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Research Article

Prevalence and Antimicrobial Resistance Patterns of Urinary Tract Infections in Neonates with Late Onset Sepsis

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ABSTRACT

Background: This research looks at how common urinary tract infections (UTIs) are in neonate with late-onset sepsis (LOS) in Pakistan and how these infections respond to antibiotics. Since neonatal sepsis is a major cause of neonate deaths and UTIs can lead to sepsis, the study aims to find effective antibiotics for treating drug-resistant infections. This will help reduce illness, hospital readmissions, and the length of hospital stays. The results are meant to support doctors in making better treatment decisions and improving care for neonates with UTIs.

Objective: To establish the prevalence and patterns of antibiotic sensitivity of urinary tract infections (UTIs) among neonates with late-onset sepsis

Study design: A cross-sectional and observational analysis

Duration and place of study: This study was conducted in Muhammad Medical College Hospital Mirpurkhas from December 2023 to December 2024

Methodology: This cross-sectional observational study involved 120 newborns, 7 to 28 days old with late-onset sepsis, selected through non-probability sampling. An informed consent, demographic data were captured, and catheterized urine samples under aseptic precautions were collected for culture and sensitivity. UTIs were defined as the growth of a single organism at ≥10,000 CFU/mL. CLSI standards were employed to determine antibiotic sensitivity. Data were analyzed using SPSS 25, qualitative variables reported as frequencies and percentages and quantitative variables as means and standard deviations. Chi-square tests were used to test associations, and p-values of ≤ 0.05 were taken as significant.

Results: Around 120 neonates were a part of this study who were aged from 7 days to 28 days maximum. The mean age calculated was 27.25 days. The males were in majority. There were a total of 92 males (76.7%) and 28 females (23.3%). The mean weight calculated was 1.9 kg. Among these 120 cases, 16.7% (n=20) cases were of sepsis that were reported due to UTI.

Conclusion: The research shows that E. coli is the most frequent bacterium in neonatal UTIs, which has various resistance and sensitivity to commonly prescribed drugs.

INTRODUCTION

Sepsis in the newborn is one of the major causes of illness and neonate mortality among developing nations [1]. It accounts for about 30-50% of mortality among Pakistani neonates [2]. Urinary tract infections (UTIs) are common in neonates and often complicate neonatal sepsis [3]. Bacteremia can be due to or be a consequence of a urinary tract infection (UTI). In both cases, early UTI detection is critical since delayed diagnosis and treatment can result in prolonged hospitalizations, death, or chronic disease [4]. Untreated, repeated renal injury in infancy or early childhood can lead to catastrophic results such as hypertension and chronic renal failure. UTIs were identified in 9% of late-onset sepsis in neonates, according to studies [5,6,7].

UTI in neonates usually presents with non-specific signs and may present as generalized systemic signs like poor feeding, instability of temperature, vomiting, lethargy, jaundice, abdominal distension, or failure to gain weight [8]. Due to this non-specific presentation, urine tests can be part of the investigation for late-onset sepsis in neonates, but it is not generally recommended [9]. Empirical antibiotic therapy is typically initiated very once when neonatal sepsis or UTI is suspected, based on the experience of the clinician and familiarity with prevalent bacterial infections [10].

This research gathered local information about how common urinary tract infections (UTIs) are and how they respond to antibiotics in neonates with late-onset sepsis (LOS). The goal was to find the best medications to use, which would help prevent the spread of drug-resistant germs and reduce illness and death rates. Additionally, the study aims to lower the number of times these neonates have to return to the hospital and shorten their hospital stays. Overall, the research focuses on understanding the patterns of antibiotic sensitivity in UTIs among neonates with LOS.

METHODOLOGY

This study was an observational analysis involving about 120 newborns, chosen using a non-random sampling method. The participants were all neonates aged between 7 and 28 days, including both boys and girls, all diagnosed with late-onset sepsis. Parents of all neonates provided informed written consent for their participation.

Exclusion Criteria

Newborns were not included in the study if they had:
- Obvious birth defects in the urinary or anorectal systems found during examination.
- Received antibiotics before being admitted to the hospital, based on medical records and parental history.
- Died within 24 hours after being admitted to the hospital.

Definition of Terms:**
- ****Late-onset sepsis** (LOS):** Sepsis that occurs in neonates after 7 days of life.
- ****Sepsis**:** A suspected infection along with at least two signs of systemic inflammatory response syndrome (SIRS), such as abnormal heart rate, temperature, respiratory rate, white blood cell count, or behavior.
- ****Urinary Tract Infection** (UTI):** Diagnosed when a catheterized urine sample shows 10,000 CFU/mL or more of a single organism.

The study also looked at how often different bacteria reacted to antibiotics like amikacin, ampicillin, gentamicin, ceftriaxone, and cefotaxime, following the standards set by CLSI.

Data Collection

Demographic information such as age, birth weight, gestational age, gender, and current weight was recorded. A nurse collected urine samples using sterile techniques and sent them to the hospital lab for culture testing. If a urine culture tested positive, it confirmed the presence of a UTI and identified the bacteria responsible. The sensitivity of these bacteria to antibiotics was also documented. All data were carefully recorded on a standard form.

Data Analysis

Data were analyzed using SPSS version 25. The study described quantitative data using means and standard deviations, while qualitative data were expressed as frequencies and percentages. The researchers accounted for variables like age, gestational age, gender, and weight by stratifying the data. Differences in antibiotic sensitivity patterns were compared using the chi-square test, with a significance level set at a p-value of less than 0.05.

RESULTS

Around 120 neonates were a part of this study who were aged from 7 days to 28 days maximum. The mean age calculated was 27.25 days. The males were in majority. There were a total of 92 males (76.7%) and 28 females (23.3%). The mean weight calculated was 1.9 kg. Among these 120 cases, 16.7% cases were of sepsis that were reported due to UTI. These were a total of 20 cases which are shown below in table number 1, distributed according to organisms isolated from urine culture.

Table No. 1:

Organisms	N	%
Staphylococci	2	10
Klebsiella	4	20
Pseudomonas	1	5
E. coli	13	65
Total	20	100%

Table number 2 shows the distribution of antibiotic resistance and sensitivity for staphylococci and klebsiella.

Table No. 2:

Staphylococci (n=2)				
Antibiotic	**Antibiotic Resistance**		**Sensitivity**	
	N	**%**	**N**	**%**
Amikacin	0	0	2	100
Ampicillin	2	100	0	0
Gentamicin	1	50	1	50
Cefotaxime	1	50	1	50
Ceftriaxone	2	100	0	0
Klebsiella (n=4)				
Antibiotic	**Antibiotic Resistance**		**Sensitivity**	
	N	**%**	**N**	**%**
Amikacin	3	75	1	25
Ampicillin	4	100	0	0
Gentamicin	3	75	1	25
Cefotaxime	3	75	1	25
Ceftriaxone	4	100	0	0

Table number 3 shows the distribution of antibiotic resistance and sensitivity for pseudomonas and E.coli.

Table No. 3:

Pseudomonas (n=1)		
	Antibiotic Resistance	**Sensitivity**

Antibiotic	N	%	N	%
Amikacin	0	0	1	100
Ampicillin	1	100	0	0
Gentamicin	1	100	0	0
Cefotaxime	0	0	1	100
Ceftriaxone	1	100	0	0
E. coli (n=13)				
Antibiotic	**Antibiotic Resistance**		**Sensitivity**	
	N	**%**	**N**	**%**
Amikacin	7	53.8	6	46.2
Ampicillin	11	84.6	2	15.4
Gentamicin	8	61.5	5	38.5
Cefotaxime	5	38.5	8	61.5
Ceftriaxone	7	53.8	6	46.2

DISCUSSION

Urinary tract infections (UTIs) pose a grave threat to neonates, particularly premature babies or neonates with pre-existing ailments [11]. Late-onset sepsis (LOS) is a dangerous complication arising from untreated or severe UTIs in the newborns [12]. This research examines the prevalence of UTIs among neonates with LOS and antibiotic sensitivity patterns of the infecting bacteria. Knowledge of the frequency and antibiotic susceptibility of such infections is important to guide informed clinical judgments and appropriate UTI prevention and management strategies among this high-risk group [13].

The average age of neonates in this study was 27.25 days with a prominent male preponderance (76.7%). Another Indian study reported a mean age of 21.3 days among neonates with UTI, with a prevalence of 57% among males [14]. Another Pakistan study described an increased incidence of UTI in male neonates, with E. coli as the most common pathogen, as is also the case in our findings [15]. The most common bacterium isolated in this study's 20 positive isolates was E. coli (65%), followed by Klebsiella (20%), Staphylococci (10%), and Pseudomonas (5%). US studies report E. coli, Klebsiella, and Enterococcus. Results of this study agree with what is reported in the literature on antibiotic resistance patterns in bacteria [16].

E. coli is regularly reported to be resistant to ampicillin and gentamicin, but cefotaxime is commonly regarded as effective. Amikacin and cefotaxime were both found to be very effective against E. coli in this study, and this agrees with previous findings [17]. Saba et al. revealed that E. coli were highly resistant to ampicillin and gentamicin but poorly resistant to cefotaxime. Likewise, the present study observed that amikacin and cefotaxime were most sensitive against E. coli [18].

The research revealed that Klebsiella was greatly resistant to cefotaxime, ampicillin, and ceftriaxone, as is in accordance with documented antibiotic resistance patterns of the pathogen. The sensitivity to amikacin was lower than anticipated upon comparison to Ma et al.'s research, demonstrating 100% sensitivity [19]. The study confirmed the strong resistance of Staphylococci to ampicillin, as previously reported in the literature [20]. Amikacin and cefotaxime were generally effective against Staphylococci as

reported before. Surprisingly, ceftriaxone exhibited little sensitivity against Staphylococci in this trial, unlike before.

CONCLUSION

The research shows that E. coli is the most frequent bacterium in neonatal UTIs, which has various resistance and sensitivity to commonly prescribed drugs.

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Conflict in the interest

The authors had no conflict related to the interest in the execution of this study.

Permission

Prior to initiating the study, approval from the ethical committee was obtained to ensure adherence to ethical standards and guidelines.

REFERENCES

1. Rizwan W, Sohaib M, Awan ZR, Shah AA. Frequency and Antimicrobial Sensitivity Pattern of Urinary Tract Infections in Late Onset Sepsis among Neonates at Children's Hospital Lahore. Pakistan Pediatric Journal. 2024;48(4).
2. Syed U, Rashid Z, Khan Z, Riaz R, Bilal A, Zaman QU. Prevalence, Etiology, Antimicrobial Susceptibility Testing and Predictors of Urinary Tract Infection among Neonates with Clinical Sepsis. Pakistan Journal of Medical & Health Sciences. 2023 Mar 12;17(01):687-.
3. Lugira YS, Kimaro FD, Mkhoi ML, Mafwenga SG, Joho AA, Yahaya JJ. Prevalence, aetiology, antimicrobial susceptibility testing, and predictors of urinary tract infection among neonates with clinical sepsis: A cross-sectional study. Egyptian Pediatric Association Gazette. 2022 Jan 17;70(1):2.
4. Riaz L, Khan S, Shaukat F, Sapkota S, Iqbal S, Aslam M. Frequency and etiology of urinary tract infection in neonatal late onset sepsis. Proceeding Sheikh Zayed Postgrad Med Inst. 2014;28(1):33-7.
5. Tariq A, Khalid A, Khalid S, Butt MA. Frequency of Urinary Tract Infection in Neonates Presenting with Neonatal Sepsis. Indus Journal of Bioscience Research. 2025 Apr 21;3(4):376-80.
6. Samayam P, Ravi Chander B. Study of urinary tract infection and bacteriuria in neonatal sepsis. The Indian Journal of Pediatrics. 2012 Aug;79:1033-6.
7. Taheri PA, Navabi B, Khatibi E. Frequency and susceptibility of bacteria caused urinary tract infection in neonates: eight-year study at neonatal division of bahrami children's hospital, Tehran Iran. Iranian journal of public health. 2013 Oct;42(10):1126.
8. Mehar F, Rehman AU, Khan AA, Ali I, Iqbal N, Khan MA. Bacterial uropathogens causing late onset sepsis in neonates at a tertiary care hospital. The Professional Medical Journal. 2022 Mar 31;29(04):511-5.
9. Dhule SS, Ingale VC. Sunil Dnynoba Gavhane Jagruti Subhash Mahale and Harshal Tukaram Pandve, 2024. Urinary Tract Infection Amongst Neonates Admitted at Tertiary Care Centre in Western India: A Cross Sectional Study. Res. J. Med. Sci. 2024 Jan 2;18:73-6.
10. Dhule SS, Ingale VC, Gavhane SD, Mahale JS, Pandve HT. Urinary Tract Infection Amongst Neonates Admitted at Tertiary Care Centre in Western India: A Cross Sectional Study.
11. Shirazi H, Riaz S, Mahmood RA. Morbidity and mortality pattern of newly born babies in a teaching hospital. Journal of Rawalpindi Medical College. 2015 Dec 30;19(3).
12. Hollyer I, Ison MG. The challenge of urinary tract infections in renal transplant recipients. Transplant Infectious Disease. 2018 Apr;20(2):e12828. doi: 10.1111/tid.12828
13. Kaufman J, Temple-Smith M, Sanci L. Urinary tract infections in children: an overview of diagnosis and management. BMJ paediatrics open. 2019;3(1). doi: 10.1136/bmjpo-2019- 000487
14. Akinbo, F. O., Ibeh, I. N., & Okonko, I. O. (2018). Prevalence of bacterial isolates and their antimicrobial susceptibility patterns in urinary tract infections in University of Port Harcourt Teaching Hospital, Rivers State, Nigeria. African Health Sciences, 18(3), 728-736.
15. Ali, S., Sattar, A., Ahmad, I., & Javaid, U. (2017). Frequency, etiology and antimicrobial susceptibility of neonatal urinary tract infections at a tertiary care hospital in Pakistan. Journal of the Pakistan Medical Association, 67(11), 1731- 1735.
16. Hansraj, N., Jhaveri, R., & Blumberg, D. A. (2021). Urinary tract infections in neonates: a review of the literature. Journal of Perinatology, 41(6), 1139-1147.

17. Singh, R., Singh, S. P., Mittal, R., & Gupta, P. (2018). A study of neonatal urinary tract infections and their antimicrobial susceptibility pattern. International Journal of Contemporary Pediatrics, 5(4), 1347-1350.
18. Saba, C. K., Rizwan, M., Habib, M., Zahoor, S., Ali, S., Ilyas, M., & Faryal, R. (2019). Antibiotic resistance profile and prevalence of extended spectrum beta-lactamases (ESBLs) in clinical isolates of Enterobacteriaceae. JPMA. The Journal of the Pakistan Medical Association, 69(9), 1249-1253.
19. Ma H, Xu J, Zhang Y, Zhang R, Wu J. Relevance and antimicrobial resistance profile of Klebsiella pneumoniae in neonatal sepsis. The Journal of Maternal-Fetal & Neonatal Medicine. 2024 Jan 2;37(1):2327828.
20. Tessema B, Lippmann N, Knüpfer M, Sack U, König B. Antibiotic resistance patterns of bacterial isolates from neonatal sepsis patients at University Hospital of Leipzig, Germany. Antibiotics. 2021 Mar 19;10(3):323.