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ORIGINAL ARTICLE

PATTERN AND OUTCOME OF RENAL DISEASES IN HOSPITALIZED CHILDREN IN TIKUR ANBESSA SPECIALIZED TEACHING HOSPITAL, ADDIS ABABA, ETHIOPIA

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ABSTRACT

Background: *Renal diseases are major causes of morbidity and mortality in pediatric practice. Pediatric patients with renal disease, especially younger ones may present with nonspecific signs and symptoms unrelated to the urinary tract. Unexplained fever or failure to thrive may be the only manifestation. Most children with renal diseases in our hospital arrive very late either because of inadequate health awareness among the parents or failure of recognizing the symptoms of renal diseases at a lower health care level. This review will highlight the symptoms of renal diseases at presentation and outcomes of treatment in children in a major referral hospital.*

Methods: *A cross-sectional retrospective chart review was done over a period of 3 years (June, 2012 to May, 2015) in 381 admitted children (Birth-17 years) at Tikur Anbessa Specialized Teaching Hospital in Addis Ababa, Ethiopia.*

Results: *Out of 14521 pediatric ward admissions in the study period, kidney diseases accounted for 473 admissions in 381 children, accounting for 3.3% of all admissions. The three most common renal diseases observed were congenital anomalies of the kidney and urinary tract (CAKUT) seen in 127 children (26.8%), followed by nephrotic syndrome in 80 children 16.9% and acute glomerulonephritis in 58 children (12.2%). Other renal diseases observed were urinary tract infection 8.0%, urolithiasis 6.7%, Wilm's tumor 6.3%, acute kidney injury 4.2% and chronic kidney disease 4.0%. Other less frequently detected diseases were bladder exstrophy, lupus nephritis, Henock shonlein Purpura nephritis and prune-belly syndrome.*

Out of 381 children 207 (54.3%) recovered normal renal function, 20(5.2%) remained with proteinuria, 13(3.4%) progressed to chronic kidney disease and 11(2.9%) died. Sixty one nephrotic children (76.3%) achieved remission but 17 children (21.3%) remained with proteinuria; one steroid resistant child died of end stage renal disease. Ten children (2.6%) with different renal diseases were lost to follow-up and 5 (1.3%) discharged against medical advice.

Conclusions: *This data reflects that many of the renal diseases are preventable or potentially curable. Therefore, improvement of pediatric renal services and training of health workers would help in early detection and treatment of these conditions leading to reduction in their morbidity and mortality.*

Key Words: *Renal disease, Children, Ethiopia*

INTRODUCTION

Renal diseases are major causes of morbidity and mortality in hospitalized pediatric patients. Pediatric patients with renal disease, especially younger ones may present with nonspecific signs and symptoms unrelated to the urinary tract. Pediatricians, therefore, should be familiar with the modes of presentation of renal disease and should have a high index of suspicion of these conditions (1).

Kidney disease often goes undetected in the general population, but children and adolescents are at an even greater risk due to the nature of the causes of the disease and the ambiguity of the symptoms (2).

The patterns of renal disease in children are different in developing countries as compared to developed countries and pediatric renal diseases contribute about 4.5-8.7% of total pediatric admissions. Renal disease in hospitalized children and young adults can be difficult to diagnose early as it may present only with few symptoms, tends to have different course than adults

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and respond variously to different treatment. During infancy and early childhood unexplained fever or failure to thrive may be the only manifestation of underling renal disease (3).

Studies from different geographical areas around the world have reported variable patterns of renal diseases in pediatric population (4). These variations could be related to genetic predisposition, environmental factors, or lack of awareness about importance of early diagnosis of such disorders. Children with potentially treatable conditions urological anomalies are often referred late with advanced disease.

Lack of advanced diagnostic and treatment facilities in many of our hospitals often leads to inaccurate diagnosis and suboptimal treatment. These factors eventually lead to progression of renal disorders to end stage renal failure (ESRF) resulting in high morbidity and mortality (5).

Despite the challenges of pediatric nephrology practice, significant success in disease outcome is being reported from developed countries. This is largely attributable to available expertise, management facilities, health insurance schemes and screening programmes. This is in contrast to what is obtainable in developing countries like ours, where low priority is accorded, partly due to the focus on communicable diseases and also because of lack of data on pediatric kidney diseases, with resultant overall poor outcome in this group of patients (6).

There are few Asia and South America studies on the pattern and outcome of renal diseases in hospitalized children (4,7,8). Other African studies on the pattern and outcome of renal diseases in hospitalized children are scarce with only few studies coming from Nigeria and Libya **(**6,9,10,11**).** Many of these diseases are preventable or potentially curable.

There are no data in the Ethiopian context and this study will highlight the magnitude of the problem and outcomes of treatment in a tertiary hospital where advanced nephrology care is being delivered. The objective of this study is to find out the patterns and outcome of hospitalized children with renal diseases in a tertiary teaching hospital.

MATERIALS AND METHODS

Study setting: The study was conducted at Addis Ababa University, College of Health Sciences, Tikur Anbessa Specialized Teaching Hospital, Department of Pediatrics and Child Health, which is located in Addis Ababa, the capital city of Ethiopia.

The department has pediatric renal clinic twice every week (Tuesday and Thursday) where all renal patients are followed. The clinics are attended by pediatric nephrologists and residents with an average of 25-30 patients per week.

Using the formula $n=z^2\ p\ (1\text{-}p)/d^2$ taking 95% CI and precision of 5%, p as 50%*, the calculated sample size (n) =384.

* Because the proportion is unknown P is taken as 50 %.

The study was performed from June 2012 to May 2015. Data were carefully reviewed and all patients with incomplete records were excluded. The data included personal, clinical and laboratory data. Data about age, gender, urinary symptoms (burning micturition, poor urinary stream, frequency, dribbling), other symptoms (hematuria, oliguria, flank or suprapubic pain), clinical signs (edema, hypertension), urine tests (cultures, urine microscopy, dipstick for protein, protein quantitative tests), blood tests (urea, creatinine, albumin, electrolytes, ASO titer, Hepatitis B and C markers, cholesterol, triglycerides) and imaging (ultrasound scan [USS], micturating cystourethrogrm [MCUG], abdominal CT scan, intravenous pyelogram (IVP), plain abdominal film (KUB) and CXR were carefully recorded. Outcome measures were recovery of normal renal function, persistence of proteinuria, chronic Kidney injury (CKD), or death.

AKI was diagnosed using the RIFLE (Risk, Injury, Failure, Loss, End-stage) criteria. Chronic kidney disease (CKD) and nephrotic syndrome were defined based on the Kidney Disease Outcomes Qualitative Initiative (KDOQI) and the International Study of Kidney Disease in Children guidelines respectively (9,12).

All admitted children who had the clinical and laboratory data and having suggestive imaging findings of renal diseases were included but patients with incomplete records were excluded. The quality and completeness of gathered information was checked periodically by the principal investigator. The collected data was cleaned manually.

Data entry and analysis were done using a software program statistical package for social science (SPSS) version 20.0. Descriptive statistics used comprised mean, median, standard deviation (SD) ± and percentages. The comparative statistics were chi-square test

and Students t-test. Statistical significance was defined as $P < 0.05$. The study was conducted after obtaining ethical clearance from the Institutional Review Board (IRB) of College of Health Sciences, Addis Ababa University. Anything that could break the anonymity of the individual was avoided including name.

RESULTS

Out of 14521 pediatric ward admissions, kidney diseases accounted for 473 admissions in 381 children, accounting for 3.3% of all admissions. There were 230 males (60.4%) and 151 females (39.6%) giving a male to female ratio of 2.1:1. The mean age at the time of diagnosis was 5±2.6 years (range 15 days-17 years). Forty six per cent of the patients were below 5 year of age, 32.3% between 5-10 years, and 21.3% above 10 years of age (Table 1). The most common presenting features of renal diseases were edema and proteinuria (Table 2).

There was a significant correlation between the pattern of renal disease and the age of presentation (P =0.002);60% of CAKUT and 65% of glomerular diseases presented in under five and five to ten years of age respectively. However, there was no significant correlation between the pattern of diseases and gender (P = 0.351).

The most common renal disease in this study was congenital anomalies of the kidney and urinary tract (CAKUT), seen in 127 children (26.8%), most of them 53/127 (; 41.7%) were due to obstructive uropathy. Posterior urethral valve (PUV) was the commonest cause of urinary tract anomalies (35/127). Table 3 shows the types or renal diseases observed in this study.

Table 1: Age distribution of study subjects with renal diseases in Tikur Anbessa Specialized Teaching Hospital, Department of Pediatrics and Child Health, Addis Ababa, Ethiopia

Age	Frequency	Percent
Birth-1 month	16	4.2
1month- 12 month	41	10.8
1-5 year	120	31.5
5-10 year	123	32.3
10-17 year	81	21.3
Total	**381**	**100.0**

Table 2- Presenting features of childhood renal diseases in Tikur Anbessa Specialized Teaching Hospital, Department of Pediatrics and Child Health, Addis Ababa, Ethiopia

Presenting feature	Frequency	Percentage
Edema (generalized or facial) + proteinuria	144	23.1%
Urinary symptoms (burning micturition, poor urinary stream, frequency, dribbling)	141	22.6%
Associated symptoms(vomiting, fever, anorexia)	108	17.3%
Hematuria	104	16.6%
Oliguria	73	11.7%
Flank and/or suprapubic pain	39	6.25%
Skin rash	15	2.4%

Table 3- Types of renal diagnoses (n=473) in 381 children with renal diseases Tikur Anbessa Specialized Teaching Hospital, Department of Pediatrics and Child Health, Addis Ababa, Ethiopia

Renal diagnosis	Frequency	Percentage
Congenital anomalies of the kidney and urinary tract	127	26.8%
Nephrotic syndrome	80	16.9%
Acute glomerulonephritis (AGN)	58	12.3%
Urinary tract infection	38	8.0%
Urolithiasis	32	6.7%
Wilm's tumor	30	6.3%
Acute kidney injury	20	4.2%
Chronic kidney disease	19	4.0%
Bladder exstrophy	12	2.5%
Lupus nephritis	10	2.1%
HSP nephritis	6	1.2%
Prune-belly syndrome	3	0.6%
Chronic glomerulonephritis	2	0.4%
Congenital NS; HUS	1	0.2%
Miscellaneous diseases	18	3.8%
Total	**473**	**100.0%**

Nephrotic syndrome (NS) was the 2nd most common renal diagnosis in the study group, accounting for 16.9% (80/473 cases). The majority of nephrotic syndrome cases (76.3%) were steroid sensitive. Acute glomerulonephritis (AGN) was diagnosed in 58 cases (12.3%), most of them (52/58; 89.6%) had clinical and biochemical features of acute post-streptococcal glomerulonephritis (PSGN) including hematuria ± edema ± hypertension ± oliguria and evidence of recent streptococcal infection.

Urinary tract infection (UTI) and urolithiasis were relatively less common 8.0% and 6.7%, respectively. More males had UTI (n = 21) than females (n=17), with a ratio of 1.2:1. The commonest sites of urolithiasis were one or both kidneys in 20 out of 32 cases (62.5%) and in the bladder in 6 cases (18.7%). Wilm's tumor was diagnosed in 30 children (6.3%) and 5 children died due to infection while on treatment.

AKI occurred in 20 children (4.2%), mainly in children between 5 to 10 years of age. Acute post streptococcal glomerulonephritis (APSGN) was the main cause in 11 children (55.0%), followed by Wilm's tumor in three children that was related to treatment complications. Most of APSGN (8/11) were treated conservatively and three required acute intermittent peritoneal dialysis (PD).

CKD was seen in 19 children (4.0%); eleven of them (57.9%) were related to structural and anatomical anomalies of the kidney and urinary tract. Bladder exstrophy and lupus nephritis were among the least common renal diagnoses (2.5% and 2.1%, respectively). Seven out of 12 cases of bladder exstrophy were females and the rest were males. Among the lupus nephritis children five were steroid-sensitive, 3 children were steroid-resistant and 2 were lost to follow-up. One patient had additional spina bifida occulta. Other rare cases in this study were HSP nephritis, prune-belly syndrome, chronic glomerulonephritis, congenital nephrotic syndrome and HUS. Eighteen children were diagnosed to have miscellaneous diseases.

By the end of the study; 207 children out of 381 (54.3%) recovered normal renal function, 20 (5.2%) remained with proteinuria, 13(3.4%) progressed to CKD and 11 children (2.9%) died. Sixty one nephrotic children out of 80 (76.3%) achieved remission. 10 renal patients (2.6%) were lost to follow-up and 5 (1.3%) discharged against medical advice. Table 4 shows the outcome of children with renal diseases in this hospital.

Table 4- Outcome of childhood renal disorders in Tikur Anbessa Specialized Teaching Hospital, Department of Pediatrics and Child Health, Addis Ababa, Ethiopia

Renal disease	Recovery	Persistence of proteinuria	CKD	Death	On Chemo	Total
CAKUT	116(91.4%)	0	7(5.5%)	4(3.1%)	0	127(100%)
NS	61 (76.3%)	17 (21.3%)	1(1.2%)	1(1.2%)	0	80(100%)
AGN	55(94.8%)	0	3(5.2%)	0	0	58(100%)
Urolithiasis	31(96.9%)	0	1(3.1%)	0	0	32(100%)
Wilms tumor	0	0	0	3(10%)	27(90.0%)	30(100%)
AKI	19(95%)	0	0	1(5%)	0	20(100%)
CKD	19	0	0	0	0	19(100%)
Bladder ex-strophy	12(100%)	0	0	0	0	12(100%)
Lupus nephri-tis	5 (50%)	3(30%)	0	0	0	10(100%)*
Isolated UTI	7(87.5%)	0	1(12.5%)	0	0	8(100%)
HSP nephritis	6(100%)	0	0	0	0	6(100%)
Miscellane-ous disease	16(88.9%)	0	0	2(11.1%)	0	18(100%)

- AGN- Acute glomerulonephritis, AKI- Acute kidney injury, CAKUT- Congenital anomalies of the kidney and urinary tract, CKD- Chronic kidney disease, HSP- Honoch-Schonlein purpura, NS- Nephrotic syndrome, chemo- chemotherapy,
- *2 lupus nephritis children were lost to follow up

DISCUSSION

This study defines for the first time the pattern and outcomes of childhood renal diseases in tertiary care setting in Ethiopia. The pattern and outcome of renal diseases in Ethiopian children is difficult to determine precisely, because of the current pattern of referral and lack of a national data registry.

A total number of 14521 children were admitted during the study period out of which 381 children had renal disease. Three hundred and eighty one patients required inpatient care, which constituted 3.3% of total number of patients admitted to pediatric wards. This finding is comparable to that reported from Pakistan (3.35%) and Libya (3.3%) (4, 9).

The most common renal disease requiring hospital admissions in this study was congenital anomalies of the kidney and urinary tract (CAKUT; 26.8%). In many other studies CAKUT was found to be the 3rd and 4th common pediatric renal disease occurring with variable frequencies (3,5,6,8). This may be explained by the reason that most cases of CAKUT are referred to our hospital whereas other renal cases, such as nephrotic syndrome, AGN, UTI, etc, were managed at the nearby secondary care levels.

The second most common renal disease in this study was NS, seen in 80 patients (16.9%). This result is comparable to other studies from Iraq (15.9%) and Libya (18.9%) (8,9) but less than that reported from Lagos, Nigeria (22.8%), Pakistan (29%), Niger Delta, Nigeria (30%) and Nepal (34.1%) (3,4,6,10). On the other hand, lower rate had been reported from Sudan study (15%) (5). This variation in prevalence rates may be related to pattern of referral, genetic and/ or environmental factors. Most of the children with NS were steroid sensitive (76.3%), which is similar to reports from other developing countries, (3-6 8, 9) and higher than other developed countries other developed countries (14). Genetic and environment differences might have contributed to the differences.

In the present series AGN, commonly post-streptococcal glomerulonephritis (PSGN), was a relatively less frequent diagnosis (12.3%). This result contrasts sharply with reports from different countries showing higher prevalence rates of AGN; Libya (40.0%), Jos, Nigeria (37.7%), China (30%), Nepal (28.7%), Niger Delta Nigeria (18.2%) and South Africa (45%) (3, 9, 10, 15-17). This finding is comparable to that reported from Sudan (12%), Pakistan (10.9%) and Lagos, Nigeria (10%) (4,5,6). Environmental, racial, and genetic factors may have a role. Moreover, our patients with PSGN are often managed at secondary care level and only symptomatic or severe cases are referred to a tertiary level.

In this study, urinary tract infection (UTI) was relatively uncommon (10.5%). It is the 4th most common renal disease requiring admission to pediatrics ward in this study. This finding is similar to published reports from Libya (10%) (9). However, other studies from African and Asian countries had reported higher prevalence rates (30%, 20% and 18.4%, 16.3%) respectively (4, 5, 8, 10). In contrast, lower rates had been reported from other areas in these continents (3.5% and 3.1%, respectively) (3,6).

This variation could be related to variation in prevalence rates of other underlying renal morbidities. In this review most of UTI cases (71.1%) were diagnosed in association with other renal morbidities (congenital urinary tract anomalies, urolithiasis/ stones, CKD and AGN). These morbidities were detected in more than 50% of our patients, which may explain our findings. Similarly other workers have also reported occurrence of UTI in association with these renal disorders (3-6,8,9).

Urolithiasis was diagnosed in 6.7% of patients in the present study. This result is comparable to reports from some African and Latin American countries in which these disorders were described as rare or having low incidence (18,19). In contrast, higher rates had been reported from Sudan (15.5%) and Iraq (15.0%) respectively (5,8). This high incidence of stones in these Arab countries may be related to the hot weather as well as nutritional or genetic factors.

In this study, Wilm's tumor was diagnosed in 6.3% children. Lower rates were reported from Sudan (2.5%), Iraq (1.8%) and Nepal (0.6%) (3,5,8). However, higher figures were reported from Lagos, Nigeria study (22.2%) (6). AKI was diagnosed in 4.2% children in this study. This result is comparable to other studies from developing countries (3,5,17,20). In the contrary, higher rates had been reported from Libya (27.1%), Lagos, Nigeria (20%), Pakistan (13.1%), Iraq (11.3%) and Niger Delta, Nigeria (10.9%).(4,6,8-10). AGN accounted for about 55% of our children with AKI which is similar to study done in Nepal (3).

4.0% of children with renal disease seen in our study had CKD. The profile of CKD was similar to other studies, with congenital urological malformations being the most common cause of CKD, followed by urolithiasis and GN (3,8). In contrast, higher figures were reported from other developing countries; Jos, Nigeria (20.3%) and Iran (14.9%) (15,20). Lower rates we reported from Venezuela (1.6%) and other Nigerian studies (2.1%) (18,19). However, on follow up 13 of our children (2.7%) developed CKD bringing our CKD rates closer to that of other developing countries; Iraq (6.7%) and Lagos, Nigeria (6.25%) (6,8).

Late presentation and lack of interventional measures including renal replacement therapy, such as continuous peritoneal dialysis, were the main constraints among these patients. Prevention is more and more important in this setting given the shortage of financial resources and the fact that dialysis centers, equipment and trained personnel are simply not available to the general population.

On follow up, 11 children (2.9%) died from various causes such as uncontrolled sepsis, Wilms tumor and pulmonary edema. Poor infection control and nutritional support were among the factors contributing to mortality. This finding is lower than that reported from Niger Delta, Nigeria (14.6%), Lagos, Nigeria (14.4%) and Sudan (6.7%).(5, 6, 10). However, studies from Libya (9) and China (16) reported a very low rate of < 1% and 0.4%, respectively.

Limitations of the study: This is a retrospective study in which accuracy of data could be doubted and loss of charts undermines the magnitude of the problem.

Conclusion: This study presents insight into the pattern and outcome of pediatric renal disease in tertiary care setting in Ethiopia. The pattern of kidney disease in this study is different from that in other parts of Africa. Congenital anomalies of the kidney and urinary tract (CAKUT) are the most common renal disease of childhood, followed by NS and AGN. Most of these renal morbidities and mortalities can be prevented with early diagnosis and referral. This can be achieved by improving pediatric health services and strengthening training programs of health workers at primary and secondary levels.

Recommendation: This is a single tertiary care level study that cannot show the overall pattern and outcome of hospitalized pediatric renal patients in Ethiopia. Thus, we recommend a large scale study.

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