ORIGINAL ARTICLE

Frequency of Causative Organism of *Urinary Tract Infection* in Neonate Presenting with Sepsis

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ABSTRACT

Background: Morbidity and mortality both among term and preterm infants is mostly related to neonatal sepsis. Although survival improved and complications reduced in preterm infants due advances in treatment, but sepsis still has major impact on mortality and morbidity in Neonatal care Units. Urinary tract infection (UTI) in neonatal age occurs with neonatal sepsis. Bacteremia may be cause or the effect of UTI. Hypertension and CRF are the complications of Progressive renal damage in early childhood. The clinical manifestations of UTI in the neonatal period may vary and are nonspecific, as well as the sepsis itself.

Aim: To determine the frequency of causative organism of Urinary tract infection in neonate presenting with sepsis

Setting: This study was carried out in the Department of Pediatric Medicine of B. V. Hospital, Bahawalpur in period of six months.

Methods: A total of 251 infants of both gender with UTI and sepsis were included in the study. Preterm newborns and infants with contraindication for bladder catheterization were excluded. We collect under aseptic techniques and obtained from all the patients by bladder catheterization. Samples were properly sent to the laboratory for microscopic analysis and culture/sensitivity, where different medias like Pyocyanin, nutrient agar and TSA (Trypticae soy agar) were used. Data for causative organism was collected and noted.

Results: Age range in this study was from 0-28 days. Mean age of infants were 19.004± 5.64 days, mean duration of complain was 29.027± 7.72 hours and mean weight was 3.117±0.37 Kg. Majority of the infants were from 16-28 days (74.9%) of age. Male infants were 78.5%. Pseudomonas was seen in 6.4% patients. E.coli was seen in 39.8% patients. Klebsiella was seen in 36.7% patients.

Conclusion: My study concluded that urine culture, analysis, and Gram-stain should be performed in routine work of all patients of neonatal septicemia, especially in males, for early detection and prompt treatment of neonatal UTI.

Keywords: Sepsis, Urinary tract infection, Pseudomonas, E.coli, Klebsiella

INTRODUCTION

According to Health Organization (WHO) reported in 2006 that almost 4 million die within the first four weeks of life,[1] out of these 99% occur in developing countries (approximately half following difficult deliveries at home) against 1% in developed countries.[2] 30-40% of all these deaths are due to neonatal infections[3].

Morbidity and mortality both among term and preterm infants is mostly due to neonatal sepsis[4]. In spite of advances in neonatal care sepsis still contributes significantly to mortality and morbidity in Neonatal Care Units[5,6].

The clinical presentation of neonatal sepsis is generally nonspecific[7]. These include fever or hypothermia, respiratory distress including cyanosis and apnea, feeding difficulties, lethargy or irritability, hypotonia, seizures, poor perfusion, bleeding, abdominal distention, visceromegaly, jaundice etc[8,9]. Sometimes may present with respiratory difficulties that may be due to acidosis, pneumonia or meconium aspiration[10].

In one report 1% prevalence of fever in term newborns with 10% of the febrile (≥37.8°C rectal or core body temperature) infants having culture-proven sepsis[11]. Term newborns most likely to react to a bacterial infection in the form of fever while preterm newborns react with hypothermia due difficulty with temperature control especially in the first 2 days[12,13].

In infant and children urinary tract infection is a common infection[14]. Urinary tract infection (UTI) often associated with neonatal sepsis in neonates. The prevalence of UTI among late-onset sepsis neonates in developed countries varies from 7.4 to 25.3%, with higher rates in preterm infants[15,16]. Hypertension and CRF are the complications of Progressive renal

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damage in early childhood.[17] The clinical manifestations of UTI in the neonatal period may vary and are nonspecific, as well as the sepsis itself[14,18].

Amelia N has found in one study that frequency of Pseudomonas is 6.4%, Staphylococcus 6.4% and Klebsiella was 2.1% in neonate presented with sepsis[19].

Omar C and others has noted in one study that frequency of Pseudomonas was 6.25%, E. coli 37.5% and Klebsiella was 46.87% in neonate presented with sepsis.[20]

A midstream urine sample is the preferred way of collecting urine sample in toilet-trained children; other ways are by catheter or by suprapubic aspirate. UTI is unlikely if the urinalysis is completely normal. Antibiotic treatment for seven to 10 days is recommended for febrile UTI. Oral antibiotics may be offered as initial treatment when the child is not seriously ill and is likely to receive and tolerate every dose.

Moreover it is important to recognize whether there is pyelonephritis in a neonate who shows clinical signs of sepsis in order to provide appropriate treatment. So we like to determine the frequency of causative organism of *Urinary tract infection* in neonate presenting with sepsis in our general population and to modify the treatment plan accordingly. This study will help us in designing more effective management of sick neonates on community basis.

MATERIAL AND METHODS:

This study was conducted in the Department of Pediatric Medicine, B V Hospital, Bahawalpur.
Sample Size: Sample size was according to the given formula:

$$n = \frac{z^2 pq}{d^2}$$

Expected least prevalence of *Pseudomonas* = 6.25%[20] where q=1-p, d= 3% with 95% Confidence level n= 251

Non-probability consecutive sampling technique was used.

Inclusion criteria: Infants age 0-28 days present with UTI and sepsis as per operational definitions with at least 48 hours duration.

Exclusion criteria:

- Premature newborns(less than37 weeks)
- Contraindication for bladder catheterization (thrombocytopenia (<50000 ml)on laboratory test)

Data collection procedure: Patients fulfilling the inclusion criteria from indoor department of pediatric medicine of BVH, Bahawalpur were included in the study after permission from ethical committee of research department. Age, gender and weight of all patients were taken. Informed consent was taken from parents with full confidentiality with proper counselling about risk free for patient taking part in the study.

Urine was collected in a sterile way and obtained from all the patients by bladder catheterization. All samples were properly sent to the laboratory for examination.

Data for causative organism was collected according to operational definitions and noted on especially designed proforma.

Data analysis: Data was analyzed by using SPSS version 16. Different variables like age groups, gender and detected organisms were computed. Chi-square test was used and p ≤0.05 was statistically significant.

RESULTS

In this study age of patients vary from 0-28 days. Mean age of infants were 19.004± 5.64 days, mean duration of complain was 29.027± 7.72 hours and mean weight was 3.117±0.37 Kg as shown in Table-I. Majority of the infants were from 16-28 days (74.9%) of age as shown in Table–II. Male infants were 78.5% as shown in Table-III. Pseudomonas was positive in 6.4% patients as shown in Table-IV. E.coli was positive in 39.8% patients as shown in Table-V. Klebsiella was seen in 36.7% patients as shown in Table-VI.

Table I: Mean±SD of patients according to age, duration of complain and weight. (n=251)

Demographics	Mean±SD
Age (days)	19.004± 5.64
Duration of complain (hours)	29.027± 7.72
Weight (Kg)	3.117±0.37

Table II: Frequency and %age of Age

Age (days)	n	%age
0-15	63	25.1
16-28	188	74.9

Table- III: Frequency and %age of Gender

Gender	n	%age
Male	197	78.5
Female	54	21.5

Table- IV: Frequency and %age of Pseudomonas

Pseudomonas	n	%age
Yes	16	6.4
No	235	93.6

Table- V: Frequency and %age of E.coli

E. coli	n	%age
Yes	100	39.8
No	151	60.2

Table- VI: Frequency and %age of Klebsiella

Klebsiella	n	%age
Yes	92	36.7
No	159	63.3
Total	251	100

Table- VII: Pseudomonas with respect to age groups

Age group (days)	Pseudomonas	
	Yes	No
0-15	4(6.3%)	59(93.7%)
16-28	12(6.4%)	176(93.6%)
Total	16(6.4%)	235(93.6%)

P value 0.992

Table- VIII: Pseudomonas with respect to gender

Gender	Pseudomonas	
	Yes	No
Male	12(6.1%)	185(93.9%)
Female	4(7.4%)	50(92.6%)
Total	16(6.4%)	235(93.6%)

P value 0.726

Table- IX: Pseudomonas with respect to duration of sepsis

Duration of sepsis (hours)	Pseudomonas	
	Yes	No
1-24	5(7.9%)	58(92.1%)
25-48	11(5.9%)	177(94.1%)
Total	16(6.4%)	235(93.6%)

P value=0.558

Table- X: Pseudomonas with respect to weight

Weight (Kg)	Pseudomonas	
	Yes	No
2.5-3	8(5%)	152(95%)
>3	8(8.8%)	83(91.2%)
Total	16(6.4%)	235(93.6%)

P value=0.237

Table- XI: E-coli with respect to age groups

Age groups (days)	E coli	
	Yes	No
0-15	21(33.3%)	42(66.7%)
16-28	79(42%)	109(58%)
Total	100(39.8%)	151(60.2%)

P value=0.223

Table- XII: E-coli with respect to gender

Gender	E coli	
	Yes	No
Male	77(39.1%)	120(60.9%)
Female	23(42.6%)	31(57.4%)
Total	100(39.8%)	151(60.2%)

P value=0.641

Table-XIII: E-coli with respect to duration of sepsis

Duration of sepsis (hours)	E coli	
	Yes	No
1-24	22(34.9%)	41(65.1%)
25-48	78(41.5%)	110(58.5%)

P value=0.357

Table- XIV: E-coli with respect to weight

Weight (Kg)	E coli	
	Yes	No
2.5-3	72(45%)	88(55%)
>3	28(30.8%)	63(69.2%)
Total	100(39.8%)	151(60.2%)

P value=0.027

Table- XV: Klebsiella with respect to age

Age (days)	Klebsiella	
	Yes	No
1-15	26(41.3%)	37(58.7%)
16-28	66(35.1%)	122(64.9%)
Total	92(36.7%)	159(63.3%)

P value=0.380

Table- XVI: Klebsiella with respect to gender

Gender	Klebsiella	
	Yes	No
Male	75(38.1%)	122(61.9%)
Female	17(31.5%)	37(68.5%)
Total	92(36.7%)	159(63.3%)

P value=0.373

Table- XVII: Klebsiella with respect to duration of sepsis

Duration of sepsis (hours)	Klebsiella	
	Yes	No
1-24	26(41.3%)	37(58.7%)
25-48	66(35.1%)	122(64.9%)
Total	92(36.7%)	159(63.3%)

P value=0.380

Table- XVIII: Klebsiella with respect to weight

Weight (Kg)	Klebsiella	
	Yes	No
2.5-3	55(34.4%)	105(65.6%)
>3	37(40.7%)	54(59.3%)
Total	92(36.7%)	159(63.3%)

P value=0.321

DISCUSSION

During the neonatal period, UTI is more prevalent in male than in female infants[21,22]. This is same as in my study as male infants were 78.5%. That is the reason there are more chances of UTI in young uncircumcised males, increased prevalence of urinary and renal anomalies in males, transient urodynamic dysfunction and vesicoureteral reflux that predominantly affects male infants[21].

To et al reported a 3.7 fold higher risk of UTI in uncircumcised male infants.[23] Schoen et al reported that the incidence of UTI among uncircumcised male infants was 2.15%, while in circumcised infants it was only 0.22%[24]

Uuncircumcised male are on risk may be due to periurethral bacterial flora[25], which is more common in first six months of life, as age increases, chances

of UTI decrease because of retracted skin and improvement inpenile hygiene. By the age of 12 months, both periurethral flora excess and the incidence of UTI in uncircumcised males will almost disappear[26].

In my study Pseudomonas was seen in 6.4% patients, E.coli was seen in 39.8% patients and Klebsiella was seen in 36.7%. My study results are consistent with Omar C and his associates who found in a study that frequency of Pseudomonas was 6.25%, E. coli 37.5% and Klebsiella was 46.87% in neonate presented with sepsis[20].

The microbial pattern of neonatal UTI has changed from that observed in the 1970s compared to that of the 1990s[21]. In 1969, Abbott[27] reported that E. coli was the most common pathogen causing UTI in neonates in Christchurch, New Zealand. Littlewood et al[28] also reported E. coli as the most frequent pathogen causing neonatal UTI in Leeds Maternity Hospital. In 1989-1992, Lohr et al[29] and Davies et al[30] reported that in Charlottesville and Toronto, the most common pathogens of neonatal UTI were coagulase-negative Staphylococcus, Candida sp. and Klebsiella sp. In 2003, Tamim et al reported that Candida sp. was the most common microorganism causing UTI among preterm infants with late-onset sepsis, followed by coagulase-negative Staphylococcus, Pseudomonas sp. and Klebsiella sp[31].

In our study, the microorganisms found in urine cultures were similar to other studies in the last fifteen years. Purniti, in 2002, found E. coli as the most common pathogen of neonatal UTI in Sanglah Hospital, Bali. In this study, all subjects who received antibiotics before urine culture were excluded.[32] The subjects with prior antibiotics had sterile urine culture. The use of broad spectrum antibiotics may change natural flora in the neonate, increasing the risk of infections by opportunistic microorganisms[33].

Neonatal UTI occurs through hematogenic spread or by ascending microorganisms through the urethral meatus.[21] In our study, one subject had the same microorganism found in blood and urine cultures (Klebsiella pneumoniae), while other six subjects with UTI had different microorganisms in both cultures. Bauer found only six urosepsis from 66 neonatal UTI, suggesting that ascending infection was the more common mechanism in neonatal UTI[34].

Late-onset sepsis in the neonatal ward of Cipto Mangunkusumo Hospital were mostly caused by Gram-negative pathogens. Rinawati et al (2002) found the most common bacteria which caused late onset neonatal sepsis in the neonatal ward Cipto Mangunkusumo Hospital were Enterobacter sp. And Klebsiella sp.

The gold standard in diagnosing UTI is urine culture from appropriate specimens obtained by supra pubic aspiration or bladder catheterization. The urinalysis cannot substitute urine culture to document the presence of UTI, but it can be valuable for prompt initiation of antibiotics since it provides information more rapidly than does urine culture[35].

CONCLUSION

It is concluded that urine culture, analysis and Gram-stain should be performed for septic investigations for neonatal septicemia, especially in males, for early detection and prompt treatment of neonatal UTI.

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