

Epidemiology and Outcomes of Acute Renal Failure in Rural Females of Low Socioeconomic Status - A Referral Hospital Experience

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Abstract: *Background: Acute kidney injury (AKI) is an important cause for mortality and morbidity and understanding the epidemiology and outcomes of AKI helps the prevention of AKI related mortality. The present study is selectively analyzed the epidemiology and outcomes of AKI in females belongs rural areas of low socioeconomic status. Methods: Retrospective observational study of female AKI patients admitted at a tertiary care hospital, India between May 2010 and April 2013. Etiology, comorbidities, management modalities and outcomes were studied. Results: the incidence of AKI in females was 29.2% (186/635). The mean age was 39±15 years. Infections are the predominant etiology for AKI in females (45.1%) and complicated malaria is the leading one. Primary glomerular diseases (12.9%), undiagnosed preexisting chronic kidney disease with acute deterioration (11.2), obstetric causes (8%) are leading etiologies following infections. Due to delay in recovery, 43 patients (23%) underwent renal biopsy, of which acute tubular necrosis (29%) and acute interstitial nephritis (20%) are the predominant histological reporting respectively. SLE/ lupus nephritis (LP) 18.6% are the predominant glomerular disease. 96% patients needed hemodialysis (3.2 sessions). Mortality is 6.9% with mean age 37 years and mean serum Creatinine 5.7±2.8mg%. Progression to Chronic kidney disease is 4.3%. Conclusions: AKI in females is predominantly of Infectious cause which is preventable, and regular health checkups may diagnose and treat pre existing CKD 's and glomerular diseases, SLE in particular which carries high morbidity and mortality.*

Keywords: acute kidney injury, Female population hemodialysis, outcomes, RIFLE

1. Introduction

The incidence of acute kidney injury is on the rise, the reported incidence varies with age, sex and regions worldwide. ⁽¹⁻⁵⁾. So far epidemiological studies of AKI selectively in female population, were reported occasionally. In developing nations AKI is commonly caused by community acquired diseases often due to infections. ^(6,7,8) The epidemiology varies from country to country and even region to region in bigger countries like India. ^(9,10,11). As there is no comprehensive registry the data on overall epidemiology of acute kidney injury is lacking and the available data often generated from single center tertiary care hospitals mostly located in urban areas, and that too the study population is not gender selective.

The present study confined to female population who are living in the rural areas belongs to north coastal region of Andhra Pradesh in India. Their socioeconomic status was evaluated by those who were covered under state sponsored community health insurance scheme which intends to the population whose annual income is <\$1500. The present study focused on the etiology, comorbidities, mode of therapy, need for renal biopsy and outcomes.

2. Materials and Methods

This is a retrospective observational study performed at a tertiary medical care center located at north coastal Andhra Pradesh in India. The study population was females with community acquired acute kidney injury admitted in the general, intensive care and obstetric care units of King George Hospital, Visakhapatnam.

The study period was between January 2010 to December 2013. Subjects with age above 18 years were included in this study and all of them hailed from rural and semi urban areas covered under community insurance scheme for the poor.

All patients admitted with AKI during study period were subjected to urine analysis, hemoglobin, blood biochemistry (urea, creatinine, electrolytes, uric acid, calcium and phosphorus) and ultrasound scan of the abdomen, renal biopsy was done in selected cases with prolonged duration of acute kidney injury (AKI) (4 weeks), and unexplained AKI and in those with features of systemic and glomerular diseases.

The diagnosis of AKI was based on history, physical examination, laboratory values and clinical course. Viral assays for hepatitis B surface antigen, anti hepatitis, retroviral serology were done in all cases. Antinuclear antibody, anti double-stranded DNA and Anti Neutrophil antibody were done in selected cases.

Acute kidney injury is defined as an acute reduction in renal function with a >2 mg creatinine where there is no baseline serum creatinine was not known or 50% rise in creatinine above the base line normal values in the presence of normal sized kidneys. Pregnancy related AKI defined as AKI that developed from the first trimester of pregnancy to the end of postpartum period. Recovery of the renal function defined as the normalization of the renal function within a period of 12 weeks from the onset of AKI. Partial recovery was non-dialysis dependent reduction in renal function

Indications for biopsies are 1) no obvious cause of AKI, 2) systemic disease causing AKI, 3) heavy proteinuria or persistent hematuria and 4) AKI more than 3 weeks.

Data collected from the case record of patients with AKI and they were analyzed for age, gender, etiology, clinical features, course and outcomes. The data was analyzed using standard statistical methods. (SPSS software V 18)

3. Results

Of total 635 Acute kidney injury cases were admitted in the nephrology department of nephrology, King George hospital, during the study period, 447 were males (70.7%) females were 186 (29.3%) with mean age 52 ± 17.3 years for males and 39 ± 15 years for females. The main comorbidities observed are hypertension (11.2%) diabetes (8%) and both in (6.1%) of patients.^(9,10,11) (table 1)

Table 1: Demographics

Age groups	Percentage (%)	No of subjects(N)
0 to 19	5.91	(11)
20 to 35	38.7	(72)
36 to 50	40.32	(75)
51 to 65	10.75	(20)
>65	4.3	(8)
Age	Males	Females
	52 ± 17.3	39 ± 15

Of these 186 female patients 165 patients were presented with acute kidney injury (88.8%) and 21 patients (11.2%) presented with acute on chronic kidney disease (diagnosis based on history, baseline serum creatinine values and bilateral contracted kidneys). (table 2). The etiology for AKI are infections 45% (n: 83), acute on chronic kidney disease (11.2%), glomerulonephritis (12.9%). Pregnancy related AKI are 8% (n:15) and obstructive (4.8%).^(12,13) (table 3)

Table 2

Renal failure	Percentage (%)	No of subjects(N)
Acute kidney injury	88.8	165
Acute on CKD	11.2	21

Among infections, malarial infection (N= 45) is the most common infection responsible for the AKI and followed by urosepsis (N= 19), community acquired pneumonia (N= 12) and acute viral hemorrhagic infections (N=7). Acute worsening of renal function over a chronic renal disease is observed in 21 and acute gastroenteritis and infections are the cause for decline renal function.

Table 3: Etiology

Etiology	Percentage (%)	No of subjects(N)
Infections	45	83
Acute on CKD	11.2	21
Pregnancy	8	15
obstructive	4.8	8
Acute glomerulonephritis	12.9	24

Renal biopsy was done in 43(23%) cases in which the course of recovery was not as expected. Renal biopsy findings are acute tubular necrosis in 12 (27.8%), acute interstitial nephritis 9(20%), acute glomerular diseases were noted in 13 (30.1%). In glomerular diseases predominant lesions are lupus nephritis (18%) and post infectious glomerulonephritis (11.2%). (table 4).

Considering pregnancy related acute kidney injury (8%) preeclampsia (n=6), intrauterine death due to prolonged labor was noted in 8 patients.

The mean serum Creatinine at the time of admission to nephrology is 4.1 ± 2.7 mg% in 73% of cases. Progression to Chronic kidney disease is 4.3% (n 8). Mortality is 6.3% (n 13) of which 47% and 23% is due to sepsis and other causes.

Table 4: Renal biopsy findings

Diagnosis	No of subjects(N)	Percentage (%)
Acute tubular necrosis	12	27.80%
Acute interstitial nephritis	9	20%
lupus nephritis	8	18.60%
PIGN	5	11.62%
CIN	4	9.30%
Others	5	11.62%

4. Discussion

The incidence of AKI worldwide, except isolated single centre studies is not very well reported. Published data on epidemiology of AKI in India and especially from below poverty line people is not reported so far. Though there are numerous definitions for AKI, We used RIFLE criteria based on serum Creatinine in those reference creatinine level is known because in previous studies it was shown that Risk and Injury stages are having high sensitivity and Failure, end stage had high specificity.^(10,11) The present study evaluated the spectrum of AKI in female patients who are below the poverty line. This is a single centre study from tertiary care hospital catering nearly 2 million population.

2.9% of the total admission to the nephrology of our hospital was diagnosed to have AKI out of which 1.3% are female. the incidence of AKI in female population is 956pmp/year. There is no separate data on incidence of AKI in female either from western countries or from India we have compared it with total incidence reported in other studies. Waiker et.al (2006) reported incidence of AKI in USA is 2880 pmp, European data showed 209 pmp from Spain by Laino et.al, and 2 data published from Scotland by Khan IH et. Al (1997) and Tariq Ali et.al.(2007), the incidence is 620 and 2147 pmp respectively^(12,13,14). The incidence of AKI is increased to 4.19/1000 in 1996 from 1.95/1000 admissions in 1983 this data from eastern India by Jai prakash et.al (2013). The incidence may be even high because the mean serum Creatinine at the time of nephrology consultation is 4.1 ± 2.7 mg% in this study.^(15,16,17)

The mean age of female patients is 39 years in this study, consistent with other studies. As a result of increase in life expectancy in developed countries, the mean age of incidence of acute kidney injury was considerably high when compared with the developing nations. The reported median or mean ages of those with AKI vary considerably in the literature, though in most studies mean age is >60 years and males predominate.⁽¹⁸⁾ The mean age in Liano and Pascual's study (1996) from Spain was 64 and 48% of AKI cases occurred in patients over 64 years and majority of patients (65%) were male, and mean age was similar in both sexes. But few studies from north India had tendency with increasing age. Majority are in the age groups of 36 – 50 yrs and 4.3% consists of age group more than 65 years. This may be due to low life expectancy in general population at that age group in below the poverty line in India and limited access to medical facilities.

The observations in this study are middle aged and reproductive age group females are more affected by AKI, which will have a great impact on the economy and family members. Medical causes have accounted nearly 90% of case of AKI in the present study, 45.1% are due to infections and complicated *Plasmodium falciparum* malaria accounts nearly 54.2% followed by *Leptospirosis* and viral hepatitis. Worldwide, the incidence of AKI caused by malaria varies from 0.6 to 60% depending on the geographical region.⁽¹⁹⁻²¹⁾ High incidence of *P falciparum* malaria is due to low socio-economic conditions and endemic area for this organism and similar results were reported by chung et.al and Prakash J et.al in their work from Thailand and India respectively.

Snake bite and AKI in this study is 7.5%, nearly all are hematotoxic venomous snake bites and all undergone hemodialysis with 0.5% mortality, low incidence of AKI probably availability of anti snake venom and bite to needle time is less.

In the past where hemodialysis was not so familiar, AKI was universally fatal and mortality was >90%. AKI mortality remained stable over the past years, varying 7% in pre renal AKI to more than 80% in critically ill. In a population based study Feest TG et.al (1993) with entry serum Creatinine 5.6 mg%, the 90 day mortality and 2year mortality is 46% and 58% respectively. A population based study by Stevens et.al. (n288),⁽¹⁸⁻²¹⁾ the mortality is 46%, 65% and 69% for in hospital, at 1 year and 2 year mortality respectively. In contrast to the high mortality associated with AKI in developed nations, AKI-associated mortality seems to be lower in developing countries between 10 and 40% Muthusethupathi MA, Shivakumar Set. al (1987). Studies based on renal replacement therapy the mortality ranged from 35% to 74% (Metcalf et.al, Bell et.al, Mehtha et.al) In our study the overall mortality was 6.9% and sepsis related mortality is 46.8%. the low mortality can be explained by more number of younger patients compared to other studies where old age people are more involved who have more co morbid conditions⁽²²⁻²⁵⁾

Pregnancy-related, acute kidney injury (PRAKI) is a rare entity in the West but continues to be a major problem in

developing countries, resulting in a high maternal mortality⁽²⁶⁻²⁹⁾ The incidence of AKI in developing countries ranges from 4% to 36% depending on the study and Maternal mortality varies between 6% and 30% depending on the study Pregnancy related AKI in this study is 8% (n15) and mortality is 6.6%^(30,31). Common cause of AKI is intra uterine death or sepsis (4%) same results were observed with others A Krishna et.al; Naresh pahwar et. Al; Saleem Nazar et.al from India^(32,33)

The incidence of AKI due to acute GN had not changed over the past three decades. Acute GN accounts for 9–10% cases of total AKI. In this Study AKI due to glomerulonephritis is 12.6% and are mostly due to post infectious. Systemic lupus erythematosus / Lupus nephritis is associated with 30% -50% renal diseases at the time of presentation, in this study of all AKI cases SLE with AKI is observed in 4.3%.

Renal biopsy are performed in 43 cases acute tubular necrosis and acute interstitial nephritis consists of 29% and 20% respectively, consistent with high percentage of infection related AKI.^(34,35)

In this study, in those cases RIFLE criteria was used serum Creatinine levels to assess the severity of AKI, because of certain limitation in measuring the urine output, this parameter is not considered. Majority of the patients were in failure group (73%) reflecting the late nephrology consultation. Association between RIFLE classification and mortality was well established in previous studies. Unlike reported Ostermann and Chang where the mortality was correlated RIFLE with mortality the present study differs by way of its increased mortality in the group that falls into the "failure" classification.

5. Limitations of the Study

This study is a retrospective one and severe AKI cases were taken. Patients with mild renal injury and those who were managed conservatively were not included that may affect the exact incidence of acute kidney injury.

6. Conclusions

In this study, Infections associated AKI is a frequent cause of Community acquired AKI in rural females of below poverty line from south India. Poor socioeconomic status and living in the endemic zone for tropical infections are major factors that affecting the incidence of renal diseases in the study population. The prevalence of chronic kidney disease in this study signifies mass based screening programs for early detection of CKD. The incidence of PRAKI comparable with the other studies but it is associated with high mortality in the productive age group, which is a preventable one. To confirm these further studies with needs large cohorts are needed.

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