

# Prevalence of Renal and Urinary Tract Diseases among Pediatric Cases Admitted in a Tertiary Hospital in Developing Country

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## ABSTRACT

### Background

Kidney disease includes diseases of the glomerulus, tubular disorders, and conditions associated with hematuria or proteinuria. Urinalysis can be a reliable and easy tool to screen.

### Objective

In this study, we aim to study the prevalence of renal and urinary tract diseases among the pediatric population in a tertiary hospital in Nepal.

### Method

A single-center retrospective cross-sectional study was conducted from 2022 to 2023 in the pediatric department. Information was obtained regarding clinical-epidemiological profile, associated condition, investigations, diagnosis, and duration of hospital stay, management, and outcome.

### Result

The prevalence of renal disease was 5.6%, with urinary tract infection being the most common diagnosis. Maximum cases presented between one and five years with a male-to-female ratio of 1.1:1 and 80.9% of the patients had new onset disease. The mean duration of hospital stay was six days. The mortality rate in renal diseases was 3.2%.

### Conclusion

Renal diseases make up a significant portion of pediatric admissions. Renal diseases contribute to significant morbidity and mortality. A large number of cases of renal diseases are due to infective etiology hence they are preventable and curable. Renal disease in children presents with vague symptoms and signs. Routine screening of renal diseases is needed for early diagnosis and reduction in morbidity and mortality.

## KEY WORDS

*Kidney diseases, Pediatrics, Urinary tract infection*

## INTRODUCTION

According to the American Journal of Kidney Diseases, kidney disease is a heterogeneous group of disorders affecting kidney structure and function.<sup>1</sup> It includes diseases of the glomerulus, tubular disorders, and conditions associated with hematuria or proteinuria. Early signs of renal diseases include fever, pain, anemia, gastrointestinal symptoms, abdominal mass, edema, hypertension, and metabolic acidosis.<sup>2</sup> Renal diseases contribute significantly to morbidity and mortality in children.<sup>3</sup> In children, renal diseases may be asymptomatic and are discovered during the routine physical examination.<sup>4</sup> Urinalysis, if performed carefully, can be a reliable and easy tool to screen for renal diseases.<sup>5</sup>

In this study, we aim to study the prevalence of renal and urinary tract diseases among the pediatric population in a tertiary hospital in Nepal.

## METHODS

A single-center retrospective cross-sectional study done for one year from January 2022 to January 2023 was done in the pediatric ward and pediatric high dependency unit and intensive care unit in the pediatric department of Dhulikhel Hospital for the presence of renal and urinary tract diseases. Ethical approval was obtained from the institutional review board of Kathmandu University School of Medical Sciences (KUSMS-IRC) with approval number 167/23.

The pediatric population (up to the age of 16 years) admitted from the emergency and outpatient Department were included. Re-admissions, neonates, and those with absent hospital records were excluded from the study. Neonates were excluded from the study because of differences in the presentation of the diseases. Total population sampling was done.

Detailed history, examination, and relevant laboratory investigations were done for all the cases. The initial investigations conducted for every case of renal and urinary tract diseases included a complete blood count, renal function test, urinalysis, and urine culture. If needed further investigations like renal ultrasonography, micturating cystourethrogram, intravenous urography, anti-streptolysin O, anti-DNAse, and 24-hour urinary protein were done. Children were divided into four age groups: one month to one year, one year to five years, five to ten years, and over ten years.

## RESULTS

During our study period, 1116 children were admitted among which 63 (5.6) children had renal disease. The commonest renal disease seen in the children was urinary tract infection 40 (63.4) followed by acute glomerulonephritis 10 (15.8), nephrotic syndrome 4 (6.3),

and acute kidney injury 4 (6.3). Other diseases that were seen were hemorrhagic cystitis 2 (3.1), hypospadias 1 (1.5), chronic renal failure 1 (1.5), complete duplication of kidney 1 (1.5) and psychogenic urinary dysfunction 1 (1.5).

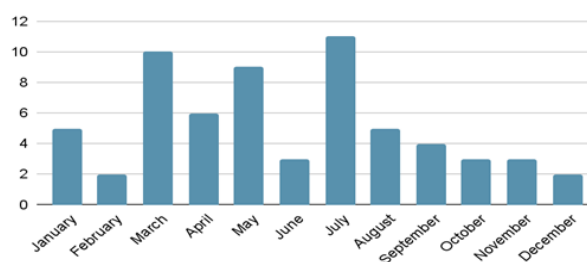
Maximum number of patients presented between one and five years. Patients aged less than one year were 14 (22.2), one to five years were 23 (36.5), five to ten years were 17 (26.9) and those greater than ten years were 9 (14.2). Cases were between 1 month to 14 years of age. There were 33 (52.3) males and 30 (47.6) females. There were more males with a male-to-female ratio of 1.1:1.

Among all the cases, 40 (63.4) were from Kavrepalanchowk where the hospital is located, while 9 (14.2) were from Sindhupalchowk, 8 (12.6) were from Sindhuli and 4 (6.3) were from Bhaktapur. The remaining two cases (3.17) were from other remaining districts.

Maximum cases presented in July 11 (17.4) followed by March 10 (15.8), signifying maximum presentation in the first six months of the year. The number of patients according to the month of the year is summarized below in a vertical bar chart.

**Table 1. Profile of renal and urinary tract diseases**

Diseases	Male, N (%)	Female, N (%)	Total N (%)
Urinary Tract Infection	20(62.5)	20(62.5)	40(63.4)
Acute Glomerulonephritis	4(12.5)	6(18.7)	10(15.8)
Nephrotic Syndrome	3(9.3)	1(3.1)	4(6.3)
Acute Kidney Injury	3(9.3)	1(3.1)	4(6.3)
Hemorrhagic Cystitis	0	2(6.2)	2(3.1)
Chronic Renal Failure	0	1(3.1)	1(1.5)
Complete duplication of kidney	0	1(3.1)	1(1.5)
Hypospadias	1(3.1)	0	1(1.5)
Psychogenic bladder	1(3.1)	0	1(1.5)



**Figure 1. Bar diagram showing the distribution of patients presenting each month during the study period.**

Most of the cases presented with fever 36 (57.1) followed by swelling of the whole body/body parts 14 (22.2%), abdominal pain 11 (17.4) and vomiting 10 (15.8). Other symptoms were burning micturition/ straining 5 (7.9), hematuria 5 (7.9), decreased frequency of micturition 5 (7.9), increased frequency of micturition 2 (3.1), dribbling of urine 1 (1.5), shortness of breath 2 (3.1) The renal and urinary tract diseases were diagnosed incidentally in 4 cases (6.3).

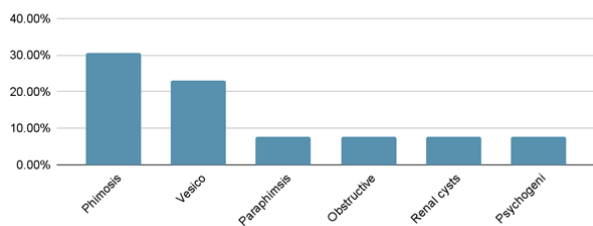
The most common age group with urinary tract infection was 1 year-5 years 18 (45.0) followed by < 1 year 10 (25.0) and 5 years to 10 years 10 (25.0) and the least was > 10 years with only 5% of cases. There was no sex predilection observed in UTI, with an equal number of males 20 (62.5) and females 20 (62.5) affected and 45% of total cases (18) of UTI were urine culture posi-tive and 55 (22) were culture negative. Escherichia coli was the most commonly isolated mi-crobe which showed growth in 10 cases (55.5). Other organisms were Klebsiella 3 (16.6), Pseudomonas aeruginosa 2 (11.1), Enterobacter sps 2 (11.1) and Enterococcus sps 1 (5.5).

**Table 2. Result of Urine Culture among the patients with UTI**

Urinary Tract Infection	Number (%)
<b>Culture positive</b>	18 (45.0)
Escherichia Coli	10 (55.5)
Klebsiella sps	3 (16.6)
Pseudomonas aeruginosa	2 (11.1)
Enterobacter sps	2 (11.1)
Enterococcus sps	1 (5.5)
<b>Culture Negative</b>	22 (55)
<b>Total</b>	40

About 50 percent of the nephrotic syndrome cases were newly diagnosed cases and the remaining 50 percent were the first episode of infrequent relapse. The mean age of children with Nephrotic syndrome and acute glomerulonephritis was 5.75 years and 9.4 years respectively. About 80 percent of acute glomerulonephritis were cases of post-infectious glomerulonephritis. Among them, 20 percent of them had a history of skin lesions and 10 percent cases had a history of pharyngitis before the disease.

Among all the cases, the majority were new-onset 51 cases (80.9), while the remaining were recurrent cases 12 (19.0). Among all the cases, 13 cases had other associated renal condi-tions like phimosis (30.7), vesico ureteric reflux (23.0), paraphimosis (7.6), Hypospadias (7.6%), complete duplication of kidney (7.6%), obstructive uropathy (bladder outlet obstruction) (7.6%), renal cysts (7.6%) and psychogenic bladder (7.6%).



**Figure 2. Figure showing associated renal conditions.**

Special procedures and management required were surgery 4 (6.3), micturating cys-tourethrogram 3 (4.7) and cystoscopy 1 (1.5).

**Table 3. Table showing Special Procedures and management required**

Procedure/ Management	N (%)
Surgery	4 (6.3)
Micturating cystourethrogram	3 (4.7)
Cystoscopy	1 (1.5)
Mortality	2 (3.2)
Referral	5 (7.9)

The mean duration of hospital stay was six days, ranging from one to twenty-one days. Twenty-one days hospital stay was for a patient with UTI. Forty-seven cases fully improved (75) with-out any residual renal dysfunction. There was a mortality of 2 cases (3.2) of which one case expired due to septic shock and the next case due to acute kidney injury.

### DISCUSSION

Pediatric renal and urinary tract diseases are often underdiagnosed and diagnosed at later stages due to diverse clinical manifestations. Among the admitted 1116 Patients, 5.6% of the cases were admitted due to renal and urinary tract diseases. The prevalence of renal and urinary tract diseases in our study is similar to other studies done by Bhatta et al. and Sonowal et al., but higher than Thakkar et al.<sup>6-8</sup>

The commonest disease requiring admission was Urinary Tract Infection (63.4%), which is similar to other studies done by Malla et al. and Anigilaje et al.; but in most of the other studies, it is seen that Nephrotic Syndrome is the commonest.<sup>6-11</sup> The high number of cases of UTI can be attributed to the fact that 8% of children between the ages of 1-11 years will have at least one episode of UTI during this time period.<sup>12,13</sup> The cases of UTI presented with unexplained fever, vomiting, abdominal pain, irritability, and other vague symptoms so a high index of suspicion of UTI is required in such cases. The difference in the pattern of disease may be due to genetic, and environmental factors and also due to fewer resources and low referral of complicated renal diseases to our center due to the absence of a pediatric nephrology unit and pediatric dialysis facilities.

The most common age group affected was one to five years of age which is similar to Thakkar et al. but different from the study by Malla et al. where they have 5-10 years of age was the commonest.<sup>8,9</sup> In our study, There were 33 (52.3) males and 30 (47.6) females. There was no significant difference in sex as seen in the study by Derakshan et al. but male predominance was observed in other studies.<sup>7,8,10,14</sup>

In our study, fever was the commonest symptom during presentation 36 (57.1%) followed by swelling of the whole body/body parts 14 (22.2%) and abdominal pain 11 (17.4%) which is comparable to another study from Nepal.<sup>9</sup>

However the other presenting symptoms like hematuria, oliguria, and burning micturition were lower in our cases. In our study, males and females were equally affected by urinary tract infection which is different from other studies, where there is a female preponderance.<sup>7,8,14</sup> *Escherichia coli* was the most commonly isolated microbe in Urinary Tract Infection which showed growth in 55.5% of culture-positive cases, like in other studies in Iran.<sup>14</sup>

Among the causes of acute glomerulonephritis, 80% of cases were due to post-streptococcal glomerulonephritis, which is the most common cause of acute glomerulonephritis in developing countries, and the remaining cases 20% cases were due to lupus nephritis.<sup>9,15-17</sup> The most common mode of presentation was hypertension (80%), swelling of the periorbital region (80%), hematuria (40%), fever (50%), and oliguria (20%) like in other studies done in our country. Fifty percent of post-streptococcal glomerulonephritis cases presented with one or more complications (pulmonary edema, encephalopathy, nephrotic range proteinuria) like in the other studies.<sup>6</sup> Hypertension should be promptly managed in children to avoid its life-threatening complications and progression to chronic kidney disease.<sup>18,19</sup>

In our study, the prevalence of AKI was 6.3% and the causes of AKI were sepsis, severe diarrhea, and obstructive pathologies which are similar to those reported in other articles.<sup>8,9</sup> Pediatric high-dependency unit and intensive care unit facilities needed for renal diseases among the pediatric admissions were 14.4% and 14.6%. This shows the increased need for specialized care for renal diseases among the pediatric population.

About 7.9% of cases were referred due to the need for pediatric dialysis and renal biopsy facilities. In a study done by Malla et al. mortality among the cases was 2.2% but mortality due to renal diseases in our setting was 3.2%, which is comparatively higher in our study and the cause being AKI and sepsis as in other studies.<sup>9,20,21</sup>

Despite offering insights into the prevalence and patterns of renal and urinary tract diseases among the pediatric population in a tertiary hospital in a developing country, the study has some limitations. Being a single-center study, generalizability to other settings may be limited. Furthermore, the data's representativeness might be impacted by the very small sample size. Due to the study's limited diagnostic techniques, more complicated aetiologies may have been overlooked. Furthermore, incomplete data and limited follow-up may hinder a comprehensive understanding of disease outcomes and progression. Lastly, resource constraints in the study setting could impact access to advanced diagnostic and treatment options, potentially influencing patient management and outcomes. Addressing these limitations in future research could enhance our understanding of pediatric renal and urinary tract diseases in similar settings.

## CONCLUSION

In conclusion, our study provides insight into the burden of renal and urinary tract diseases among pediatric populations in a tertiary hospital in a developing country, with urinary tract infections as the most common condition observed. We also observed notable proportions of cases presenting with acute glomerulonephritis, nephrotic syndrome, and acute kidney injury. Renal diseases make up a significant portion of pediatric admissions. Renal diseases contribute to significant morbidity and mortality. A large number of cases of renal diseases are due to infective etiology hence they are preventable and curable. Renal diseases in children present with vague symptoms and signs. Late stages of renal disease/ complicated renal disease demand highly skilled manpower and technical resources like renal histopathology, dialysis machines, and fluid and kidney transplantation facilities, which are not readily available in developing countries. Routine screening of renal diseases is needed for early diagnosis and reduction in morbidity and mortality.

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