Fate of Emphysematous Pyelonephritis: A Single Center Study

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ABSTRACT

Background: Emphysematous Pyelonephritis (EPN) is a Urological emergency. It is a gas forming infection of the renal parenchyma and also involves the perirenal fat. It affects persons having Diabetes Mellitus specifically females.

Objectives: To present clinical features, and compare abnormal laboratory investigations among poor and good outcome in patients affected by emphysematous pyelonephritis.

Materials and methods: This retrospective study was conducted in Institute of Kidney Diseases Hayatabad Peshawar on records of 50 patients affected by EPN. Patients having age from 35 to 85 years, clinical feature of upper urinary tract infections, and gas accumulation in renal parenchyma seen on computed tomography (CT) scan were included in the study. Age, sex, control of glucose status and abnormal laboratory investigations were recorded. Outcome was measured as poor or good. Data analysis was done in SPSS version 22.

Results: The mean age was 63.1±11.48 years and 62% were females. The clinical features in patients with EPN was fever (n=37, 74%) Flank, abdomen, or back pain (n=34, 68%). Urine analysis showed that pyuria was common (n=35, 70%) followed by severe proteinuria (n=31, 62%). Macrohematuria was found in 19(38%), thrombocytopenia in 24(48%) and leukocytosis in 28(56%) patients. In 35(70%) patients HbA1C was > 8% of which 6(12%) died (P=.021). In 32(64%) the outcome was good.

Conclusion: Emphysematous Pyelonephritis affects females more than males. Most common abnormal laboratory findings are leukocytosis, thrombocytopenia and HbAIC > 8%. EPN is a fatal disease so quick management is required.

Keywords: Emphysematous Pyelonephritis, Diabetes Mellitus, Pyuria, Proteinuria, Macrohematuria.

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INTRODUCTION

Emphysematous pyelonephritis (EPN) is a disease in which there is gas in the renal parenchyma, collecting system or peri-nephric tissues leading to acute severe necrotizing infection.[1] In 80 to 96% of cases affected by EPN diabetes mellitus is present, and in 22 to 66% hydronephrosis associated with urinary tract obstruction is found.[2, 3] Nonetheless EPN can be associated with kidney stones and neoplasms in those cases who are immuno-compromised.[4] Emphysematous pyelonephritis affecting more females than males with female to male ratio of 3:1.[5]

The common clinical features in patients with EPN are fever with chilling, abdominal or flank pain, nausea, vomiting, dyspnea, acute renal impairment, altered sensorium, shock, and thrombocytopenia.[6] Diagnosis of EPN involves proper history, examination and laboratory investigations. Ultrasound, plain radiograph and CT scan.[7] The diagnostic sensitivity for EPN with plain radiograph is 65%, ultrasound is 69%, and CT scan is 100%.[8] On CT scan the findings for EPN are the enlargement and destruction of renal parenchyma, presence of gas in renal parenchyma, collection of fluid and necrotic foci or abscesses.[9] It shows that computed tomography is of great importance and has great contribution in the diagnosis of EPN.[10]

Management of EPN spreads over a wide spectrum. The most conservative approach of managing EPN is resuscitation vigorously, treatment with antibiotic and good control of glycemic level. The invasive approaches involved urinary drainage by percutaneous nephrostomy (PCN) and nephrectomy in cases not responding to conservative treatment.[11]

Very little literature is available on clinical features, and treatment outcome of EPN in our province KPK, Pakistan. Ali et al.[12] reported only a review of 6 cases affected with emphysematous pyelonephritis. Our study is relatively of large sample size of 50 cases which can provide detailed statistics for clinicians. Institute of Kidney Disease is major renal health facility with expert clinicians in our province so this study will give detailed insights to other renal health providers.

The aim of our study is to present clinical features, abnormal laboratory investigations and compare abnormal laboratory investigations among poor and good outcome in patients affected by EPN.

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MATERIAL AND METHODS

This retrospective study was conducted on records of 50 patients affected by EPN admitted in the Department of Urology IKD, Hayatabad, Peshawar from 1st January 2017 to 30th June 2020. Written approval was taken from the hospital ethical review committee with diary no 609/Urol/IKD dated 13/10/2020.

The inclusion criteria was age range from 35 to 85 years, clinical feature of upper urinary tract infections (fever, positive urine culture, pus discharge in urine without recognized infections foci), and gas accumulation in renal parenchyma, or perinephric or pararenal space seen on CT scan. The exclusion criteria was the presence of fistula between bowel and urinary tract, history of recent trauma, recent urinary catheter insertion or drainage.

Age, sex, control of glucose status, shock, and urinary obstruction was recorded. Glucose status control was assessed by glycosylated hemoglobin level (HbA1C). HbA1C > 8% was considered poor diabetic control.[3] Leukocytosis (>12 × 10^9/L white blood cells count), thrombocytopenia (<120 × 10^9/L platelet count), macrohematuria (RBCS in urine >100 per high power field), Severe proteinuria (urinary proteins >3g/L on 2 occasions) were recorded.

CT scan of abdomen was taken for all participants. Percutaneous nephrostomy drainage (PCN) was inserted into renal or extra renal lesion under Ultrasound guidance. PCN was labeled failed if there was a progressive or persistent lesion with clinical manifestations of shock or prolonged fever after procedure.

We divided the outcome into two groups; “good” and “poor”. Good outcome was assigned to those cases that were managed successfully only with antibiotics or PCN drainage combined with antibiotics while poor outcome was assigned to those whose PCN was unsuccessful and ended with nephrectomy or mortality.

Data analysis was done in SPSS version 22. Descriptive statistics were calculated as mean ± SD for continuous variables like age and percentages for categorical variables like gender, clinical features, urine analysis and laboratory investigations. Fisher's Exact Test under two tailed hypothesis was applied to compare laboratory investigations among outcome (survived or died and good or poor). P=0.05 was considered as significant.

RESULTS

Of total 50 cases 31(62%) were females and 19(38%) were males. The mean age was 63.1±11.48 years with age ranged from 35 to 85 years. The most common clinical feature in patients with emphysematous pyelonephritis was fever (n=37, 74%) followed by Flank, abdomen, or back pain (n=34, 68%). Dyspnea was found in 7(14%), nausea or vomiting in 11(22%) and shock in 22(44%) cases. Urine analysis of patients with emphysematous pyelonephritis showed that pyuria was common (n=35, 70%) followed by severe proteinuria (n=31, 62%). Macrohematuria was found in 19(38%) patients. Laboratory investigations showed that 24(48%) patients were affected by thrombocytopenia and 28(56%) by leukocytosis. In 35(70%) patients HbA1C was greater than 8%.

In 32(64%) cases the outcome was good while in 18(36%) the outcome was poor. Of total 44(88%) survived while 6(12%) patients with emphysematous pyelonephritis died.(Table 01)

Table 1. Frequency of outcome and survival in patients with EPN.

		Frequency	Percent (%)
Outcome	Good	32	64.0
	Poor	18	36.0
Survival	Survival	44	88
	Mortality	6	12

HbA1C was statistically more than 8% in those who died due to emphysematous pyelonephritis than those who survived but the results were not statistically significant (P=.087). Urinary tract obstruction was also not statically different between the two outcome for survival (P=0.971). (Table 02).

Table 2. Comparison of laboratory investigations among outcome for survival

		Outcome for Survival		P-value*
		Survival	Mortality	
		n(%)	n(%)	
Glycosylated hemoglobin A1C >0.08	Yes	29 (82.9)	6(17.1)	.087
	No	15 (100)	0(0)	
Urinary tract obstruction	Yes	15(88.2)	2(11.8)	.971
	No	29(87.9)	4(12.1)	

*Fisher's Exact Test

Similarly only HbA1C more than 8% was statistically significant in patients with poor than good outcome (P=0.005). Urinary tract obstruction was not statically different between the two outcomes (P>0.05). (Table 03)

Table 3.
Comparison of laboratory investigations among good and poor outcome affected by EPN

		Outcome		P-value*
		Good	Poor	
Glycosylated hemoglobin A1C >0.08	Yes	18 (51.4)	17(48.6)	.005
	No	14 (93.3)	1(6.7)	
Urinary tract obstruction	Yes	12(70.6)	5(29.4)	.548
	No	20(60.6)	13(39.4)	

DISCUSSION

The current study was aimed to present clinical features, abnormal laboratory investigations and compare abnormal laboratory investigations among poor and good outcome in patients affected by EPN. The baseline features of patients with emphysematous pyelonephritis at initial presentation were fever, flank, abdomen, or back pain, dyspnea, nausea, vomiting, and shock. On urine analysis pyuria, severe proteinuria and macrohematuria was present. Laboratory investigations showed that leukocytosis, thrombocytopenia and HbA1C greater than 8% was found. In 36% the outcome was poor in which percutaneous nephrostomy (PCN) drainage was unsuccessful and end with nephrectomy or patient died. Similarly HbA1C more than 8% was not statistically more in those who died due to emphysematous pyelonephritis than those who survived (P=.087).

Our results showed that females were more affected by EPN than males. This can be due to more occurrences of urinary tract infection and ultimately urinary tract obstruction in females. Similar results were found in previous studies.[5,13,15] Ideguchi et al.[5] reported that emphysematous pyelonephritis affecting more females than males with female to male ratio of 3:1. Thomas et al.[13] reviewed literature of 135 cases and found that

64% females were more affected by EPN. Other studies conducted in India on EPN reported that 62% and 59% were female.[7,14]

Our findings showed that mean age was 63.1±11.48 years with age ranging from 35 to 85 years. Huang et al.[3] published a large sample size study on 48 cases affected by EPN and reported that mean age was 60 years with range of 37 to 83 years. Another retrospective review of 10 cases affected with EPN reported that mean age was 59.8 years and age range was 47 to 84 years.[13] These results are in consistent with our findings.

Our results revealed that fever (74%) was most common features followed by flank, abdomen, or back pain (68%). In 44% cases shock was present. A study conducted on EPN in Indian population on 74 cases in which 62 were respondent reported that the common feature was fever followed by abdominal and flank pain.[7] Huang et al.[3] conducted a study on 48 cases with EPN in Taiwan and reported that fever (79%) was most common features followed by flank, abdomen, or back pain (71%). Shock was present in 29% cases. Aboumarzouk et al.[16] applied Cochrane guidelines to systematically review studies published from 1980 to 2013. Their results showed that fever were present in 74.7% and flank pain in 70.4% and shock in 54.4% cases. These results are closure to our study.

The urine analysis of patients with EPN in our sample showed that pyuria was present in 70%, severe proteinuria in 62%, and macrohematuriain 38%. In Haung et al. [3] study the pyuria was present in 79%, severe proteinuria in 21%, and macrohematuria in 13%. The difference can be due to laboratory standard values, reagents used and patients variability.

The current study showed that in 36% the outcome was poor in which percutaneous nephrostomy (PCN) drainage was unsuccessful and ended with nephrectomy or patient died. Huang et al.[3] used same operational definition of 'poor outcome' and reported that poor outcome was present in 34.47%. Another study conducted in India reported that out of total 26 cases with EPN, 3(11.5%) had poor outcome (2 PCN unsuccessful and 1 died).[17] The difference in results can be due to difference in disease severity, provided health care facilities, genetic and ethnic variability.

We compared two parameter between good and poor outcome; Glycosylated hemoglobin A1C more than 8% and urinary tract obstruction. None of the results were statistically significant. Haung et al. [3] made such type of comparison and reported that there was no statistical difference for any of these parameters. These results are similar to our study.

In our study the mortality rate was 12% i.e. 6 cases died out of 50 patients. Aboumarzouk et al.[16] conducted a systematic review in 2014 on studies published from 1980 to 2013 and finally included 32 studies in their qualitative analysis. Their results showed that combined mortality rate was 18%. So our mortality rate is lower than international studies. Recently a small sample size study was conducted on 20 cases with EPN in Karachi by Irfaan et al.[18] reported zero percent mortality in EPN cases. Their results also showed that most of the patients were managed with conservative therapy. The difference can be due to the fact that in our center most of the patients are in end stage of the disease and referred later from secondary and primary care center so our mortality rate can be higher.

CONCLUSION

EPN affects females more than males. Most common abnormal laboratory findings are leukocytosis, thrombocytopenia and HbAIC > 8%. EPN is a fatal disease so quick management is required.

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DATA SHARING STATEMENT: The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under

Naeem M, Khan RA:	Concept and design of study, Collection of data, statistical analysis
Shah G:	Writing of manuscript, critical review of manuscript
Shamsher A:	Analysis and interpretation of data, statistical analysis
Gul B:	Data collection, bibliography

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.