



Outcome of neonatal jaundice at Fatima Al-Zahra Hospital for maternity and children in Baghdad

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Abstract

Background: Neonatal hyperbilirubinemia is a common disease in neonates especially in early days of birth that requires a good and successful treatment for reducing the disease and its complication that can produce important and irreversible effects.

Objectives: To evaluate the effectiveness of treatment with phototherapy, intensive phototherapy and exchange transfusion on outcomes of neonatal jaundice at Fatima Al-Zahra Hospital for maternity and children in Baghdad.

Patients & Methods: A retrospective study was carried out using medical records of neonates with diagnosis of jaundice, admitted in the neonatal care unit of Fatima Al-Zahra hospital over 6 months period between 1st May till 31st October 2018. The total serum bilirubin and blood group were done in all cases. Neonatal jaundice was treated with phototherapy, intensive phototherapy and exchange transfusion according to severity of jaundice.

Results: Total neonates admitted from 1st may to 31st October 2018 in neonatal care unit were 1254, among them 432 (35%) were diagnosed as neonatal jaundice "hyperbilirubinemia". Male : Female ratio (1.4:1), males 256(59.3%), females 176(40.7%). Physiological jaundice was the most common cause 129(29.9%) cases. Prematurity in 104(24.1%) and ABO incompatibility 59(13.7%) while Rh incompatibility 14(3.2%), sepsis 8(1.9%) and others causes of jaundice were 118(27.3%). Phototherapy was the most common kind of treatment in 237(55%) while intensive phototherapy used in 175(40.3%) cases with successful reduction in T.S.B level and improvement without need for exchange transfusion (92%) (161/175).Only 20(4.5%) cases treated with exchange transfusion especially for ABO incompatibility 8 (42.1%) cases and Rh incompatibility 4 (21.1%) cases. Most of neonates 429 (99.3%) discharge with complete improvement and only 2 (0.5%) neonates suffered from kernicterus and one death (0.2%).

Conclusion: Phototherapy is still the standard treatment of mild to moderate hyperbilirubinemia .Use of intensive phototherapy in the treatment of neonatal hyperbilirubinemia is effective in reducing T.S.B level , need for exchange transfusion and hospital staying .

Keywords: Hyperbilirubinemia, Intensive phototherapy, Phototherapy, Exchange transfusion, Neonatal jaundice

Introduction

Neonatal hyperbilirubinemia is a common and seen during the 1st week after birth in about 60% of term neonates and 80% of preterm neonates (1, 2). It is one of the important causes of morbidity and mortality in the neonatal period, especially in the 1st week of life (3). In severe neonatal hyperbilirubinemia, bilirubin can cross the blood-brain barrier and can lead to bilirubin neurotoxicity. The most severe and permanent clinical manifestation of severe neonatal hyperbilirubinemia is Kernicterus (4).

In some developing countries, the incidence of severe neonatal hyperbilirubinemia may be as much as 100 times higher than in developed countries (5). The incidence of severe neonatal hyperbilirubinemia due to the ABO incompatibility has become the most common cause of hemolytic jaundice in newborns but Rh incompatibility declined (6).

The largest number of cases of jaundice does not have significant clinical importance but pathological jaundice has very importance as high indirect bilirubin level at birth has irreversible effects on the nervous system "Kernicterus" (7).

The treatment of neonatal hyperbilirubinemia with exchange transfusions was introduced initially as specific treatment for Rhesus hemolytic disease in the 1940s (8). Exchange transfusions reduce serum bilirubin level and remove the antibody-coated neonatal erythrocytes and circulating maternal antibodies to reduce further erythrocyte destruction. Approximately 85% of the neonatal blood is replaced by irradiated donor blood double volume exchange transfusion (9, 10).

Since the introduction of phototherapy in the 1970s, it has been the main treatment for neonatal hyperbilirubinemia of moderate-severe type. Phototherapy causes photoisomerization of bilirubin in the skin to water-soluble isomers that can be excreted by the kidneys and stool. The efficacy of phototherapy depends on wave length of the light, blue or green light with range of 460–490 nm, the intensity, time under phototherapy, amount of skin exposed, and/or the threshold at which phototherapy is commenced (11,12). Intensive phototherapy using "special blue" fluorescent tubes, placing the lamps within 15-20 cm of the infant, and putting a fiberoptic phototherapy blanket under the infant's back to increase the exposed surface area. Aggressive phototherapy may improve

neurodevelopmental outcome in infants <1.000 g (13). Exchange transfusions are recommended when bilirubin levels remain above exchange transfusion thresholds despite intensive phototherapy, or if signs of acute bilirubin encephalopathy occur (14).

Aim of study

The current study was conducted aiming to evaluate the effectiveness of treatment with phototherapy, intensive phototherapy and exchange transfusion on outcomes of neonatal jaundice at Fatima Al-Zahra Hospital in Baghdad.

Patients and Methods

A retrospective study was carried out using the medical records of all cases of neonatal hyperbilirubinemia admitted into the neonatal care unit of the Fatima Al-Zahra hospital over a 6 months period between 1st May and 31st October 2018.

Data collected from the case records include patients' sex, age, total serum bilirubin, maternal and neonatal blood group and Rh, weight, risk factors, type of feeding, type of delivery, type of treatment, and outcomes.

Total serum bilirubin was taken and measured each morning and evening and sometime each 4 hours especially for severe neonatal hyperbilirubinemia. The blood collected from capillary blood and tested with the colorimetric method.

Mild neonatal hyperbilirubinemia was considered when total serum bilirubin (T.S.B) level of up to 10 mg/dL in preterm neonates and up to 12 mg/dL in full-term neonates. Level above 18 mg/dL in preterm neonates and above 20 mg/dL in full-term neonates were considered severe neonatal hyperbilirubinemia. Bilirubin levels between these values indicated moderate neonatal hyperbilirubinemia (12)

Kernicterus was diagnosed in severely jaundiced infants depending on clinical features as poor sucking, stupor and hypotonia were symptoms in the early phase while hypertonia and opisthotonus were symptoms in the late phase (15).

Infants with neonatal hyperbilirubinemia (<15 mg/dl) were treated with phototherapy while infants with (>15 mg/dl) were treated with intensive phototherapy.

Phototherapy interrupted only during breastfeeding or nappy change. Severe neonatal hyperbilirubinemia which not response to intensive phototherapy were treated with exchange transfusion and neonates who present with signs of Kernicterus on admission were treated with immediate exchange transfusion.

Neonates with blood group A or B of mothers with blood group O were considered as ABO incompatibility. Newborns with a positive Rh born from mother with negative Rh were defined as Rh incompatibility (3).

Septicemia was diagnosed depending on with positive blood culture and/or clinical features like poor activity, poor feeding, hypothermia or hyperthermia and neonate treated with antibiotic for 7 days or more. Tests for G6PD, pyruvate kinase and gluronyl transferase could not be done because of a lack of facilities.

Phototherapy units used were blue light fluorescent tubes, with the spectral irradiance of 10–30 mW/cm² /nm.

The device which had been used for intensive phototherapy was Novos TIBBI CIHAZLAR SAN. TiC. iTi. ve iHR.LTD. STi Mod: Bilisphere 360 SN:BS-12-01-208.It consists of 16 blue light fluorescent tubes with up and down double surfaces .

Exchange transfusion was procedure by the umbilical vein using fresh whole blood usually less than 72-hour old, this procedure was taking about 45-60 minutes by repeatedly removing and replacing 20cc of blood and one cc of calcium gluconate 10% was given after exchange of every 100 ml of blood. For Rh incompatibility, Rh negative and blood group that compatible with mother and baby, cross-matched with

baby's blood was used; for ABO incompatibility, blood group and Rh compatible with mother and baby. Outcomes were classified as discharged with improvement, kernicterus or death.

Data analysis was performed using SPSS program, version 24.

Results

The total No. of neonates admitted from 1st of May to 31st October 2018 in neonatal care unit were 1254, among them 432 (35%) were diagnosed as neonatal jaundice. Males 256(59.3%) and females 176 (40.7%) with male to female ratio (1.4:1).The most common age group was 72 hs-1week in 266 cases (61.6%) and > 1 week in 132(30.6%) while the least age group was < 24 hours in 5 (1.2%) cases (mean=3.2 days) .Body weight of newborns on admission was > 2.5 kg in the majority of patients 351 cases (81.3%) while 81 newborns (18.7%) < 2.5 kg. Most neonatal deliveries were by normal vaginal delivery 278 (64.3%) and caesarean section was 154 (35.6%).Breast feeding found in most neonates 334 (77.3%).mixed feeding 78 (18.1%) and only 20 (4.6%) neonates with bottle feeding. (Table 1).

Physiological jaundice was the most common cause of neonatal hyperbilirubinemia in 129 cases (29.9%). Prematurity 104(24.1%) and ABO incompatibility 59(13.7%) were also major causes of jaundice .The lower rate of patients with Rh incompatibility 14(3.2%) and sepsis 8(1.9%). There was a high rate of patients constituting 118 cases (27.3%) with unidentifiable cause labeled as "others" e.g glucose-6-phosphate dehydrogenase deficiency, birth trauma as cephalhematoma, polycythemia, breast-milk jaundice, TORCH Infection, oxytocin induced jaundice, Gilbert's syndrome, Crigler–Najjar syndrome, and spherocytosis. Table -1-

Table 1: The patients' criteria

Age at time of Admission (days)	<1 day	6	1.2
	1---2		28
3---6		266	61.6
=>7		132	30.6
Gender	Male	256	59.3
	Female	176	40.7
Weight (Kg)	=>2.5 Kg	351	81.3
	<2.5 kg	81	18.7%
Type of delivery	CS	154	35.6
	NVD	278	64.4
Feeding	Bottle feeding	20	4.6
	Breast feeding	334	77.3
	Mixed	78	18.1
Risk factors	Physiological	129	29.9
	Prematurity	104	24.1
	ABO-Incompatibility	59	13.7
	Rh-Incompatibility	14	3.2
	Sepsis	8	1.9
	Others*	118	27.3

*Glucose-6-phosphate dehydrogenase deficiency, birth trauma as cephalhematoma, polycythemia ,breast-milk jaundice, TORCH Infection, oxytocin induced jaundice, Gilbert's syndrome, Crigler–Najjar syndrome, and spherocytosis.

A relatively high rate of patients 237(55%) cases were treated with phototherapy .Intensive phototherapy was used in treatment of moderate and severe Neonatal jaundice (N.H) in 175 (40.5%) cases with successful reduction in T.S.B level and improvement without need for exchange transfusion (92%) 161/175). Only 14 cases (8%) failed to respond to intensive

phototherapy and exchange transfusion was done. The decision of immediate exchange transfusion was made in 6 cases; 3 of them because of patients age was < 1 day old with ABO incompatibility and the other 3cases because of signs of kernicterus on admission so the total No. of cases with exchange transfusion was 20(4.5%) cases, see table -2-

Table-2- Kinds of treatment and sequels

Type of treatment	Total	%	Improved	Not improved	% of improved
Phototherapy	237	55	237	0	100
Intensive Phototherapy	175	40.5	161	14	92
Exchange transfusion after a trial of intensive phototherapy	14	3.2	14	0	100
Immediate exchange transfusion	6	1.3	5	1	83.3

Table -3- demonstrate the modes of treatment according to the T.S.B level .The higher percentage of patients were with moderate N.H (10-19 mg /dl) in 360 cases (83.6 %) mostly treated with phototherapy in 234 cases (65 %), intensive phototherapy in 124 cases (34.4 %) and only exchange transfusion in 2 cases (0.05%) .

A challenging group of patients with severe N.H (> 20 mg /dl) without signs of kernicterus constituting 63 (14.5 %) cases; treated with intensive phototherapy with successful outcome in 49/63 cases (77.8 %) while only 14/63 cases (22.2 %) with exchange transfusion after they had been given a chance of intensive phototherapy for 4-6 hours .

Table-3- Modes of treatment in relation to T.S.B level

		Total No.	Phototherapy	Intensive phototherapy	Exchange transfusion	%
TSB (mg/dL)	<10 mg/dL	6	3	2	1*	1.4%
	10-19 mg/dL	360	234	124	2*	83.6%
	=>20 mg/dL without Kernicterus	63	0	49	14**	14.5%
	=>20 mg/dL & Kernicterus	3	0	0	3*	0.5%
Total No.		432	237	175	20	100%

*Immediate exchange transfusion

**Exchange transfusion after trial of intensive phototherapy

Table - 4 - shows the gender and its relationship to the modes of treatment .The response of male to intensive

phototherapy (98.2%) is much higher than female (84.8%).

Table -4- Gender in relation to modes of treatment

gender	Type of treatment	Total	Improved	Non-improved	Percentage of improvement
Male n=256	phototherapy	141	141	0	100
	Intensive phototherapy	109	107	2*	98.2
	Immediate Exchange transfusion	6	5**	1***	83.3
Female n=176	phototherapy	97	97	0	100
	Intensive phototherapy	79	67	12*	84.8

*Exchange transfusion after trial of intensive phototherapy.

** Immediate exchange transfusion due to kernicterus on admission or 1st day jaundice.

* **1 case : died after exchange transfusion.

Staying at hospital < 4 days in (92.8%) of cases, while only 31(7.2%) cases stay > 4 days. Outcomes of neonatal jaundice revealed that 429(99.3%) neonates

discharge with complete improvement and only 2 (0.5%) neonates suffered from kernicterus and 1(0.2%) death. see table -5-

Table -5-Length of stay and outcome

		No	%
Length of stay in hospital (days)	=<4 days	401	92.8
	>4 days	31	7.2
Outcome	Improved	429	99.3
	Kernicterus	2	0.5
	Death	1	0.2

Discussion

The rate of neonatal jaundice reported in the study is (35%) in agreement with Dantas et al(16) (31%) while it is lower than Siromani et al(17) (42.03%) and Thielemans et al(18) (53%).

The results revealed a higher rate of male predominance with male to female ratio 1.4:1 is comparable to Sharma et al(19) (60%), Thielemans et al(18) (58.4%) ,Siromani et al(17) (64%).

The results showed that the most common age group was 72 hs-1week in (61.6%), similar findings reported in the Sharma et al (19) (57.9%), while (1.2%) of neonates admitted within first 24 hours of age which is lower as compared to Sharma et al(19)(7.6%). Depending on the popular beliefs and the use of some traditional medicine made people late to bring the neonate to the hospital for treatment which lead to poor prognosis in some neonates with severe jaundice.

The majority of patients (81.3%) were > 2.5 kg which is in contrast to Siromani et al (17) which revealed that 66% with low birth weight which is considered as one of the contributing factors for hyperbilirubinemia (17).

There was a higher rate of Breast feeding (77.3%) which is higher than Siromani et al (17) (67%) and to Singhal et al(20) (65.6%) . This is can be explained by that our hospital policy is baby-friendly which means encourage mothers to breastfeeding and prevent the promotion of bottle-feeding.

The results showed that physiological jaundice was the most common cause of neonatal hyperbilirubinemia (29.9%) ,the same conclusion reached by Rasul et

al(21) (26.7%) and Singhal et al(20) (34.6%) . Prematurity which is one of contributing factors for development of neonatal hyperbilirubinemia consist (24.1%) of results which is lower than Rasul et al(21) (37%) but higher than Singhal et al(20) (16.7%).

The rate of ABO incompatibility was (13.7%) born to O group mothers similar to Siromani et al (17) (12%) but it is lower than Thielemans et al (18) (17.9%).

RH incompatibility was (3.2%), in line with Bhutani et al(4)(2%) but it is different from Siromani et al(17)(10%) .The use of anti D for Rh -ve mothers with RH +ve neonate reduced risk of RH incompatibility and most mothers at marriage time will know their blood group so the mother will be more careful especially when her blood group negative and her baby blood group positive .

Sepsis found in (1.9%) as minor cause, this was disagree with Sharma et al (19) (43%), Siromani et al(17)(43%). and Thielemans et al (18) (18.7%) which showed that sepsis being major cause of neonatal jaundice .This is may be due to more number of home deliveries, poor socio economic conditions, or living in rural places while most deliveries in our study occurred in hospital and in urban area .

The cause of neonatal hyperbilirubinemia could not be determined unfortunately in a relatively high percentage of patients (27.3%) because the use of retrospective design in the study which have limited information and lack of some special analysis such as lack of extensive investigations to determine the causes of jaundice.

Regarding gender in relation to types of treatment, it seems that the response of male to intensive phototherapy (95.5%) is much higher than female (84.8%), in contrast to the study done in Baghdad by Al-Momen H.H et al(22) which showed equal success rate (72%) in both sex groups. The occurrence of complications e.g kernicterus on admission and death after exchange transfusion was higher in male than female, this is in agreement with scientific fact that risk of developing significant neonatal jaundice is higher in male infants (1).

Different modes of treatment were used according to the bilirubin level. A relatively higher rate of patients 237 cases (55%) was treated with phototherapy, same finding reported by Rasul C H study(21) (62.6%) cases.

Intensive phototherapy was used in 175 cases (40.5%) with successful improvement (92%) (161/175) in consistent with Al-Momen H.H et al(22) (72%), Abdelazeem KS et al(23) study in Assiut university children hospital, Egypt (68%). Intensive phototherapy played an important role in treatment of severe N.H (> 20 mg /dl) and reduction of need to exchange transfusion and this was approved in 63 (14.5 %) cases with severe N.H (> 20 mg /dl) without signs of kernicterus on admission with success rate 49/63 cases (77.8%) and failure rate 14/63 cases (22.2%). The causes behind failure of intensive phototherapy may be due to other causes e.g direct hyperbilirubinemia.

Exchange transfusion in 20(4.5%) cases which is same finding reported by Rasul et al(21) (5.2%) and lower as compared to Siromani et al(17)(26%). In our hospital intensive phototherapy is used to treat moderate and severe jaundice as early as possible so lead to reduce treatment with exchange transfusion.

Length of stay in hospital was < 4 days in (92.8%) mean 2.5 ± 1 , same as Abdelazeem KS et al(23) study which showed the mean of duration was 2.5 ± 1.5 days and > 4 days in (7.2%) because of sepsis and neonates treated with exchange transfusion; both condition need cover antibiotics and close follow up. While in Sharma et al(2) (67.6%) of neonate stay < 4 days and (32.4%) of neonate stay for > 4 days. This is may be due to use of intensive phototherapy in our study for treatment of neonatal hyperbilirubinemia is effective in reducing hospital staying and reducing needs for exchange transfusion and has good effect on outcomes of jaundice.

There were 429 (99.3%) babies with neonatal hyperbilirubinemia discharged with improvement. It is comparable with Siromani et al (17) (96%).

Conclusion

Phototherapy is still the standard treatment of mild to moderate hyperbilirubinemia. Use of intensive phototherapy in the treatment of neonatal hyperbilirubinemia is effective in reducing T.S.B level, need for exchange transfusion and reduce duration of hospital staying.

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