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AIM: TO STUDY THE CLINICAL PROFILE OF PATIENTS WITH ACUTE PYELONEPHRITIS PRESENTING AS ACUTE KIDNEY INJURY.

Nephrology

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ABSTRACT

Background: Acute pyelonephritis (APN) is an important cause of mortality and morbidity in the general population1.Acute kidney injury (AKI) is a known and important complication of APN. But there is a paucity of data on the exact incidence of AKI in APN. In this study we analysed the patients with acute pyelonephritis and acute kidney injury at our centre.

Methods: We retrospectively collected clinical, biochemical and radiological data of patients hospitalized in nephrology ward of our institute with a diagnosis of APN with AKI from June 2016 to December 2017.We collected the records of 58 patients out of which 41 were selected for the evaluation as per our study criteria.

Results: Among 41 patients, 32(78%) are male and 9 (22%) are female. Mean age of the patients is 46.56 ± 15.8. Risk factors for pyelonephritis like diabetes mellitus, obstructive uropathy, renal calculi and renal transplant were present in 16 (39%), 14 (34.1%), 5 (12.2%) and 2 (4.9%) respectively. Emphysematous pyelonephritis was present in 6 patients (14.6%). 4 (66.6%) of them had diabetes and 2 patients (33%) had positive blood culture.

Conclusions: Our data suggests that APN remains as an important cause of AKI which should be early diagnosed and promptly treated with almost complete recovery of renal function.

KEYWORDS

Acute pyelonephritis, Acute kidney injury, Diabetes mellitus, Emphysematous pyelonephritis, Obstructive uropathy

Introduction:

As per the existing data there are approximately 250,000 cases of acute pyelonephritis each year, resulting in more than 100,000 hospitalizations.[1] APN can be defined clinically, pathologically or radio logically. The British Medical Research Council Bacteriuria Committee defined APN as a clinical syndrome of flank pain, costo-vertebral tenderness and fever accompanied by laboratory evidences of renal infection including leukocytosis, pyuria, haematuria, bacteriuria, positive urine culture and sometimes bacteraemia.[2]Hill et al defined APN pathologically as a suppurative inflammation of the renal parenchyma and pyelo-calyceal system typically distributed along one or more medullary rays supporting an ascending route of infection.[3]Radiologically, APN manifests on contrasted computed tomography (CECT) scans as hypo-enhancing regions with or without renal swelling and may be focal or diffused. To standardise terminologies, Talner et al suggested in 1994 that all radiological parenchymal abnormalities without abscess attributable to acute infection be called APN.[4]

AIM

To study the incidence of acute kidney injury in patients with acute pyelonephritis

Material and methods

This was a retrospective study and included all patients who were admitted with a diagnosis of AKI in nephrology ward of Indira Gandhi Institute of Medical Sciences (IGIMS), Patna during the period June2016 to November 2017.Diagnosis of AKI was based on KDIGO 2012 guidelines. AKI is defined as increase in Serum Creatinine by more than 0.3 mg/dl within 48 hours or increase in Serum Creatinine more than 1.5 times baseline, which is known or presumed to have occurred within the prior 7 days or urine volume less than 0.5 ml/kg/h for 6 hours. Diagnosis of APN was based on clinical features consisting of fever, flank pain and ultrasound (USG) or Computed tomography (CT) suggestive of swollen kidneys either unilateral or bilateral with or without perinephric stranding. Computed tomography (CT) was performed in patients who didn't show expected clinical recovery or in whom USG was not conclusive. Patients were excluded if there was history of renal dysfunction or were known to have chronic kidney disease.

Results: We collected the records of 58 patients out of which 41 were selected for the evaluation as per our study criteria. Among 41 patients, 32(78%) were male and 9 (22%) were female. Mean age of the patients were 46.56 ± 15.8 years. Baseline characteristics of the patients are shown in table 1.Risk factors for pyelonephritis like diabetes mellitus, obstructive uropathy, renal calculi and renal transplant were present in 16 (39%), 14 (34.1%), 5 (12.2%) and 2 (4.9%) respectively. Emphysematous pyelonephritis was present in 6 patients (14.6%). [4] (66.6%) out of 6 had diabetes and 2 patients (33%) had positive blood culture. One patient had bilateral renal calculi with right sided pyonephrosis with emphysematous pyelonephritis.4 patients were worked up for vesico-ureteric reflux(VUR) as they had history of recurrent UTI.VUR was not present in any of them.

Mean duration of symptoms was 13.2 ± 8.6 days. Fever was present in 38 (92.7%). Mean leucocyte count was 19321 ± 6289 per microliter of blood. Serum Creatinine was 4.97mg/dl ± 2.4mg/dl at the time of admission. 10 (24.4%) patients required one or more sessions of hemodialysis (mean 2.2 sessions per patient). Mean Serum Creatinine at the time of discharge was 2.27 ± 1.0. 48.8% patients had Serum Creatinine less than 2.0 mg/dl at the time of discharge. All patients were discharged with improving renal function. (Table 2) Urine culture was positive in 35 (85.4%), isolates being E coli 29 (70.7%)], Klebsiella 4 (9.8 %)] and Pseudomonas 2 (4.9%)]. Blood culture was positive in 4 patients (9.8%). 2 patients (50%) had diabetes and emphysematous pyelonephritis both. Average duration of hospitalisation was 8.37 ± 5.4 days.(Table 3)

Age of the patient, S. Creatinine at presentation and presence of diabetes was significantly associated with poor outcomes in terms of higher S Creatinine at the time of discharge and longer duration of hospitalization (p Value <0.05) while S Creatinine at presentation and duration of symptoms before hospitalisation were significantly

associated with number of dialysis session and duration of hospitalisation (p Value <0.05) table 4. Presence of diabetes was significantly associated with worse outcome in terms of higher

Discussion:

Acute pyelonephritis is a potentially reversible cause of renal failure. The causes of renal failure in APN are multifactorial .It can be due to bilateral renal involvement; associated bilateral urinary tract obstruction. Septicaemia or shock secondary to sepsis from unilateral acute pyelonephritis and use of nephrotoxic drugs especially non-steroidal anti-inflammatory drugs(NSAID), aminoglycosides or alternative form of medicines may be the cause of AKI. There have been few case reports of patients with APN and AKI. Rollino et al presented a case series of 223 patients with pyelonephritis. [21] patients(9.4%) had AKI.5Yadla et al reviewed the clinical profile of 25 patients of acute pyelonephritis with acute kidney injury in patients of type 2 diabetes mellitus and concluded that bilateral acute pyelonephritis needs to be considered while evaluating acute kidney injury in type 2 diabetes mellitus patients.[6] If we look into the aetiology of AKI ; sepsis has emerged as the leading cause in few Indian studies.[7,8] But the source of sepsis was not elaborated in any of these studies except a study where urosepsis was the leading cause in 34% of the patients.[9] In renal transplant recipients urinary tract infection (UTI) remains the most common cause of infection. The most common site of UTI after kidney transplant is the urinary bladder (>95%), followed by renal transplant pyelonephritis. Most UTI occur in first three months. While lower UTI does not seem to affect transplant function, it can develop into transplant pyelonephritis in 20% of cases.[10,11] APN not only affect graft function, but 10–12% of patients develop urosepsis which can be lethal in almost half.[12]

In our study urine culture was positive in around 85 % of the patients probably due to early presentation of the patients with no prior antibiotic therapy. Urine culture positivity was comparable with other studies. Blood culture was positive in 4 patients (9.8%).All patients had pyuria.

We didn't encounter any fungal pyelonephritis in our study which may be due to small sample size or having only one renal transplant recipient. Fungal pyelonephritis is an important cause especially in immunocompromised patients.13All patients were treated empirically with intravenous antibiotics as per the Infectious Diseases Society of America (IDSA) guidelines or later as per culture sensitivity reports.

Outcome

10 patients were discharged with a normal serum Creatinine and they had normal serum Creatinine till last follow-up. Of the remaining 31 patients with higher serum Creatinine at discharge, serum Creatinine settled to baseline in 3 patients while remaining patients had abnormal values in their last follow-up. [5] out of these 28 patients had received HD during hospitalization. These groups of patients will require longer follow up to know the renal outcome.

Conclusions

APN remains an important cause of AKI with significant morbidity if not treated promptly. Strong suspicion is required in patients with unexplained renal failure with fever and other symptoms. Aggressive and early treatment can revert back the disease process with significant recovery of renal function in majority.

Table.1 Baseline characteristics of the patients

Male: Female	32:9 (78%: 22%)
Age (in years)	46.56 ± 15.8
Diabetics	16 (39%)
Renal calculi	5 (12.2%)
Obstructive uropathy	14 (34.1%)
Graft kidney	2 (4.9%)
Bilateral Pyelonephritis	16 (39%)
Emphysematous pyelonephritis	6 (14.6%)
Abscess	2

Table.2 Clinical and laboratory parameters

		Range
Fever in degree C	38 (92.7%)	
Leucocyte count (per micro L)	19321	43200 - 12000
S Creatinine at admission(mg/dL)	4.97 ± 2.4	1.8 – 12.2
S Creatinine at discharge (mg/dL)	2.27 ± 1.0	0.8 – 4.9
Days of hospitalization	8.37 ± 5.4	3 - 27
Duration of symptoms (days)	13.2 ± 8.6	3 – 45
Patients requiring dialysis	10	
Mean number of dialysis sessions	2.2	1 - 6
Positive Urine culture	35 (85.4%)	
Blood culture Positivity	4 (9.8%)	
Pyuria	41 (100%)	

C- Centigrade, S- serum,

Table 3. Urine culture

Sterile	6 (14.6%)
E coli	29 (70.7%)
Klebsiella	4 (9.8 %)
Pseudomonas	2 (4.9%)

Table 4. The variables influencing outcome at the time of discharge.

Variables	S creatinine at discharge(P value)	No. of dialysis sessions (P value)	Duration of hospitalisation (P value)
Age	0.017	0.15	0.415
S Creatinine at Presentation	0.010	0.020	0.017
Duration of symptoms	0.239	0.015	0.004
Diabetes mellitus	0.003	0.037	0.028

S - serum

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