

Neonatal jaundice with Urinary Tract Infection

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Abstract

- Background** Urinary tract infection is a common and serious clinical problem in newborns. Renal scarring, hypertension, and even kidney failure can be prevented by early diagnosis and treatment of urinary tract infection. Jaundice is an important and sometimes the presenting feature of urinary tract infection.
- Objectives** To evaluate the frequency and bacterial profile of urinary tract infection in full term and preterm newborns with hyperbilirubinemia in the first two week of life, and the relation with some demographic parameters.
- Methods** Seventy two jaundiced neonates were studied. Hematocrit, white blood cell count, reticulocyte count, blood group and Rh, bilirubin (direct and total), Coombs test, and glucose 6-phosphate dehydrogenase level were evaluated. Septic screen and thyroid function test, urinalysis and culture for all patients.
- Results** Twenty two (30%) out of 72 complain from urinary tract infection. Majority of them were full term 15 (68%), and Body weight > 2.5 Kg 12 (54%), fifteen delivered by normal vaginal delivery (68%). Breast feeding was recorded in 12 (54%), total serum bilirubin level above 20 mg/dl was found in 19 (86%). Gestational age, Normal Vaginal Delivery, Type of feeding, and total serum bilirubin level more than 20 mg/dl had significant correlation with urinary tract infection in jaundiced neonates, while birth weight was not significant. Commonest isolated bacteria was *Escherichia coli* in 11 (50%), *staphylococcus* infection in 2 cases (9.1%) have significant correlation with male gender. Ultrasound result was only positive in one (4.5%) neonate and showed pelvi-calceal obstruction.
- Conclusion** Urinary tract infection is common among jaundiced neonates particularly in males. *Escherichia coli* is the commonest causative bacteria. Gestational age, normal vaginal delivery, type of feeding, and total serum bilirubin level more than 20 mg/dl had significant correlation with urinary tract infection in jaundiced neonates, while birth weight was not significant.
- Key word** Neonatal jaundice, hyperbilirubinemia, UTI

List of Abbreviations: CS = Caesarean section, E. coli = *Escherichia coli*, G6PD = Glucose 6- phosphate dehydrogenase, LBW = low birth weight, NBW = normal birth weight, NICU = neonatal intensive care unit, NVD = normal vaginal delivery, PUJ = pelvi ureteric junction obstruction, TSB = total serum bilirubin, UTI = urinary tract infection, VCUG = voiding cystourethrography.

Introduction

Urinary tract infection (UTI) is a common and serious clinical problem in newborns. Previous studies have suggested that jaundice may be one of the signs of a UTI in infants⁽¹⁾. It is well known that UTI can occur without apparent signs, and

jaundice is an important and sometimes the presenting feature of UTI⁽²⁾.

Renal scarring, hypertension, and even kidney failure can be prevented by early diagnosis and treatment of UTI. Symptoms and signs of UTI in infants are nonspecific and prolonged jaundice is more common in breastfed infants than artificially fed infants⁽³⁾.

Jaundice although it is mostly benign, some cases may have the possibility of having other diseases in combination. There have been some reports regarding the relationship of

idiopathic hyperbilirubinemia and bacterial infections, such as UTI. However, it is still not recommended to perform routine urinary tests in jaundiced infants for such infections. Urinalysis and a urinary culture are only recommended under some certain conditions, such as infants who have an elevation of direct-reacting or conjugated bilirubin, and infant readmitted for phototherapy or exchange transfusion. However, coincidental UTI in jaundiced infants were not uncommon in our clinical practice⁽⁴⁾.

The objective of this study was to evaluate the frequency and the bacterial profile of UTI in full term and preterm newborns with hyperbilirubinemia in the first two week of life, and the relation with some demographic parameters.

Methods

A cross sectional prospective study conducted on 72 jaundiced neonates whose age less than 2 week, ranged from 3 to 14 days, admitted to Neonatal care unit or the pediatric ward at Al-Imamain Al-Kadimain Medical City, for the period from 1st of October 2013 till June 30th 2014, which is the period of collection of data.

A well constructed questionnaire was performed for data collection including: gender, gestational age, birth weight, mode of delivery.

Blood samples were taken from all the cases for hemoglobin, hematocrit, white blood cell count, reticulocyte count, blood group and Rh, bilirubin (direct and total), Coombs test, and Glucose 6- phosphate dehydrogenase (G6PD) level were evaluated. Septic screen and thyroid function test, and urine samples were collected by urine bag for urinalysis and culture for all patients. UTI is positive if there is more than 5 leukocytes per high power field on urine sample, and positive urine culture (There is no colony count done in hospital labs). Renal ultrasound done for all neonates with UTI.

Data analysis was entered into the Microsoft Excel -2010, p value ≤ 0.05 was considered to be statistically significant.

Results

Total number of jaundiced patients was 72. Males were 42 (58%) while females were 30 (42%) with male to female ratio of 1.4:1.

Full term neonates were 48 (67%), birth weight < 2.5 kg was found in 38 (52%) of cases, 44 (61%) were delivered by normal vaginal delivery (NVD).

Regarding etiological causes of Jaundice; ABO incompatibility was diagnosed in 12 patients (17%) and 10 (14%) of them were recorded in full term ($p < 0.05$) while Rh- incompatibility and G6PD was found in 2 cases (3%) for each. Septicemia was found in 18 (25%) of cases and 12 (17%) of them were found in preterm ($p < 0.05$). One case was diagnosed as hypothyroidism 1 (1.4%) as shown in Table 1.

As shown in table 2, total number of neonates complain from UTI was 22 (30%), 13 of them were males while 9 were females, majority of them were full term 15 (68%) ($p < 0.05$), and body weight > 2.5 Kg 12 (54%), delivered by NVD 15 (68%). Breast feeding was recorded in 12 (54%), TSB level above 20 mg/dl was found in 19 (86%) of cases. All the studied parameters show significant correlation with gender in jaundiced neonates with UTI except birth weight.

Only in 3 male neonates (14%); the TSB was below 20mg all of them respond to intensive phototherapy with no need to exchange transfusion.

Urine culture revealed that the commonest bacteria was E- coli in 11 (50%), enterobacter in 5 (22%), Proteus in 3 (13%), staphylococcus in 2 (9%), mixed infection of multiple bacteria in 1 (4.5%) as shown in the table 3. Staphylococcus and mixed infection of multiple bacteria have significant correlation with gender.

Ultrasound result was only positive in one (4.5%) neonate and showed pelvi-ureteric junction obstruction (PUJ).

Table 1. Distribution of 72 jaundiced patients according to different parameters

Parameter		Full term	Preterm	No. (%)
Birth wt. (Kg)	<2.5	20 (27)	18 (25)	38 (52)
	>2.5	28 (38)	6 (8)	34 (48)*
Gender	Male	27 (37)	15(21)	42 (58)*
	Female	21 (29)	9 (12)	30 (42)
Mode of delivery	Cesarean section	19 (26)	9 (13)	28 (39)*
	Normal vaginal delivery	29 (40)	15 (21)	44 (61)*
Hypothyroidism		1 (1.4)	0 (0)	1 (1.4)
Rh- incompatibility		2 (3)	0 (0)	2 (3)
Glucose 6-phosphate dehydrogenase		2 (3)	0 (0)	2 (3)
ABO incompatibility		10 (14)	2 (3)	12 (17)*
Septicemia		6 (8)	12 (17)	18 (25)*
Total		48 (67)	24(33)	72 (100)*

* = p < 0.05

Discussion

Males were more than females (42 vs 30), which is in agreement with several studies^(3, 5-10). Gestational age was found to be statistically significant in this study, while it was not in other studies^(2,7,11). This might be related to relatively higher number of preterm neonates

included in this study. This finding was highlighted by high number of LBW neonates in this study. Septicemia showed significant relation with jaundiced preterm neonates. This is related to higher susceptibility of sepsis among preterm's.

Table 2. Distribution of 22 jaundiced patients with UTI according to gender with different parameters

Parameter		Male	Female	No. (%)
Birth Weight (Kg)	< 2.5	8	4	12 (54)
	>2.5	6	4	10 (46)
Mode of delivery	Cesarean section	4	3	7 (32)*
	Normal vaginal delivery	10	5	15 (68)
Feeding Type	Breast	8	4	12 (54)*
	Artificial	5	2	7 (32)
	Mixed	2	1	3 (14)
Total serum bilirubin	>20mg	12	7	19 (86)*
	<20mg	3	0	3 (14)
Preterm		4	3	7 (32)*
Full term		9	6	15 (68)*

* = p < 0.05

The presence of jaundice may be an early sign of sepsis in neonates, especially UTI⁽⁴⁾. We need to pay it much attention in clinical practice. Several studies from different regions of the world reported incidence of UTI of 3.6%

- 21% range^(2,3,5-14). This wide difference may be due to age selection, different sample size and different methods of urine collection in different studies. In this study the urine was collected with urine bags because it is non-

invasive and easy to perform, although it is known to have high false positive rates⁽¹²⁾. UTI was more common in males, which is in agreement with several studies^(2,3,7-11). In Study

from Egypt (11), a higher prevalence of UTI was present in full term (77.4%) compared with preterm neonates (22.6%).

Table 3. The frequency of different bacteria according to urine culture

Type of bacteria	Male	Female	No. (%)
Escherichia- coli	7	4	11 (50)
Enterobactor	3	2	5 (22.7)
Proteus	2	1	3 (13.7)
Staphylococci	2	0	2 (9.1)*
Mixed infection	1	0	1 (4.5)*

* = p < 0.05

In this study, we found a significant relation with UTI in jaundiced babies and mode of delivery; this might be attributed to exposure of bacteria while passing the birth canal. Iranian study⁽⁵⁾ detected formula feeding as a significant factor for UTI among jaundiced neonates and this is related to the protective function of the breast milk. On the other hand other studies found no significant relation between type of feeding and UTI^(2,3,7,15). Birth weight was found to be not significant factor for UTI, which is similar to many other studies^(4,7,8,11,12).

Relation of Higher TSB level with UTI was highlighted by Francisco J study who reported increase in the conjugated bilirubin fraction in 2 of 12 infants with a positive urine culture⁽⁷⁾. Hyperbilirubinemia associated with UTIs can be unconjugated and related to hemolysis caused by Gram-negative organisms, or conjugated secondary to cholestasis. Possible mechanisms include microcirculatory changes in the liver, direct effects from bacterial products, and/or from endotoxin-induced mediators^(4,7).

In agreement with different studies, E.coli was the commonest bacteria isolated by urine culture from 22 neonates with jaundice, enterobacter, klebsiella and proteous and were isolated with different percentages^(2,3,6,7,9-11). Since both of these two organisms E.coli and enterobacter are commonly seen in stool and

stool on the diaper may spread over the perineum, hygiene care is very important⁽⁴⁾. Interestingly, we detect a significant correlation between staphylococci and male gender; this is mostly related to un-circumcision state of the neonates. This was highlighted in an Iranian study which stated that circumcision was protective factor for UTI⁽⁵⁾.

Regarding US results, Nader study found 1/6 renal abnormalities⁽³⁾, another Iranian study reported 23/ 400⁽⁵⁾, Francisco study detected 6/ 11⁽⁷⁾. This difference may be related to use of other imaging studies beside the renal ultrasound like VCUG, renal scan

We conclude that UTI is common among jaundiced neonates particularly in males. E.coli is the commonest causative bacteria. Gestational age, NVD, Type of feeding, and TSB level more than 20 mg/ dl had significant correlation with UTI in jaundiced neonates, while birth weight was not significant. Significant correlation between Staphylococci and male neonates with UTI.

We recommend urinalysis and urine cultures to be performed for infants with jaundice less than 2 weeks of age, as UTI might be asymptomatic, only presented with jaundice.

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Author contribution

Dr. Ali put the idea and protocol of the work; Dr. Khalaf writes the article; and Dr. Ibrahim collects the samples.

Conflict of interest

The authors declare no conflict of interest.

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