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A STUDY OF URINARY TRACT INFECTION IN NEONATAL SEPSIS

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ABSTRACT: OBJECTIVE: Urinary Tract Infection (UTI) is an important clinical problem in the neonatal period. Early diagnosis and treatment of UTI is important. This study was undertaken to estimate the proportion of UTI in neonatal sepsis. **METHODS:** This prospective study included 207 neonates admitted with suspected sepsis. A detailed history and clinical examination was performed. Neonates presenting within 72 hours of life were grouped as early onset sepsis and after 72 hours of life were grouped as late onset sepsis. All the neonates were investigated for sepsis. Urine sample was collected by suprapubic aspiration and subjected to analysis and culture. Pyuria was defined by the presence of at least 5 leukocytes per high power field in a centrifuged sample and a positive urine culture- Bacterial growth of >1000 colony-forming units/ml was defined as UTI. **RESULTS:** Among the early onset sepsis group, 10.8% neonates had pyuria, of which 21.4% were culture positive. Among the late onset sepsis group, 44.2% neonates had pyuria, of which 35.3% were culture positive. Pyuria was more common in males (27.5%) than females (17.2%). Overall, culture positive UTI in EOS group was 2.3% and LOS group was 15.6% (p=0.001). Overall, the proportion of culture positive UTI in the entire study group was 7.2%. The most common causative organisms were E.Coli -53% followed by klebsiella- 27%. **CONCLUSION:** It is very important to investigate for the UTI in newborns with sepsis especially late onset sepsis, as it can be easily missed. As congenital malformations of the urinary tract are also associated with UTI, it is essential to investigate for the same. Undiagnosed and/or inadequately treated UTI can lead to renal scarring, hypertension and end stage renal disease. This study highlights the need for routine urine analysis and culture, especially in newborns with late onset sepsis so they can be treated appropriately.

KEYWORDS: Neonate, urinary tract infection, late onset sepsis

INTRODUCTION: UTI is defined as significant bacteruria irrespective of the site of infection in the urinary tract ¹. The exact rate of urinary tract infections (UTIs) in newborns is not known, but studies have found that from about 1 in 1000 to 1 in 100 in full-term infants, and up to 1 in 10 premature infants, will have a UTI during the first month of life ².

Most newborns and young infants present with symptoms of UTI and not asymptomatic bacteruria. The diagnosis of UTI can be overlooked because the symptoms are often non-specific and the sterile samples may be difficult to obtain. The symptoms of UTI in newborn are nonspecific and manifest as systemic symptoms such as fever/irregular temperature, vomiting, refusal of feeds, jaundice, lethargy, poor weight gain, abdominal distension³. The higher incidence of UTI among male infants persists for the first 3-4 months of life, but thereafter the incidence and prevalence of UTI are considerably higher in females compared with males⁴. Morbidity associated with pyelonephritis is characterized by systemic symptoms, such as fever, abdominal pain, vomiting, and dehydration. Bacteremia and clinical sepsis may occur. Children with pyelonephritis also may have cystitis. Long-term complications of pyelonephritis are hypertension and impaired end-stage renal disease. The

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voiding symptoms of cystitis are usually transient, clearing within 24-48 h of effective treatment. Long-term complications of UTI are caused by renal damage secondary to pyelonephritis⁵.

UTI are almost always ascending in origin and caused by bacteria in the periurethral flora and the distal urethra. These bacteria inhabit the distal gastrointestinal tract and colonize the perineal area. *Escherichia coli* usually cause a child's first infection (were responsible for more than 90% of cases of acute pyelonephritis in infants and children), but other gram-negative bacilli like *Klebsiella* and enterococci may also cause infection. More rarely, the urinary tract may be colonized during systemic bacteremia (sepsis), this usually happens in infancy ⁶. Negative microscopic findings for bacteria do not rule out a UTI, nor do negative results of dipstick testing for nitrite and leukocyte esterase⁷. The study was conducted with an objective to estimate the proportion of UTI in neonatal sepsis.

PATIENTS AND METHODS: This prospective study included 207 neonates admitted with suspected sepsis. A detailed history and clinical examination was performed and the findings were recorded on predesigned questionnaire. Neonates presenting within 72 hours of life were grouped as early onset sepsis and after 72 hours of life were grouped as late onset sepsis⁸. All the neonates were investigated for sepsis with septic screen. Urine sample was collected by suprapubic aspiration (SPA) and subjected to analysis and culture. Urine culture was considered positive when bacterial growth of >1000 colony-forming units/ml or $\geq 10,000$ CFU of 2 organisms were obtained was defined as Urinary tract infection ⁹. Descriptive statistics was used to describe the study parameters. Chi square test was used to compare the categorical variables. A p value of <0.05 was considered significant.

RESULTS: A total of 207 neonates were included in the study, of which 54.6% were term and 45.4% were preterm neonates. 69.5% were inborn neonates and 30.5% were referred from elsewhere. 58% were males and 42% were females. 62.8% were early onset sepsis and 37.2% were late onset sepsis. Among the early onset sepsis group, 14(10.8%) neonates had pyuria, of which 3 (21.4%) were culture positive. Among the late onset sepsis group, 34(44.2%) neonates had pyuria, of which 12 (35.3%) were culture positive. Pyuria was more common in males (27.5%) than females (17.2%). but the culture positive UTI was similar in males (30.3%) and females (33.3%). Overall, culture positive UTI in EOS group was 2.3% and LOS group was 15.6% (p=0.0003). Overall, the proportion of culture positive UTI in the entire study group was 15/207 (7.2%). The most common causative organism grown on urine culture was *E.coli* -53% (8/15) followed by *Klebsiella* species- 27% (4/15), enterococcus and gram negative bacilli accounted for the rest.

Group	Number of cases (n=207)	Urine analysis showing pyuria	Culture positives among pyuria	Culture positive cases in the group	P value
EOS	130 (62.8)	14 (10.8)	3 (21.4)	2.3%	p=0.001
LOS	77 (37.2)	34(44.2)	12(35.3)	15.6%	
Term	113 (54.6)	33 (29.2)	11(33.3)	9.7%	
Preterm	94 (45.4)	15(15.6)	4 (26.7)	4.3%	p=0.15
Male	120 (58)	33(27.5)	10 (30.3)	8.3%	
Female	87 (42)	15 (17.2)	5 (33.3)	5.7%	
Inborn	144 (69.5)	29 (20.1)	9 (31)	6.3%	p=0.43
Outborn	63 (30.5)	19 (30.2)	6 (31.6)	9.5%	

Table I: Showing the UTI in different groups. Figures in parentheses indicate percentage

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DISCUSSION: UTI is an important clinical problem in the neonatal period. Therefore, early diagnosis and proper treatment of UTI as early as possible is important¹⁰. But the diagnosis of UTI can be overlooked because the symptoms are often non-specific and the sterile samples may be difficult to obtain³. UTI may have long-term consequences as they may produce kidney damage, which may lead later in life to hypertension, recurrent infections and renal failure¹¹.

In our study, overall, 23.2% (48/207) neonates with sepsis were found to have pyuria, of which 7.2% (15/207) were culture UTI. In a similar study, Samayam P et al¹² found that the magnitude of UTI is 6% in neonatal sepsis. Similar results were obtained by Garcia et al¹³ found the incidence of UTI of 160 participants enrolled was 7.5%. Jurczak et al¹⁴ found that the UTI represents 14.9% in NICU.

In our study, it has been observed that UTI is more commonly associated with late onset sepsis. The proportion of UTI in LOS group was 15.6% as compared to EOS which was only 2.3% ($p=0.0003$). Amelia N et al⁸ in their study concluded that UTI in late onset sepsis was higher at 14.9%. Varying prevalence of UTI in late onset sepsis has been reported in literature: Tamim et al- 25.3%¹⁵, Bauer et al - 12.2%¹⁶ and Visser and Hall- 7.4%¹⁷. A few studies have also described low rates of positive blood cultures in neonates with positive urine cultures^{16, 18-20}. All these observation emphasize that urine culture should be done as a routine investigation during evaluation and management of late onset sepsis. This is because the symptoms of UTI in newborn are nonspecific and the diagnosis can be easily missed.

In present study, the proportion of UTI in males (8.3%) was high than in females (5.7%). Klein JO²¹ et al, found that males are more affected than females with UTI in the neonatal period. During the neonatal period, UTI is more prevalent in male than in female infants.

In the current study, of the 15 culture positive UTI, 11 (73.3%) were term neonates and 4 (26.7%) were preterm neonates. Similar results were reported by Movahedian et al²² with term neonates at 81.6% and preterm at 18.4%. In contrast, Tamim et al¹⁵ showed that the rate of UTI in preterm newborns was higher than full-term newborns.

E.coli was the most common organism isolated from urine accounting to 53% (8/15) of the UTI, followed by klebsiella species accounting to 27% (4/15) of the cases. In 1969, Abbott²³ reported that E. coli was the most common pathogen causing UTI in neonates in Christchurch, New Zealand. Littlewood et al²⁴ also reported E. coli as the most frequent pathogen causing neonatal UTI in Leeds Maternity Hospital. In 1989-1992, Lohr et al²⁵ and Davies et al²⁶ reported that in Charlottesville and Toronto, the most common pathogens of neonatal UTI were coagulase-negative Staphylococcus, Candida sp. and Klebsiella species. Zorc et al.²⁷ reported that the most common pathogen causing UTI was E. coli accounting to 80%. Ultrasonography was normal in all the cases in our study. However, congenital anomalies of the genitourinary tract in association with UTI have been reported in literature by Doaa MA et al²⁸, in 9.6 % (3/31) and Ghaemi S et al²⁹ 17.39% of subjects (4/23).

CONCLUSION: Urinary tract infection is one of the most common problems in the neonates. It is significantly more common in late onset sepsis than in early onset sepsis. As the symptoms are nonspecific in the neonatal period, it is very important to investigate for the UTI so that appropriate treatment can be initiated. Undiagnosed and/or inadequately treated UTI can lead to long term complications like renal scarring, hypertension and end stage renal disease. This study highlights the need for routine urine analysis and culture, especially in late onset sepsis.

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