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Evaluation of acute kidney injury of infectious etiology in monsoon season in IGIMS

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Abstract
Acute kidney injury (AKI) is a sudden episode of kidney failure or kidney damage that happens within a few hours or a few days. AKI causes a build-up of waste products in the blood and makes it hard for the kidneys to keep the right balance of fluid in the body. AKI can also affect other organs such as the brain, heart, and lungs.
The patients above 20 years of age hospitalized in the department of nephrology and referred from department of general medicine to nephrology, suspected of infectious etiology and AKI, were included in the study. AKI was defined as an absolute increase in serum creatinine concentration of 0.3 mg/dl or greater as per the AKI Network (AKIN) consensus definition. The patients identified with the chronic kidney disease were excluded from the study.
Tropical AKI presents in severe stage and in significant proportion during monsoon. Malaria and AGE are still the predominant etiologies while leptospirosis and dengue are emerging etiologies causing AKI during monsoon.

Keywords: acute kidney injury (aki), infectious ethology, monsoon season etc.

Introduction
Acute kidney injury (AKI) is a sudden episode of kidney failure or kidney damage that happens within a few hours or a few days. AKI causes a build-up of waste products in the blood and makes it hard for the kidneys to keep the right balance of fluid in the body. AKI can also affect other organs such as the brain, heart, and lungs. Acute kidney injury is common in patients who are admitted in the hospital, in intensive care units, and especially in older adults.
Acute kidney injury (AKI), previously called acute renal failure (ARF) [1, 2], is an abrupt loss of kidney function that develops within 7 days [3].
Its causes are numerous. Generally it occurs because of damage to the kidney tissue caused by decreased blood flow to the kidneys (kidney ischemia) from any cause (e.g., low blood pressure), exposure to substances harmful to the kidney, an inflammatory process in the kidney, or an obstruction of the urinary tract that impedes the flow of urine. AKI is diagnosed on the basis of characteristic laboratory findings, such as elevated blood urea nitrogen and creatinine, or inability of the kidneys to produce sufficient amounts of urine.
AKI may lead to a number of complications, including metabolic acidosis, high potassium levels, uremia, changes in body fluid balance, and effects on other organ systems, including death. People who have experienced AKI may have an increased risk of chronic kidney disease in the future. Management includes treatment of the underlying cause and supportive care, such as renal replacement therapy.
The clinical picture is often dominated by the underlying cause. The symptoms of acute kidney injury result from the various disturbances of kidney function that are associated with the disease. Accumulation of urea and other nitrogen-containing substances in the bloodstream lead to a number of symptoms, such as fatigue, loss of appetite, headache, nausea and vomiting [4]. Marked increase in the potassium level can lead to abnormal heart rhythms, which can be severe and life-threatening [5]. Fluid balance is frequently affected, though blood pressure can be high, low or normal [6].
Pain in the flanks may be encountered in some conditions (such as clotting of the kidney's blood vessels or inflammation of the kidney); this is the result of stretching of the fibrous tissue capsule surrounding the kidney [7]. If the kidney injury is the result of dehydration, there may be thirst as well as evidence of fluid depletion on physical examination [7]. Physical examination may also provide other clues as to the underlying cause of the kidney problem, such as a rash in interstitial nephritis (or vasculitis) and a palpable bladder in obstructive nephropathy [7].
New cases of AKI are unusual but not rare, affecting approximately 0.1% of the UK population per year (2000 ppm/year), 20x incidence of new ESKD. AKI requiring dialysis (10% of these) is rare (200 ppm/year), 2x incidence of new ESKD.
There is an increased incidence of AKI in agricultural workers, particularly those paid by the piece. No other traditional risk factors, including age, BMI, diabetes, or hypertension, were associated with incident AKI. Agricultural workers are at increased risk for AKI because of occupational hazards such as dehydration and heat illness [8].
Acute kidney injury is common among hospitalized patients. It affects some 3–7% of patients admitted to the hospital and approximately 25–30% of patients in the intensive care unit. Acute kidney injury was one of the most expensive conditions seen in U.S. hospitals in 2011, with an aggregated cost of nearly $4.7 billion for approximately 498,000 hospital stays. This was a 346% increase in hospitalizations from 1997, when

there were 98,000 acute kidney injury stays [3]. According to a review article of 2015, there has been an increase in cases of acute kidney injury in the last 20 years which cannot be explained solely by changes to the manner of reporting [9].

The severity of acute kidney injury was defined by the Acute Kidney Injury Network staging criteria as follows [9].

- Stage I, serum creatinine increase to 1.5–2 fold of baseline
- Stage II, serum creatinine increase to >2–3 fold of baseline
- Stage III, serum creatinine increase to >3 fold of baseline or serum creatinine of >4 mg/dl
- All patients requiring dialysis were categorized in Stage III

Most studies till date have highlighted the causes of AKI in tropics or individual disease with AKI due to malaria or leptospirosis. Studies which have addressed AKI due to infectious etiology in epidemic proportions during monsoon are very less. Hence this study was planned with the objective to assess the acute kidney injury of infectious etiology in monsoon season.

Methodology

The study was planned in IGIMS to assess incidence, etiology, clinical profile, and outcome of AKI of infectious origin during monsoon season. The patients visited to Out Patient Department (OPD) and in-patient department (IPD) of IGIMS were considered in the study. All the patients were informed consents. The entire patient's clinical history was collected.

The patients above 20 years of age hospitalized in the department of nephrology and referred from department of general medicine to nephrology, suspected of infectious etiology and AKI, were included in the study. AKI was defined as an absolute increase in serum creatinine concentration of 0.3 mg/dl or greater as per the AKI Network (AKIN) consensus definition. The patients identified with the chronic kidney disease were excluded from the study.

Detailed history taking and clinical examination of patients were carried out and noted. Biochemical investigations were carried out.

Results and discussion

The total 100 patients were studied and the data collected and presented as below.

Table 1: Demographic Data

Clinical details	Observations in Cases
Total number of admissions with AKI	100
Mean age of study population in years	32-45 years
Sex distribution	
Males	73
Females	27
Presenting features	
Fever	90
Vomiting	84
Oliguria	72
High-colored urine	62
Breathlessness	41
Diarrhoea	23
Altered sensorium/convulsions	21
Bleeding	9
Severity of AKI as per the AKIN criteria	
Stage I	40
Stage II	12
Stage III	48
RRT requirement	46
Mortality	12
Complete recovery of renal function	88

Table 2: Distribution of study group as per infectiousdisease etiology

Diagnosis	Observations in Cases
Malaria:	30
Falciparum	16
Vivax	10
Mix malaria	4
Acute gastroenteritis	24
Dengue	15
Leptospirosis	12
Multiple etiology :	6
Malaria + dengue	4
Malaria + leptospirosis	1
Leptospirosis + dengue	1
Typhoid	4
Undifferentiated	9
Total	100

Most of the studies in India have focused on AKI secondary to either malaria [5, 16, 17]. Leptospirosis [10]. Dengue [11]. Ordiarrhea [12]. Others have highlighted tropical infections leading to AKI in all seasons. [13]. No single study has focused on AKI only during monsoon season. Only three studies, including the present study, have considered AKI in different infections together in one study [14].

Incidence and clinical demography of acute kidneyinjury: It is generally believed that tropical infections contribute tomore than 2/3rd of AKI cases in tropics which may account up to 800 per million population according to certain calculations. More than twenty tropical infections may be associated with AKI; the most widely known are malaria, leptospirosis, cholera, shigellosis, dengue, and HIV [15].

The main causes of ICU admission were AIDS-related diseases, pneumonia, leptospirosis, meningitis, and tetanus. Basu *et al* [13]. From CMC Vellore in South India in 2007–2008 reported an incidence of 41.1%of AKI in infectious diseases, one of the highest incidences noted among tropical infections. Most of the patients in the study done by Basu *et al*. were in risk class and had milder degree of renal dysfunction. Our study included patients of AKI due to infections in monsoon season, in prominent metro politan city of a tropical country. The enormous burden of infectious diseases is reflected in the number of patients being admitted in the present study in 8 months which is more than four times the number of patient sad mitted in 1 year in the study done by Basu *et al* [13].

Conclusions

Tropical AKI presents in severe stage and in significant proportion during monsoon. Malaria and AGE are still the predominant etiologies while leptospirosis and dengue are emerging etiologies causing AKI during monsoon.

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