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Urinary Tract Infection Amongst Neonates Admitted at Tertiary Care Centre in Western India: A Cross Sectional Study

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ABSTRACT

Neonates with sepsis may have concurrent urinary tract infection (UTI), which may be asymptomatic or have nonspecific symptoms. Objectives: to determine the contribution of UTI to neonatal sepsis and to assess different risk factors that could be associated with UTI. Hospital based cross sectional study was carried in the neonatal ward of private tertiary care teaching hospital. All consecutive male and female neonates admitted to the NICU for UTI were included. Neonates with congenital anomalies and those whose parents refused to be enrolled were excluded. The recruited participants were subjected to full history taking including prenatal, natal and postnatal history. For all study subjects' detailed examinations and appropriate investigation done. Total study subjects included in study were 39. 87.2% of the neonates developed sepsis, 76.9% required central venous catheter (CVC), 61.53% required NIV. The most common organism isolated from urine and blood culture was Klebsiella pneumonia. Majority of the neonates developed sepsis and neonatal sepsis was found to be significantly associated with CVC and NIV.

INTRODUCTION

Neonatal sepsis is defined as a systemic condition of bacterial, viral, or fungal (yeast) origin that is associated with haemodynamic changes and other clinical manifestations and results in substantial morbidity and mortality. Early-onset sepsis (EOS) presents within 72 hrs of life and late-onset sepsis (LOS) presents beyond 72 hrs of life^[1]. EOS presents where the maternal genital tract is the source of ascending infection. Maternal risk factors like premature rupture of membranes (PROM), chorio-amnionitis, peripartum fever, urinary tract infection within 2 weeks prior to delivery and prolonged rupture of membranes >18 hrs, multiple gestations and caesarean sections are associated with increased risk of EOS. LOS occurs as a result of postnatal nosocomial infections or community-acquired infections. The risk factors associated with LOS are prematurity, prolonged invasive like mechanical ventilation and intra vascular catheterization, failure of early enteral feeding with breast milk, long duration of parenteral nutrition, hospitalization, surgery and underlying respiratory and cardiovascular diseases^[2].

Neonates with sepsis may have concurrent urinary tract infection (UTI), which may be asymptomatic or have nonspecific symptoms^[3]. Failure to diagnose UTI, resulting in a delay of appropriate therapy, has been reported to cause renal scarring, hypertension and kidney failure among infants^[4,5]. Urinary tract is a common site of infection in infants and young children. Prevalence of urinary tract infection (UTI) among full-term neonates has been reported to be up to 1.1%. This figure increased up to 7% among those with fever^[6], whereas the incidence of neonatal UTI varies from 0.1-1% of all infants.

This study was carried out with objectives to determine the contribution of UTI to neonatal sepsis and to assess different risk factors that could be associated with UTI.

MATERIALS AND METHODS

This hospital based cross sectional study was carried in the neonatal ward of private tertiary care teaching hospital in central Maharashtra. All consecutive male and female neonates admitted to the NICU for UTI were included. Neonate presenting with major congenital anomalies and those whose parents refused to be enrolled in the study were excluded. A total of 39 neonates having UTI, 29 male and 10 female, aged 1-28 days, were enrolled in this study. Informed consent was obtained from the parents of each neonate before enrolling them in the study. Ethical approval was obtained from the institutional ethics committee (IEC) prior to the study. The recruited participants were subjected to full history taking including prenatal, natal and postnatal history. Each

neonate was examined generally and locally to assess their state of consciousness, weight, complexion and vital signs. Abdominal examination (for tenderness, renal mass, hepatomegaly, splenomegaly) and neurological examination (eliciting suckling and Moro reflexes) were carried out.

Each case was subjected to standard laboratory investigations, including blood and urine culture. Complete information of all the study subjects, including results of laboratory investigations was recorded in a pre-designed format. The data entry was done in Microsoft Office Excel 2010 software, and analysed using IBM SPSS software 16 trial version. Frequency, percentage, and proportion were calculated. Data was represented in tabular and graphical format. Chi-square test was used as test of significance.

RESULTS

This study was carried out among 39 neonates having UTI Fig 1 shows the gender distribution of study participants, Out of total 39 neonates 29 (74%) were boys and 10 (26%) were girls, 19 (49%) weighed between 1.6-2.5kgs, 13 (33%) were from (= 1.5 kg) category and only 7 (18%) had a normal birth weight (= 2.6kg).

Table 1 displays the clinical characteristics of the study participants, 87.2 % of the neonates developed sepsis, 76.9% required central venous catheter (CVC), 61.53% required NIV. Out of 32 neonates requiring CVC, 24 (75%) required non-invasive ventilation (NIV) while 8 (25%) did not. This difference was statistically significant. ($\chi^2 = 13.650$, $p = 0.000$) Total 6 (15.4 %) needed steroid therapy and 94.9% required antibiotic therapy beyond 7 days, 17.9% neonates had inadequate weight gain, 5.1% had jaundice, 17.9% had fever, 12.8% were anaemic. Table 2 displays the blood and urine culture sensitivity reports of the study participants. 71.79% of the neonates had a sterile blood culture. The most common organism isolated from urine culture was Klebsiella pneumonia. Out of 11 neonates with non-sterile blood culture, 4 (36.36%) neonates were anaemic while 63.63% were not anaemic. This difference was statistically

Fig 1. Shows the distribution of study subjects according to gestational age, 23 (59%) of the neonates were preterm.

Table 1: Distribution of study participants according clinical parameters.

Variable		Frequency	Percentage
Onset of sepsis	Early onset sepsis	12	30.8
	Late onset sepsis	22	56.4
	No Sepsis	05	12.8
Catheterization	No	9	23.1
	PICC	9	23.1
	UVC	21	53.8
NIV	No	15	38.46
	Yes	24	61.53
Steroids treatment	No	33	84.6
	Yes	6	15.4
Duration of antibiotic Treatment	<7 Days	2	5.1
	>7 Days	37	94.9
Inadequate weight gain	No	32	82.1
	Yes	7	17.9
Jaundice	No	37	94.9
	Yes	2	5.1
Fever	No	32	82.1
	Yes	7	17.9
Anaemia	No	34	87.2
	Yes	5	12.8

Table 2: Distribution of study participants according to blood and urine culture sensitivity.

B-C/S	Frequency	Percentage	U-C/S	Frequency	Percentage
E.coli	3	7.7	Candida albicans	1	2.6
Klebsiella pneumoniae	5	12.8	Candida tropicalis	1	2.6
MDR +ve	1	2.6	E.coli	6	15.4
Pseudomonas aeruginosa.	1	2.6	E.coli faecium	1	2.6
Staphylococcus haemolyticus	1	2.6	Enterococcus faecium	10	25.7
Sterile	28	71.79	Insignificant bacteriuria	2	5.12
-	-	-	Klebsiella pneumoniae	11	28.2
-	-	-	MDR e.coli	1	2.6
-	-	-	MDR klebsiella pneumo	1	2.6
-	-	-	Sterile	4	10.3
-	-	-	V.R enterococcus faecium	1	2.6
Total	39	100.0	Total	39	100.0

Table 3 : Association between sepsis and CVC

CVC	Sepsis		Total	X ²	p-value
	Absent	Present			
Absent	3 (42.9%)	4 (57.1%)	7	6.886	0.009
Present	2 (6.3%)	30 (93.8%)	32		
Total	5 (12.8%)	34 (87.2%)	39		

Table 4 : Association between sepsis and NIV

NIV	Sepsis		Total	X ²	p-value
	Absent	Present			
Absent	4(26.7%)	11(73.3%)	15	4.181	0.04
Present	1(4.2%)	23(95.8%)	24		
Total	5(12.8%)	34 (87.2%)	39		

significant. ($2 = 7.598$, $p = 0.006$). Out of 11 neonates with positive blood culture, 9 (81.81%) neonates developed late onset sepsis while 2 (18.18%) neonates developed early onset sepsis. This difference was statistically significant. ($2 = 4.022$, $p = 0.045$). 95.8% of neonates with NIV developed sepsis, while 73.3% neonates without NIV developed sepsis, this difference was statistically significant.

DISCUSSIONS

This study was conducted in private tertiary care teaching hospital in central Maharashtra. Among 39 neonates with UTI. UTI is one of the most important clinical problems in infancy that early diagnosis and appropriate treatment are very important because if the infection is untreated, it will lead to high blood pressure, recurrent infections and kidney failure^[7,8].

The prevalence of UTI varies with age, birth weight, and whether the neonates are preterm or full term^[9]. Out of the 39 study participants, 87.2% of the neonates developed sepsis, out of which 30.8% developed early onset sepsis and 56.4% developed late onset sepsis. Another study by Getabelew *et al* found that the overall prevalence of neonatal sepsis was 77.9%. From this 65 and 35% of neonates developed early onset neonatal sepsis and late onset neonatal sepsis, respectively^[10].

We found that out of 39 participants, 5.1% had jaundice, 17.9% had fever, 12.8% were anaemic. A study conducted by Mohamed *et al*. reported that 20% of neonates with UTI presented with jaundice, 30% had fever while 30% were anaemic^[11]. The most common organism isolated from urine culture was Klebsiella pneumoniae. Klebsiella species were the most

prevalent organism that caused UTI in neonates, with a prevalence of 28.57% in another study by Omoregie *et al.*^[11]. Out of 11 neonates with positive blood culture, 9 (81.81%) neonates developed late onset sepsis while 2 (18.18%) neonates developed early onset sepsis. however, Alam, *et al.* reported in their study Among blood culture positive cases 82% were early onset neonatal septicaemia and 18% were late onset septicaemia^[13].

In our study, 71.79% of the neonates had a sterile blood culture and the most common organism isolated from blood culture was *Klebsiella pneumoniae*. Bazaid *et al.* in their study also reported that the most commonly isolated bacteria from blood observed were *Acinetobacter baumannii* (33%) and *K. pneumoniae* (22%) in neonatal patients^[14]. Out of 32 neonates, 30 (93.8%) of neonates with CVC developed sepsis, while 57.1% neonates without CVC developed sepsis, this difference was statistically significant. Couto RC *et al.* and Graham 3rd *et al.* also reported CVC was largely associated with neonatal sepsis, not only due to its use but also due to its duration, being the risk higher after the first 10 days of CVC and increasing with its duration^[15,16]. Out of 24 neonates, 23(95.8%) of neonates with NIV developed sepsis, while 73.3% neonates without NIV developed sepsis, this difference was statistically significant. several other studies found a significant association between mechanical ventilation and neonatal sepsis^[17-19].

CONCLUSION

This study was carried out among 39 neonates having UTI, majority of them were preterm and low birth weight. The most common organism isolated from urine and blood culture was *Klebsiella pneumoniae*. Majority of the neonates developed sepsis and neonatal sepsis was found to be significantly associated with CVC and NIV.

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