Site of Infection and Causative Organisms Responsible for Infection in Critically Ill Patients with Acute Kidney Injury in the Intensive Care Unit of Manipal Teaching Hospital

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ABSTRACT

Acute kidney injury (AKI) is the most common problem seen in critically ill patient admitted to Intensive Care unit (ICU). AKI in presence of infection is responsible for increased mortality and morbidity. Early diagnosis of the infection and the causative organism and prompt initiation of treatment significantly decreases the mortality and morbidity in these patients. The objective of this study was to study the site of infection and the causative organism responsible for infection in critically ill patient with AKI admitted to ICU of Manipal Teaching Hospital. This is a prospective observational study including 100 patients admitted to ICU with Infection and AKI. The diagnosis of AKI was made on the basis of serum creatinine level of the patient previously and during the treatment period. Other relevant investigations were done in order to identify the site and causative organisms responsible for infection. The site of infection could not be found in 34 % of the patients studied but the most common site of infection was genitourinary tract infection in 30 % of the patients, followed by respiratory tract infection in 27%, bacteremia in 5%, gastrointestinal tract in 3% and co-infection with genitourinary and respiratory tract in 1%. The causative organisms could not be isolated in 33% of the patients. Gram negative organism were responsible for 54% of cases of infection which was followed by gram positive organism in 10%, polymicrobial in 1%, fungal in 1% and malarial parasite in 1% of patients.

Keywords: infection, causative organism, acute kidney Injury, intensive care unit

INTRODUCTION:

Acute renal failure (ARF) is defined as a rapid and usually at least partially reversible decline in glomerular filtration rate that may occur either in the setting of pre-existing normal renal function, that is classic acute renal failure (ARF) or in someone with pre-existing renal disease, that is acute- on- chronic renal failure[1.] Acute kidney injury (AKI) was formerly known as acute renal failure. The term AKI is intended to emphasize the reversible nature of most renal insults. The term ARF is now generally reserved to describe the condition of patient who sustains kidney injury that necessitates renal replacement therapy[2]. ARF has been reported to affect 1- 25 % of Intensive Care Unit (ICU) patients and has led to mortality rate ranging from 15 to 60%[3]. A common cause of AKI is sepsis[4]. ARF is a common complication of critical illness, which is associated with high mortality and has a separate independent effect on risk of death[5]. ARF in patient with sepsis provokes high mortality and financial cost[6]. Critically ill patients with infection are at increased risk of AKI and AKI is associated with increased risk for infection. Both conditions are associated with prolonged length of hospital stay and worse outcome[7]. AKI occurred in up to 30% of all ICU admissions, is usually due to multi-organ failure syndrome[8]. When the more liberal RIFLE definition is applied apparently two third of ICU patient develop an episode of renal dysfunction [9,10.]

Delay in initiation of appropriate antimicrobial therapy independently predicts development of AKI in septic patients. Both delay in appropriate antimicrobials and initiation of renal support are also associated with higher mortality. Survival in ICU and /or hospital discharge from septic AKI patient is significantly lower when compared to patient with either non-septic AKI or sepsis alone. However, survivor of septic AKI show trends for greater rates of renal recovery and dialysis independence compared with non-septic AKI[11].

However, only few data exist on study of infection in patient with AKI in ICU in developing countries. The main aim of this study was to investigate the site of infection and the causative organism responsible for infection in critically ill patient with AKI which has been identified by isolation of the organism in blood, urine, body fluid and secretions. The results drawn will

help us by proving data which will give us an idea about the prevalence of infection in our setup, on the basis of which, decision making in choosing empirical antibiotics for critically ill patient will probably improve survival, prevent chronic renal failure, decrease need for renal replacement therapy and decrease length of hospital stay in these patients.

MATERIALS AND METHODS

We conducted a prospective observational study of 100 patients, admitted to Intensive Care Unit (ICU) of Manipal Teaching Hospital (MTH) from August 2013 to July 2014. All the patients who were admitted to ICU of MTH with AKI defined by RIFLE criteria and had infection that is the patients who met the criteria for SIRS were included in this study. The exclusion criteria include: 1) AKI not associated with infection, that is not meeting the criteria for SIRS; 2) Patient admitted in ICU for reasons other than AKI or infection without AKI; 3) patient who refused to give consent.

Detailed history of all patients with AKI and infection was taken from the patient or patient party in case patient is not able to give on their own. Clinical examination was performed. Blood sample was taken for investigation which included complete blood count (CBC), renal function test (RFT) and blood culture. When clinically indicated chest X-ray, ultrasonography and other microbiological tests of the body fluid and secretions and instruments were done. Fungal culture was done only in patients who were at risk of fungal infections. AKI was diagnosed on the basis of increase in creatinine level from the baseline creatinine measured in last 3 months.

RESULTS

Out of 100 patients included in the study, 53(53%) were female and 47% were male patients. The age of the patients ranged from 15 years to 92 years. Most of the patients (68%) were of age more than 50 years.

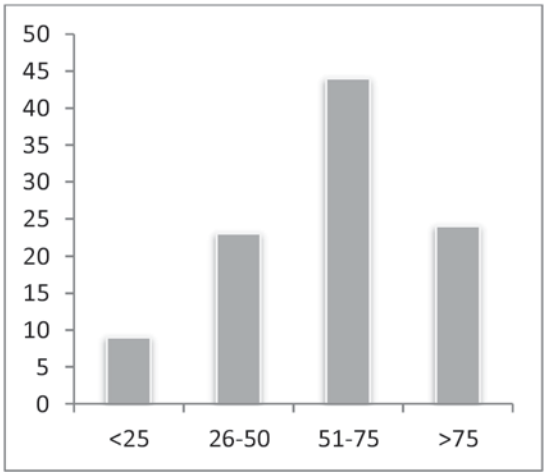

Figure 1: Distribution of patient according to age group

In our study, out of 100 patients studied, source of infection could be identified in 66 patients. Genitourinary tract infection was present in 30 % of the patients with Confidence limit (CI) of 21.2 to 40.0 % which is followed by respiratory tract infection which accounted for 27 % with CI of 18.6 to 36.8 %. 5 % of the patient had bacteraemia with CI of 1.6 to 11.3 %, 3 % of the patients had gastrointestinal infection with CI of 0.6 to 8.5% and 1 % patient had co- infection of genitourinary and respiratory tract with CI of 0 to 5.4 % .

Table1: Site of infection in patients with infection and AKI

Organs involved	Frequency (Percentage)	Confidence limit
Genitourinary	30(30%)	21.2 to 40.0 %
Respiratory	27(27%)	18.6 to 36.8%
Bacteraemia	5 (5%)	1.6 to 11.3%
Gastrointestinal	3(3%)	0.6 to 8.5 %
Genitourinary and respiratory	1(1%)	0 to 5.4%
Not known	34(34%)	24.8 to 44.2 %
Total	100(100%)	

In our study, gram negative organisms were the most common among the organisms responsible for causing infection in patient with AKI. Gram negative organisms accounted for 54 % .Gram positive organisms accounted for 10 % of cases. Polymicrobial organism in 1%, infection with Falciparum malaria 1 % and Candida accounted for 1%. This patient with Candida infection was an old patient of 92 years who was on antibiotics for prolonged period before hospital admission. However in 33 % of the patients the causative organisms could not be found.

DISCUSSION

In our study, the most common site of infection was genitourinary which accounted for 30 % of the patients with AKI admitted to ICU. Other sites of infection were respiratory tract infection in 27 % of the patient and gastrointestinal in 3 % of the patients. This result was different from the result of the study done in retrospective cohort study done by Reynort et al, in which pneumonia was the most frequent, followed by intra-abdominal infection and urinary tract infection[7]. Similarly in a study done by Salt KE in 8 academic medical centers, all the patients admitted to ICU were studied and it was found that respiratory system was the most common site of infection accounting for 42% of the infection in ICU which was followed by genitourinary 11% and abdominal 10%[12]. Bagshaw SM et al carried out a study at Department of Medicine, Austin and

Table 2: Causative organisms responsible for infection in ICU patient with AKI

MICROORGANISMS	EPISODES OF INFECTION
Gram negative	**54**
E.coli	32
Klebsiella	10
Pseudomonas	5
Acinectobacter	3
Enterobacter	1
Proteus	1
Shigella	1
Moraxella	1
Gram positive	**10**
Staphylococcus	4
Streptococcus	4
Enterococcus	2
Polymicrobial	1
Others	**2**
Candida	1
Falciparum malaria	1
Organisms could not be isolated	33

Repatriation Medical Center, Melbourne, Australia. A total of 1753 patients with AKI were studied. Sepsis was considered the cause in 47.5 % of the patients with AKI. The predominant source of infection in these patients was respiratory tract infection which accounted for 30 %. It was followed by intra-abdominal (24.3%), endovascular (6.7%),haematogenic (5.8%), urogenital (4.1%), skin/soft tissue/ bone (3.5%), central nervous system (1.4%), others (0.8%) and source was unknown or unspecified in 23.4% of the patients[13]. In our study source of infection could not be identified in 33% of the patients, gram negative organisms were responsible for maximum number of infection, that is, 54% of the total ICU patients with AKI and infection, gram positive organisms was found in 10 % of the patients, other few patients had polymicrobial infection, fungal infection and malaria. This result is similar to the results in the previous studies also[7,14]. Reynort carried out study in 519 patients from surgical ICU, cardiac surgical ICU, medical ICU and burn unit and found that gram negative organisms were responsible for 33.7% of infections, gram positive organisms were responsible for 21.6% and yeast in 9.1 %[7]. Similar results were found in a study done by Sand KE et al. This study was carried out in 8 academic medical centers. In this study also they found out that around 40 % of the infection was due to gram negative organism, 31 % due to gram negative organisms and rest due to polymicrobial organisms, fungus, anaerobes and unclassified organisms [12].

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