IJBPAS, February, 2026, 15(2): 722-733

ISSN: 2277–4998

International Journal of Biology, Pharmacy and Allied Sciences (IJBPAS)

'A Bridge Between Laboratory and Reader'

www.ijbpas.com

CLINICAL SPECTRUM OF PYELONEPHRITIS: PROGNOSTIC FACTORS AND LONG-TERM OUTCOMES REVEALED: A CASE SERIES

YANAMADALA PK[1], SANA P[2], GIDLA HR[3], VENI BALLA SK[4] AND RAMOJU LDL[4]

1: Associate Professor at Aditya Pharmacy College (A), Surampalem-533437, Andhra Pradesh, India

2: Senior Consultant in Nephrology at Trust Multispeciality Hospitals, Kakinada-533005, Andhra Pradesh

3: Intern of Pharm. D at Aditya Pharmacy College (A), Surampalem-533437, Andhra Pradesh, India

4: Students of Pharm. D at Aditya Pharmacy College (A), Surampalem-533437, Andhra Pradesh, India

***Corresponding Author: Dr. Pavan Kumar Yanamadala: E Mail:** pavan.yanamadala@gmail.com

Received 15th Oct. 2024; Revised 5th Dec. 2024; Accepted 5th Feb. 2025; Available online 1st Feb. 2026

https://doi.org/10.31032/IJBPAS/2026/15.2.9836

ABSTRACT

Pyelonephritis is a severe bacterial infection of kidney parenchyma, often leading to kidney scarring, and is potentially life-threatening. **Objective:** The study was aimed at assessing the clinical profile, prognostic factors, and the 6-month outcome of patients with pyelonephritis. **Methodology:** This observational study involved qualitative and quantitative approaches to analyze various factors. The qualitative section includes those related to the antibiotics prescribed, symptoms, risk factors, and other demographic details, among which the latter two were approached quantitatively. **Results:** Ten patients who were randomly selected were involved in the study. The mean Age of the study group was 52.0 ± 8.628 years. Out of 10 subjects, 50% were males and 50% were females. Most of the subjects with Pyelonephritis suffered from symptoms like Pain (90%), pyrexia (80%), and Dysuria (70%). In our study, we had 20% subjects with Shock, 70% with Sepsis, and 20% with Disseminated Intravascular Coagulation. 10/10 cases had Type II Diabetes Mellitus. Four cases had unilateral involvement and six had bilateral involvement. Candida was the most common organism cultured (30%) followed by *E. coli* (20%). Eight cases Underwent DJ stent and one case had percutaneous nephrostomy. One subject with Advanced Disease expired. Antibiotics are irreplaceable drugs in the management of Pyelonephritis. All the patients were treated with IV Antibiotics and 8 Out of 10 subjects underwent surgical interventions. **Conclusion:** The disease should be suspected and

investigated in both males and sick females with diabetes, with early recognition and appropriate management through medical and surgical therapies being crucial.

Keywords: Pyelonephritis, Chronic Kidney Disease, IV Antibiotics, Uncontrolled Diabetes Mellitus, Unilateral and Bilateral involvement, *E. coli* and Candida species

INTRODUCTION

Pyelonephritis is an infection-related inflammation of a kidney's parenchyma as well as the lining of its renal pelvis **[1]**. In the US, there are 15–17 instances of pyelonephritis per 10,000 females and 3–4 cases per 10,000 males per year. It is a subset of urinary tract infections brought on by bacteria that move up the genitourinary system, including the kidney, from the lower to the upper regions **[2]**. When bacteria, frequently originating from the fecal flora, migrate via the urethra to the bladder, causing symptomatic cystitis or silent bacteriuria, urinary tract infections ensue.

Gram-negative bacteria, of which Escherichia coli is the most prevalent type, are the primary cause of acute pyelonephritis. Up to 80% of cases have Escherichia coli as the probable cause. Along with Pseudomonas aeruginosa, Klebsiella pneumonia, Enterococcus, Proteus mirabilis, Klebsiella oxytoca, and others, Gram-negative bacteria can also colonize the urinary tract. While the Viridians streptococci group, Staphylococcus saprophyticus, and Streptococcus agalactiae are among the gram-positive species. The fecal flora of the majority of patients is the source of the infectious organism.

Although pyelonephritis is a common condition, there are still unresolved issues with the diagnostic process, the development of abscesses, and the indication of hospitalization. Despite being five times more likely to be impacted than males, women die at a lower rate **[3]**.

Women are more likely than men to get Pyelonephritis and populations with diabetes are more susceptible to infection. Renal stone disease, anatomical abnormalities of the urinary system, and immunosuppression are the most prevalent related comorbidities in the non-diabetic population **[4]**.

Even in patients with poorly controlled Type-II Diabetes Mellitus, a high tissue glucose level did not correlate with an increased risk of mortality or a requirement for dialysis, despite the possibility that it would create a favorable environment for the growth of bacteria that produce gas in people with diabetes **[5, 6]**.

Pyelonephritis occurs when the uropathogens, primarily Escherichia coli,

ascend to the kidneys from fecal flora; it is a rare complication of bacteremia that seeds the kidneys **[7]**. Sexual activity frequency, genetic susceptibility, advanced age, urinary devices, Diabetes, and recent urinary tract infections are risk factors **[8-17]**. It is unclear exactly how adult pyelonephritis and vesicoureteral reflux relate to one another.

The general objective of the study is to study the clinical profile prognostic factors and the **6**-month outcome of patients with pyelonephritis, and the specific objectives of the study are to identify the group that is most susceptible to pyelonephritis, to clarify the clinical characteristics, radiological categorization, and prognostic variables of Pyelonephritis, and to evaluate the outcomes of the various therapy approaches (nephrectomy, percutaneous catheter drainage with DJ stent, and antibiotic treatment alone).

This case study series helps practice-based literature on the treatment of pyelonephritis. Additionally, it emphasizes the significance of investigating Pyelonephritis as a diagnosis in patients with urinary infections who share some of the risk variables we listed in our case series.

METHODOLOGY:

Our work entails the case study examination of the clinical profile, prognostic variables, and outcomes of 10 patients with pyelonephritis, despite the fact that there are many dissertations and other works linked to Pyelonephritis as a whole and those relevant to Kidney disease and Urinary Tract Infections specifically. We did adhere to certain procedures in which findings of various aspects were done on a predetermined basis and the outcomes of our investigations were contrasted with those of earlier studies.

It is a kind of observational study in which the sample population's data variables are examined after data collection, which takes place at a set period without interfering with the subjects. The following advantages of the study were taken into consideration when choosing the study design such as all kinds of descriptive analysis can be performed with this, multiple results could be achieved simultaneously, and the collection of variables simultaneously and quickly.

A self-structured data collecting form and certain criteria were used to select the sample. The study that was conducted comprised criteria for inclusion as well as exclusion for the conduct of the study following patient approval.

The patients from both genders who met the inclusion criteria for pyelonephritis diagnosis and management were the subjects enrolled. The persons aged below 30 years and who have crossed 80 years along with the

Pregnant and Lactating women were excluded along with those who weren't willing to participate in the study.

RESULTS AND DISCUSSION:

Table 1: Age-Wise & Gender-wise Distribution of Study Subjects

S. No.	Age Group	Male (n=5)	Female (n=5)	Total (n=10)
1	31-40 Years	1	0	1
2	41-50 Years	1	1	2
3	51-60 Years	1	4	5
4	61-70 Years	2	0	2

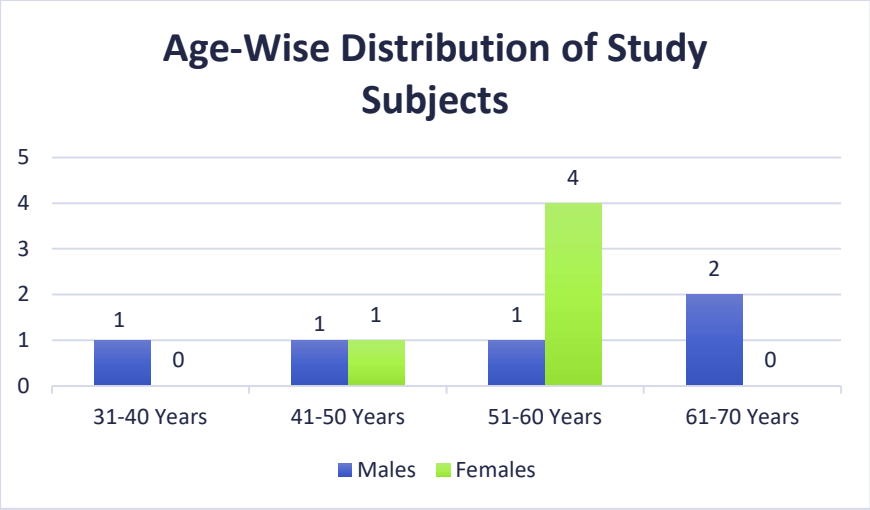

Figure 1: Age-wise distribution of Study Subjects

Table 2: Clinical Picture Distribution among the Study Subjects

S. No	Clinical Picture	No. of Subjects
1	Pyrexia	8
2	Pain	9
3	Dysuria	7

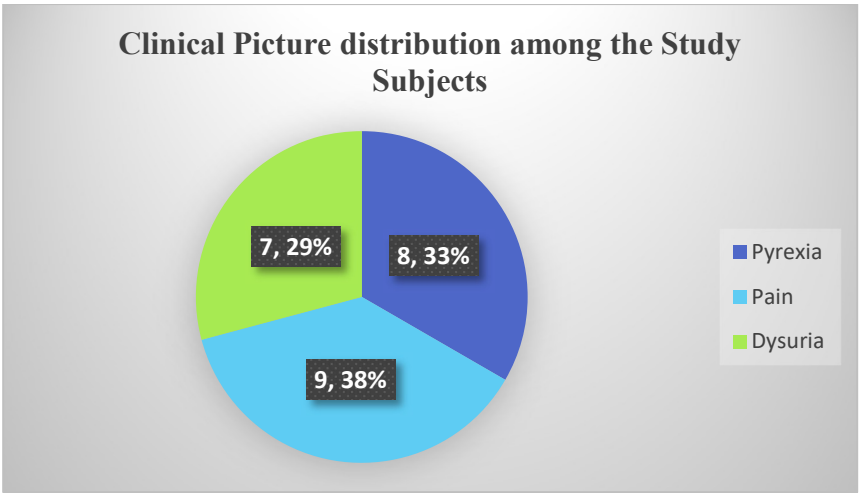

Figure 2: Clinical Picture Distribution among the Study Subjects

Table 3: Prognostic Factors in the Patients with Pyelonephritis

S. No.	Prognostic Factors	No. of Subjects
1	Type-II Diabetes Mellitus	10
2	Shock	2
3	Sepsis	7
4	Disseminated Intravascular Coagulation	2

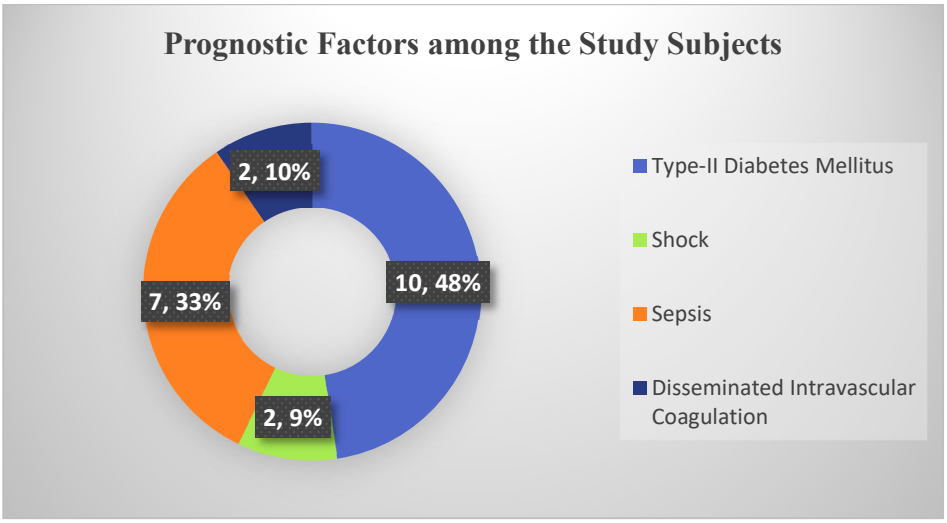

Figure 3: Prognostic Factors in the Patients with Pyelonephritis

Table 4: Surgical Interventions Performed on the Study Subjects

S. No.	Surgical Interventions undergone	No. of Study Subjects (n=10)
1	Percutaneous Nephrostomy	1
2	Double J Stent	8
3	None	1

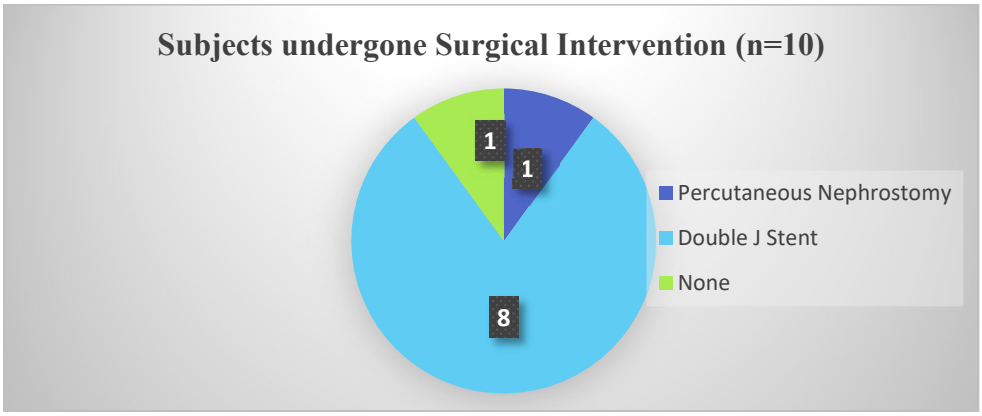

Figure 4: Surgical Interventions Performed on the Study Subjects

Table 5: Distribution of Organisms isolated among the Subjects

S. No.	Name of the Organism isolated	No. of Subjects
1	*E. coli*	2
2	*Klebsiella*	1
3	*Candida*	3
4	*Staphylococcus*	1
5	*Acinetobacter*	1
6	*Burkholderia cepacia*	1
7	None	1

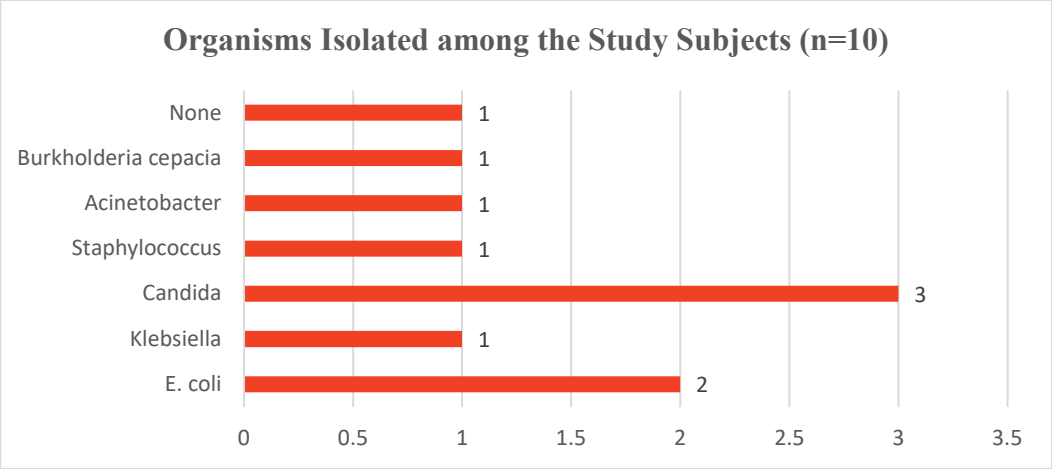

Figure 5: Distribution of Organisms isolated among the Subjects

Table 6: Different Antibiotics prescribed for the Patients with Pyelonephritis

S. No	Antibiotics Prescribed	No. of Patients (n=10)
1	Meropenem, Levofloxacin	3
2	Cefoperazone + Sulbactam, Levofloxacin	1
3	Piperacillin + Tazobactam, Levofloxacin	1
4	Ertapenem, Tigecycline	1
5	Meropenem, Prulifloxacin	2
6	Ceforperazone + Sulbactam, Prulifloxacin	1
7	Piperacillin + Tazobactam	1

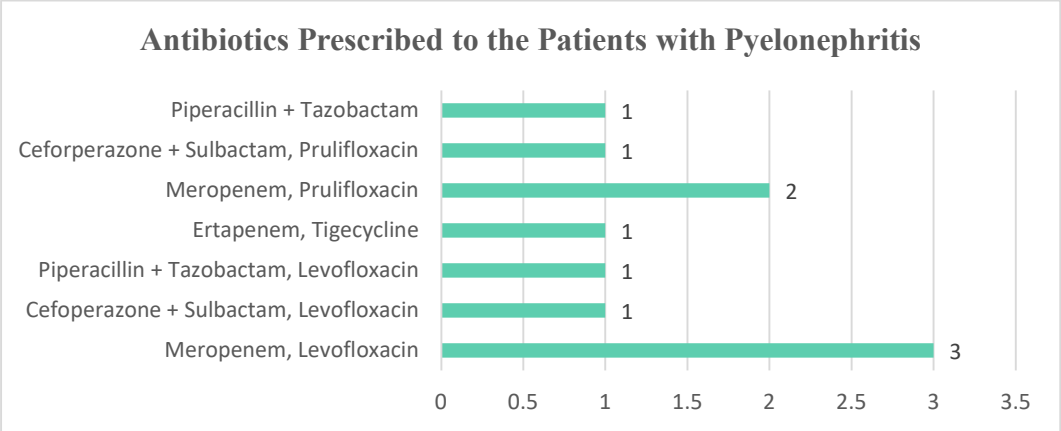

Figure 6: Different Antibiotics prescribed for the Patients with Pyelonephritis

Table 7: Comparison of Serum Creatinine Levels at admission and after 3 months

S. No	Case Details	Serum Creatinine (First Reading)	Serum Creatinine (After 3 Months)
1	Case 1	0.7 mg/dL	0.6 mg/dL
2	Case 2	1.1 mg/dL	1.0 mg/Dl
3	Case 3	0.6 mg/dL	0.6 mg/dL
4	Case 4	2.8 mg/dL	0 mg/dL
5	Case 5	5.2 mg/dL	3.3 mg/dL
6	Case 6	3.7 mg/dL	2.6 mg/dL
7	Case 7	0.6 mg/dL	0.6 mg/dL
8	Case 8	5.3 mg/dL	2.7 mg/dL
9	Case 9	2.0 mg/dL	1.7 mg/Dl
10	Case 10	7.3 mg/dL	5.5 mg/Dl

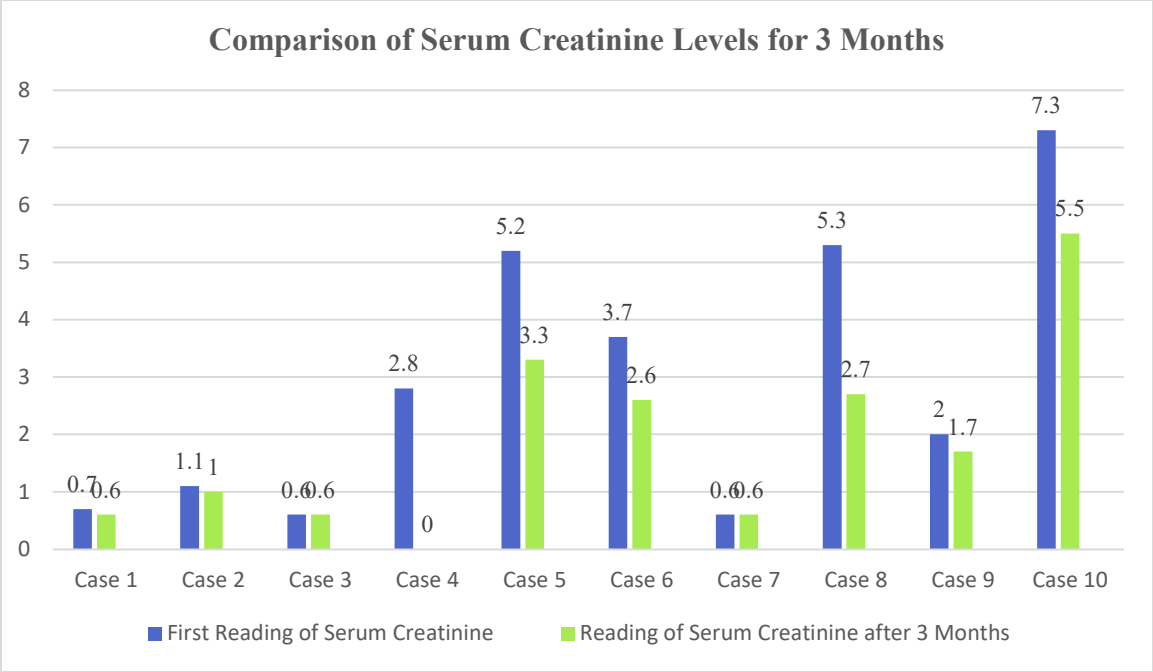

Figure 7: Comparison of Serum Creatinine Levels at admission and after 3 months

Table 8: Details of the Patients with the Hospital stay & number of days of IV Antibiotic Therapy

S. No.	Age of the Study Subjects	Type of Pyelonephritis (Kidney Involvement)	No. of days of Hospital Stay	Number of days of IV Antibiotic Therapy
1	55 Years	Right	5 Days	5 Days
2	59 Years	Right	13 Days	13 Days
3	54 Years	Bilateral	4 Days	4 Days
4	65 Years	Right	7 Days	6 Days
5	47 Years	Bilateral	11Days	10 Days
6	34 Years	Bilateral	5 Days	4 Days
7	50 Years	Left	6 Days	6 Days
8	65 Years	Emphysematous	5 Days	4 Days
9	58 Years	Bilateral	3 Days	3 Days
10	53 Years	Bilateral	8 Days	5 Days

Our study's key conclusions are that serum creatinine levels greater than 5 mg/dL, shock, and DIC all independently predict poor prognosis and that the disease's overall mortality rate of 10% is substantially lower than previously thought. Our study reveals that the condition primarily affected people in the age range (52.0 ± 8.628 Years) and had a similar incidence in men (50% and women, respectively). Our data on gender is in contrast to other studies' findings that the disease primarily affects females. According to other records from the Indian subcontinent, the average age of ailment is significantly younger (54.4_± 20.6 Years) than it is in Western data (60 years).

This may be due to the Indian ethnic population's rising prevalence of diabetes mellitus, the most significant risk factor for

developing pyelonephritis, which manifests at a much younger age.

The patient profiles for those who were admitted with pyelonephritis are shown in the **Table 9**. There were five female patients with a mean age of 55.2 ± 3.563 years and five male patients with a mean age of 49.04 ± 11.366 years.

Table 9: Complete Case Variables of the Patients with Pyelonephritis (n=10)

Age	Type-II DM	Sepsis	Shock	DIC	Pain	Pyrexia	Dysuria	Organism
55F	Yes	Yes	No	No	Yes	Yes	Yes	Candida
59F	Yes	No	No	Yes	Yes	Yes	No	Candida
54F	Yes	No	No	Yes	Yes	Yes	No	Acinetobacter
65M	Yes	No	No	No	Yes	No	Yes	Klebsiella
47M	Yes	Yes	No	No	Yes	Yes	Yes	Staphylococcus
34M	Yes	Yes	Yes	No	No	Yes	No	None
50F	Yes	Yes	No	No	Yes	Yes	Yes	Candida
65M	Yes	Yes	Yes	No	Yes	No	Yes	*E. coli*
58F	Yes	Yes	No	No	Yes	Yes	Yes	*E. coli*
53M	Yes	Yes	No	No	Yes	Yes	Yes	Burkholderiacepacia

Age	Antibiotics Prescribed	Surgical Intervention	RRT	Admitting SCr	Stay Days	eGFR at Admission
55F	Piperacillin + Tazobactam	PCN	No	0.7 mg/dL	5	102.6 ml/min
59F	Levofloxacin	None	No	1.1 mg/dL	13	54.9 ml/min
54F	Meropenem. Levofloxacin	DJ Stent	No	0.6 mg/dL	4	103.3 ml/min
65M	Meropenem	DJ Stent	No	2.8 mg/dL	7	22.6 ml/min
47M	Meropenem	DJ Stent	No	5.2 mg/dL	11	13.4 ml/min
34M	Meropenem	DJ Stent	No	3.7 mg/dL	5	20.1 ml/min
50F	Meropenem, Levofloxacin	DJ Stent	No	0.6 mg/dL	6	106.3 ml/min
65M	Cefoperazone, Sulbactam, Prulifloxacin	DJ Stent	No	5.3 mg/dL	5	11 ml/min
58F	Ertapenem, Tigecycline	DJ Stent	No	2 mg/dL	3	26.8 ml/min
53M	Piperacillin + Tazobactam, Tigecycline	DJ Stent	Yes	7.3 mg/dL	8	7.7 ml/min

It is also interesting that, despite the fact that 10 out of 10 individuals were known to have diabetes, three of them had poorly regulated blood sugar levels when they were admitted. According to a number of earlier case series, diabetes is the underlying diagnosis in 80–100% of cases.

The other prevalent risk factor for the condition, urinary tract blockage, has been observed in 58–60% of cases. In 50% of our cases, we discovered renal calculi or a co-existing blockage.

Both diabetics and non-diabetics have been known to develop pyelonephritis, and the condition has been successfully treated with conservative measures. The therapy for all instances included aggressive hydration, IV antibiotics, and renal support. DJ stenting was used in eight (80%) patients, while percutaneous nephrostomy was used in one case.

The most frequently reported symptoms included Lower Abdominal discomfort (9/10; 90%), fever (8/10; 80%),

and dysuria (7/10; 70%). Huang et al. found that fever (79%) and flank pain (71%) were the most prevalent symptoms in their study of 48 EPN patients.

In their series of 21 patients, Tang et al. noted the same thing. In our research, 9 out of 10 (90%) patients reported experiencing loin pain or tenderness. Although there have been a variety of symptoms recorded, soreness in the loin area is usually provoked.

E. coli was shown to be the cause of 65.6% of EPN cases in a thorough assessment of published data, followed by Klebsiella in 19.5% of cases and mixed organisms in 10%. Our findings show the opposite. *E. coli* 2/10 (20%), Klebsiella 1/10 (10%), Candida 3/10 (30%), Staphylococcus 1/10 (10%), Acinetobacter 1/10 (10%), and Burkholderiacepacia 1/10(10%) were all present in two instances each.

Acinetobacter was isolated from one patient who had renal/ureteric calculi, whereas *E. coli* and Burkholderia were isolated from another patient.

None of the patients in our study needed renal replacement treatment since their eGFRs at presentation placed them in stages I through V of CKD.

In contrast to other reports, our series' overall mortality rate was substantially lower at 10%. Since percutaneous drainage/DJ stenting has become widely used, there has been a decline in mortality during the past ten years.

The likelihood of bacteremia being controlled early is increased by the availability of potent medicines against extended-spectrum beta-lactamase-producing pathogens. Most of our patients were treated with fourth-generation cephalosporins and carbapenems, two classes of extended-spectrum antibiotics that are highly effective against coliforms. We believe that in order to effectively treat the disease, it must first be identified early.

Seven out of ten (70%) of our cases had sepsis. Sepsis has never been studied or characterized as an independent prognostic factor in any of the previously published big series. Three of our cases (30%) had thrombocytopenia. It has also been noted that having thrombocytopenia at admission of less than 1, 20, 000 cells/cu.mm is a separate prognostic indicator in the past. In 2/10 (20%) of the instances, shock was evident. 40 percent of cases (4 out of 10) had hypotension. Once more, serum creatinine [>5.0 mg/dL] was linked to death. Our findings are consistent with those of other studies in which serum creatinine was identified as a distinct predictive factor.

In two of the ten instances in which DJ stenting was performed, DIC was a standalone risk with a bad prognosis. Our study was further limited by the fact that it was a retrospective analysis and that there weren't enough cases to properly examine the other risk factors. Additionally, statistical discrepancies in relation to the other risk factors may have been explained by this. We are aware that a 6-month follow-up period is not very long, but we believe that it still provides us with a general idea of how the disease is progressing.

CONCLUSION:

Males and females with diabetes are disproportionately affected by pyelonephritis, however, this is not always the case. Even though coliforms are the most typical organisms that cause the sickness, EPN can also be brought on by uncommon bacteria. With a mild version of the condition, early and aggressive hydration along with the proper IV extended-spectrum antibiotics is the preferred course of treatment. In advanced stages, percutaneous drainage (and, if necessary, nephrectomy) should be carried out. With the most recent dialysis technologies, it's crucial to start kidney support early.

All the sick males and females with Diabetes and Kidney Complications should have the disease suspected and evaluated. The importance of early disease detection and adequate treatment with a combination of medicinal and surgical therapy cannot be overstated. Additional, larger trials that are prospective are required.

CONFLICT OF INTEREST: On behalf of all authors, the corresponding author states that there is no conflict of interest.

REFERENCES:

[1] Acute Pyelonephritis – Correlation of Clinical Parameter with Radiological Imaging Abnormalities – Leelavathi Venkatesh and Emphysematous pyelonephritis: clinic pathological classification, management, Prognosis, and pathogenesis – J J Huang, C C Tseng

[2] Nandakumar V. A Prospective study of Clinical Profile of Emphysematous Pyelonephritis in Type 2 Diabetes Mellitus (Doctoral dissertation, Kilpauk Medical College, Chennai).

[3] Gupta K, Hooton TM, Naber KG, Wullt B, Colgan R, Miller LG; et al. (2011). "International clinical practice guidelines for the treatment of acute uncomplicated cystitis and pyelonephritis in women: A 2010 update by the Infectious Diseases Society of America and the European

Society for Microbiology and Infectious Diseases". Clin Infect Dis.

[4] Mohsin N, Budruddin M, Lala S, Al-Taie S. Emphysematous pyelonephritis: a case report series of four patients with review of literature. Renal failure. 2009 Jan 1;31(7):597-601.

[5] Arsene C, Saste A, Arul S, Mestrovich J, Kammo R, Elbashir M, Berger G. A case series of emphysematous pyelonephritis. Case Reports in Medicine. 2014 Apr 9;2014.

[6] Huang JJ, Tseng CC. Emphysematous pyelonephritis: clinicoradiological classification, management, prognosis, and pathogenesis. Archives of internal medicine. 2000 Mar 27;160(6):797-805.

[7] Al-Geizawi SM, Farney AC, Rogers J, Assimos D, Requarth JA, Doares W, Winfrey S, Stratta RJ. Renal allograft failure due to emphysematous pyelonephritis: successful non-operative management and proposed new classification scheme based on literature review. Transplant Infectious Disease. 2010 Dec;12(6):543-50.

[8] Fatima R, Jha R, Muthukrishnan J, Gude D, Nath V, Shekhar S, Narayan G, Sinha S, Mandal SN, Rao BS, Ramsubbarayudu B. Emphysematous pyelonephritis: A single center study. Indian Journal of Nephrology. 2013 Mar;23(2):119.

[9] Khaira A, Gupta A, Rana DS, Gupta A, Bhalla A, Khullar D. Retrospective analysis of clinical profile prognostic factors and outcomes of 19 patients of emphysematous pyelonephritis. International urology and nephrology. 2009 Dec;41:959-66.

[10] Ahmad M. Emphysematous pyelonephritis due to Aspergillus fumigatus: a case report. Journal of Nephrology. 2004 May 1;17(3):446-8.

[11] Prognosticystem and risk stratification in patients with emphysematous Pyelonephritis: an 11-year prospective study at a tertiary referral center. – KrishnamoorthyS, Zumla A, Sekar H, Muneer A, Thiruvengadam G, Kumaresan N.

[12] Emphysematous pyelonephritis: clinical characteristics and prognostic factors. – Lu YC, Chiang BJ, Pong YH, Chen CH, Pu YS, Hsueh PR, Huang CY.

[13] Diagnosistment for emphysematous pyelonephritis: analysis of 14 cases from a Single center. – Yu SC, Xu ZH, Zhang C, Zhu SB, Ding GQ, Li GH.

[14] Emphysematous pyelonephritis. Epidemiological, clinical, biological, bacteriological, Radiological, therapeutic and prognostic features. Retrospective study of 30 cases – Cherif M, Kerkeni W, Bouzouita A, Selmi MS, Derouiche A, Ben Slama MR, Chebil M.

[15] Fujita S, Watanabe J, Reed AI, Hemming AW, Solis D, Netzel TC, Banull K, Schain DC, Howard RJ. Case of emphysematous pyelonephritis in a renal allograft. Clinical transplantation. 2005 Aug;19(4):559-62.

[16] Modi P, Goel R, Dodia S. Scrotal extension of emphysematous pyelonephritis. International Urology and Nephrology. 2007 Jun;39(2):405-7.

[17] Al-Geizawi SM, Farney AC, Rogers J, Assimos D, Requarth JA, Doares W, Winfrey S, Stratta RJ. Renal allograft failure due to emphysematous pyelonephritis: successful non-operative management and proposed new classification scheme based on literature review. Transplant Infectious Disease. 2010 Dec;12(6):543-50.