

## A Tertiary Care Experience is provided for Acute Kidney Injuries under 14 Years of Age

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### Abstract

#### Introduction

The abrupt loss of renal function to the point that bodily fluid equilibrium is impossible to maintain is known as acute kidney injury. Serum creatinine levels rise to about twice the usual amount for the patient's age due to a decrease in GFR, which is the condition's primary characteristic. Its frequency, morbidity pattern, diagnostic challenges, treatment options, prognosis, and final results in individual instances have all been forecasted to make it a significant issue for the paediatric age range. Due to the high occurrence of infections, sepsis, acute glomerulonephritis, and gastroenteritis in hot and humid climates, it is still a prevalent ailment in underdeveloped nations, but in western countries, the main causes are trauma, surgery, alcohol, and narcotics. AKI has been becoming more common, and other investigations have shown varying degrees of mortality as well.

#### Material And Method

Children throughout the newborn period who were at high risk of developing AKI or those who came with AKI to the paediatric ward of the S.C.B. Medical College and Hospital and the S.V.P. Post Graduate Institute of Paediatrics in Cuttack were included in the study's material. The instances chosen for the research and the methods used are described in full below. Laboratory parameters were used to test for signs of AKI in all children older than 28 days who had clinical indications of developing oligouria or anuria. They also included those who showed signs of AKI while they were in the hospital. Serum creatinine levels of 1.5 mg/dl or higher in children older than one year, and 1 mg/dl or higher in children less than one year, were used to include those who were clinically suspected.

#### Result

Indicates age incidence of AKI cases in the present study. Majority of cases, 38.8% were observed in the age group of 5-10 years followed by 31.3% in 1-5 years. 44% cases occurred in the under 5 age group in our study. In the present study male children outnumbered females (M:F=1.4:1). Indicates the various clinical features observed in AKI cases in the present work. Oliguria / anuria was present in approx. 86% of cases, next most common presenting feature was fever in 67.2% followed by H/O snake bite in 14.9%, loose stool in 16.9% cases amongst the study group. We observed presence of skin infection as a marker of AGN (4%), altered sensorium (9%), hematuria (14.4%), convulsion (15.4%), abdominal distension (20%), bleeding manifestation and bloody stool (5%) cases amongst the study population.

#### Conclusions

This study demonstrated the etiological patterns in this region of the state and certain areas of Eastern India, and it focused on the many domains of Acute Kidney Injury in children who presented to the hospital. The study population was well-characterized and heterogeneous. Children's AKI has a heterogeneous aetiology that differs not only between

countries but even between areas within the same nation. Contemporary medical services have the potential to promptly reverse impaired kidney function; nonetheless, rapid intervention, early identification, and clinical awareness are crucial.

**Keywords:** Serum creatinine, GFR, Acute Kidney Injuries

## INTRODUCTION

The abrupt loss of renal function to the point that bodily fluid equilibrium is impossible to maintain is known as acute kidney injury. Serum creatinine levels rise to about twice the usual amount for the patient's age due to a decrease in GFR, which is the condition's primary characteristic<sup>1</sup>. Its frequency, morbidity pattern, diagnostic challenges, treatment options, prognosis, and final results in individual instances have all been forecasted to make it a significant issue for the paediatric age range. Due to the high occurrence of infections, sepsis, acute glomerulonephritis, and gastroenteritis in hot and humid climates, it is still a prevalent ailment in underdeveloped nations, but in western countries, the main causes are trauma, surgery, alcohol, and narcotics.

AKI has been becoming more common, and other investigations have shown varying degrees of mortality as well. Even with contemporary therapeutic techniques like dialysis, the death rates have not altered over time. This is due to changes in the patient population, including an increase in nephrotoxic causes and a decrease in transfusion-related causes, modifications to surgical techniques, advancements in resuscitation and intensive therapy, which lead to longer survival times, and the development of AKI. The data on various features of the disease in the international literature are becoming less and less useful due to these changes in the age at which AKI begins and its etiological pattern.

Predisposing factors include malnutrition, low socioeconomic status, unfavourable climatic and geographic conditions, a high rate of illiteracy, inadequate medical facilities, and unsanitary environmental conditions. However, in developing nations like India, precipitating factors like gastroenteritis with dehydration, shock, infections, nephritic syndrome, snake bite, and drug abuse are more common. Scientific evidence for the above listed AKI features is woefully insufficient when considering the Indian setting.

AKI's early and established clinical characteristics are varied and resemble those of several different illnesses. The majority of institutions have very inadequate laboratory facilities for diagnosis, and the biochemical markers for early detection are not adequately defined.

Since our setup can not completely accommodate the therapeutic techniques proposed by foreign authors, our only option for therapy is conservative, often peritoneal dialysis. For younger children with AKI, it is still the primary operation that saves their lives. Given the severity of the issue and the evolving landscape with respect to the age distribution, etiological pattern, clinical presentations, and the advantages of prompt identification and effective treatment, this study was conducted to examine the different facets of AKI in children within our setting.

## MATERIAL AND METHOD

Children throughout the newborn period who were at high risk of developing AKI or those who came with AKI to the paediatric ward of the S.C.B. Medical College and Hospital and the S.V.P. Post Graduate Institute of Paediatrics in Cuttack were included in the study's material. The instances chosen for the research and the methods used are described in full below.

**Study duration:** September 2011 to October 2013.

Laboratory parameters were used to test for signs of AKI in all children older than 28 days who had clinical indications of developing oligouria or anuria. They also included those who showed signs of AKI while they were in the hospital. Serum creatinine levels of 1.5 mg/dl or higher in children older than one year, and 1 mg/dl or higher in children less than one year, were used to include those who were clinically suspected.

The study eliminated all suspected children who did not meet laboratory standards. Children who suffered from acute or chronic renal insufficiency were also not included.

Each case's comprehensive medical history, clinical examination, investigations, course of treatment, and reaction to therapy were recorded in the proforma that was created. They were evaluated for nutritional status using the Indian Academy of Paediatrics classification.

Patients who were at risk of developing pre-renal type AKI were given a fluid challenge consisting of 20 millilitres per kilogramme during a 30-minute period of time. This was followed by a diuretic challenge (frusemide, 2 milligrammes per kilogramme) until dehydration, hypotension, or shock, if connected, had been corrected. Pre-renal type AKI patients were those who had urinated, but intrinsic type AKI patients did not. Each patient's clinical profile and renal status were noted, and every effort was made to ascertain the cause of each condition.

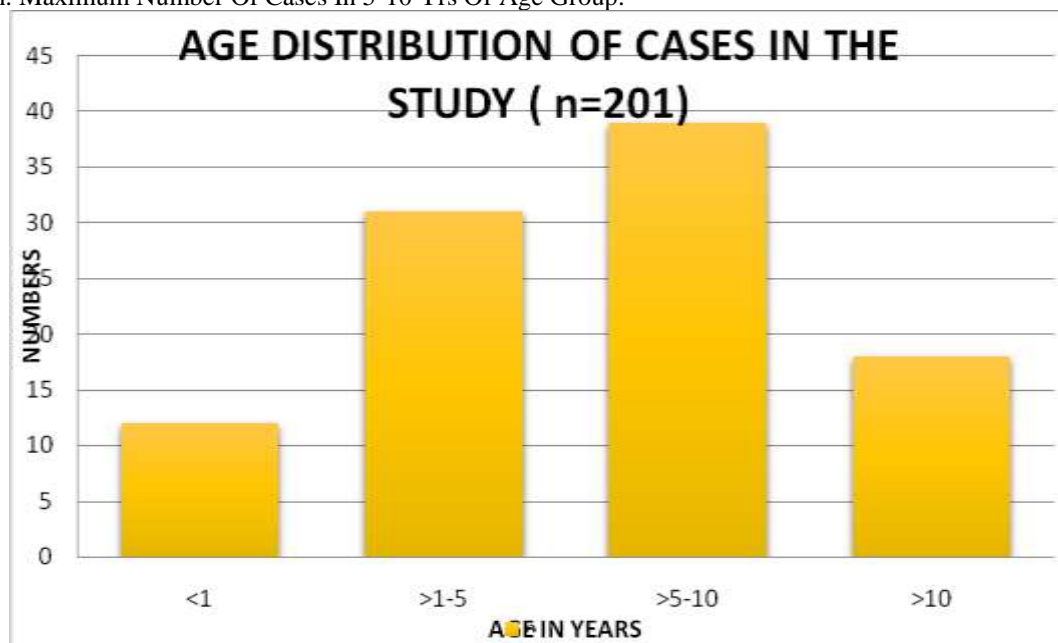
The information was recorded in tabular form. MS Excel and "SPSS version 19" were used to apply the necessary statistical techniques. The proportion of the outcome variable in various clinical and demographic subgroups was observed using it. In order to reach a conclusion, additional parametric and non-parametric analysis and hypothesis verification were carried out.

**RESULT**

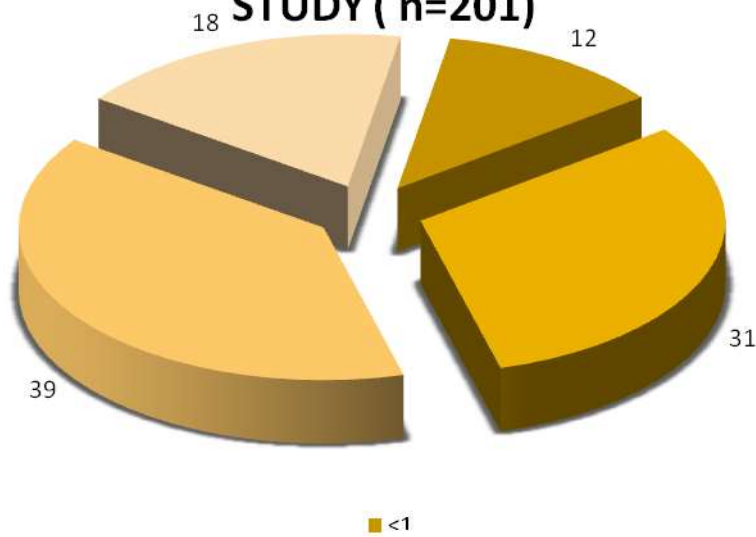
**Table 1 AGE DISTRIBUTION IN THE STUDYBPOPULATION (n = 201)**

SL. NO.	AGE GROUPS (IN YRS)	NUMBER(n)	PERCENT(%)	CUMULATIVE PERCENT
1.	<1	24	11.9	11.9
2.	>1-5	63	31.3	43.3
3.	>5-10	78	38.8	82
4.	>10	36	17.9	100
	TOTAL	201	100	

Table 1 : Shows Age Distribution Of Cases In This Study. Under 5 Age Group Comprised 43 % Of Total Study Population. Maximum Number Of Cases In 5-10 Yrs Of Age Group.



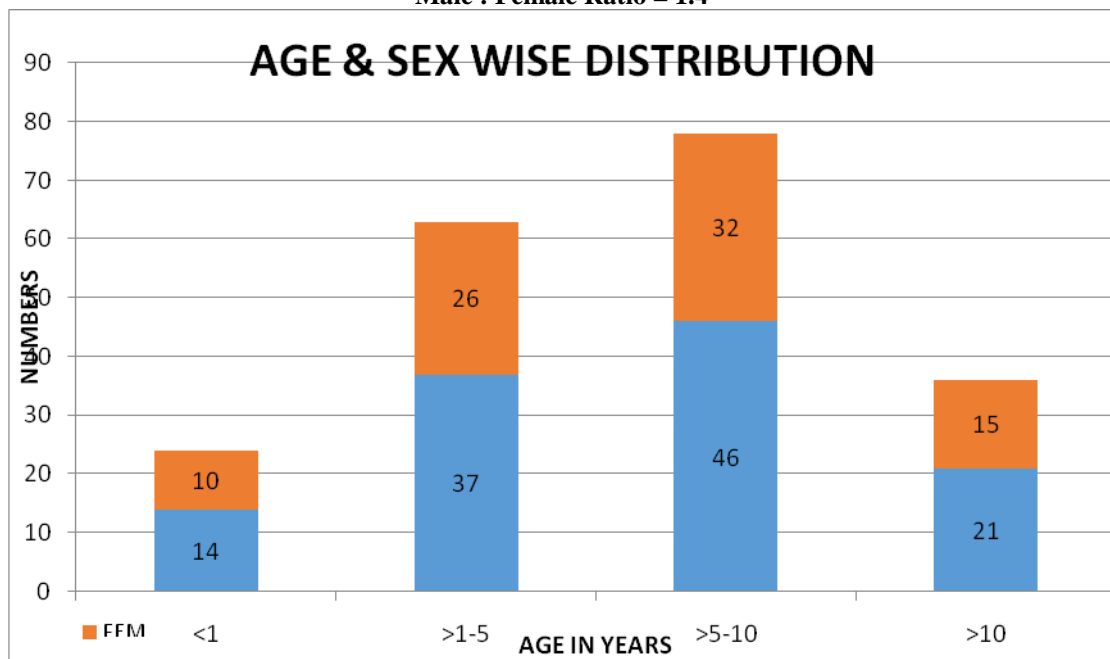
**AGE DISTRIBUTION OF CASES IN THE STUDY ( n=201)**



**Table 2 AGE & SEX DISTRIBUTION IN THE STUDYBPOPULATION (n = 201)**

SL. NO.	AGE GROUPS ( IN YRS)	SEX		Total(n)
		F	M	
1.	<1	10	14	24
2.	>1-5	26	37	63
3.	>5-10	32	46	78
4.	>10	15	21	36
	<b>TOTAL</b>	<b>83</b>	<b>118</b>	<b>201</b>

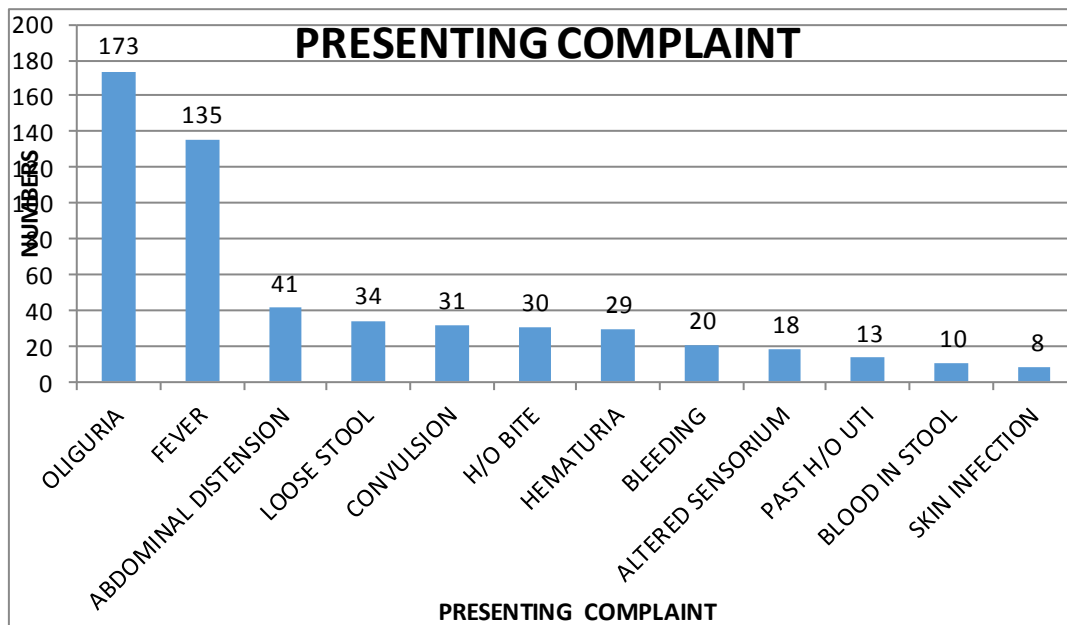
**Table 2 : Outline The Sex Composition Of The Study Population In Each Age Group. Male : Female Ratio = 1.4**



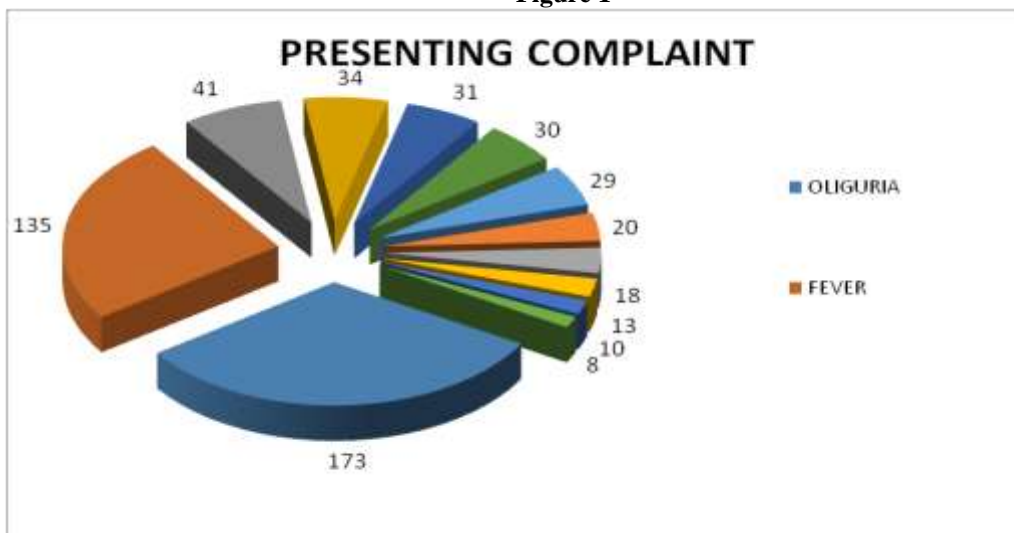
**Table 3 PRESENTING COMPLAINT OF PATIENTS IN THE STUDY GROUP (n=201)**

SL. NO.	SYMPTOMS	NO OF CASES (n=201)	PERCENT
1.	Oliguria	173	86.1
2.	Fever	135	67.2
3.	H/O Bite	30	14.9
4.	Loose stool	34	16.9
5.	Skin infection	8	4
6.	Abdominal distension	41	20.4
7.	Hematuria	29	14.4
8.	Convulsions	31	15.4
9.	Altered sensorium	18	9
10.	Bleeding	20	10
11.	Blood in stool	10	5
12.	Past H/O UTI	13	6.5

**Table 3 : Shows The Presenting Symptomatology Of Study Population.Oliguria/Anuriawas The Most Common Presenting Complaint Among 86%. Fever Was The Next Common Presenting Feature In 67%.**



**Figure 1**



**The Comparison Of Clinical Features Between The Study Group And U.T.N Acharya *Et al* Is Outlined Below.**

Sl. no.	Clinical presentation	Study group (n=130)	U.T.N Acharya <i>et al</i> <sup>57</sup>
		Percent (%)	Percent (%)
1.	Oliguria/anuria	86.1	100
2.	Anemia	63	80.5
3.	Malnutrition		70.7
4.	Loose stool	17	58.5
5.	Edema	38.3	48.8
6.	Dehydration	17.4	39
7.	Sepsis	21.4	29.3
8.	Hypotension	25.4	26.8
9.	Hypertension	11.9	12.2
10.	Encephalopathy	18.9	19.5
11.	GI hemorrhage	4.8	7.3

**DISCUSSION**

If treatment for acute kidney injury in children is postponed or ignored, the disease might be lethal. In contrast to Western or industrialised nations, where congenital deformities, trauma, or poisons are the primary causes of AKI, the majority of the causal diseases in our nation are easily curable or avoidable. Clinical knowledge, early identification, and treatment of AKI, however, can significantly alter these patients' prognosis. The current research from SCB Medical College & SVP Post Graduate Institute of Paediatrics, "STUDY ON SPECTRUM OF ACUTE KIDNEY INJURY (AKI) IN CHILDREN BETWEEN 1 MONTH AND 18 YEARS OF AGE GROUP," effectively illustrates this. The majority of the districts in eastern Odisha and the surrounding states receive their critically sick patients from Cuttack, which is home to tertiary care referral centres.

Thirty-one cases that met the inclusion criteria were included in the current study out of the total number of 12947 admissions to the paediatric department in the specified age range throughout the study period. Thus, 1% of hospitalised patients in the current research had an incidence of AKI. R.N Srivastava *et al.* identified a similar frequency of about 1%, although other authors<sup>3,5,22</sup> have reported an incidence that ranges from 5% to 19%, which is significantly higher than the current research. This discrepancy can result from their series' inclusion of neonatal cases and greater number of research cases.

Indicates age incidence of AKI cases in the present study. Majority of cases, 38.8% were observed in the age group of 5-10 years followed by 31.3% in 1-5years. 44% cases occurred in the under 5 age group in our study. Similar age distribution was observed by P. Arora *et al.*<sup>5</sup> (51.9% below 4 years), R.N.Srivastava *et al*<sup>78</sup> (49% in less than 4 years age group) and U.T.N Acharya *et al*<sup>57</sup> (51.2% between 1-4 years).

In the present study male children outnumbered females (M:F=1.4:1) as shown in table 2. P. Arora *et al*<sup>5</sup>, R.N Srivastava *et al*<sup>78</sup> and U.T.N Acharya *et al*<sup>57</sup> also reported a similar male dominance, though the ratio was different being 3:1, 2.3:1, 2.1:1 respectively. This discrepancy might be due to regional and social difference in the above three studies which were conducted in the states of UP, Delhi and Northern India. The reason for male preponderance could be because of gender bias favouring male children, secondly due to higher susceptibility to infection and also more outdoor activities leading to snake bite, mostly in the above 5 years age group. Males are also more prone for certain congenital anomalies like PUV.

indicates the various clinical features observed in AKI cases in the present work. Oliguria / anuria was present in approx. 86% of cases, next most common presenting feature was fever in 67.2% followed by H/O snake bite in 14.9%, loose stool in 16.9% cases amongst the study group. Oligouria / anuria was the presenting feature in 100% cases of the study undertaken by U.T.N Acharya *et al*<sup>57</sup> (Anuria in 95.1% and Oliguria 24.9) and P.Arora *et al*<sup>5</sup> (anuria in 53.6% and oliguria in 46.4%). This difference is due to detection of biochemical derangements in snake bite cases mostly during their hospital stay and in this study these cases contributing to significant number among study population. Loose stool was found in 16.9% cases admitted as AGE in our study population as against 58.5% in U.T.N Acharya *et al*<sup>57</sup>, 17% in R.N Srivastava *et al*<sup>78</sup>, difference attributed to the regional and cultural practices, increasing level of awareness among

the people regarding oral rehydration. We observed presence of skin infection as a marker of AGN(4%) , altered sensorium(9%), hematuria(14.4%), convulsion (15.4%), abdominal distension (20%), bleeding manifestation and bloody stool(5%) cases amongst the study population. Agarwal *et al* 80 observed main presenting complaints were diarrhoea (86%),oliguria (72%), rapid respiration (37%), oedema (37%), vomiting (19%) and seizures (13%) in their study population.

## CONCLUSIONS

Based on the findings of this study, children aged 5 to 10 years had a higher incidence of acute kidney injury, with a higher incidence rate among boys. With sepsis coming in second, malaria was the most prevalent cause of oliguria/anuria, which was the most common presenting pattern. The most prevalent kind of AKI was intrinsic. In most cases of hyperkalemia in a sizable patient sample, there was a mild disturbance of renal function. Dialysis was needed for 34% of patients, and 13% of cases ended in death. There was no correlation found between the outcome prediction and age, sex, nutritional status, length of oliguria, type of renal failure, level of CRP(Q), and serum sodium level. However, there was a significant correlation with anaemia, leucocytosis, blood pressure at the time of presentation, level of urea, creatinine, and potassium, and the type of management conducted.

This study demonstrated the etiological patterns in this region of the state and certain areas of Eastern India, and it focused on the many domains of Acute Kidney Injury in children who presented to the hospital. The study population was well-characterized and heterogeneous.

Children's AKI has a heterogeneous aetiology that differs not only between countries but even between areas within the same nation. Contemporary medical services have the potential to promptly reverse impaired kidney function; nonetheless, rapid intervention, early identification, and clinical awareness are crucial.

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