"Microbiological Profile of Blood Stream Isolates in Urosepsis from A Tertiary Care Hospital"

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Abstract:

Urosepsis implies to a clinically evident severe infection of the urinary tract associated with features of systemic inflammatory response syndrome or bacteremia. This study was conducted to determine the bacteriological profile and antimicrobial susceptibility pattern of the organisms associated with urosepsis. A descriptive study was carried out after obtaining approval from Institute Ethics Committee. Demographic details, duration of hospital stay, underlying risk factors, bacteriological profile and antimicrobial susceptibility pattern of the isolates, were recorded from 10 patients confirmed to have urosepsis.. Overall incidence of urosepsis was 3.57% in patients admitted to the hospital during the study period. Type 2 diabetes mellitus was the major risk factor (50%), with underlying renal conditions of chronic kidney disease. Escherichia coli were the predominant isolate (75%). Early recognition of symptoms followed by accurate diagnosis and early goal directed therapy is essential to decrease morbidity and mortality from urosepsis.

Keywords: Blood stream, Urosepsis, E.coli

Introduction

Urosepsis implies to a clinically evident severe infection of the urinary tract associated with features of systemic inflammatory response syndrome or bacteremia [1] It is a life-threatening organ dysfunction caused due to a deregulated host response to infection [2]. The incidence of urosepsis increases with risk factors like age (≥65 years), diabetes mellitus, immune suppression (organ transplantation, chemotherapy, corticosteroid treatment, Acquired Immune Deficiency Syndrome (AIDS), nosocomial UTI and prior urological interventions [3,4]. It is postulated that ascending urinary tract infection (UTI) from the bladder to the kidney, with resultant bacteremia is the main cause of urosepsis [5] Gram-negative rods (75-85%), are most commonly associated with this condition; while gram-positive organisms are less frequently (15%) involved [6, 7] An early diagnosis and identification of the causative bacteria of urosepsis is important so as to facilitate a prompt treatment with appropriate antibiotics. The present study was conducted to determine the bacteriological profile, antimicrobial susceptibility pattern and the resistance phenotype of the organism causing urosepsis

Material and Methods

Retrospective data of all patients diagnosed to have urosepsis by simultaneous positive urine and blood culture during the period from Jan 2019 to Dec 2019, were analyses from hospital and laboratory records. A total of 10 patients with urosepsis fitted into the criteria.

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A similar anti bigram was taken as a method to link the urine and blood isolate, standard microbiological protocol was followed. All patients with simultaneously positive urine and blood cultures with an identical bacterial isolate were included in the study. Repeat isolates from the same patients, isolates with differing anti biogram and patients with incomplete case records were excluded from this study. The demographic details, risk factors, duration of fever, length of hospital stay, treatment history and the outcome of each patient, along with bacteria isolated and its anti biogram were recorded in all 10 cases. The antimicrobial agents tested by standard Kirby Bauer disc diffusion technique for all gram-negative bacteria isolates and all gram-positive isolates.

Results

Out of the total 1030 urine cultures obtained from suspected UTI patients during the study period, 280 (27.18%) had significant bacteriuria. Out of 280 patients, 10 (3.57%) patients also had positive blood cultures with the same organism(s) and hence fulfilled the definition of urosepsis. These 10 patients were included in the study for further analysis. The mean age of the patients was 50-60yrs. The male were 4(40%) and 6 (60%) females. Common risk factors for developing urosepsis were Diabetis mellitus and chronic kidney disease. All 10 patients had a mono-microbial infection (9GNB and 1 Enter ococcus). [Table 1] shows the distribution of the isolates and [Table 2] shows the antibiotic susceptibility profile of the GNB. There was a 55.5% (5/9) multidrug resistance (Carbapenem resistance) among GNB isolates. Of the 9 GNB isolates, Enterobacteria ceae isolates were 7 (70%) and among these, E. coli was the commonest isolate (5/7, 71.42%). Of the total 5 E. coli isolates, 3 (60%) were only ESBL producers and 2/5 (40%) were ESBL and Carbapenemase producers. Of the total 2 K.

pneumonia isolates, 2/2(100%) were ESBL and Carbapenemase producers. Severe sepsis and high mortality of 5 (71.4%), were associated with resistant phenotypes (ESBL and Carbapenemases producers {E.coli (3) and Klebsiella pneumonia (2)}. Of the 2 Pseudomonas aeruginosa isolates, 1 isolate showed resistance to carbapenems. Both these patients with Pseudomonas aeruginosa infection had severe sepsis and a fatal outcome with significant levels of proinflammatory markers (CRP).Among GPC isolates, there were 1 Enterococcus isolate and were resistant to Beta lactams and Macrolides but susceptible to vancomycin, teicoplanin and linezolid.

Organism	N=10	Percentage
E.coli	5	50%
Klebsiella pneumoniae	2	20%
Pseudomonas aeroginosa	2	20%
Enterococcus faecium	1	10%

Antibiotic	E. coli (5)	Klebsiella pneumonia (2)	Pseudomonas aeroginosa (2)
Amoxicillin-clavulanic acid	3 (60%)	2 (0%)	NA
Piperacillin tazobactum	4 (80%)	1 (50%)	1 (50%)
Cefataxime	3 (60%)	2 (0%)	NA
Ceftazidime	3 (60%)	2 (0%)	2 (0%)
Cefaperazone sulbactum	2 (40%)	1 (50%)	2 (0)
Imipenem	3 (60%)	2 (0%)	1 (50%)
Meropenem	3 (60%)	2 (0%)	1 (50%)
Amikacin	3 (60%)	1 (50%)	2(0%)
Gentamycin	3 (60%)	2 (0%)	2 (0%)
Ciprofloxacin	2 (40%)	2 (0%)	2 (0%)
Levofloxacin	2 (40%)	2 (0%)	2 (0%)
Celestin	5 (100%)	2 (100%)	2 (100%)

Discussion

Urosepsis resulting from complicated UTI in patients with underlying risk factors increases morbidity and mortality in these patients. Successful management of patients with urosepsis depends on isolating the causative agent and instituting specific antibiotic therapy, along with removing the focus of infection [8] In the current study, urosepsis was noted in 3.57% patients, among 280 culture positive cases with UTI and between age group 50-60(60%).

Age of the patients is one of the risk factors. In the present study, the mortality of 71.4%. Other studies observed a mean age range of 60–83.6 years [9-11], with a mortality rate of 33% [10]. Underlying co-morbid conditions, especially diabetes mellitus has been shown to be associated with development of pyelonephritis and further progressing to urosepsis [9, 12]. In the present study, Type 2 DM was a major risk factor among 5/10 (50%) patients. Of the 5 diabetic patients, 1 were elderly patients (>60 years) who died of urosepsis.In the present study, all the 10 cases were of mono microbial infections with GNB being the predominant isolates 9/10 (90%). E. coli was the commonest causative organism, 43/53 (50%). The isolation rate of E. coli from other studies were 46.1% [10], 69% [13], 75% [9] and 79% [11]. Multidrug resistant urosepsis is being increasingly reported in various studies [9-13]. This can be attributed to recurrent infections, repeated hospitalizations of the patients and indiscriminate use of antibiotics [14] Pseudomonas is associated with long term hospitalization. Multidrug resistance to commonly used antibiotics like fluroquinlones, amino glycosides and combination antibiotics like piperacillin/ tazobactam or amoxicillin/ clavulanic acid, have been increasingly reported in various studies including present study (Magiorakos et al [15] There is high mortality rate associated with Multidrug resistant organisms (MDROs) for which a combination therapy of carbapenem plus a Polymyxin B would be effective. Similar studies done on MDROs causing blood stream infections showed a 2-3 fold increase in mortality rate and treatment failure. To decrease the mortality rate among MDROs various studies have shown effective therapy in such cases to be a combination therapy with Carbapenem plus a Polymyxin B compared to immunotherapy. [16-20]

Conclusion

Type 2 diabetes mellitus was the major risk factor (50%), with underlying renal condition/s. Escherichia coli was the predominant isolate (75%). Early recognition of symptoms followed by accurate diagnosis and early goal directed therapy is essential to decrease morbidity and mortality from urosepsis.

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