



A one year prospective study of the patterns and outcomes of acute kidney injury subjected to renal replacement therapy

Tarek Z Elbaz⁽¹⁾, Al-Sayed M Rashed⁽¹⁾, Abdullah M. Zahra⁽¹⁾
and Mohamed A. Shazly⁽²⁾

Departments of Internal Medicine (Nephrology Division)¹ and Radiodiagnosis²,
Al-Hussein University Hospital, Faculty of Medicine, Al-Azhar University, Cairo, Egypt.

Correspondence: Alsayed M Rashed, MD Lecturer of Nephrology, Al-Azhar University, Cairo, Egypt.
E-mail: drsayedaswad@gmail.com, Mobile: (002) 01003360943, Fax: (002) 24774546.

Abstract

Background: End stage renal disease (ESRD) is a devastating medical, social and economic problem in the community and needs dedicated supervision and health care. Mortality rate depends upon age, gender, race, cause of ESRD, modality of treatment and its complications besides unknown reasons. **Aim of the study:** The aim of this study was to study the patterns and outcomes of acute kidney injury (AKI) in emergency haemodialysis unit, at Al-Hussien university hospital over 1 year in order to define different aetiologies of renal diseases. **Patients and methods:** Two hundred twenty patients were attended emergency haemodialysis unit for urgent haemodialysis according to clinical and laboratory indications for haemodialysis, AKI was defined according to AKIN classification. All these patients were subjected to complete medical and surgical history, physical examination, all lab chemistry were done, hepatitis B, C and HIV antibodies, and for glomerulonephritis: 24 hrs urinary protein, immunological serology for systemic lupus especially antinuclear antibody (ANA) and antidouble stranded DNA (Anti-DS). Lastly renal biopsy for indicated cases. **Results:** Mean age of studied patients was 50.009 ± 14.931 , males forming 52.73%, hypertension was present in about 52.27% of studied cases, while diabetes mellitus was present in 27.27% of cases. Renal biopsy was done for 14.09% of cases from these cases focal segmental glomerulosclerosis represent 25.806% of biopsied cases, resolved cases of AKI represent 20.45% of cases and the recorded mortality was 20% of cases (44 patients), the mortalities were associated with the more complex aetiologies of AKI such as sepsis and postcardiac surgery complications. **In conclusion:** AKI remains a significant cause of morbidity and mortality especially in critically, ill patients, so prospective strategies and early referral to nephrologists are important to decrease the risk of AKIs and subsequent decrease in CKD patients.

Keywords: Patterns, outcomes, AKI.

Introduction

Kidney diseases leading to ESRD have many causes; the prevalence varies by country, region, ethnicity, gender and age. Due to lack of national renal registry system, there is information on the prevalence rate, clinical and laboratory features of renal diseases in Egypt. Socioeconomic, geographical and genetic factors play important roles in determining the prevalence and pattern of renal diseases in each part of the world. There is no

doubt that local conditions in Egypt such as poverty, malnutrition, poor hygienic conditions and high rate of consanguinity play a major role in the development of several renal diseases⁽¹⁾.

AKI is a common health problem worldwide; AKI remains a significant cause of morbidity and mortality worldwide. The mortality rate is 40-50% in general and

70-80% in intensive care (ICU) settings. Approximately 95% of consultations to nephrologists are related to AKI (2).

Even though, AKI can be a reversible condition, it carries a high mortality rate. The main cause of AKI are commonly categorized in prerenal, intrinsic and postrenal(3).

Aim of the work

The aim of this study was to study the patterns and outcomes of AKI in Emergency Haemodialysis Unit at Al-Hussien University Hospital over a period of 1 year..

Patients and Methods

The present is a prospective study of all patients who presented to EmergencyHaemodialysis Unit in Al-Hussien University Hospital with AKI, to receive haemodialysis as a form of renal replacement therapy, over a period of one year; all studied patients were subjected to the following: complete medical, surgical history and physical examination.

Thorough history taking for predisposing factors, age, gender, diabetes mellitus, hypertension, obesity, previous nephrology care and/or renal replacement therapy (either dialysis or renal transplantation), nephrotoxic drugs, exposure to contrast medical history of stones or repeated UII, history of major surgery, associated hepatitis B, C or HIV infection or autoimmune disease, cardiovascular diseases, liver diseases and vascular diseases. Complete physical examination for all patients especially for blood pressure (BP), cardiac, chest examination for clinical signs of overloaded patients (elevated jugular venous pressure bilateral basal crackles, bilateral lower limb edema) and other physical signs of any associated diseases.

Venous blood samplings were withdrawn for serum creatinine, blood urea, serum sodium (s. Na) , serum potassium (s. K⁺), serum calcium (s. Ca), serum phosphorous (s. phosph), serum uric acid, complete blood count (CBC) urine analysis, random blood sugar, hepatitis B surface antigen (HBs Ag), hepatitis C antibody (HCV Abs), human immunodeficiency virus antibody (HIV abs) by ELIZA.For patients suspected to have glomerulonephritis presented with lower limb edema, presence of active urinary sediment or albuminuria. Autoimmune serology e.g., antinuclear antibody (ANA) and anti double stranded DNA (AntiDs DNA), also abdomino pelvic ultrasound (Abdpelvic U/S) to determine kidney size, echogenicity, corticomedullary differentiation, parenchymal thickness and any back pressure changes. Lastly, renal biopsy was done for indicated cases after given informed consent from each patient.

Statistical analysis

The collected data were organized, tabulated and statistically analyzed using statistical package for social science (SPSS) for Windows, version 16 [SPSS inc., USA]. Numerical data were expressed as relative frequency and percentage; *t* test was used to compare 2 independent groups of numerical data. Chi square test was used to compare categorical groups of data. A P value was considered to be non-significant if > 0.05, significant if 0.05 and highly significant if < 0.01.

Results

In the present study, the total number of patients was 220 who attended the acute haemodialysis unit at Al-Hussien University Hospital over a period of one year. Men age of studied patients was 50.009 ± 14.931 (9-88 years) most of cases were male forming 52.73%.

Hypertension was present in 52.2% of cases as shown in figure 1. While, DM was present in 27.27% of cases as shown in figure 2.

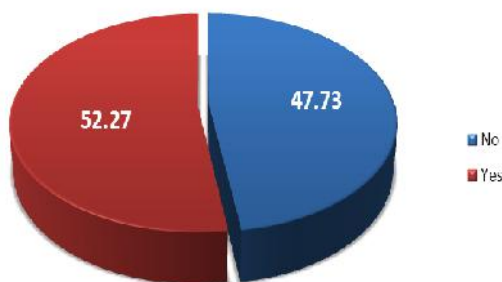


Figure (1): Prevalence of hypertension mellitus in all studied cases

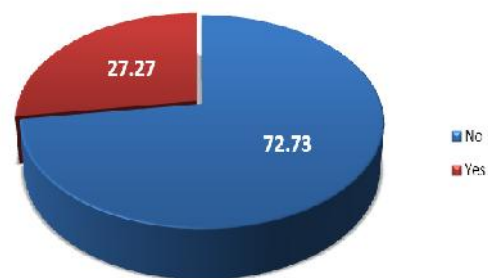


Figure (2): Prevalence of diabetes mellitus in all studied cases

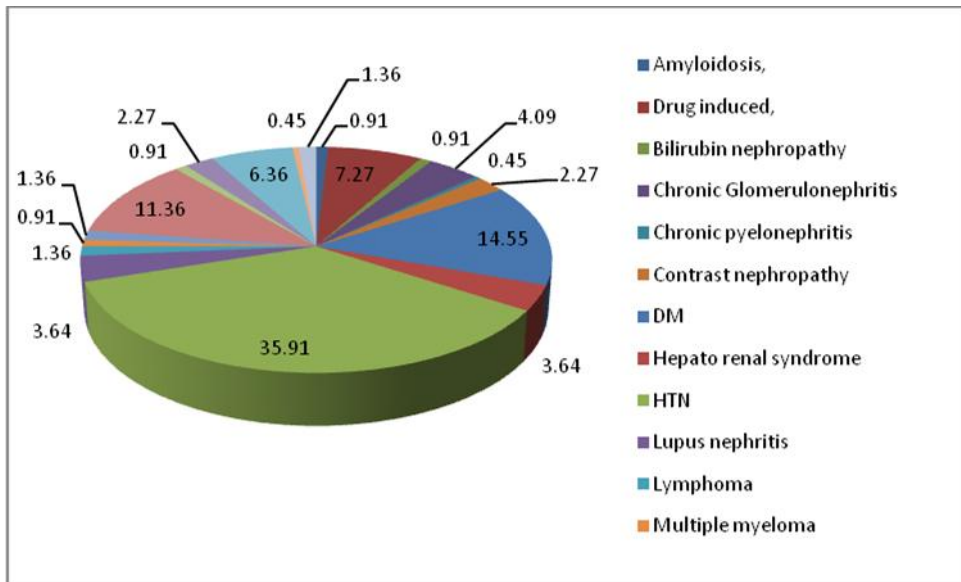


Figure (3): Classification of the cause of hemodialysis or association in all studied cases

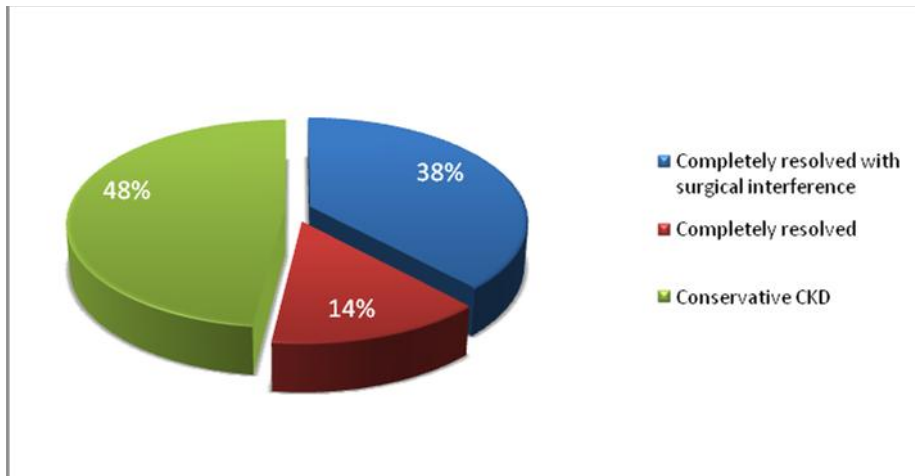


Figure (4): Classification of resolved AKI cases

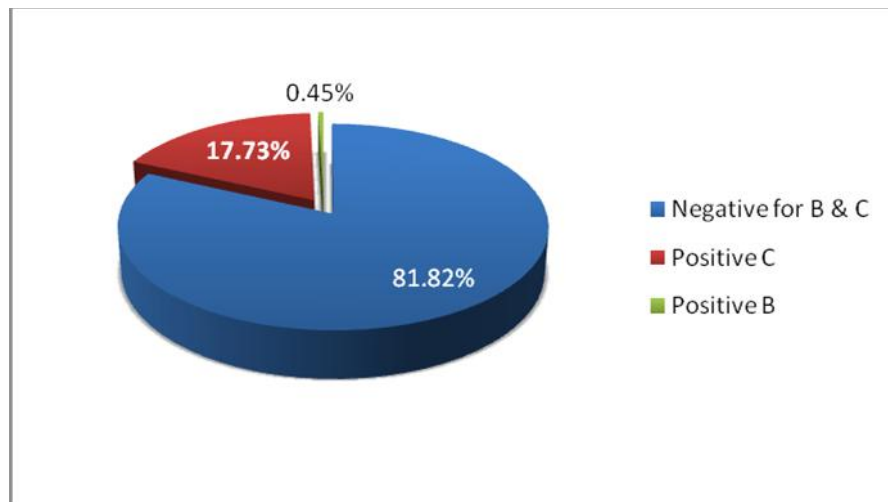


Figure (5): Prevalence of hepatitis B and C in all cases

Table (1): Causes of ICU admission with comparison as regarding clinical improvement

	Clinical improvement					
	Died		Improved		Total	
	N	%	N	%	N	%
Bleeding peptic ulcer	0	0.00	1	100.00	1	100.00
Dilated cardiomyopathy	3	75.00	1	25.00	4	100.00
Hypovolemic shock	2	66.67	1	33.33	3	100.00
Infective endocarditis	1	100.00	0	0.00	1	100.00
Lupus cerebritis	2	100.00	0	0.00	2	100.00
Massive postpartum bleeding	2	66.67	1	33.33	3	100.00
Post aortic valve replacement	1	100.00	0	0.00	1	100.00
Post CABG	2	100.00	0	0.00	2	100.00
Post traumatic bleeding	2	100.00	0	0.00	2	100.00
Pulmonary embolism with post arrest	2	66.67	1	33.33	3	100.00
Sepsis	8	80.00	2	20.00	10	100.00
Sepsis due to diabetic foot	3	75.00	1	25.00	4	100.00
Severe chest infection	3	75.00	1	25.00	4	100.00
Severe ante par turn bleeding	3	75.00	1	25.00	4	100.00
Total	34	77.27	10	22.73	44	100.00

Many causes for ICU admission were reported in the study (44 cases) most common was sepsis due to

different causes (14 patients). About 34 cases died, and 10 cases were improved 22.7% of ICU cases.

Table (2): Correlation between resolved AKIs and associated comorbidities of all cases

Co-morbidities	Resolved AKI						Chi-Square	
	Negative		Positive		Total			
	N	%	N	%				
%	N	%	N	%	X ²	P-value		
/"Negative	28	16.47	15	30.00	43	19.55	4.497	0.034*
Positive	142	83.53	35	70.00	177	80.45		
Total								
170	100.00	50	100.00	220	100.00			

Table (3): Correlation coefficient between mortality and other variables of the studied patients.

Mean ± SD	Mortality		T-Test	
	Alive	Died		
	Mean ± SD			
Mean ± SD	t	P-value		
Age(years)	50.697 ± 14.328	47.209 ± 17.065	1.375	0.170
Diastolic blood pressure (mmHg)	91.029 ± 14.226	82.500 ± 13.490	3.591	<0.001*
Systolic blood pressure (mmhg)	145.829 ± 22.489	131.818 ± 22.928	3.680	<0.001*
Hb(mg/dl)	8.575 ± 1.918	8.541 ± 2.152	0.103	0.918
WBCs(mg/dl)	9.091 ± 4.000	12.514 ± 7.866	-4.010	<0.001*
Blood Urea(mg/dl)	157.806 ± 42.879	153.068 ± 49.447	0.635	0.526
Creatinine(mg/dl)	10.291 ± 4.704	7.635 ± 3.408	3.483	0.001*
Na(mmol/l)	137.705 ± 7.871	135.273 ± 8.595	1.800	0.073
K(mg/dl)	5.327 ± 3.748	4.727 ± 0.881	1.052	0.294
Serum.Ca(mg/dl)	7.858 ± 1.164	7.827 ± 0.836	0.163	0.871
Phosphorous(mg/dl)	5.082 ± 1.057	4.584 ± 0.778	2.933	0.004*
Uric acid(mg/dl)	6.063 ± 3.268	5.611 ± 1.502	0.892	0.373
Albumin(mg/dl)	3.693 ± 0.648	3.302 ± 0.918	3.265	0.001*
Random blood sugar (mg/dl)	153.368 ± 82.580	145.068 ± 88.103	0.588	0.557
24hour urinary proteins(gm)	2.494 ± 1.746	3.615 ± 2.373	-1.986	0.051
Parathormone hormone (pg/ml)	265.848 ± 183.463	179.240 ± 148.224	2.230	0.027*
PH (mg/dl)	7.178 ± 0.120	7.166 ± 0.128	0.584	0.560

There was a significant correlation between diastolic blood pressure, systolic blood pressure and the dead cases (P < 0.001, P < 0.001) respectively. Also, there

was a significant correlation between white blood cells and dead cases (P < 0.001). It was higher in dead than in alive cases.

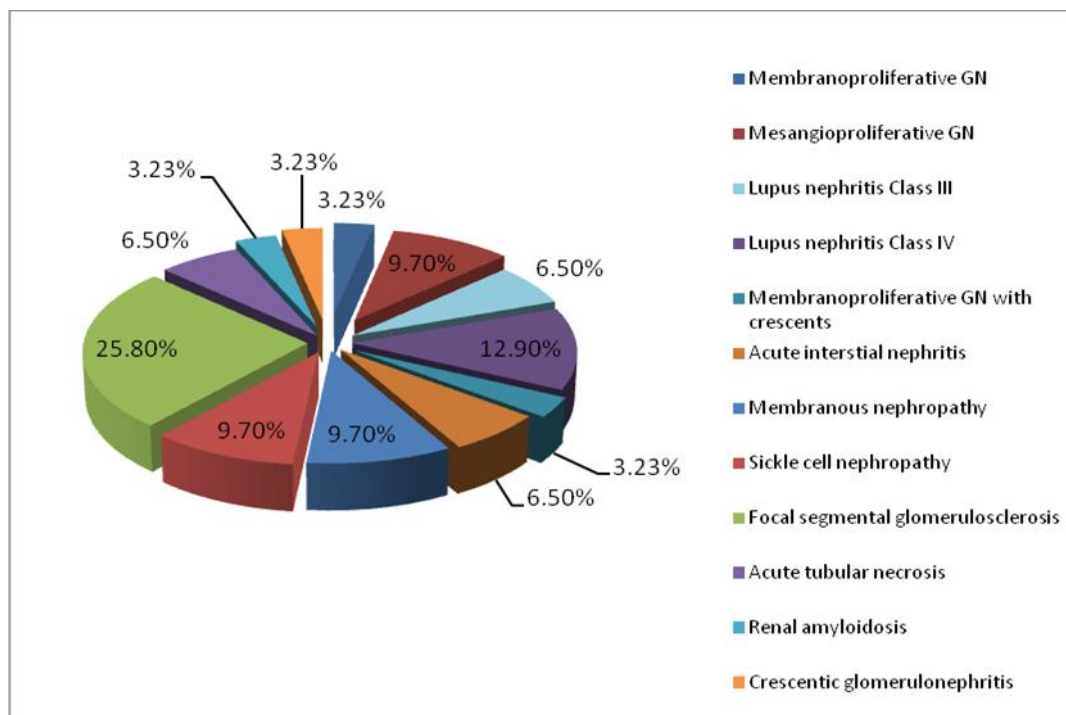


Figure (6): Histopathological aetiologies of biopsied cases

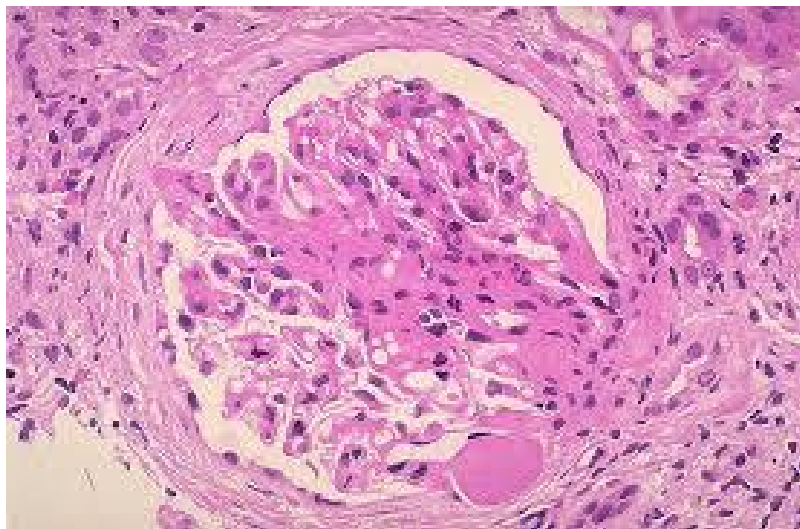


Figure (7): Aslide shows Focal segmental glomerulosclerosis

Discussion

Acute kidney injury (AKI) is characterized by a sudden impairment of kidney functions occurring over a period of hours to days ⁽⁴⁾.

In our study, we used the acute kidney injury network (AKIN) classification which is modified version of RIFLE classification; having additional benefits and limitations related to the modifications introduced to the RIFLE. But, in fact, the AKIN Classification compared with the RIFLE Classification did not exhibit a better prognostic acuity in terms of in hospital mortality, although it enabled the identification of more AKI patients ⁽⁵⁾.

Sepsis is the most frequent cause of AKI especially in intensive care units (ICUs) it reached up to 51% in patients with septic shock, the combination of AKI and sepsis are associated with more than 80% mortality ⁽⁶⁾.

In a one year study from August 2013 to July 2014 the total number of patients were 220, their mean age was (50.009 ± 14.931) years) most of the cases were males forming 52.73% of patients in the present study, we had 50 patients with AKI, representing 22.72% of patients, patients with CKD were presented with acute on top of chronic kidney disease representing 60.45% of our studied patients, and 25 patients with obstructive uropathy representing 11.36% of all patients.

Hypertension was the most common comorbid condition in our patients about 52.27%, this study was broadly similar to Ibrahim et al. which showed that hypertension is a major health problem in Egypt with a prevalence rate of 26.3% among adult population 25 years and its prevalence increases with age ⁽⁷⁾.

Diabetes mellitus (DM) in the present study comes next to hypertension, about 27.27% of patients were diabetics. The prevalence of T2 DM is rising at an alarming rate throughout the world, due to increase in life expectancy, obesity and sedentary life style ⁽⁸⁾.

Our study showed that DM is the second cause after hypertension as a cause of morbidity needing haemodialysis. These results could be explained by most of studied patients not fully investigated by presence of retinopathy, albuminuria and renal biopsy or HbA1c 2nd was due to limited number of studied patients, 3rd most of diabetic patients reaching ESRD became euglycemic, 4th was that our study focused on data collection and registration but not on diabetic nephropathy per se.

Other findings showed that 7.7% of patients had liver cirrhosis, presented with AKI explained by prerenal cause 2ry to (diuretics overuse, abdominal paracentesis and dehydration or due to sepsis, also, there were 3.6% of patients were presented by hepatorenal syndrome (HRS) diagnosed according to major and minor criteria of HRs, they were presented with AKI needed haemodialysis (hyperkalemia, volume, overload, severe metabolic acidosis, we had 17.7% patients have HCV abs, 0.45 patient had Hbs Ag and there were no patients with HIV abs.

In 2008, nearly 15% of population aged 5-59 years had antibodies to HCV and 10% approximately 5 million persons had chronic HCV infection ⁽⁹⁾.

The risk of HCV infection is extremely high among hemodialysis patients. Recent surveys show that the prevalence of HCV infection among hemodialysis patients is not related to history of blood transfusion. Considering the fact that the length of time on dialysis is significantly associated with HCV seropositivity ⁽¹⁰⁾. Other etiologies of AKI in our study were malignancy, we have 5 patients; 3 had lymphoma, 2 with multiple myeloma representing 2.72% of total patients.

AKI in cancer patients is multifactorial, but is still clinically useful to consider causes as prerenal, intrinsic renal and postrenal ⁽¹¹⁾.

Multiple myeloma related AKI is a particularly important cause of renal failure and ESRD, regularly 20% of patients with myeloma have renal failure and those patients have more advanced disease at diagnosis and shortened survival ⁽¹²⁾. In the present study, we had 2.98% of patients with contrast and pigment nephropathy, the incidence of contrast induced nephropathy (CIN) is about 11.3% using the definition of contrast-induced nephropathy (CIN) as the impairment of renal function and is measured as either a 25% increase in serum creatinine (SCr) from baseline or 0.5 mg/dL (44 µmol/L) increase in absolute value, within 48-72 hours of intravenous contrast administration ⁽¹³⁾, our results explained by that patients with CIN needing haemodialysis not CIN induced CKD.

Also, in our study, drug induced AKI were 7.2 of patients; most of these drugs NSAIDs, antibiotics e.g., Amikacin and chemotherapies.

Drugs are common cause of AKI or acute on top of CKD due to drug abuse e.g., NSAIDs and due to lack of knowledge in many patients.

We had 3.64% of cases with lupus nephritis presented with AKI needing HD these patients were diagnosed by renal biopsy and immunology profile.

Renal biopsy was an important tool for diagnosis of the cause of AKI, in our study we had 14.09% of patients. It was done after stabilization of patient's general condition, control of BP, normal coagulation profile, it was performed under CT guidance by an experienced radiologist.

The biopsy results showed focal segmental glomerulosclerosis (FSGS) in 3.61% of patients, 2.7% of patients with lupus nephritis two of them had lupus nephritis class II and 4 had class IV, membranous GN in 1.36% of patients, 1.36% of patients with sickle cell nephropathy, 0.91% of patients with acute interstitial nephritis, 3 patients had mesangio-proliferative GN (1.36%), one patient had membranoproliferative GN (0.45%), one patient with MPGN with crescents, while acute tubular necrosis (ATN) was found in 0.91% of patients. Only 0.45% of patients had renal amyloidosis and crescentic GN in 0.45% of patients.

These results are near to the results of Barsoum et al. ⁽¹⁴⁾ who proved that GN was responsible for 23.2% to 58.4% of patients on regular dialysis in the tropics compared to renal 16-18% in United States and 9-15% in Europe. Its prevalence among dialysis patients in Egypt has been reported as 16.6% in 1998.

The cause of high prevalence of FSGS in Egypt is not clear, racial factors have been reported. The disease being more in blacks. However, other possible precipitating factor such as genetic, viral infections (hepatitis B and C), socioeconomic status or immune system abnormalities proven that the rate of FSGS are higher in African-American population ⁽¹⁵⁾

The present study reported mortality in 20% of cases (44 patients) and 80% (176 patients) are still alive. These mortalities were associated with the more complex aetiologies of AKI such as ICU sepsis and post-cardiac surgery complications, 50 patients had resolved from AKI, most of them due to surgically treated obstructive uropathy about 19 patients, twenty four patients from 50 patients (48%) had CKD on conservative treatment and stopped HD. 20% of cases were admitted to ICU due to various etiologies, there were 14 patients with sepsis (20%). Eleven patients with sepsis (78.5%) died and three patients (21.5%) were improved and stopped HD.

Cardiovascular causes came next to sepsis as regarding ICU admission about 18.5% of ICU admission due to dilated cardiomyopathy, infective endocarditis, post CABG, postoperative valve replacement (cardiogenic shock) and pulmonary embolism. Others like obstetric complications (ante & post-partum haemorrhage), hypovolemic shock (prerenal AKI) and or bleeding peptic ulcer.

In Conclusion,

Acute kidney injury (AKI) is a common health problem worldwide, it remains a significant cause of morbidity and mortality especially in critically ill patients also chronic kidney disease is a common health problem, preventive strategies for DM, HTN, HCV may lead to decreased number of CKD patients.

The advances in radiology, excess use of radiocontrast, chemotherapies and abuse of NSAIDs increase the prevalence of AKI, so preventive strategies and early referral to nephrologist are important to decrease AKIs.

References

- Boulware LE, Troll MU, Jaar BG, Myers DI, Powe NR. (2006):** Identification and referral of patients with progressive CKD: a national study. *Am J Kidney Dis.*; 48:192.
- Agarwal SK, Dash SC, Irshad M, Raju S, Singh R, Pandey RM. (2005):** Prevalence of chronic renal failure in adults in Delhi, India *Nephrol Dial Transplant*; 20(8):1638-42.
- Bellomo R, Ronco C, Kellum JA, et al. (2004):** Acute renal failure-definition, outcome measures, animal models, fluid therapy and information technology needs: the Second International Consensus Conference of the Acute Dialysis Quality Initiative (ADQI) Group. *Crit Care*; 8:R204—R212.
- Akçay A, Turkmen K, Lee D, Edelstein CL. (2013):** Update on the diagnosis and management of acute kidney injury. *Int J Nephrol Renovasc Dis*; 3: 129-140.
- Lopes J and Jorge S (2013):** The Rife and AKIN Classification for Acute Kidney Injury: A critical and comprehensive review. *Clinical Kidney Journal*, volume 6, P: 8-14.
- Liano F, Pascual J (1998):** Outcomes in acute renal failure. *SeminNephrol* 18: 541-550.
- Ibrahim S, Fayed A, Fadda S, Belal D. (2012):** A five-year analysis of the incidence of glomerulonephritis at Cairo University Hospital-Egypt. *Saudi J Kidney Dis Transpl.*; 23(4):866-870.
- Holman RR, Paul SK, Bethel MA, Neil HA, Matthews DR (2008):** Long-term follow-up after tight control of blood pressure in type 2 diabetes. *N Engl J Med*; 359: 1565-1576.
- Elzanaty M and Ann Way (2009):** Prevention of hepatitis C infection in Egypt. *Egypt demographic and health survey 2008 Cairo, Egypt.* Ministry of Health, Elzanaty and Associates, Macro international.
- Alavian S, Fallahian F. (2009):** Epidemiology of Hepatitis C in Iran and the World. *Shiraz E Medical J.*; 10:162–172.
- Da Silva JJ, Mesler D (2001):** Acute renal failure as a result of malignancy. In: *Acute renal failure: a companion to Brenner & Rector's the Kidney* (ed. B Molitoris), pp. 312-21. Saunders Company, Philadelphia.
- Blade J, Fernandez-Llama P, Bosch F, Montoliu J, Lens XM, et al. (1998):** Renal failure in multiple myeloma: presenting features and predictors of outcome in 94 patients from a single institution. *Arch Intern Med* 158: 1889-1893.
- Murphy SW, Barrett BJ, Parfrey PS.** Contrast nephropathy. *J Am Soc Nephrol.* 2000 Jan. 11(1):177-82.
- Barsoum RS, Francis MR (2000):** Spectrum of glomerulonephritis in egypt. *Saudi J Kidney Dis Transpl* 11: 421-429.
- Naumovic R, Pavlovic S, Stojkovic D, Basta-Jovanovic G, Nestic V (2009):** Renal biopsy registry from a single centre in Serbia: 20 years of experience. *Nephrol Dial Transplant* 24: 877-885.

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