

## Evaluate the patients with neonatal jaundice at central teaching hospital of pediatrics in Baghdad : descriptive study

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### Abstract:

**Background:** - Neonatal jaundice is a frequent condition at newborns, particularly in the first few days after delivery, and it has to be treated well to prevent complications that might have significant, long-lasting complications.

**Objective:** - To assess the outcome of newborn jaundice at the central teaching Hospital of pediatrics in Baghdad using different modality of treatments.

**Patients and Methods:** - A retrospective study is done depending on the medical data of infants have jaundice who were admitted to the neonate units of the central teaching hospital within the period of a year, from May 1st 2020 to May 1st 2021. Blood grouping and total serum bilirubin measurements were taken in each case. Phototherapy, strong phototherapy, and exchange transfusion were utilized to treat the newborn jaundice, depending on its severity.

**Results:** Total neonates admitted from 1st may 2020 to 1st may 2021 in neonate unit were 2508 and 855 [34%] have jaundice. the male: female ratio is [1.6:1], males 516[60.3%], females 339[39.6%]. The Physiological jaundice is the often-frequent cause 285[33.3%] patients. The Prematurity seen in 171[20%] patient and the ABO incompatibility seen in 128[1.3%] and the Rh incompatibility 17[2%] patient, the sepsis found in 16[2%] case and the other causes of hyperbilirubinemia seen in 238[27.8%] patient. the Phototherapy is the most frequent kind of management used in 513[55%] and intensive phototherapy is applied for 342[40.3%] patients and just 59[7%] of patients treated with exchange transfusion particularly patients with ABO incompatibility 25 [42%] also Rh incompatibility 34 [57.6%] Good decline in TSB level and not require the exchange transfusion is 812 [95%] of patients. Majority of infants 849 [99.55%] discharge with clinical improvement and only 17 [0.3%] of infant's patients develops kernicterus and 8 patients is dying [0.1%]

**Conclusion:** Moderate to severe hyperbilirubinemia is still often treated with phototherapy. Intensive phototherapy is beneficial in lowering T.S.B levels, minimizing the need for exchange transfusions, and shortening hospital stays in patients with newborn hyperbilirubinemia.

**Key words:** Hyperbilirubinemia, Phototherapy, Exchange transfusion, Neonatal jaundice

تقييم الاطفال المصابين باليرقان في مستشفى الطفل المركزي في بغداد: دراسته توصيفيه

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**الخلاصة:**

**معلومات أساسية:** فرط بيليروبين الدم الوليدي هو حالة شائعة عند الأطفال حديثي الولادة ، خاصة في الأيام القليلة الأولى بعد الولادة ، ويجب معالجته جيداً لمنع المضاعفات التي قد يكون لها مضاعفات كبيرة وطويلة الأمد.

**الأهداف:** - تقييم نتائج اليرقان عند الأطفال حديثي الولادة في المستشفى التعليمي المركزي للأمومة والأطفال في بغداد باستخدام العلاج بالضوء والمعالجة الضوئية المكثفة ونقل الدم.

**المرضى والطرق:** تم إجراء دراسة بأثر رجعي باستخدام السجلات الطبية للرضع المصابين باليرقان الذين تم إدخالهم إلى وحدة رعاية الأطفال حديثي الولادة في المستشفى التعليمي المركزي على مدار عام ، من ١ مايو ٢٠٢٠ إلى ١ مايو ٢٠٢١. فصائل الدم و تم أخذ قياسات البيليروبين الكلي في الدم في كل حالة. تم استخدام العلاج بالضوء والمعالجة الضوئية القوية ونقل الدم لعلاج اليرقان عند حديثي الولادة ، اعتماداً على شدته

**النتائج:** إجمالي عدد الولدان الذين تم قبولهم من ١ مايو ٢٠٢٠ إلى ١ مايو ٢٠٢١ في وحدة رعاية الأطفال حديثي الولادة كان ٢٥٠٨ منهم ٨٥٥ [٣٤٪] تم تشخيصهم على أنهم يرقان حديثي الولادة. الذكور: نسبة الإناث [١،٦ : ١] ، الذكور ٥١٦ [٦٠،٣٪] ، الإناث ٣٣٩ [٣٩،٦٪]. كان اليرقان الفسيولوجي السبب الأكثر شيوعاً في ٢٨٥ حالة [٣٣،٣٪]. الخداج في ١٧١ [٢٠٪] وعدم توافق ABO 128 [١،٣٪] بينما عدم توافق العامل الريصي ١٧ [٢٪] ، تعفن الدم ١٦ [٢٪] وأسباب أخرى لليرقان كانت ٢٣٨ [٢٧،٨٪]. كان العلاج بالضوء هو أكثر أنواع العلاج شيوعاً في ٥١٣ [٥٥٪] بينما تم استخدام العلاج بالضوء المكثف في ٣٤٢ [٤٠،٣٪] حالة مع ٥٩ [٧٪] حالة فقط تم علاجها بنقل الدم خاصة في حالة عدم توافق ABO 25 [٤٢٪] حالة وعدم توافق عامل ريسس. ٣٤ [٥٧،٦٪] حالة

التخفيض الناجح في مستوى T.S.B. والتحسين دون الحاجة إلى تبادل نقل الدم هو ٨١٢ [٩٥٪] مريض. غالبية الولدان ٨٤٩ [٩٩،٥٥٪] يخرجون مع تحسن كامل و ١٧ [٠،٣٪] فقط من حديثي الولادة عانوا من اليرقان و ٨ وفيات [٠،١٪]

**الخلاصة:** مازال يتم علاج فرط بيليروبين الدم المعتدل إلى الشديد بالعلاج بالضوء. يعد العلاج بالضوء المكثف مفيداً في خفض مستويات T.S.B. ، وتقليل الحاجة إلى عمليات نقل الدم ، وتقصير مدة الإقامة في المستشفى في المرضى الذين يعانون من فرط بيليروبين الدم عند الأطفال حديثي الولادة

**الكلمات المفتاحية:** مادة اصفراء، العلاج الضوئي، تبديل الدم، يرقان ولادي

**Introduction**

Neonatal hyperbilirubinemia is a frequent condition that affects 60% of term and 80% of preterm newborns within the first week following delivery <sup>[1,2]</sup>. It is a significant contributor to illness and death in the newborn time, particularly during the first week of infant's life <sup>[3]</sup>.

The blood-brain barrier can be breached by bilirubin in severe neonatal hyperbilirubinemia, which can result in bilirubin neurotoxicity. Kernicterus is the most severe and persistent clinical symptom of severe newborn jaundice <sup>[4]</sup>. The prevalence of severe newborn hyperbilirubinemia in some underdeveloped nations may be up to 100 times greater than in industrialized nations <sup>[5]</sup>. Although Rh incompatibility decreased, ABO-related severe neonatal hyperbilirubinemia frequency incompatibility has grown to be the most prevalent cause of hemolytic jaundice in infants. <sup>[6, 25]</sup>.

The majority of patients with hyperbilirubinemia have no permanent

consequences on the neurological system except patients with severe jaundice may present with neurological complications called ["Kernicterus"]. <sup>[7]</sup>.

Exchange transfusions were first used to treat newborn hyperbilirubinemia as a particular kind of Rhesus hemolytic illness in the 1940s <sup>[8]</sup>. In order to stop additional erythrocyte oxidation, exchange transfusions lower the blood bilirubin level and get rid of circulating maternal antibodies and antibody-coated newborn erythrocytes. A twofold volume exchange transfusion of irradiated donor blood replaces around 85% of the blood in newborns <sup>[9,10]</sup>.

Neonatal hyperbilirubinemia of the moderate-severe kind has been treated mostly with phototherapy since its inception in the 1970s. The skin's bilirubin is photo-isomerized by phototherapy into water-soluble isomer that may be eliminated around the kidney and stool. The effectiveness of phototherapy is dependent on the intensity, time spent receiving phototherapy, the area of skin

exposed, and/or the threshold at which phototherapy is started. The wavelength of the light, either azure or leafy light with a wavelength rang 460-490 nm, also plays a role <sup>[11,12]</sup>.

High indirect bilirubin levels at birth have increased the exposed surface area, making it crucial to treat pathological jaundice with the intensive phototherapy "special blue" fluorescent tubes, lamps placed as near as 15 \_20 cm from the neonate, and the fibero- optic cover placed below the infant. Infants weighing under 1.000 g may benefit from aggressive phototherapy for prevent neurodevelopmental abnormality <sup>[13]</sup>. When bilirubin levels remain high after rigorous phototherapy or when acute bilirubin encephalopathy symptoms appear, exchange transfusions are advised <sup>[14]</sup>.

### Aims of study: -

The aim of his study is to evaluate the prevalence, clinical course, management modality and the outcome of infant with jaundice at the central teaching hospital in Baghdad using different treatment methods.

**Patients & Methods:**  
A medical records for all newborn hyperbilirubinemia cases admitted into neonatal care at the central teaching hospital over the course of one year, between May 1st, 2020, and May 1st, 2021, were used in retrospective research. Patients' gender, age, serum bilirubin level, mother and newborn blood group, Rh subtype , body weight, factors may cause complications , type of milk feed, delivery method, type of management , also the outcome of patients. Every morning and evening, as well as occasionally every four hours, total serum bilirubin was assessed, particularly in severe newborn with jaundice. The blood drawn from capillaries and examined using a colorimetric technique.

Total serum bilirubin [TSB] levels of 10mg/dL in premature baby and to level of 12 mg/dL in fullterm baby were regarded

to be mild neonatal hyperbilirubinemia. Severe newborn hyperbilirubinemia was defined as a level 18mg/dL in premature baby and more than 20 mg/dL in fullterm baby. Between these ranges, bilirubin levels indicated mild newborn hyperbilirubinemia. <sup>[12]</sup>

Clinical aspects were used to determine the diagnosis of kernicterus in newborns who were extremely jaundiced since the early signs included hypotonia, lethargy, and poor sucking. but late-stage signs like opisthotonus and hypertonia <sup>[15]</sup>

Phototherapy was used to treat newborns with neonatal hyperbilirubinemia [ $<15$  mg/dl], while extensive phototherapy was used to treat newborns with  $>15$  mg/dl. only while changing diapers or nursing was phototherapy interrupted. Exchange transfusions were used to treat severe neonatal hyperbilirubinemia that did not respond to extensive phototherapy, and they were also used to treat newborns who showed indications of Kernicterus upon arrival.

ABO incompatibility was defined as newborns blood group type A or B whose mother had blood type O. Rh incompatibility is the term used to describe infants has blood group positive Rh born to mothers have the negative Rh. <sup>[3]</sup>.

Based on clinical signs such as poor activity, poor eating, hypothermia or hyperthermia, and the treatment of the newborn with antibiotics for at least seven days, septicemia was determined to be the cause.

Due to a lack of facilities, measure of G6PD, pyruvate kinase, and glurOnyl transferase can't performed.

Fluorescent azure light pipe with a radiation power 10–30 mW/ cm<sup>2</sup> / nm were utilized as phototherapy devices. NOVOS Tibbi CIHAZLAR SAN TiC.iTtlve IHR.LTD was the apparatus that had been utilized for intensive phototherapy. Bilisphere 360SN:BS-12-01-208 STi Mod. 16 azure fluorescent light tube have twin surfaces that face up and down make up this fixture.

Exchange transfusions were performed through the umbilical vein and took around 45 to 60 minutes to complete. one ml of Calcium Gluconate 10% was administered following each exchange each 100ml of exchanged blood. Cross-matching with the infant's blood was utilized with Rh noncompatible, Rh negative with blood group compatibility, for ABO noncompatibility, blood group and Rh compatible for mother and neonates was used.

End Results were divided into three categories: discharged with improvement, kernicterus, and death. Version 26 of the SPSS software was used for the data analysis.

## Result

There were 2508 neonates hospitalized between May 1, 2020, and May 1, 2021, and 855 [or 34% of them] were identified as having neonatal jaundice. females made up 323 [37.7%], and Males 510[59.6%] with a male to female ratio of 510 to 323. [1.6:1].

Least common age group was 24 hours in 22 [2%] and the age 1-2 days is 38 [4.4%]. The most frequent age group was 3-7

days 547 [64%] of patients and age > 1 week is 248 [27.3%].

The body weight of infants at time of admission > 2.5 kg consider the most of patients 722 patients [84.5%] and only 133 newborns [15.5%] weight < 2.5 kg.

559 born by vaginal deliveries [65.4%] represented the majority of infant births and 296 born with caesarean sections [34.6%].

The majority of newborns [643 [75.3%] received breast milk, 124 [14.5%] had mixed milk, and just 88 [10.2%] received bottle milk.

In 277 patients [32.4%], physiological jaundice was identified as the underlying cause of newborn hyperbilirubinemia. ABO incompatibility 138 [16.1%] and prematurity 182 [21.3%] were also significant contributors to jaundice. Less individuals had sepsis 10 [1.2%]<sup>(24)</sup> and 44 [5.2%] had Rh incompatibility.

258 cases [30%] of patients had an undetermined cause that was classified as "others," such as a lack of G6PD deficiency, cephalhematoma from birth injury, polycythemia, breast milk hyperbilirubinemia, TORCH infection, Oxytocin induced jaundice, Gilbert's disease, Crigler-Najjar syndrome, and spherocytosis.

**Table (1): criteria of patients.**

criteria	Sub-criteria	number	Percent%
age	< 1 day	22	2%
	1-2 day	38	4.4%
	3-6 day	547	64%
	>7 days	248	27.3%
gender	male	516	60.4%
	female	339	39.6%
weight	<2.5 kg	722	84.5%
	>2.5 kg	133	15.5%
Mode of delivery	VND	559	65.4%
	CS	296	34.6%
Type of feeding	Breast feeding	643	75.3%
	Bottle feeding	88	10.2%
	mixed	124	14.5%
Risk factor	Physiological	277	32.4%
	Prematurity	182	21.3%
	ABO incompatibility	132	16.1%
	Rh incompatibility	44	5.2%
	sepsis	10	1.2%
	Others*	258	30%

\* G6PD insufficiency, cephalhematoma during delivery, polycythemia, jaundice in breast milk, Spherocytosis, Gilbert's disease, Crigler-Najjar disease, Oxytocin induced jaundice, and TORCHinfection.

496 of individuals, or 58% of the total population, received phototherapy. In 319 [37.3%] cases with moderate or severe Neonatal hyperbilirubinemia, intensive phototherapy was utilized to treat the condition, and in 95% [303/319] of those cases, the bilirubin level was successfully reduced and the patient improvement [when TSB < 10mg/dl] without the need for an exchange transfusion. There were

only 16 cases [5%] in which intense phototherapy did not work, and exchange transfusions were carried out. 40 [4.6%] case of them required an emergency exchange transfusion since the patient's age was less than one day old and they had an ABO incompatibility, and 16 cases [1.87%] required it because they had kernicterus symptoms when they were admitted. 72 instances, or 8.4%, of all cases involved exchange transfusions. see table-2-

**Table (2): types of management and it's fait**

Type Of management		number	Percent %	Impr0ved	Percent %
Phototherapy		496	58 %	496	100%
Intensive phototherapy		319	37.3%	303	95%
Exchange transfusion after trial of intensive phototherapy		16	5%	16	100%
Immediate exchange transfusion.	1 <sup>st</sup> day+ABO incompatibility	40	4.6%	37	92.5%
	kernicterus	16	1.8 %	11	68.7%

Table -3- shows the modality of management according to the TSB level .The minimum number Of patients with mild hyperbilirubinemia 10 [1.1%] admitted for treatment due to prematurity with sepsis all of them treated with phototherapy and 3[30%] with 100% successfully treated patients transferred to extensive phototherapy after 2 days., the majority of admitted patients moderate hyperbilirubinemia 681 [78.7%] mostly treated with phototherapy in 424/681 [62 %], intensive phototherapy in 245/681

[36%] and only exchange transfusion is done in 15/681 [2%] patient with 100 % successfully treated . Another group of patients with severe hyperbilirubinemia and no signs of kernicterus is 148 [17.3 %] cases managed by intensive light therapy with good outcome is 140/148 [95 %] while only 24/148 [16.2 %] with exchange transfusion with 3 dead patients. all patients admitted with kernicterus treated with immediate exchange transfusion, with 4 patients dead.

**Table (3): Treatment approaches in relation to TSB level**

<b>TSB (mg / dl)</b>	<b>T0tal number</b>	<b>Phototherapy</b>	<b>Intensive phototherapy</b>	<b>Exchange transfusion</b>	<b>Improved (no. and %)</b>
<b>&lt; 10</b>	10(1.1%)	10(100%)	3(30%)	0(0%)	10 (100)[
<b>11-20</b>	681 (78.7%)	424 (62 %)	245 (36%)	15 (2%)	681 (100%)
<b>&gt;20 without kernicterus</b>	148 (17.3 %)	0(0%)	140 (95)	24(16.2 %)	145(97.8%)
<b>&gt;20 with kernicterus</b>	16(1.8%)	0(0%)	0(0%)	16 (100%)	12(75%)

Table -4- view the sex and its correlation to the type of management. The improvement in male to phototherapy [100%] is higher than female [97%], while

the response to extensive phototherapy is almost equal the same for both male [93.7%] and female [94.2%], also same for response to exchange transfusion same for male [92.3%] and female [93%].

**Table (4): response to treatment for both male and female**

<b>Patients 855</b>	<b>Mode of treatment</b>	<b>Total number</b>	<b>Improved</b>	<b>Not improved</b>
<b>Male 516 (60.3%)</b>	phototherapy	251 (48.6%)	251 (100%)	0(0%)
	intensive phototherapy	239 (46.3%)	224 (93.7%)	2(2.9%)
	Exchange transfusion	26 (5.1%)	24 (92.3%)	2 (7.7%)
<b>Female 339 (39.6%)</b>	phototherapy	170 (50.7%)	165 (97%)	5(3%)
	Extensive phototherapy	140(45.8%)	132(94.2%)	8 (5.8%)
	<b>Exchange transfusion</b>	29(8.5%)	27 (93%)	2 (7%)



Table -5- shows the time of stay in hospital, shows that 554 [64.8%] of patients stay in hospital less than 4 days, while only 391 [35.2%] of patients stay more than 4 days.

Also shows the outcome, the majority of patients 832 [97.3%] was discharged from hospital without complications, and 19 [2.2%] of patients have kernicterus either when admission or during staying in hospital, and only 4 [0.4%] of patients was die.

**Table (5): Length of stay and outcome**

Criteria	Sub-criteria	Number and percent
<b>Time staying in hospital</b>	< 4days	554 (64.80%)
	>4 days	301 (35.2%)
<b>outcome</b>	ImprOved	832 (97.3%)
	kernicterus	19 (2.2%)
	die	4 (0.4%)

## Discussion

Neonatal jaundice was recorded at a rate of 34% in the study, which is similar to Dantas et al. <sup>[16]</sup> [31%], but less from SirOmani et al. <sup>[17]</sup> [42. 03%] also Thielemans et al <sup>[18]</sup> [53%]. The male to female ratio was found to be 1.6:1, which is near to Sharma et al. [19] [60%], Thielemans et al. <sup>[18]</sup> [58. 4%], and SirOmani et al. <sup>[17]</sup> [64 %].

The data indicated were 72 hours-1 week age was the most prevalent age group [64%], which was also the case for Sharma et al <sup>[19]</sup> [57.9%]. Additionally, fewer neonates [2%] were hospitalized within the first 24 hours of life less than t0 Sharma et al <sup>[19]</sup> [ 7.6%]. Depending On the prevailing wisdom and the application Of various traditional remedies, such as putting garlic seeds on newborns cloths, delay in getting the newborn to the hospital for treatment causes some newborns with severe jaundice to have a bad prognosis.

In contrary to SirOmani et al <sup>[17]</sup> finding the 66% of patients had low birth weight. Which is regarded as the most serious health problems, the most of patients [84.5%] were > 2.5 kg, the findings supported Rasul et al. <sup>[21]</sup> who found physiological jaundice to be the most frequent cause of newborn hyperbilirubinemia [26.7%], and Singhal et al. <sup>[20]</sup>,

who found it to be the most prevalent cause [33%] in my study, physiological jaundice is the most frequent cause of admission with 32.4%.

Prematurity, one of the variables that contribute to the development of newborn hyperbilirubinemia, is represented by results in a percentage of 24.1%, which is greater than Singhal et al <sup>[20]</sup> [16.7%] but lower than Rasul et al <sup>[21]</sup> [37%]. Born to O group mothers, the rate of ABO incompatibility was [16.1%], which was lower than Thielemans et al [18%]. rate but similar to Siromani et al <sup>[17]</sup>. [12%] rate. RH incompatibility was [5.2%], which is similar to Bhutani et al. [4] finding of 2% but different from Siromani et al <sup>[17]</sup> finding of 10%. The risk of RH incompatibility was reduced by administration of anti-D for Rh -ve mothers with Rh +ve neonates, and since the majority Of mothers are aware of their blood type when they get married, they are more cautious, especially when the mother is blood group -ve and the baby is blood group +ve.

The Sepsis has been discovered in [1.2%] as less common cause; however, Sharma et al <sup>[19]</sup> and the SirOmani et al <sup>[17]</sup> disagreed [43%]. moreover, Thielemans et al <sup>[18]</sup> [18. 7%] shown the sepsis is a significant

contributor to newborn jaundice. This may be because more babies are delivered at home, there are more people living in rural areas, or there are more home births than hospital births in our research. Unfortunately, in a significant number of patients [27.3%], the causative factor of neonatal jaundice could not be identified due to the retrospective study design, which had insufficient information and lacked some specialized analysis, such as in-depth investigations to identify the causes of jaundice. the causes of elevated bilirubin levels.

Breastfeeding was more prevalent [75.3%] than it was for Sir0mani et al. <sup>[17]</sup> [67%] also Singhal et al [20] [65. 6%]. This may be translated by the fact that the hospital's policy is to support breastfeeding and discourage the marketing of bottle feeding. According to research conducted in Baghdad by Al- momen H.et al <sup>[22]</sup>, which revealed an identical success rate [92%] in both sexes, it appears that males respond to intensive phototherapy in the same way [93.2%] as females [94.7%]. Both males and females had problems, such as kernicterus upon admission and mortality following an exchange transfusion, it is consistent with the scientific finding that both genders have an equal likelihood of experiencing serious newborn jaundice.

Depending on the level of bilirubin, several forms of therapy were employed. Phototherapy was used at a substantially greater rate in 496 patients [58%] than in Rasul C. H. study <sup>[21]</sup> [62.6%]. In accordance with studies conducted at the Assiut University Children Hospital in Egypt [68%], Al-momen H.et al <sup>[22]</sup> [7 2%], and Abdelazeem KS.et al [23, 319 patients [37.3%] had intensive phototherapy with a success rate of 95% [303/319].

A significant part of treating severe neonatal jaundice [ $> 20$  mg/dl] and reducing the need for exchange transfusions was intensive phototherapy, which was seen in 63 [14.5%] cases had severe jaundice [ $> 20$  mg /dl] without

findings of kernicterus. Only 16 [5%] cases in which intensive phototherapy failed and the patients required exchange transfusions. The reasons behind the reason behind non-response to intensive light therapy could be due to the other underlying etiology such as direct hyperbilirubinemia.

Exchange blood transfusion was done in 56 [6.4%] patients, the same seen in Rasul et al <sup>[21]</sup> [5. 2%] study and the lower than Sir0mani et al <sup>[17]</sup> [2 6%] report. In mine hospital, extensive phototherapy is performed as soon as feasible to treat moderate and severe jaundice, reducing the need for exchange transfusions.

The average time of stay in hospitals was 2.5 days, according to research by Abdelazeem KS et al [23], and it was less than 4 days in 554 [64%] cases of sepsis and 301 [35.2%] cases of neonates receiving exchange transfusions; both conditions require antibiotics and strict monitoring. In contrast, Sharma et al. <sup>[2]</sup> found that 32.4% of neonates stayed more than 4 days and 67.6% stayed for less time. This may be because extensive phototherapy, used in our trial to treat newborn hyperbilirubinemia, is successful in shortening hospital stays, minimizing the need for exchange transfusions, and improving jaundice outcomes.

429 [97.3%] newborns with neonatal jaundice were released after improve. It is similar with Sir0mani et al [17] [96%].

### Conclusion: -

The golden therapy for mild to moderate hyperbilirubinemia is still phototherapy. Utilizing intense phototherapy to treat newborn hyperbilirubinemia is successful in lowering T.S.B levels, minimizing the require for exchange transfusions, and shortening hospital stays.

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