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KEY WORDS: AKI, dehydration, nephrotoxins, sepsis, hemodialysis

ETIOPATHOGENESIS AND OUTCOME OF ACUTE KIDNEY INJURY IN CHILDREN

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ABSTRACT

Objectives: To study the clinical profile of AKI in a tertiary care hospital
Design: Descriptive study
Setting: Tertiary care teaching hospital
Method: Children 1 month-12years presenting with clinical and biochemical evidence of Acute kidney injury were studied regarding age, sex, clinical features, etiology and prognosis. Those children with preexisting renal diseases were excluded.
Results: In our study, children less than 1 year commonly affected with female predominance. Common etiologies was sespis, diarrhoeal dehydration and acute glomerulonephritis. Common symptom was oliguria. Overall mortality was 41% in our study population.

INTRODUCTION:

Acute Kidney Injury (AKI), the new term heralds a paradigm shift for our conceptualization of the syndrome which is previously called "acute renal failure." Acute renal failure (ARF), now increasingly referred to as "acute kidney injury" or AKI, which is characterized by a abrupt (ie., hours to days) impairment of kidney function. Acute kidney injury in children is a complex disorder that occurs in a variety of settings with clinical manifestations ranging from a minimal elevation in serum creatinine to anuric renal failure.During the last five years, several groups have recognized these limitations and have worked to identify the knowledge gaps and define the necessary steps to correct these deficiencies. This study was conducted to determine the clinical profile of AKI in children in tertiary care centre hospital in our population.

SUBJECTS AND METHODS:

Children 1 month-12years presenting with clinical and biochemical evidence of Acute kidney injury admitted in the hospital from July 2015 to June 2017 were studied regarding age, sex, clinical features, etiology and prognosis. Those children with preexisting renal diseases were excluded.All chidren were evaluated with a detailed history ,clinical examination and necessary investigation. Cases were followed with standard line of treatment and the outcome and various factors affecting the final outcome were analysed.

RESULTS:

Of 230 children included in our study, with Acute kidney injury were due to varied etiology. Most of the children were under 1 year age group accounting 37% of total children. Next major group was noted in 4-8 years age group with 25% of total children. Of 230 children in our study, there were 90 males with male:female ratio 0.6;1 . There was no statistical association between sex and the outcome.

Children with A.K.I presented with various signs and symptoms. In this study most children presented with oliguria b (80%), edema (67%), fever (50%), diarrohea (30%), breathlessness(24%). In infants major presenting features were refusal of feeds, vomiting , lethargy.

Sepsis constituted the most common cause of A.K.I contributing 45% of cases. Next common causes were acute gastroenteritis(22% of cases),and Infection related glomerulonephritis -IRGN(18% of cases);toxin was attributed as a causative factor in 4% of cases. Leptospirosis was the cause in 2% cases and Malaria was the cause in 1.5%.Nephrocalcinosis accounted for 3% of cases.Hemolytic uremic syndrome[HUS] was seen in 23 patients[10%]. Diarrhoea associated HUS was seen in 10 patients and Atypical HUS was seen in 13 children.Children with age group 1 month to 4 years had a mortality 51 % . Low mortality was noted in the age group of 8-12 years(14.3%mortality).Over all mortality recorded was 41%.

Clinical evidence of sepsis was noted in 103 children .60 out of 103 children expired. Mortality rate was 58.5% in those cases presented with sepsis .Presence of sepsis is a poor prognostic indicator.Shock was present in 75 cases and among those cases 38 had expired. That is 50.6% mortality. So, presence of shock adversely affects outcome.

Hypertension was noted in 62 cases. Hypertension was mostly in cases of acute glomerulo nephritis ,responded well to anti hypertensive patients.

Dehydration was noted in 72 cases. Among those cases 54.6% mortality rate was observed.Presence of dehydration did not alter the outcome as there was no statistical significance in our study. Hypotension at the time of admission or during hospital stay was noted in 57 patients. Among the 57 patients 40 had expired amounting to 70.6% mortality. Hence presence of hypotension adversely affected the outcome .

History of toxin ingestion was noted in 10 cases.Native medicine ingestion was present in 5 patients. Among Toxin induced AKI, 50% mortality rate was observed. Snake bite causing AKI was seen in 2 patients.Both the patients were treated with Antisnake venom and Hemodialysis.The average number of Hemodialysis sessions needed were 7.Both patients were oliguric at presentation and improved with treatment and were discharged with a normal serum creatinine...Congestive cardiac failure was noted in 16 cases. Among those cases 50% mortality rate was observed.Presence of CCF does not alter the outcome as there was no statistical significance in our study.

Patients with Atypical HUS[13] were investigated with Factor H antibody.All patients were treated withplasmapharesis, steroids,Cyclophosphamide and Mycophenolate.Patients with High titres of antibody [7] progressed to CKD

Anuria was present in 54 cases. Among 54 cases 35 had expired which amounted to 64.5% mortality. Presence of anuria , adversely affected the outcome ,as its presence was statistically significant with outcome. Risk factors associated with poor outcome were age group, anuria, bleeding, shock, hypotension, hypertension, sepsis, AGN, blood urea serum creatinine values as mentioned earlier. Statistical significance ($P<0.05$) was noted for these factors in univariate analysis. In multiple regression models, predictive factors for poor outcome in acute kidney injury found

were anuria, shock, hypotension ,blood urea (≤200 mg/dl) with P value (<0.05) and with 81.4% percentage correctness for poor outcome.

DISCUSSION:

In our study, the maximum numberof cases of acute kidney injury were under 1 year age group accounting 37% of total children. This is because of increased incidence of sepsis in this age group. Next major group was noted in 4-8 years age group with 25% of total children. With regard to the sex distribution, the females are predominantly affected

A.K.I can occur due to number of causes. Significant portion being acute glomerulonephritis, acute tubular necrosis following diarrhoeal dehydration ,Hemolytic uremic syndrome, Post surgical etc., In our study ,sepsis is the leading cause of A.K.I. It differs from the study conducted by B.V. Singh et al., His study showed that Acute glomerulo nephritis is commonest. Our study showed that next to sepsis, diarrholeal dehydration and A.G.N were common. In study conducted by Arora et al., showed haemolytic uremic syndrome as the commonest cause of A.K.I. Patrick Niaudet et al., also showed that haemolytic uremic syndrome as the commonest cause of AKI. which he attributed mostly due to the precipitating factor like diarrhoea and high incidence of H.U.S may be probably due to poor socio economic conditions and poor sanitary facilities, leading on to diarrhoea .

H.U.S is a cause of A.K.I in 10% of cases in our study. H.U.S was found to be a bad prognosticator by R.S Trompeter , he gave a mortality of 30% .In our study 4 children expired out of 23 children affected with haemolytic uremic syndrome[17.4%]. In our study overall mortality rate of acute kidney injury in children aged between 1 month to 12 years noted was 41%.In male children mortality rate was 45.3% and in female children it was 41.4%. The mortality rate was similar to the study conducted by McNeic et al 68 which showed Overall, sepsis was the major cause of acute renal failure followed by hypovolemia, poststreptococcal glomerulonephritis, systemic lupus erythematosus,HUS and infectious diseases. The overall mortality rate was 41.%.

One of the important symptom of A.K.I is oliguria.But absence of oliguria does not rule out A.K.I. Non oliguric renal failure is well known entity and is seen commonly following septicaemia , PUV and the use of nephrotoxic drugs. In our study among 15 children with non oliguric AKI 2 children died. In all those 10 children sepsis was the underlying etiology.The commonest presentation of A.K.I in our study is oliguria. This fact is being assesssed by P.W.Kandoth et ai.,who also finds oliguria as the commonest presentation in their study. The prognosis is better when the oliguria is very short. This is considered by B.V.Shah et al. The delay in diagnosing AKI increases mortality rate.

One another factor that alters the mortality of A.K.I is associated systemic complications like respiratory , urinary tract infections , peritonitis and central nervous system involvement.

In our study also statistical significance was noted for anuria and poor outcome. Jyothimurugan et al.,showed that infancy,female sex, associated neurological symptoms,shock,and hypertension were the factors associated with poor outcome though statistically significant poor prognosis(P<0.5) was noted only with factors like infancy and in etiology of ATN/HUS alone. In our study risk factors associated with poor outcome were age group (4-8 years), anuria, bleeding, shock, hypotension ,hypertension, sepsis, AGN, blood urea serum creatinine values as mentioned earlier. Statistical significance (P<0.05) was noted for these factors in univariate analysis. In multiple regression modes, predictive factors for poor outcome in acute kidney injury found were anuria, shock, hypotension ,blood urea with P value (<0.05) and with 81.4% percentage correctness for poor outcome. In our study all AKI children with shock /hypotension solely have underlying sepsis.

CONCLUSIONS:

Acute kidney injury is one of the important causes of morbidity and mortality in children. Female predominance with a male : female ratio 0.6:1 is observed. Sepsis is the commonest cause of acute kidney injury in children. Other common causes of acute kidney injury in children are acute gastro enteritis, acute glomrulonephritis and HUS. Overall mortality rate of acute kidney injury in children aged between 1 month to 12 years noted was 41%.In male children mortality rate was 45.3%and in female children it was 41.4%. Non oliguric AKI is usually diagnosed by high index suspicion and by periodic biochemical monitoring. Mortality among non oliguric AKI patients was due to septicaemia. Risk factors associated with poor outcome were, anuria, bleeding, shock, hypotension,hypertension, sepsis, AGN, high blood urea, serum creatinine values. Clinically, predictive factors for poor outcome in acute kidney injury found were anuria, shock, hypotension. Hence extra attention should be given for these cases in future to reduce the mortality.

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