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Original Article

Evaluating the Frequency of Urinary Tract Infections in Neonates with Prolonged Jaundice at Ghurki Trust Teaching Hospital, Lahore, Pakistan

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ABSTRACT

Objective: To evaluate the frequency of urinary tract infection (UTI) in neonates with prolonged jaundice.
Study Design: Quasi-experimental study.
Place and Duration of Study: Neonatal Unit, Ghurki Trust Teaching Hospital, Lahore Pakistan, from Apr to Oct 2022.
Methodology: The study included 140 newborns having jaundice for >2 weeks. Blood and urine samples were obtained from patients upon admission and urine samples were sent for culture and urinalysis to detect the presence of pyuria, where 10,000 CFUs of a single infectious agent indicated a urinary tract infection. Additional examinations such as kidney function tests, renal ultrasonography, voiding cystourethrography, and renal scintigraphy were conducted on patients who had a positive urine culture for bacteria.
Results: Out of 140 patients, 88(62.86%) were males and 52(37.14%) were females. In 26 out of 140 neonates (18.57%), UTI was present. Out of 26, 12(23.08%) were females and 14(15.91%) were males. UTI positive group had significant serum bilirubin values compared to UTI negative group (p<0.001). The microorganisms that were found in isolation were Proteus mirabilis in 4(15.38%), Klebsiella pneumonia in 6(23.08%), and Escherichia coli in 16(66.67%) patients.
Conclusion: The prevalence of urinary tract infection in neonates presenting with prolonged jaundice is significant and females were noted to be affected more.

Keywords: Breastfeeding, Jaundice, Neonatal jaundice, Urinary tract infection.

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INTRODUCTION

Neonatal jaundice is a pathological concern with a frequency of 60% among newborns,[1] with only a small number having primary hemolytic illness, metabolic or endocrine problems, enzymatic deficits of the liver, bacteremia, or sepsis.[2] For neonates presenting with jaundice of more than two weeks duration, it is advisable to conduct further examinations to ascertain the root cause.[3] Bilirubin, like uric acid, plays a crucial role as an antioxidant in the biological system of a neonate,[4] as excessive bilirubin levels can be hazardous to the central nervous system's development as several risk factors including birth weight, gestational age, premature rupture of membranes, maternal infections, or other disorders during pregnancy, might have an impact on neonatal jaundice.[5] The correlation between neonatal jaundice and urinary tract infection has been studied in literature.[6] However, studies have primarily focused on the relationship between jaundice and newborns with late onset (≥8 days), prolonged jaundice (≥15 days), or conjugated hyperbilirubinemia.[7] Limited research has been conducted on newborns with early onset (≤7 days) jaundice. The aim of this study was to measure the prevalence of urinary tract infections in newborns who had persistent jaundice.

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METHODOLOGY

This quasi-experimental study was undertaken at the Neonatal Unit of Lahore Medical and Dental College, Ghurki Trust Teaching Hospital, Lahore, Pakistan, following authorization from the Ethics Review Committee via letter Ref No.2022/04/READ-02, dated 19 April 2022. Non-probability consecutive sampling technique was used. Sample size was calculated using World Health Organization (WHO) sample size calculator, taking confidence level as 95%, margin of error as 5%, reported prevalence of neonates with jaundice having UTI 57%,[8] and absolute precision of 0.09, with estimated sample size calculated to be 140.

Inclusion Criteria: Infants aged 15-28 days, of any gender, who presented with persistent jaundice, exceeding 14 days, in infants born at full-term.

Exclusion Criteria: Neonates born before 37 weeks of gestation, already undergoing treatment for jaundice (such as phototherapy or exchange transfusion), history of recurrent jaundice, already receiving antibiotics, sepsis or a recorded fever exceeding 38°C, symptoms of vomiting, diarrhea, poor feeding, tachypnea (respiratory rate exceeding 60 breaths per minute), lethargy, or irritability.

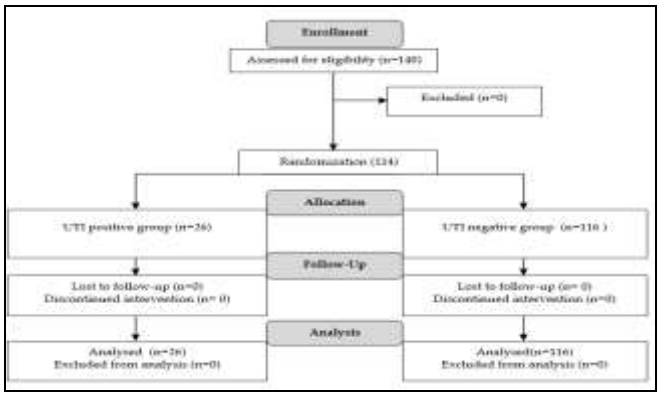

Figure: Patient Flow Diagram (n=140)

Physiological jaundice usually appears between 24-72h of age and between 4th and 5th days can be considered as its peak in term neonates and in preterm at 7th day, where it disappears by 10-14 days of life.[9] Informed consent was taken from parents and demographic data was collected. Blood sample was taken from each patient to check serum bilirubin levels (unconjugated and conjugated) with normal reference range for serum bilirubin levels as 4-10 mg/dL.[10] A urine sample was acquired using the process of bladder catheterization. The specimen was sent for culture and urinalysis to detect the presence of pyuria, which was recorded as the number of leukocytes per high-power field (HPF). A diagnosis of urinary tract infection was confirmed if a single microorganism with a colony-forming unit (CFU) count of 10,000 or more was detected. E. Coli, Proteus mirabilas, Klebsiella pneumoniae, Acinobacter, and Enterococcus species were checked for UTI. The pediatric nephrologist conducted additional examinations, such as Technetium Tc 99m dimercaptosuccinic acid (99mTc-DMSA), renal scintigraphy, on patients who had a positive urine culture for bacteria, renal function tests, and renal ultrasonography. The patients were then divided into two groups: UTI positive group and UTI negative group. Data was analyzed using Statistical Package for the Social Sciences (SPSS) version 27. Qualitative variables were described as frequency and percentages while quantitative data was reported as Mean±SD. Fisher's exact test and Chi-square test was used to compare the qualitative variables whereas the independent sample t-test was used to compare the mean of quantitative variables where a significance level of $p \leq 0.05$ was considered as significant.

RESULTS

During the study period, 140 patients with the clinical diagnosis of jaundice, fulfilling the inclusion criteria, participated in the study. The admission mean age was 20.63±3.62 days ranging from 15 to 28 days. Out of the 140 patients, 88(62.86%) were male and 52(37.14%) were females with male to female ratio of 1.7:1. Mean gestational age was 38.45±1.29 weeks while mean birth weight was 3.18±0.55 kg as listed in Table-I.

Table-I: Characteristics of Patients With or Without Urinary Tract Infection (UTI), (n=140)

Factors	All Patients Mean±SD	Patients With UTI Mean±SD	Patients Without UTI Mean±SD	*p*-value (≤0.05)
Mean gestation age (weeks)	38.45±1.29	37.15±0.14	38.08±0.37	0.62
Mean birth weight (kg)	3.18±0.55	2.92±0.73	3.03±0.77	0.79
Mean age (days)	20.63±3.62	21.04±2.81	25.32±3.87	0.51
Mean serum bilirubin levels	18.69±6.80	31.98±3.39	15.66±2.11	<0.001

SD: Standard Deviation

None of the newborns had direct hyperbilirubinemia but UTI was present in 26 out of 140 neonates with prolonged jaundice accounting for 18.57% of total patients. UTI positive group had significant bilirubin values compared to UTI negative group (<0.001). Stratification of urinary tract infection concerning demographic profile was also done and the findings indicate that 21.05% cases found with UTI infection between 15-21 days while less cases observed 13.33% between 22-28 days but in terms of gestational age, those born between weeks 37 and 39 had a UTI rate of 16.67%, whereas those born between weeks 40 and 41 had a rate of 20.00%. UTI rates were 17.54% and 19.28%, respectively, for infants weighing less than 3 kg and more than 3 kg at birth as shown in Table-II.

The microorganisms that were found in isolation were Proteus mirabilis in 4(15.38%), Klebsiella pneumonia in 6(23.08%), and Escherichia coli in 16(66.67%) patients as listed in Table-III. All individuals had kidney function tests that fell within the reference ranges. The 99mTc- DSMA scan revealed

bilateral decreased absorption of isotope in the renal parenchyma of four male infants with a urinary tract infection (UTI). The VCUG verified the presence of Grade 3 to 4 unilateral reflux in two female patients.

Table-II: Clinical and Demographic Information of Newborns Presenting with Prolonged Jaundice Upon Admission (n=140)

Factors	All Patients (n=140)	Patients With UTI (n=26)	Patients Without UTI (n=116)	*p*-value (≤0.05)
Sex				
Male	88(62.86%)	14(15.91%)	74(84.09%)	0.37
Female	52(37.14%)	12(23.08%)	40(76.92%)	
Age (days)	15-21(n=95) 22-28(n=45)	20(21.05%) 06(13.33%)	75(78.95%) 39(86.67%)	0.51
Birth weight (kg)	≤3 >3	10(17.54%) 16(19.28%)	47(82.46%) 67(80.72%)	0.79
Gestational Age (weeks)	35-39 40-41	10(16.67%) 16(20.00%)	50(83.33%) 64(80.00%)	0.62

Table-III: Microorganisms Causing Urinary Tract Infection (n=26)

Gender	Proteus mirabilis (n=4)	Klebsiella pneumonia (n=6)	Escherichia coli (n=16)	*p*-value (≤0.05)
Male=14 Female=12	1(25%) 3(75%)	2 (33.33%) 4 (66.67%)	11 (68.75%) 5 (31.25%)	0.15

DISCUSSION

Neonatal jaundice is a common manifestation in newborns, affecting approximately 60% of babies in the first week of life,[11] among neonates who exhibit jaundice and the clinical sign of hyperbilirubinemia, may also have urinary tract infections.[12] Research has found that infants with persistent jaundice were twice as likely to get a urinary tract infection (12.2% vs. 6%) with prolonged jaundice in newborns being linked to a higher risk of urinary tract infections (21.1%).[13] Several studies have shown that jaundice may serve as an initial indicator of a UTI, especially among patients presenting with asymptomatic unexplained indirect hyperbilirubinemia, UTI was found in around 8% of the cases,[14] while a 5.8% occurrence of UTIs among a cohort of 400 neonates was noted while UTI was found in 8% of 102 newborns diagnosed with jaundice.[15] Another study noted that 6.6% of infants were found to have a positive urine culture,[16] with one study noting that among infants with prolonged jaundice, UTI was diagnosed in 11.0%.[17] We found that UTI was more frequent in females similar to another study.[18] Conjugated hyperbilirubinemia was significantly more correlated with E. coli infection than with unconjugated hyperbilirubinemia however, no significant correlation was seen between Klebsiella pneumonia infection and the aforementioned factor which could be due to pro-inflammatory cytokines decreasing the expression of transporter genes or directly impeding the function of transport proteins.[19]

LIMITATIONS OF STUDY

One of the limitations of our research was the absence of a control group involving healthy newborns without jaundice for comparative purposes.

CONCLUSION

Prolonged jaundice was noted to significantly cause UTI in neonates with a significant difference seen in bilirubin levels, symptoms and signs of neonates having jaundice with and without UTI. Early identification and management should be done to decrease morbidity and mortality, and urine cultures should be considered as a standard procedure in the diagnosis of all infants with prolonged jaundice.

Conflict of Interest: None.

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Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

SH & MI: Data acquisition, data analysis, critical review, approval of the final version to be published.

SS & SR: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

AR & RR: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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