemia who were hospitalized in Neonatal and NICU Wards at Amir Almomenin (AS) Hospital in the first half of 2013. The inclusion criterion was neonates with hyperbilirubinemia, and the exclusion criterion was blood transfusion. The required data were collected using a form and analyzed with SPSS Software. Data analysis was carried out through descriptive-analytical statistics using independent t-test and one-way ANOVA. The level of statistical significance was set at $p < 0.05$.

Findings: In this study, 120 neonates suffering from hyperbilirubinemia who were hospitalized in Neonatal and NICU Wards at Amir Almomenin (AS) Hospital, Zabol were studied. Out of them, 64 neonates (53.3%) were boys and 56 (46.7%) were girls. Based on transcutaneous bilirubin in the present study, the neonates were assigned into two groups: a group that needed phototherapy and a group that did not need it. Afterwards, serum bilirubin was employed as the standard golden method to check the accuracy of transcutaneous bilirubin. Therefore, transcutaneous bilirubin sensitivity was calculated as 97.3%, feature 70%, positive predictive value 97.3%, and negative predictive value 70%. According to statistical analysis, the highest level of sensitivity in transcutaneous bilirubin was in 10-16.

Conclusion: Bilirubin is a tetrapyrrole pigment that is produced when hemoglobin heme of the old blood cells is destroyed. The results of the present study showed that bilichex device can be recommended as an appropriate tool to monitor and screen the process of phototherapy and use it instead of the serum method.

Keywords: neonatal, hyperbilirubinemia, zabol

Introduction

Hyperbilirubinemia (bilirubin) mainly emerges when the heme of worn-out red blood cells is destroyed during enzymatic reactions and is excreted through the bile after it has been conjugated in the liver cells by the glucuronidase transferase enzyme. Hyperbilirubinemia is classified into two types: unconjugated (indirect) and conjugated (direct) [1]. Some causes of indirect hyperbilirubinemia are among those factors that lead to more destruction of red blood cells, disrupt the removal of bilirubin by liver cells, and affect the activity and amount of glucuronidase enzyme. Some factors

that cause conjugated hyperbilirubinemia are liver cell damage, infections, biliary obstruction or atresia, and some metabolic diseases [2]. Neonatal jaundice is highly significant because it causes dangerous complications. One of the most dangerous of them is kernicterus which is caused by deposition of unconjugated bilirubin unbound to albumin in the central nervous system. Some causes lead to an increase in its danger (reduced blood albumin, decreased temperature, decreased blood glucose, increased osmolarity), and its symptoms include reduced reflexes, excessive movements, spasms, and seizures [3]. Unfortunately, this condition is fatal in

75% of cases, and it causes complications like mental retardation, deafness, and so on in 80% of those that survive [4]. Appropriate treatment of neonatal jaundice requires knowledge on its level which is determined by the traditional method of blood sampling from the neonate [5]. Non-invasive skin bilirubinometry is carried out using bilichex device, which is an appropriate method in order to diagnose and monitor the treatment process of neonatal hyperbilirubinemia because it brings about very few complications, prevents infection induction, does not involve frequent blood sampling, and requires less cost and time [6]. Poark was the first scholar that found out that there is a relationship between neonatal jaundice and the level of serum bilirubin [7]. The first investigation into this issue was carried out in 1980, and the results showed that there is a linear relationship between amounts of serum and transcutaneous bilirubin [8]. The studies carried out in Spain, the US, and India proved the high relationship between these two methods [9]. Since frequent blood sampling from the neonates is required in most cases of jaundice and the complications of such blood sampling are increased risk of infection (due to less competent immune system of the neonates in different aspects), formation of anemia in case of repetition (given the low volume of the neonate's blood), pain and stress and as a result disruption in performance of different organs, a special consideration has been paid to non-invasive methods of measuring bilirubin in order to make medical decision without frequent blood

sampling with knowledge about the level of bilirubin [6-24]. Based on the results of the studies conducted in different parts of the world, the present study was carried out in order to determine the serum method of bilirubin in neonates.

Methods

The present descriptive analytical study was carried out on neonates with hyperbilirubinemia who were hospitalized in Neonatal and NICU Wards at Amir Almomenin (AS) Hospital in the first half of 2013. The inclusion criterion was neonates with hyperbilirubinemia, and the exclusion criterion was blood transfusion. The required data were collected using a form and analyzed with SPSS Software. Data analysis was carried out through descriptive-analytical statistics using independent t-test and one-way ANOVA. The level of statistical significance was set at $p < 0.05$.

Results

In this study, 120 neonates suffering from hyperbilirubinemia who were hospitalized in Neonatal and NICU Wards at Amir Almomenin (AS) Hospital, Zabol were studied. Out of them, 64 neonates (53.3%) were boys and 56 (46.7%) were girls.

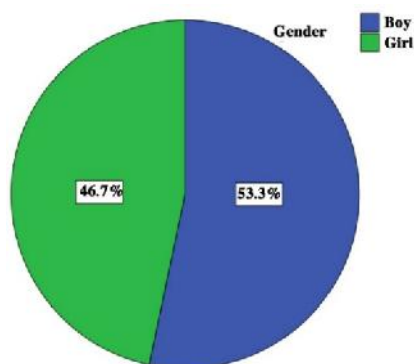


Diagram 1. Gender frequency of the neonates with hyperbilirubinemia

1.2.1. Determining the amount of serum bilirubin in the neonates under study

In the present study, the average amount of serum bilirubin in the neonates with hyperbilirubinemia was 13.4 ± 3.1 mg/dl (See Diagram 2).

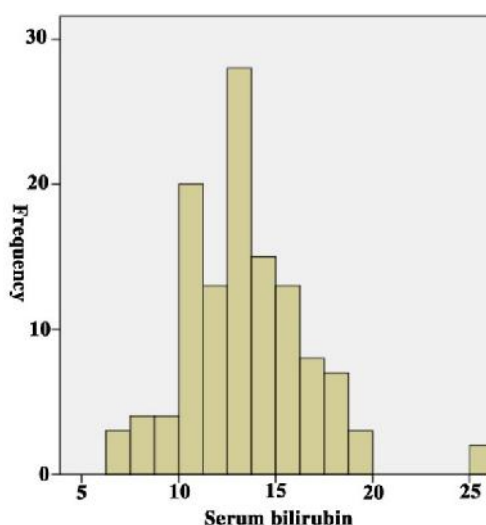


Diagram 2. Frequency of serum bilirubin in neonates with hyperbilirubinemia

Based on transcutaneous bilirubin in the present study, the neonates were assigned into two groups: a group that needed phototherapy and a group that did not need it. Afterwards, serum bilirubin was employed as the standard golden method to check the accuracy of transcutaneous bilirubin. Therefore, transcutaneous bilirubin sensitivity was calculated as 97.3%, feature 70%, positive predictive value 97.3%, and negative predictive value 70%. According to statistical analysis, the highest level of sensitivity in transcutaneous bilirubin was in 10-16.

Discussion and Conclusion


Bilirubin is a tetrapyrrole pigment that is produced when hemoglobin heme of the old blood cells is destroyed. For every kg of the body's weight, about 4 ml of this substance is produced every day, and a large portion of it (80-85%) is produced from hemoglobin and the rest from destruction of thyroid cells that prematurely form in the bone marrow during ineffective erythropoiesis process and from destruction of different hemoproteins such as cytochrome p-450 and cytochrome c. Destruction happens in monocular phagocytic cells of the spleen, liver, and bone marrow [11]. Hyperbilirubinemia is the most common cause that leads to hospitalization of neonates in the first month of life. Although most neonates with hyperbilirubinemia do not develop permanent complications of the disease, acute bilirubin encephalopathy (kernicterus) may be seen in high levels of bilirubin, and it is highly significant to use a reliable noninvasive method to determine the level of bilirubin in order to prevent kernicterus [12]. In their study carried out in Turkey in 2011, Kaynak-Türkmen et al reported the level of correlation between the two methods as 0.85, and bilicheck device was suggested as a complete substitute to measure serum bilirubin because it brings about few false positive results and

is highly sensitive [13]. That study is in agreement with the present study; however, its correlation is a little higher. In the study carried out by Yu et al (2014) in China, 9174 healthy neonates were examined. Out of them, 972 neonates (10.6%) had hyperbilirubinemia. The results showed that using transcutaneous bilirubin along with clinical risk factors can enhance the accuracy of diagnosing hyperbilirubinemia [14]. Panburana et al (2010) studied the correlation between the two methods and reported it as 0.81. The results showed that RCB can predict TSB in cutoffs and different ages of pregnancy [15]. The results of the present study showed that bilicheck device can be recommended as an appropriate tool to monitor and screen the process of phototherapy and use it instead of the serum method.

References

1. Tebruegge M, Curtis N. Enterovirus infections in neonates. In Seminars in Fetal and Neonatal Medicine 2009 Aug 31 (Vol. 14, No. 4, pp. 222-227). WB Saunders.
2. Prateek B, Narang A, Minz RW. Neonatal cytomegalovirus infection: diagnostic modalities available for early disease detection. Indian journal of pediatrics. 2010 Jan 1;77(1):77-9.
3. Geaghan SM. Diagnostic laboratory technologies for the fetus and neonate with isoimmunization. In Seminars in perinatology 2011 Jun 30 (Vol. 35, No. 3, pp. 148-154). WB Saunders.
4. Yamada K, Yamamoto Y, Uchiyama A, Ito R, Aoki Y, Uchida Y, Nagasawa H, Kimura H, Ichiyama T, Fukao T, Kohno Y. Successful treatment of neonatal herpes simplex-type 1 infection complicated by hemophagocytic lymphohistiocytosis and acute liver failure. The Tohoku journal of experimental medicine. 2008;214(1):1-5.

5. Goedhals D, Kriel J, Hertzog ML, van Rensburg MJ. Human cytomegalovirus infection in infants with prolonged neonatal jaundice. *Journal of Clinical Virology*. 2008 Oct 31;43(2):216-8.
6. Said RN, Zaki MM, Abdelrazik MB. Congenital toxoplasmosis: evaluation of molecular and serological methods for achieving economic and early diagnosis among Egyptian preterm infants. *Journal of tropical pediatrics*. 2010 Oct 20;57(5):333-9.
7. Bellomo-Brandao MA, Andrade PD, Costa SC, Escanhoela CA, Vassallo J, Porta G, De Tommaso AM, Hessel G. Cytomegalovirus frequency in neonatal intrahepatic cholestasis determined by serology, histology, immunohistochemistry and PCR. *World journal of gastroenterology: WJG*. 2009 Jul 21;15(27):3411.
8. Bhutani VK, Zipursky A, Blencowe H, Khanna R, Sgro M, Ebbesen F, Bell J, Mori R, Slusher TM, Fahmy N, Paul VK. Neonatal hyperbilirubinemia and Rhesus disease of the newborn: incidence and impairment estimates for 2010 at regional and global levels. *Pediatric research*. 2013 Dec;74(Suppl 1):86.
9. Albanna EA, El-latif RS, Sharaf HA, Gohar MK, Ibrahim BM. Diagnosis of congenital cytomegalovirus infection in high risk neonates. *Mediterranean journal of hematology and infectious diseases*. 2013;5(1).
10. Keren R, Luan X, Friedman S, Saddlemire S, Cnaan A, Bhutani VK. A comparison of alternative risk-assessment strategies for predicting significant neonatal hyperbilirubinemia in term and near-term infants. *Pediatrics*. 2008 Jan 1;121(1):e170-9.
11. Watchko JF. Identification of neonates at risk for hazardous hyperbilirubinemia: emerging clinical insights. *Pediatric clinics of North America*. 2009 Jun 30;56(3):671-87.
12. Gamaleldin R, Iskander I, Seoud I, Aboraya H, Aravkin A, Sampson PD, Wennberg RP. Risk factors for neurotoxicity in newborns with severe neonatal hyperbilirubinemia. *Pediatrics*. 2011 Oct 1;128(4):e925-31.
13. Bhutani VK, Zipursky A, Blencowe H, Khanna R, Sgro M, Ebbesen F, Bell J, Mori R, Slusher TM, Fahmy N, Paul VK. Neonatal hyperbilirubinemia and Rhesus disease of the newborn: incidence and impairment estimates for 2010 at regional and global levels. *Pediatric research*. 2013 Dec;74(Suppl 1):86.
14. Gamaleldin R, Iskander I, Seoud I, Aboraya H, Aravkin A, Sampson PD, Wennberg RP. Risk factors for neurotoxicity in newborns with severe neonatal hyperbilirubinemia. *Pediatrics*. 2011 Oct 1;128(4):e925-31.
15. Kaplan M, Merlob P, Regev R. Israel guidelines for the management of neonatal hyperbilirubinemia and prevention of kernicterus. *Journal of Perinatology*. 2008 Jun 1;28(6):389-97.

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