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CLINICAL AND LABORATORY PROFILE AT PRESENTATION AS PREDICTOR OF SHORT TERM OUTCOME IN ACUTE PYELONEPHRITIS

Anna George[1], Prasantha Kumar[2], Vivek Krishnan[3]

[1]Junior Resident, Department of General Medicine, Government Medical College, Kottayam, Kerala, India
[2]Professor, Department of General Medicine, Government Medical College, Kottayam, Kerala, India
[3]Assistant Professor, Department of General Medicine, Government Medical College, Kottayam, Kerala, India

Abstract

Background: Acute pyelonephritis is an acute infection of the upper urinary tract including the renal parenchyma and pelvis. We conducted a study to assess the relationship between the clinical and laboratory data at presentation and adverse outcomes. To study the clinical features and laboratory profile in acute pyelonephritis. **Materials and Methods:** After obtaining permission from the IRB Government medical college, Kottayam, a prospective observational study was conducted among patients admitted with provisional diagnosis acute pyelonephritis to the medical wards. Patients were selected according to inclusion and exclusion criteria. Informed consent was taken from all the study subjects. Information was collected through prepared proforma from each patient. Routine blood investigations were done for all patients. **Result:** The total numer patients included in the study was 85.The mean age of the patients was 50.3±15.7. Maximum no of patients belonged to 51-60 year age group (32.9%) and then in 61-70 and ≤30 years age group (18.8% each). The mean hemoglobin was 11.0±1.9g/dl. The mean total WBC count was 19730±5045.3. The mean Random blood sugar (RBS) value was 251.8±152.8mg/dl. The mean blood urea was 68.8±58.The mean serum creatinine was 2.6±2.5mg/dl. The mean serum sodium was 132.8±8.1mEq/L. Out of 13 patients who had shock at the time of presentation 12 patients (92.3%) required renal replacement therapy(p<0.0001). **Conclusion:** The mean age of the patients included in the study was 50.3±15.7. There was significant association between shock at the time of presentation and need for ICU care, renal replacement therapy, mortality and increased duration of hospital stay when compared with patients who did not have shock.

INTRODUCTION

Acute pyelonephritis is an acute infection of the upper urinary tract including the renal parenchyma and pelvis. Earliest citing of the disease dates back to ancient Egypt.[1] The incidence is as high as 250,000 cases per year and requires 100,000 hospitalizations every year in USA The clinical presentation of APN includes lower urinary tract symptoms such as frequency, urgency, and dysuria accompanied by fever, upper gastrointestinal symptoms, headache, and flank pain.[2] Clinical history and physical examination are the most useful components of diagnosis. Complications include renal abscess, septic shock, and renal impairment, including acute renal failure. The clinical spectrum of the disease varies from mild costovertebral tenderness, mictional syndrome and fever to life threatening condition or even death.[3] It is essential to define the clinical, biochemical, and radiological profile of patients with APN to identify the early prognostic markers so as to prevent the morbidity and mortality.[4] However, there are not many Indian studies addressing these issues of incidence, prevalence and risk factors.[5] There are considerable number of hospitalizations within 4 weeks of lower respiratory tract infections and UTIs with a cardiovascular cause of admission are particularly intriguing, as both infections have been found to exacerbate underlying cardiovascular comorbidity .Hence, identification of the novel prognostic markers for this ancient disease is the need of hour to triage those with the risk of adverse outcomes. We conducted a study to assess the relationship between the clinical and laboratory data at presentation and adverse outcomes.

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MATERIALS AND METHODS

It was a Prospective observational study done between July 2020 to June 2021 at Department of General Medicine, Govt. Medical College, Kottayam. According to study by Umesh, et al. from march 2014 to June 2016 published in 2018 in Indian journal of nephrology, among 296 patients with Acute pyelonephritis 18 deaths were noted (6.1%).[6]Considering mortality as the most significant outcome, sample size was calculated as shown below.

$Z\alpha = 1.96$ for α at 5% level of significance

P = 6.1%

Q = (100-P)

D=absolute proportion=5%

Sample size = $Z(1-\alpha/2)2PQ/d2$

= 1.96 2× 6× 94

25

= 86.6

So, the approximate sample size was taken as 85
Patients admitted to General medicine wards of Government medical college, Kottayam with diagnosis of acute pyelonephritis satisfying the inclusion criteria and exclusion criteria. Simple random sampling was used as sampling technique.

Methodology: Semi Structured peer reviewed proforma was used. After obtaining permission from the IRB Government medical college, Kottayam, patients were selected according to inclusion and exclusion criteria. Informed consent was taken from all the study subjects. Information was collected through prepared proforma from each patient. Routine blood investigations were done for all patients. Urine routine examination and urine culture were sent. CT abdomen was taken for all patients. Patients included in the study were followed up till discharge or death.

Inclusion criteria

Patients aged >18years with provisional diagnosis of acute pyelonephritis, satisfying 2 or more criteria given below

- Axillary temperature ≥38.3°C
- Flank pain or costovertebral angle tenderness on bimanual palpation of the kidney
- Presence of pyuria (urinalysis with more than ten leukocytes/mL in urine without centrifuging or more than five leukocytes per high power field in centrifuged sediment) or a positive urine culture with radiological evidence (CT) of acute pyelonephritis.

Exclusion Criteria

- Patients with post-operative pyelonephritis
- Pregnant patients
- Patients with known structural abnormality of genitourinary tract

Data Management and Analysis

The data was entered in Microsoft excel and further statistical analysis was done using SPSS software version 24. Chi square test was used to analyse qualitative data and independent sample t test was done to analyse quantitative data. The statistical level of significance was set at level of p<0.05.

RESULTS

Maximum no of subjects with acute pyelonephritis belonged to 51-60-year age group (32.9%) and then in 61-70 and ≤3o years age group (18.8% each). Majority of the study population was constituted by females (78.8%). Males were only 21.2%. A total of 85 subjects were included in the final analysis. [Table 1]

Out of 85 patients studied 78 patients (91.8%) had recorded fever (axillary temperature ≥38.30C) and 7 patients (8.2%) did not have recorded fever at the time of admission or before. Out of 85 subjects 74(87.1%) had flank pain. Whereas 11(12.9%) subjects did not have flank pain, 77(90.6%) had history of chills. Out of 85 patients studied 57(67.1%) had history of one or more episodes of vomiting whereas 28 patients (32.9%) did not have history of vomiting. Out of 85 patients only 34(40%) had history of dysuria.51(60%) patients did not have history of dysuria. [Table 2]

Out of 85 subjects 52(61.2%) had diabetes mellitus as a co morbidity. 36 patients (42.4% of study population) were hypertensive. 17 patients (20%) had Chronic kidney disease out of total 85. [Table 3]

Out of 85 patients, 13 patients (15.3%) had shock at the time of presentation and 72 patients (84.7%) had renal angle tenderness on examination. [Table 4]

The mean hemoglobin was 11.0±1.9g/dl. Minimum Hb value was 6.2g/dl and maximum Hb value was 14g/dl. The mean total WBC count(TC) was 19730±5045.3, with minimum value 5890 and maximum value 32160. The mean Random blood sugar (RBS) value was 251.8±152.8mg/dl, minimum value was 72mg/dl and maximum value was 584mg/dl. The mean blood urea was 68.8±58.2mg/dl, minimum value was 15mg/dl and maximum value was 281mg/dl. The mean serum creatinine was 2.6±2.5mg/dl, minimum value was 0.5mg/dl and maximum value was 12.2mg/dl. The mean serum sodium was 132.8±8.1mEq/L and minimum value was 110mEq/L and maximum value was 148Me/l. The mean serum potassium value was 4.5±0.7mEq/L minimum value was 3.1mEq/L and maximum value was 6.6mEq/L. [Table 5]

100% of cases who presented with shock needed ICU care where as only 2.8% of the non-shock cases needed ICU care. There was a significant association between ICU care and presence of shock at the time of presentation(p<0.05). [Table 6]

15.4% of patients with shock succumbed to death whereas none of non-shock patients expired during the study which was statistically significant p<0.05 using fisher's exact test. [Table 7]

Out of 13 patients who had shock at the time of presentation 12 patients (92.3%) required renal replacement therapy. Out of 72 patients who did not have shock at the time of presentation only 10

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patients (13.9%) required RRT. This shows there was significant association between presence if shock and need for renal replacement therapy which was statistcally significant using fisher's exact test with p value<0.001. [Table 8]

The mean duration of hospital stays in patients with shock and without shock was 10.81 days and 4.78 days respectively. Which shows that presence of shock at the time presentation was associated with increased duration of hospital stay. This was statistically proven significant using chi square test p=<0.001. [Table 9]

The mean creatinine value of patients who required ICU care was 5.01±3.00 and those who did not was 2.05±2.03.The patients who required ICU care had higher mean creatinine values when compared with those who did not.It is statistically significant using fisher's exact test with p value<0.001. [Table 10]

Correlation between creatinine and hospital stay was analysed by Pearson correlation. The correlation coefficient r = 0.681 with p<0.05 shows that there was a strong positive correlation between serum creatinine and hospital stay. Higher serum creatinine level was associated with longer hospital stay and vice versa. [Table 11]
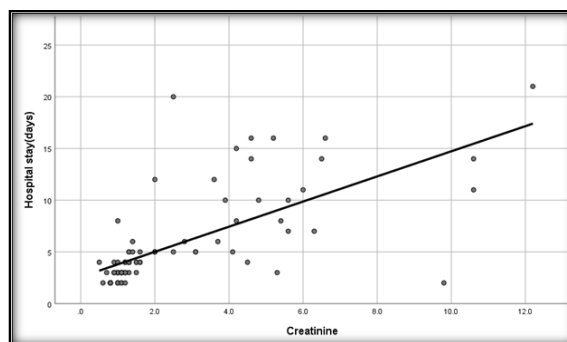
Figure 1: Scatter plot showing correlation between creatinine level and hospital stay

The upward direction of the trend line indicates the strong positive correlation exist between creatinine level and hospital stay.

Table 1: Age and Sex wise distribution of the study population

Age in years	Frequency	Percent
≤ 30	16	18.8
31 - 40	10	11.8
41 - 50	10	11.8
51 - 60	28	32.9
61 - 70	16	18.8
>70	5	5.9
Total	85	100

Table 2: Symptoms in study participants

Fever	Frequency	Percent
No	7	8.2
Yes	78	91.8
Total	85	100

Table 3: Types of Co-Morbidities in study participants

Diabetes	Frequency	Percent
No	33	38.8
Yes	52	61.2
Total	85	100

Table 4: Presence of shock at the time of presentation

Shock	Frequency	Percent
No	72	84.7
Yes	13	15.3
Total	85	100

Table 5: Investigations

	Mean	SD	Min	Max	Median
Hb	11.0	1.9	6.2	14	11.6
TLC	19730.6	5045.3	5890	32160	19100
RBS	251.8	152.8	72	584	230
Blood urea	68.8	58.2	15	281	44
Creatinine	2.6	2.5	0.5	12.2	1.3
S.Na	132.8	8.1	110	148	135
S.K	4.5	0.7	3.1	6.6	4.6

Table 6: Association between Shock and ICU care

Shock	ICU care				Total	
	No		Yes			
	n	%	n	%	n	%
No	70	97.2	2	2.8	72	100
Yes	0	0	13	100	13	100

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Total	70	82.4	15	17.6	85	100

Fisher's exact test p <0.001

Table 7: Shock and mortality

Shock	Mortality				Total	
	No		Yes			
	n	%	n	%	n	%
No	72	100	0	0	72	100
Yes	11	84.6	2	15.4	13	100
Total	83	97.6	2	2.4	85	100

Fisher's exact test p =0.022

Table 8: Shock and need for Renal replacement therapy

Shock	RRT				Total	
	No		Yes			
	n	%	n	%	n	%
No	62	86.1	10	13.9	72	100
Yes	1	7.7	12	92.3	13	100
Total	63	74.1	22	25.9	85	100

Table 9: Shock and hospital stay

Shock	N	Hospital stay in days		t	p
		mean	sd		
No	72	4.78	3.557	5.201	<0.001
Yes	13	10.85	5.367		

Table 10: Serum creatinine and ICU care

ICU care	N	Creatinine		t	p
		mean	sd		
No	70	2.05	2.03	4.665	<0.001
Yes	15	5.01	3.00		

Table 11: Correlation of Hospital days and creatinine

	Pearson Correlation Coefficient r	p
Correlation of Hospital days and serum creatinine	.681	<0.001

DISCUSSION

This study was conducted at Government medical college Kottayam to study the clinical and laboratory profile at presentation and to find the association of shock and serum creatinine with four short term outcomes. A total of 85 patients were studied and observations were made regarding age and sex distribution, symptoms of fever, chills, flank pain, dysuria and vomiting. Information was collected about past history of diabetes mellitus, systemic hypertension and chronic kidney disease. Observation was made whether shock was present at the time of admission or not and renal angle tenderness was checked. Routine investigations including Hb, Total leucocyte count, RBS, blood urea, serum creatinine, serum sodium and serum potassium were recorded. Patients were followed up till discharge or death.

The mean age of the patients included in the study was 50.3±15.7. Maximum no of subjects with acute pyelonephritis belonged to 51-60 year age group (32.9%) and then in 61-70 and ≤30 years age group (18.8% each). In a single centre study conducted by Umesha et al 6 on 296 patients with acute pyelonephritis at Indian Institute of Nephrology Urology, Bengaluru, Karnataka, the mean age of patients was 53.85±9.78years.

In the present study majority of the study population was females (78.8%). Males constituted only 21.2%. The male: female ratio was 1.3:7. In a study by Dae-Hong Jeon et al on incidence, risk factors and clinical outcomes of patients with AKI 50/403(12.4%) were males and 353/403(87.6%) were females.[7]

In the present study out of 85 subjects 52(61.2%) had diabetes mellitus. In the study conducted by Umesha et al 145(54.4) % patients out of total 296 were diabetic.6 In study by V M Damotharan et al 73% patients had diabetes which was observed to be the most common risk factor.[8]

17 patients (20%) had Chronic kidney disease out of total 85. In another study by Due Hong Joen et al7 30% patients had CKD. In study by Leelavathi venkatesh et al at Indian institute of nephro-urology Bengaluru, on correlation of clinical parameters with radiological abnormalities 32% patients had CKD. In study by Leelavathi venkatesh et al leukocytosis was seen 68% patients and thrombocytopenia was present in 16% patients.[9]

15 patients (17.6%) out of study population required ICU admission. In study by Chung VY et al in patients with severe acute pyelonephritis 56% required ICU care.[10] 2 patients (2.4%) out of 85 succumbed to death during the study period. In a study by Ruiz Mesa JD on factors associated with

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severe sepsis/septic shock in acute pyelonephritis the mortality was 17.7%.[11]

The mean duration of hospital stays in patients with shock and without shock was 10.81 days and 4.78 days respectively(p<0.001). Patients with shock had more duration of hospital stay. In study by Jae Hoon Lee Et al,[12] on risk factors for septic shock in bacteremia acute pyelonephritis they observed that the overall mortality was 6.7%, but the patients who initially presented with shock had a mortality rate of 25.9% which was much higher. In study by Chung VY et al it was observed that patients with shock had long duration of hospital stay (>14 days).[10] Correlation between creatinine and hospital stay was analysed by Pearson correlation. The correlation coefficient r = 0.681 with p<0.05 shows that there was a strong positive correlation between serum creatinine and hospital stay. Higher serum creatinine level was associated with longer hospital stay and vice versa.

CONCLUSION

The mean age of the patients included in the study was 50.3±15.7. Majority of the study population was females (78.8%). Fever was the most common presenting symptom. Renal angle tenderness was the most common sign. There was significant association between shock at the time of presentation and need for ICU care, renal replacement therapy, mortality and increased duration of hospital stay when compared with patients who did not have shock. Higher serum creatinine level at presentation was associated with increased risk of mortality, need for ICU care, need for renal replacement therapy and longer duration of hospital stay.

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