AlQalam
Alq J Med App Sci
https://journal.utripoli.edu.ly/index.php/Alqalam/index eISSN 2707-7179

Original article

Jaundice and Associated Factors among Hospitalized Neonates in Tripoli-Libya

Rehab Walli*, Abed Alnaser Drbal, Jannat Albashir

Department of Biochemistry and Clinical Biochemistry, Faculty of Pharmacy, University of Tripoli, Tripoli, Libya

ARTICLE INFO

Corresponding Email. *rehabwalli2003@yahoo.com*

Received: *23-07-2024*
Accepted: *06-09-2024*
Published: *11-09-2024*

Keywords: *Jaundice, Neonates, Preterm, Rhesus Factor, Bilirubin.*

ABSTRACT

Jaundice can occur in full term and preterm neonates within the first week of life. Severe neonatal jaundice can lead to death. This study was conducted to address the common risk factors associating with jaundice among newborns admitted to the intensive care unit at Aljala Hospital at Tripoli city in Libya. The study is performed in the period from June to November in the year 2023. A total of randomly selected 72 neonates paired with their mothers were involved. Data were collected from the medical files. In this study we found that 57% of the neonates were males and 43% were females. Also, neonatal jaundice was more prevalent among full term (75%) than preterm (25%) hospitalized newborns. We found that 43% of our neonates were hospitalized due to neonatal jaundice only, while 33% of the neonates were hospitalized due to neonatal jaundice and Rh-negative mother. In about 30% of the neonates in this study, sepsis and respiratory distress were common neonatal illness coexisting with neonatal jaundice. Additionally, neonates with positive Rh (83%) and blood group O have a higher level of total serum bilirubin than those with negative Rh of other blood groups. We found that the prevalence of neonatal jaundice is higher in full term male neonates than females. The commonest cases are neonates with Rh+ blood groups, specifically O+. Sepsis and respiratory distress are markedly associated with neonatal jaundice in this study.

Cite this article. *Walli R, Drbal A, Albashir J. Jaundice and Associated Factors among Hospitalized Neonates in Tripoli-Libya. Alq J Med App Sci. 2024;7(3):878-883. https://doi.org/10.54361/ajmas.247360*

INTRODUCTION

Bilirubin is an endogenous compound and its increased levels have various neurotoxic effects especially in neonates [1]. However, it has recently been recognized that mild jaundice might have positive health effects. Bilirubin is the end product of hemoglobin degradation and is used in diagnosis of liver and blood disorders. It is also related to drug metabolism [2,3]. Preterm neonates have higher rates of bilirubin production than adults, because they have red blood cells with a higher turnover and a shorter life span. In neonates, the activity of conjugation enzymes of bilirubin is limited therefore the unconjugated bilirubin is accumulated [4].

Measurement of total serum bilirubin levels is the most laboratory investigation of jaundice which is performed to confirm the diagnosis of neonatal jaundice. A total serum bilirubin level of 5 mg/dl (85 µmol/L) or higher is considered as a confirmatory result for neonatal jaundice [5]. Neonatal jaundice may lead to severe complications, including lifelong disability such as growth retardation and hearing impairment [4]. Some risk factors have been found to be associated with developing jaundice among neonates such as maternal age and illness, maternal pharmacotherapy, gestational age prematurity, and blood group incompatibility [6]. One of these risk factors that have been identified was ABO incompatibility which will lead to hemolysis of the neonatal RBCs through immune mechanisms due to maternal

antigens. ABO incompatibility remains an important cause of neonatal morbidity and mortality [7]. Therefore, it is important to investigate the neonatal blood group for neonates born to mothers with an O-blood group to identify ABO incompatibility. It has been shown that the risk of neonatal jaundice is increased in male newborns compared to females [8]. We also examined in this study if neonatal serum total bilirubin is highly affected by the age of gestation at delivery (full term or preterm neonates). Many hospitalized neonates are suffering from other health problems that coexist with neonatal jaundice such as sepsis [9]. In this study we noticed that respiratory distress and sepsis are very common among our neonates. In other cases, neonatal jaundice can be found in neonates suffering from sepsis and respiratory distress at the same time. We therefore investigated whether there is a significant difference in the average of serum total bilirubin if the neonates suffering from one of these medical problems alone or not.

METHODS

Study Population

The study population consisted of 72 neonates whose medical records were randomly selected from the hospital's neonatal department throughout the period of June to November during the year 2023. Data were extracted from the medical records of the admitted neonates. All cases were neonates diagnosed as having jaundice by pediatricians using physical examinations and blood tests. The following information was collected: Mother's information: (blood group, rhesus factor, prenatal problems, and infant's information: (weight, age, gender, blood group, rhesus factor Rh, cause of admission, serum total bilirubin, other clinical data like infection, etc.).

Statistical analysis

Data are transformed into a Microsoft Excel spreadsheet and analyzed using Sigma plot program version 2 for statistical calculation. Independent student –t-test was applied to calculate the significance. Med Calc program for medical statistical testing also was helpful in this study. The level of significance was set at $p < 0.05$ [10].

Laboratory analysis

Total bilirubin is measured in serum using COBAS INTEGRA 400 plus system, which uses colorimetric diazo method for total bilirubin, in the presence of suitable solubilizing agent, is coupled with 3,5-dichlorophenyl diazonium in strongly acidic media (BILT3 reagent). Neonatal jaundice is defined as total bilirubin > 2 .00 mg/dl, although this value may vary depending on the infant's age, gestational age, and other factors [11].

RESULTS

We examined at first the prevalence of neonatal jaundice in full-term and preterm neonates. The total number of neonates was 72, the average bilirubin level of 18 preterm neonates was 9.6± 5 mg/dl and for 54 full term neonates was 8.1± 4 mg/dl. The difference between the total serum bilirubin measured in full term and the total serum bilirubin level in preterm neonates was insignificant P>0.05.

Figure 1. Serum total bilirubin levels and the gestational age of neonates at delivery

As represented in figure 2, we also compared between the average serum total bilirubin of the neonates with age of less than 24 hours after delivery and those of more than 24 hours after delivery to 5 days. The difference seen between both groups is significant P< 0.05.

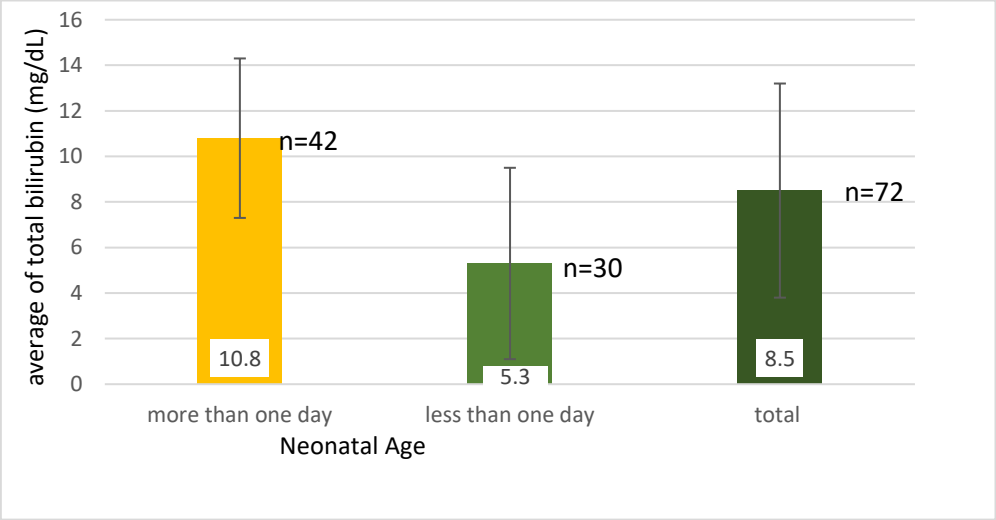

Figure 2: Average of serum total bilirubin according to the neonatal age. (Note that more than one day means the age from 1 to 5 days. P< 0.05)

To see how the gender of neonates could affect the serum total bilirubin in our neonates, we classified them into male group (41 neonates) and female group (31 neonates) then compared between the average of serum total bilirubin of males and females. As it's seen in figure 3 males exhibit slightly higher level of serum total bilirubin than females and this difference was insignificant (P >0.05).

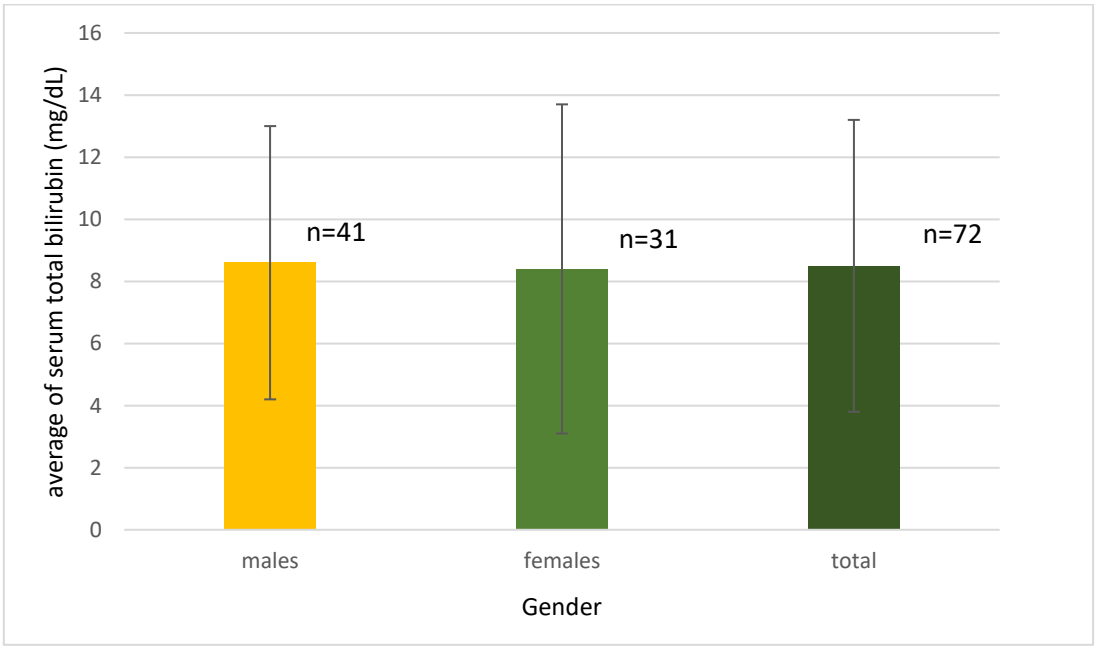

Figure 3. Average of serum total bilirubin (mg/dl) of male and female neonates.

In this study we also investigated the average serum total bilirubin of neonates with high risk factors such as those of blood group incompatibility. In figure 4 we represent the difference of serum total bilirubin between the neonates according to their blood group also we calculated the average of serum total bilirubin for those carrying Rh positive blood group and those of Rh-negative blood group as appears in figure 5. The results reveal that neonates with positive Rh and blood group O have higher level of total serum bilirubin than the others.

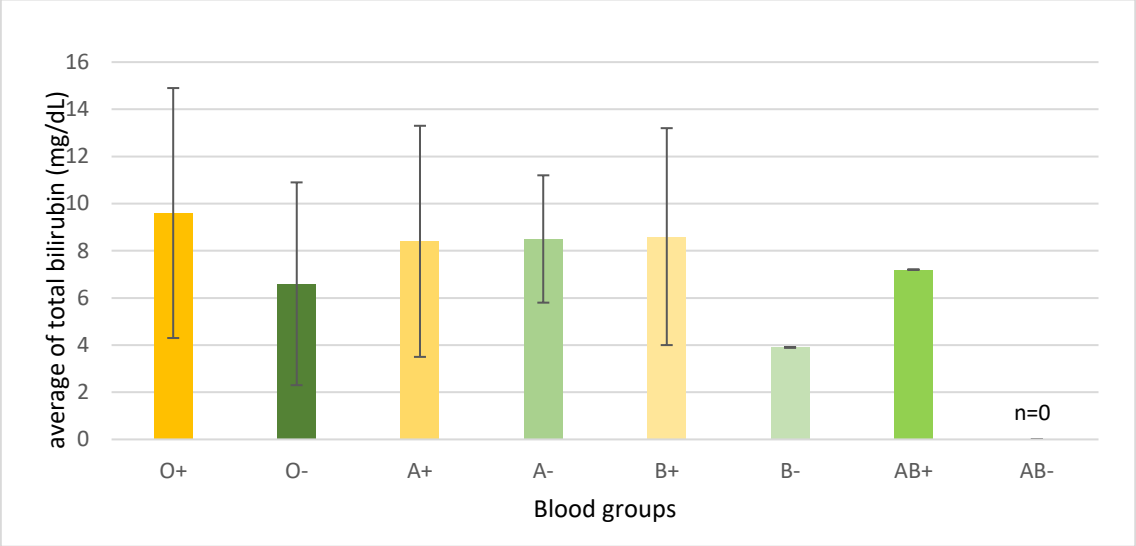

Figure 4. Average of serum total bilirubin according to the blood group of the neonates

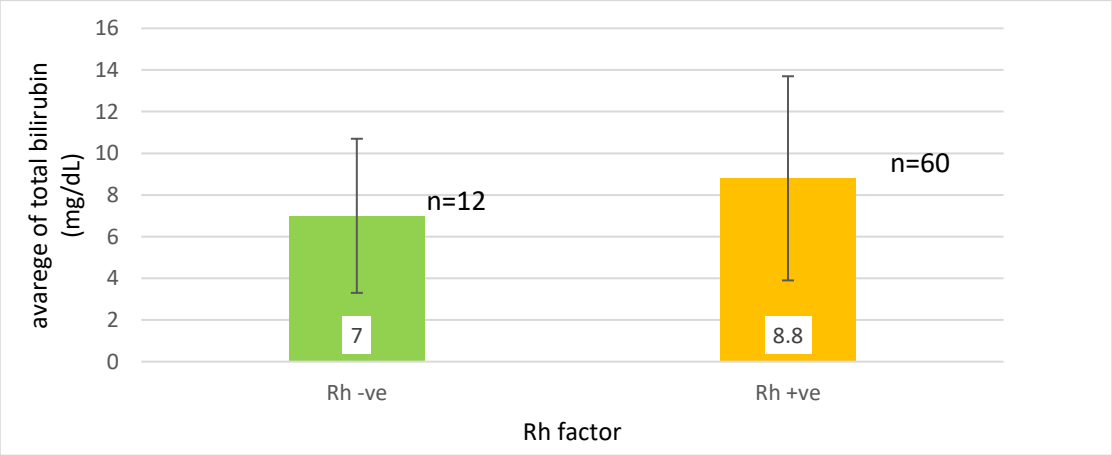

Figure 5. Average of neonatal serum total bilirubin according to their Rh factor

On the other hand, we have also examined if the presence of other illness rather than neonatal jaundice can affect the level of serum bilirubin, we found that 16.7% of the neonates included in this study were admitted to the hospital due to neonatal jaundice and sepsis, 13.8% were admitted due to neonatal jaundice and respiratory distress, 26.4% were admitted due to neonatal jaundice, sepsis and respiratory distress together, 33.3% were admitted due to neonatal jaundice and Rh negative mother, and 25% were admitted due to neonatal jaundice with mother and infant ABO incompatibility. However, in 43.1% of the neonates, jaundice was the only cause of admission. As shown in table 1.

Table 1. Average of neonatal serum total bilirubin according to the cause of hospitalization

Cause of admission	Number of neonates	Average of total bilirubin (mg/dl)	Standard deviation	Level of significance
neonatal jaundice	31	6.3	±3.7	-
neonatal jaundice, neonatal sepsis	12	11.1	±5	P <0.05
neonatal jaundice, respiratory distress	10	10.2	±5.4	P <0.05
neonatal jaundice, neonatal sepsis, respiratory distress	19	9.6	±4.5	P <0.05
ABO incompatibility	18	9.69	±3.9	P <0.05
Rh negative mother	24	5.1	±2.9	P <0.05

The average of total bilirubin of neonates admitted to the hospital only because of neonatal jaundice was set as control to test the significant difference of the other subgroups in the table in comparison to it.

DISCUSSION

High serum bilirubin in the first days of life in some neonates is due to their immature livers resulting in impaired bilirubin metabolism [12,13]. In the current study, among 72 neonates of average weight of 3.1Kg, the average of serum total bilirubin was 8.5 mg/dl (normal level is < 2.00 mg/dl), and 75% of jaundiced neonates were full term and 25% were preterm, which is inconsistent with global prevalence of jaundice that is seen in approximately 60% of full-term and 80% of preterm neonates [14]. Also, no significant difference was found in serum total bilirubin between full term and preterm neonates. As neonatal gender is identified as an important predictor of jaundice, in this study we found that male neonates were more likely to develop jaundice than females. 56.9% of neonates were males, and 43.1% were females, which is consistent with a study in Ethiopia [15] and in Nigeria [16]. This finding is also consistent with other studies conducted in Malaysia [17] and Iran [18]. This can be attributed to the fact that neonatal jaundice could be genetically linked to the X chromosome, making males more susceptible. Also, deficiency of glucose-6-phosphate dehydrogenase G6PD has been identified as a contributor in development of neonatal jaundice, G6PD is shown to be higher in males [19]. The difference seen in this study between the average serum total bilirubin of male and female neonates was statistically insignificant. This is consistent with a study performed in India, where no significant association was observed between gender and the occurrence of neonatal jaundice [20,21]. Additionally, most of the neonates included in this study have the blood group O positive. This is inconsistent with a study in Iran 2019, where the most common blood group of neonatal jaundice was A+ with prevalence of 35% [22]. However, we could not detect any significant difference of the average serum total bilirubin levels of each group of neonates with a different blood group when compared to the common O positive blood group. With regard to the Rhesus factor (Rh), we found that 83.3% of neonates have Rh positive blood groups and 16.7% have Rh negative blood groups which is consistent with the Iranian study in 2019 where 90% of jaundiced neonates were of Rh-positive blood groups [22]. We then categorized our neonates according to the cause of hospitalization as explained in table 1, we found that 43.1% of neonates were hospitalized due to neonatal jaundice only and about 16.7% were hospitalized due to neonatal jaundice plus sepsis and these findings were inconsistent with Indian study [23].

Acknowledgements

We would like to thank the administrative and clinical staff of Aljala hospital in Tripoli for their cooperation.

Conflict of interest

The authors declare no conflicts of interest.

REFERENCES

1. Fevery, J. Bilirubin in clinical practice: a review. Liver International. 2008;28(5): 592-605.
2. Reuben A. Jaundice. Textbook of clinical gastroenterology and hepatology. Rajiv: Gandhi University of Health Sciences, India, 2012:84–92.
3. Hansen W, Wong J, Stevenson K. Molecular physiology and pathophysiology of bilirubin handling by the blood, liver, intestine, and brain in the newborn. Physiol Rev. 2020;100(3):1291–346.
4. Kliegman R, Stanton B, Geme J, Schor N. Nelson's textbook of pediatrics (20th edn.; Elsvier: Philadelphia, USA, 2017; pp1364–5.
5. Duan Z, Zeng R. Jaundice: handbook of clinical diagnostics, Springer: 2020;9(1):67–70
6. Boskabadi H, Rakhshanizadeh F, Zakerihamidi M. Evaluation of maternal risk factors in neonatal jaundice. Arch Iran Med. 2020;23(2):128–40.
7. Bhat Y, Pavan Kumar P, health c. Morbidity of ABO hemolytic disease in the newborn. Pediatrics Int Child Health. 2012;32(2):93–6.
8. Norman M, Aberg K, Holmsten K, Weibel V, Ekeus P. Predicting nonhemolytic neonatal jaundice. Acad Am Pediatr. 2015;136(6):1087–94
9. Alemu M, Ayana M, Abiy H, Minuye B, Alebachew W, Endalamaw A. Determinants of neonatal sepsis among neonates in the northwest part of Ethiopia: case-control study. Ital J Pediatr. 2019;45(1):1–8.
10. Snedecor G, Cochran W. Statistical Methods, edn. 6, Oxford & IBH Publishing Co: New Delhi, 1967; pp. 45-83.
11. Mussavi M, Niknafs P, & Bijari B. Determining the correlation and accuracy of three methods of measuring neonatal bilirubin concentration. Iranian Journal of Pediatrics. 2013; 23(3): 333.
12. Porter L, & Dennis L. Jaundice in the term newborn. American family physician. 2002; 65(4): 599-607.
13. Rosa-Mangeret F, Benski A-C, Golaz A, Zala P, Kyokan M, Wagner N, et al. 2.5 million annual deaths are neonates in low-and middle-income countries too small to be seen? A Bottom-Up overview on neonatal Morbi-Mortality. Trop Med Infect Disease. 2022;7(5):64.

14. Ansong-Assoku B, Shah S, Adnan M, & Ankola P. Neonatal jaundice. StatPearls. Treasure island (FL): StatPearls Publishing; 2024: February 12.
15. Aynalem S, Abayneh M, Metaferia G, Demissie G, Gidi W, Demtse G, et al. Jaundice in preterm infants admitted to neonatal intensive care units in Ethiopia. Global Pediatric Health. 2020;28(7):2333794.
16. Awe O, Olawade B, Afolalu D, Wada Z, & Alabi D. Prevalence of jaundice among neonates admitted in a tertiary Hospital in Southwestern Nigeria. Adv Pediatr Neonatol Care. 2021; 3(1):121.
17. Awang H, Ja'afar M, Ishak N, Dollah Z, Sciences C. Determinants of neonatal jaundice among newborns in Pasir Puteh district, Kelantan. Int J Public Health Clin Sci. 2020;6(6):109–22.
18. Boskabadi H, Rakhshanizadeh F, Zakerihamidi M. Evaluation of maternal risk factors in neonatal jaundice. Arch Iran Med. 2020;23(2):128–40
19. Garosi E, Mohammadi F, Ranjkesh F. The relationship between neonatal jaundice and maternal and neonatal factors. Iran J Neonatology. 2016;7(1):37–40.
20. Harsha, G. N. prevalence of neonatal jaundice in a maternity home. int j acad med pharm. 2023;5(5):1184-1188.
21. Menon S, Amanullah N. Maternal and neonatal determinants of neonatal jaundice–a case control study. J Med Sci Clin Res. 2017;5(03):19659–65.
22. Seyedi R, Mirghafourvand M, Dost J, Mohammad-Alizadeh-Charandabi S, Jafarabadi A. Relationship between neonatal skin bilirubin level and severe jaundice with maternal, childbirth, and neonatal characteristics. Iranian Journal of Neonatology. 2019;10(2): 61-67.
23. Zabeen B, Nahar J, Nabi N, Baki A, Tayyeb S, Azad K, & Nahar N. Risk factors and outcome of neonatal jaundice in a tertiary hospital. Ibrahim Medical College Journal. 2010; 4(2): 70-73.

اليرقان والعوامل المرتبطة به بين الأطفال حديثي الولادة في المستشفيات بطرابلس-ليبيا

رحاب والي*، عبد الناصر دربال، جنات البشير

قسم الكيمياء الحيوية والكيمياء الحيوية السريرية، كلية الصيدلة، جامعة طرابلس، طرابلس، ليبيا

المستخلص

يمكن أن يحدث اليرقان عند الأطفال حديثي الولادة في فترة الحمل الكاملة والخدج خلال الأسبوع الأول من الحياة. ويمكن أن يؤدي اليرقان الوليدي الشديد إلى الوفاة. أجريت هذه الدراسة لمعالجة عوامل الخطر الشائعة المرتبطة باليرقان بين الأطفال حديثي الولادة الذين تم إدخالهم إلى وحدة العناية المركزة في مستشفى الجلاء في مدينة طرابلس في ليبيا. أجريت الدراسة في الفترة من يونيو إلى نوفمبر في عام 2023. شارك في الدراسة 72 طفلًا حديثي الولادة تم اختيارهم عشوائيًا مع أمهاتهم. تم جمع البيانات من الملفات الطبية. في هذه الدراسة وجدنا أن 57٪ من الأطفال حديثي الولادة كانوا من الذكور و 43٪ من الإناث. كما كان اليرقان الوليدي أكثر انتشارًا بين الأطفال حديثي الولادة في فترة الحمل الكاملة (75٪) مقارنة بالأطفال الخدج (25٪) في المستشفى. وجدنا أن 43% من الأطفال حديثي الولادة دخلوا المستشفى بسبب اليرقان الوليدي فقط، بينما دخل 33% من الأطفال حديثي الولادة المستشفى بسبب اليرقان الوليدي والأمهات ذات العامل الرايزيسي السلبي. وفي حوالي 30% من الأطفال حديثي الولادة في هذه الدراسة، كان الإنتان وضيق التنفس من الأمراض الوليدية الشائعة التي تصاحب اليرقان الوليدي. بالإضافة إلى ذلك، فإن الأطفال حديثي الولادة ذوي العامل الرايزيسي الإيجابي (83%) وفصيلة الدم O لديهم مستوى أعلى من البيليروبين الكلي في المصل مقارنة بأولئك ذوي العامل الرايزيسي السلبي من فصائل الدم الأخرى. وجدنا أن انتشار اليرقان الوليدي أعلى في الأطفال حديثي الولادة الذكور من الإناث. الحالات الأكثر شيوعًا هي الأطفال حديثي الولادة ذوي فصائل الدم+Rh ، وخاصة .O+ يرتبط الإنتان وضيق التنفس بشكل ملحوظ باليرقان الوليدي في هذه الدراسة.

الكلمات المفتاحية. اليرقان، الأطفال حديثي الولادة، الخدج، عامل الريسوس، البيليروبين.