



Admission pattern and outcomes of renal diseases among hospitalized children at Saint Paul Hospital Millennium Medical College, Addis Ababa, Ethiopia

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List of Abbreviations

AGN- acute glomerulonephritis

AKI- Acute kidney injury

BUN-blood urea nitrogen

CAKUT- congenital anomalies of kidneys and urinary tract

CFU- colony forming unit

FMOH- federal ministry of health

GBD- global burden of disease

GFR- glomerular filtration rate

HMIS- Health management information system

HUS- hemolytic Uremic syndrome

IVU- intravenous urography

KDIGO- Kidney Disease Improving Global Outcomes

DAMA- discharged against medical advice

MCUG- micturating cystourethrogram

NS- nephrotic syndrome

OPD- out patient department

PICU- pediatric intensive care unit

PUJ- pulviuretric Junction

SPHMMC- Saint Paul Hospital millennium medical college

SLE- Systemic Lupus Erythematosus

USS- ultrasound scan

UTI- urinary tract infection

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Abstract

Background: Renal disorders in children constitute important causes of morbidity and mortality worldwide especially in developing countries where advanced diagnostic and treatment facilities are very limited and generally not affordable. A delay in presentation and diagnosis together with limited resources contribute to the poor treatment outcomes. Knowledge of the pattern of prevailing renal diseases and possible etiological factors allows for a more focused preventive nephrology that reduces burden of renal diseases. This study determines the pattern and the outcomes of childhood renal diseases.

Methods: A cross-sectional retrospective medical record review done among all patients between the age of 7 days to 15years admitted to pediatric ward and PICU from September 11, 2017 to September 10, 2020 at saint Paul hospital millennium medical college, Addis Ababa, Ethiopia. Data were collected using structured questionnaire developed for this study and entered using EpiData version 3.1 and exported to IBM SPSS Statistics for Windows, Version 26. Results were presented as frequencies and percentages. Selected characteristics were tested for associations with chi-square and student's t test. The level of significance was set at $P < 0.05$.

Results: Out of 3,212 pediatric admissions, 175 had renal disorders accounting of 5.5% of all admission of which Ninety-three (53.1%) were males and 82(46.9%) were females. The mean age of presentation was 7.8 ± 4.4 years. The most common renal disease in the study was Acute glomerulonephritis 73(41.7%) followed by Nephrotic syndrome 32(18.3%), Acute kidney injury 22(12.6%) and CAKUT 10(5.7%). Other cases were chronic kidney disease and urinary tract infection each 9(5.1%), Hemolytic uremic syndrome 8(4.6%), Lupus nephritis 5(2.9%). Regarding the outcome, 122(69.7%) discharged improved, 13(7.4%) DAMA, 11(6.3%) referred, 13(7.4%) progressed to CKD and 8(4.6%) death. The most common cause of death was AGN 3(1.7%) followed by AKI 2(1.1%).

Conclusions: This study shows majority of patients were AGN of post infectious cause and Nephrotic syndrome of having unfavorable outcome. Emphasizing on infection control strategy, early detection and appropriate treatment, and effective referral systems decreases the disease burden.

Key words: renal disease, pattern, Ethiopia

1. Introduction

1.1 Background

Renal disorders in children constitute important causes of morbidity and mortality worldwide especially in developing countries where advanced diagnostic and treatment facilities are very limited and generally not affordable.¹ It has been described as the most neglected chronic disease and affects millions of adults and children worldwide. Pediatric patients with renal disease, especially younger ones may present with nonspecific signs and symptoms unrelated to the urinary tract. They may present with signs and symptoms of the disease, abnormal urinalysis, urinary tract infection, electrolyte and acid-base abnormalities, decreased renal function, renal involvement in systemic disease, glomerular and renal tubular diseases, congenital abnormalities, failure to thrive and hypertension.

The pattern of renal disease varies from one geographic region to another even within the same country. This variation is influenced by factors such as genetic predisposition, environmental background, and to a large extent the level of awareness. The causes are different in developing countries as compared to developed ones. The profile of renal diseases prevalent in Africa is unique with respect to etiology and clinical presentation. Endemic infections are a major cause of many renal diseases. The low socioeconomic status in many areas, coupled with the lack of clean water (secondary to poor sanitation and irrigation systems), and overcrowded housing promote endemic infections such as schistosomiasis, malaria, tuberculosis, hepatitis, streptococcus, salmonella, shigella, and filariasis. A number of social and political factors, including poor control of drug abuse and prostitution, contributing to the unique pattern of renal diseases and Clinically, infection and malnutrition commonly complicate the presentation and treatment.^{2 3} Children develop kidney diseases in early life ranges from treatable disorders without long-term sequelae to life-threatening conditions and the spectrum varies from congenital anomalies of kidneys and urinary tract (CAKUT) such as obstructive uropathies, hypoplasia-dysplasia and tubular disorders like Fanconi's syndrome to acquired urinary tract disorders such as primary and secondary glomerulonephritis, urinary stone disease and recurrent UTI.^{4 5}

The rising incidence of kidney diseases in children highlights the need for early detection and healthy lifestyle, starting at birth and continuing into adult life. It is worthwhile to note that a majority of renal disorders in children result from preventable causes such as urinary tract infection (UTI) with the good outcome when the patients present early before the onset of end-stage renal disease requiring permanent renal replacement therapy.⁶ Children with acute kidney injury (AKI) may develop long-term consequences leading to chronic kidney disease (CKD) later in life.⁷ Another important aspect is in obstructive uropathy which may cause CKD, the availability of prenatal ultrasound in pregnant women minimizes the renal damage. Most mothers in the public health sector do not have access to ultrasonography and are therefore diagnosed late, usually after a UTI, thus compromising kidney function further.⁷ A delay in the diagnosis of acute kidney injury and CKDs and the limited resources available for their management often contribute to the poor treatment outcomes seen in the developing countries, highlighting the imperativeness of preventive nephrology for childhood renal diseases. In the light of this, knowing the pattern of prevailing renal diseases in a particular setting allows for a more focused preventive nephrology that is aimed at reducing the burden of renal diseases in the same locality.⁸

1.2 Statement of the Problem

Reliable estimates of the global burden of kidney disease require more population-based studies, but specific risks occur across the socioeconomic spectrum from poverty to affluence, from malnutrition to obesity, in agrarian to post-industrial settings, and along the life course from newborns to older people. The GBD 2015 study estimated that, in 2015, 1.2 million people died from kidney failure, an increase of 32% since 2005. Additionally, each year, around 1.7 million people are thought to die from acute kidney injury. Overall, therefore, an estimated 5–10 million people die annually from kidney disease.⁹ A recent editorial on childhood kidney diseases in developing countries highlights flawed epidemiological data on renal diseases, especially in Africa, with a paucity of data to guide for resource allocation, despite the rising incidence of kidney diseases in children.⁷ This increases the challenges of providing care for children with kidney disease in a resource-limited environment. Regular audits in different hospitals could provide data that would guide healthcare stakeholders in planning for preventive nephrology, which is necessary to reduce the morbidity and mortality from renal diseases.

1.3 Significance of the study

To the best of the investigators' knowledge, there is no published data in our context that determine the pattern and outcome of renal disorders specially at SPHMMC and this will provide data that may guide practitioners in either preventing these disorders or in early intervention to halt the progression to end stage renal disease. This is also important as preventive nephrology that has been increasingly recognized as the key to effective management of common childhood renal diseases in low-income countries. The data may also assist in health planning, allows for adequate resource allocation, enables adequate renal services provision, may use as a base line for further study.

2. Literature review

Studies from different geographical areas around the world have reported variable patterns of renal diseases in pediatric population. The percentage of renal-related admissions among different centers and countries ranges between 2.2–8.9% of total pediatric admissions.^{1 2 8 10}

In a study done at Bangladesh, Dhaka by Qader A. et al. the most common renal disease among admitted patients were Nephrotic syndrome 76% (Among this, about 95% patients were steroid sensitive and 5% steroid resistant), Chronic Kidney Disease 6%, Glomerulonephritis 6% and Acute Kidney Injury 5.9%. Common presenting features were proteinuria (27.6%), oliguria (26.2%), edema (25.7%), abdominal pain (7.15%) and fever (2.16%).⁵

In a study done Dharan, Nepal by Yadav SP, Shah GS, Mishra OP, et al reported that renal disease during the study duration accounted to be 6.98% of total pediatric admissions and 58% were male. Most of the cases belonged to the age group of 6–10 year (44.1%); with mean of 8.3 years. Triad of edema (78.2%), oliguria (39%), and hematuria (27%) was the main presenting features in addition to fever, which was present in 57.3% of cases. Hypertension and microscopic hematuria were found in about half of the patients. common renal disease was AGN (37.1%), followed by NS (26%), UTI (21.3%), and AKI (17.9%). Obstructive uropathy and CKD were seen in 1.9% and 1.2%, respectively. Ninety three percent improved, 5% expired, and about 2% cases required referral for surgical intervention and further treatment to higher nephrology centers. The non-survivors had AKI and mostly due to sepsis causing multiorgan dysfunction syndrome.²

In a study done at University of Abuja Teaching Hospital, Gwagwalada, Abuja, Nigeria by Emmanuel Ademola Anigilaje, et al. among total admissions 3.8% had renal disorders of which 58.3% were males and 41.7% females with a male-to-female ratio of 1.4:1. There was a progressive increase in the proportion of the diagnoses of renal diseases during the study period, increasing from 3.1% in 2013 to 5.4% in 2016. This study also reported that the major childhood diseases were AKI (30.7%) and UTI (30.7%), with NS (11.7%) coming at a distant third position and UTI occurred more in males (54%) than females (46%). The diagnosis of CAKUT was made in 9.2% and CKD in 6.7%. Regarding the outcome, 68.1% of the patients were discharged, 14.1% died, 10.4% LAMA, while 7.4% were referred. The highest mortality was among patients with AKI (47.8%) followed by those with CKD (39.1%)⁸. In other study in Nigeria by Muoneke, et al. reported that the prevalence rate of renal disorders was 4.4% . The majority of the patients seen were males 62% with a male:female ratio of 1.6:1.0. Fever, dysuria, and generalized body swelling were the most common symptoms recorded accounting for 30.4%, 20.3%, and 12.7%, respectively, of the study population. Majority 32.9% of the patients were aged between 10 and 14 years, whereas 29.1% were aged <5 years. The most common renal disorder was nephrotic syndrome 32.9% , UTIs/pyelonephritis 26.6% , acute glomerulonephritis (AGN) 10.1%, obstructive renal conditions (including posterior urethral valves [PUV], meatal stenosis) – 13.9%.⁶

In Ethiopia, data regarding pediatric kidney diseases are scanty, there were a single study performed at black lion specialized hospital, a tertiary care teaching hospital, the annual pediatric admissions were found to be 3.3%. The three most common renal diseases observed were congenital anomalies of the kidney and urinary tract (CAKUT) 26.8%, followed by nephrotic syndrome 16.9% of children and acute glomerulonephritis 12.2% of children. 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%. By the end of the study; (54.3%) recovered normal renal function, (5.2%) remained with proteinuria, (3.4%) progressed to CKD and (2.9%) died. 2.6% of renal patients were lost to follow-up and 1.3% discharged against medical advice. Among NS patients (76.3%) achieved remission.¹¹

3. Objective of the study

3.1 General objective

- ❖ To determine the magnitude and patterns of pediatric renal disease admitted to SPHMMC

3.2 Specific objective

- ✓ To describe pattern of renal disease
- ✓ To assess the magnitude of renal disease
- ✓ To determine possible outcome

4. Methodology

4.1 study setting

The study was conducted at Saint Paul hospital millennium medical college, department of pediatrics and child health, located in Addis Ababa, the capital city of Ethiopia, and is a tertiary care teaching hospital that serves as referral under FMOH. The hospital was built by the Emperor Haile Selassie in 1961. In 2007 it became a medical college, its core services include provision of medical care, teaching and research.

The pediatric department has one renal clinic (Wednesday) and one major round per week where all renal patients were followed and the clinic and rounds were attended by pediatric nephrologist and residents

4.2 Study design

A three years cross sectional retrospective hospital based medical record review was held from September 11, 2017 to September 10, 2020

4.3 Study Period

The study was conducted from September 11, 2017 to September 10, 2020

4.4 Source population

All patients admitted to pediatrics ward and PICU between September 11, 2017 and September 10, 2020

4.5 Study population

All patients between the age of 7days to 15 years admitted to pediatric Ward and PICU due to renal disease over three years during the study period

4.6 Sampling method

All patients who was admitted due to renal disease between September 11, 2017 and September 10, 2020 were included

4.7 Sample size

Using a single population proportion formula $n = z^2 p (1-p) / d^2$ taking 95% CI and precision of 5%, p as 3.3%*, the calculated sample size $(n) = 49.036 \cong 50$. * Because the prevalence in local study was found to be 3.3%. Since the sample size calculated was small, all patients who fulfill the eligibility criteria in the study period were included.

4.8 Eligibility criteria

4.8.1 Inclusion criteria

- Children aged from 7days to 15yrs admitted to pediatric ward and PICU for renal disease who have complete medical records were included in the study

4.8.2 Exclusion criteria

- Patients who did not have complete medical records were excluded
- Children re-admitted for the same renal disorder was only counted once at the first presentation
- Patients admitted with renal disease and if discharge diagnosis is changed
- Patients who are diagnosed to have renal disease in between of treatment of other medical illness as a complication

4.9 Study variables

4.9.1 Independent variables

- Sociodemographic factors
Age, sex, residence
- Presenting signs and symptoms

Body swelling, vomiting, cough, fever, fatigability, failure to thrive, flank pain, suprapubic pain, urinary symptoms (burning micturition, poor urinary stream, frequency, dribbling), other symptoms (hematuria, oliguria, flank or suprapubic pain), clinical signs (anthropometry, hypertension, edema, ascites, pallor, rash)

➤ Investigation

urine tests (urine microscopy, dipstick), blood tests (urea, creatinine, electrolytes), CBC

4.9.2 Dependent variables

➤ Pattern of renal disease

CAKUT, AGN, NS, AKI, CKD, UTI, HUS, HSP nephritis, Lupus Nephritis urolithiasis, renal tumor

➤ Outcomes

Discharged improved, DAMA, Referred, Death, Progressed to CKD,

4.10 Data collection techniques

The data for this study was collected from registration log book and patient chart. The data was collected by structured check list for medical record review developed for this study. The data was collected by pediatric residents. The data collectors were one-day training on the checklist and the check list was tested at Emergency OPD at SPHMMC and necessary modification was made. The data collectors were continuously supervised by the primary investigator during data collection process.

4.11 Data analysis and interpretation

The collected data was checked for completeness and consistency by the investigator. The collected data was cleaned, coded and entered into Epidata version 3.1 and then exported in to SPSS Version 25.0 for analysis. Descriptive statistics using frequencies and percentages for categorical variables and means and SD for quantitative variables were used. Ch-square test and student's t test were used to identify the association b/n dependent and independent variables. P-value less than 0.05 was considered statistically significant.

5. Ethical consideration

The ethical clearance was obtained from SPHMMC ethical review committee, written letter was obtained from hospital administration, and confidentiality of the information was ensured using codes rather than names during registering data.

6. Operational definition

Each diagnosis will be based on the primary disease. For example, children with urinary tract infection (UTI) and background NS were classified as NS and those with AGN and AKI was classified as AGN.

Acute kidney injury (AKI) has been traditionally defined as an abrupt loss of kidney function leading to a rapid decline in the glomerular filtration rate (GFR), accumulation of waste products such as blood urea nitrogen (BUN) and creatinine, and dysregulation of extracellular volume and electrolyte homeostasis. Its severity was described by the Kidney Disease Improving Global Outcomes (KDIGO) AKI Consensus Conference takes both serum creatinine and urine output criteria into account to define and stage AKI.^{12, 13}

Estimation of glomerular filtration rate (eGFR) was by the Schwartz's formula¹⁴, and adequacy of urinary output was based on the body weight.

CKD was defined based on the National Kidney Foundation-Kidney Disease Outcomes Qualitative Initiative definition as kidney damage lasting for at least 3 months with or without a decrease in GFR or any patient who has a GFR <60 ml/min/1.73 m² for 3 months with or without kidney damage^{5, 13, 15}

Total renal recovery was considered when creatinine or eGFR at 3 months returned to normal or to baseline value for those with CKD. Partial recovery when serum creatinine at 3-month decrease or eGFR increase from the baseline value but did not return to normal and no recovery when at 3 months serum creatinine increase or eGFR decreased compared to admission values or if the patient remain on hemodialysis.¹⁶

Nephrotic syndrome was defined as presence of nephrotic range proteinuria(>3.5g/24hrs) or a urine protein: creatinine ratio > 2, hypoalbuminemia (≤2.5 g/dL), edema, and hyperlipidemia (cholesterol > 200 mg/d.¹³

AGN was diagnosed by edema, hematuria (usually gross), oliguria, hypertension along with diminished GFR. Child may present with systemic features also.^{5 17}

Urinary tract infection is an infection that affects any part of the urinary tract and can be confirmed with urinalysis which shows the presence of urinary nitrites, white blood cells (WBCs; leukocytes), or leukocyte esterase, and microscopy which shows the presence of a high number of WBCs, RBCs, and white cell casts or the growth of 100,000 or more colony forming units (CFU) of a single organism per millilitre of a midstream/clean catch urine sample or the growth of any amount of bacteria from urine specimen obtained by suprapubic aspiration^{1 6 18} CAKUTs including renal hypodysplasia, solitary kidney, horseshoe kidney, multicystic dysplastic kidney, posterior urethral valves and pelvic-ureteric junction (PUJ) obstruction diagnosed by micturating cystourethrogram (MCUG), ultrasound scan (USS) and intravenous urography (IVU).¹⁹

Hemolytic uremic syndrome (HUS) is defined clinically by the triad of microangiopathic hemolytic anemia, thrombocytopenia and renal involvement/acute kidney injury (AKI)¹⁷

SLE was diagnosed using the Presence of 4 of the 11 American College of Rheumatology (ACR) 1997 revised classification criteria for SLE simultaneously or cumulatively over time and the updated criteria validated by the Systemic Lupus International Collaborating Clinics (SLICC) in 2012.¹³

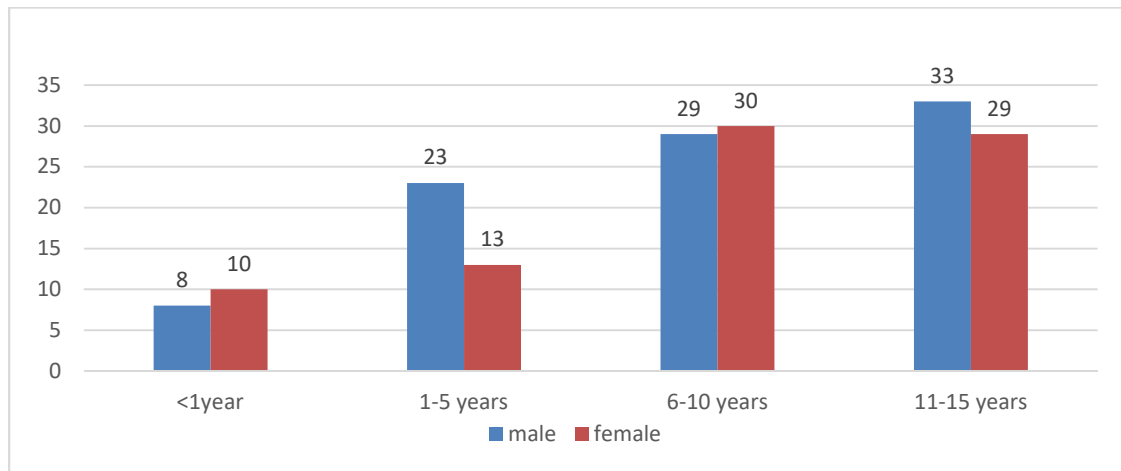
7. Result

Out of 3,212 pediatric admissions, 175 had renal disorders giving prevalence of 5.5% (55 per 1000 admissions) table 1. Ninety-three (53.1%) were males and 82(46.9%) were females with male to female ratio of 1.1: 1. Twenty-three (13.1%) of the cases was readmitted. Majority of the patients 132 (75.2%) were came with referral of which 49 (28%) from teaching and referral hospitals. Most of the cases belong to the age 11-15 years 62(35.4%); with the mean age of presentation 7.8 ± 4.4 years.

Table 1 Trends of renal disease during the study period

Year (EC.)	Total pediatric admission	renal case	prevalence	annual prevalence per 1000 children
2010	1139	60	5.3	53
2011	1114	54	4.8	48
2012	959	61	6.4	64
2010-2012	3212	175	5.5	55

Figure 1 Age and gender distribution



The most common presenting symptoms were body swelling (74.3%) followed by decreased urine output (61.1%) and urine color change (58.9%) Table 3. Hypertension was found (70.5%), pedal edema and facial puffiness (69.1%) and ascites in (33.1%) Table 4. Hematuria and proteinuria were found 85.1% and 83.1 % respectively. Renal function test shows high urea (87.7%) and high creatinine (60.9%). Fifty-nine (35.8%) patients present with moderate to severe anemia.

The most common renal disease in this study was Acute glomerulonephritis seen in 73(41.7%) of which 63(86.3%) were PIGN, followed by Nephrotic syndrome 32(18.3%), Acute kidney injury 22(12.6%) and CAKUT 10(5.7%). Other cases were chronic kidney disease and urinary tract infection each 9(5.1%), Hemolytic uremic syndrome 8(4.6%), Lupus nephritis 5(2.9%). Table 5

Among acute glomerulonephritis 63(86.3%) were PIGN, Majority of the cases occurs at the age of 6 -10 years which is significant ($P= 0.001$). The mean age of presentation is $8.98 \text{ years} \pm 3.60 \text{ SD}$. It affects more males (58.9%) than females making male to female ratio of 1.43: 1. Renal replacement was done for 15(20.5%) of AGN of which 8(53.3%) has partial to complete recovery and 2(13.3%) progressed to CKD and 5(33.3%) has unknown outcome.

Table 2 common presenting symptoms

Presenting symptoms*	Frequency	Percent
body swelling	130	74.3
decreased urine output	107	61.1
urine color change	103	58.9
Fever	57	32.6
Vomiting	54	30.9
skin rash	24	13.7
Dysuria/frequency/urgency/straining/poor stream	21	12.0
Fatigability	20	11.4
Cough	20	11.4
Headache	15	8.6
ABM	15	8.6
Diarrhea	15	8.6
change in mentation	14	8.0
SOB	8	4.6
flank pain	6	3.4
loss of appetite	5	2.9
hx of sore throat	4	2.3
Others**	8	4.6

*multiple responses possible

**others(blurring of vision, failure to suck, herbal medication ingestion, joint pain, chillis rigors)

Nephrotic syndrome was the second most encountered renal disease in the study accounting 32(18.3%). It affected males and females equally 16(50%). The mean age of presentation is 7.87 ± 3.99 years and majority 13(40.6%) occurs at the age group of 6-10 years although this is not significant ($p= 0.466$). Among patients with NS only 7(21.8%) was SSNS, majority 10(31.3%) were SRNS, 6(18.75%) was SDNS and 8(25%) was unknown.

Table 3 common presenting signs		
Presenting sign*	Frequency	Percent
Hypertension	117	70.5
pedal edema facial puffiness	121	69.1
Ascites	58	33.1
Growth	32	19.2
Pallor	21	12.0
Anasarca	18	10.3
Comma	2	1.1
abdominal tenderness	1	0.6

*multiple responses possible

There were a total of 22(12.6%) cases of AKI with no variation among age group and gender. Twelve (54.5%) had renal replacement of which 5(41.6%) was hemodialysis and 7(58.4%) was peritoneal dialysis. Eight patients were discharged improved, 4 DAMA, 7 referred and 1 patient progressed to CKD. The diagnosis of CKD was made in 9(5.1%) of the cases and the majority of the cases 7(77.8%) occurs at the age group of 11 -15years which is clinically significant ($p=0.042$).

Table 4 Pattern and Gender distribution of renal disease diagnosed					
Renal disease	Male	Female	Frequency(%)	x2	P
Acute glomerulonephritis	43	30	73(41.7)	1.669	0.196
Nephrotic syndrome	16	16	32(18.3)	0.155	0.693
Acute Kidney Injury	11	11	22(12.6)	0.1	0.752
chronic kidney disease	3	6	9(5.1)		0.308
Hemolytic Uremic syndrome	3	5	8(4.6)		0.477
Lupus Nephritis	1	4	5(2.9)		0.187
HSP Nephritis	2	0	2(1.1)		0.499
UTI	5	4	9(5.1)		0.579
CAKUT	8	2	10(5.7)	3.072	0.081
Nephritic-Nephrotic syndrome	0	3	3(1.7)		
Nephrolithiasis	1	1	2(1.1)		

Nine (5.1%) patients admitted with the diagnosis of UTI and not significantly varies with gender and age group. Eight (4.6%) of the cases were HUS, 4(50%) occurs between 1-5years, more occurs in females 5(62.5%) although not significant ($p= 0.477$). Ten (5.7%) cases presented with CAKUT of which 5(50%) was PUV, 6(60%)occurs less than 1 year. There were more males 8(80%) than females but this difference was not statistically significant ($p=0.081$). other renal diseases like nephrolithiasis, nephrotic-Nephritic syndrome occurs in 5(2.9%).

Table 5. Comparative analysis of NS and AGN			
Parameter	Nephrotic syndrome	Acute glomerulonephritis	P*
mean age in years(SD)	7.87(3.99)	8.98(3.60)	0.164*
mean duration of symptom in days(SD)	21.22(16.99)	10.79(10.25)	<0.001*
mean length of hospital stay in days (SD)	11.9(6.99)	11.95(7.59)	0.980*
body swelling	32(100)	68(93.2%)	0.32**
urine color change	19(59.4%)	59(80.8%)	0.021**
decreased urine output	15(46.9%)	55(75.3%)	0.004**
Hypertension	19(59.4%)	65(89%)	<0.001**
Proteinuria	28(90.3%)	56(84.8%)	0.461**
Hematuria	23(74.2%)	65(100%)	<0.001**
Creatinine	11(36.7%)	43(58.9%)	0.040**
Anemia	2(7.1%)	26(36.6%)	0.003**

* students t test **chi-square test

Comparative analysis of the two most common renal disease Acute glomerulonephritis and Nephrotic syndrome (table 6) in the study showed there was no significant difference in the mean age of presentation and the length of hospital stay 11.95 days in AGN and 11.9 days in NS ($p=0.980$). The mean duration of symptoms at presentation in NS were prolonged 21.22 days than in AGN 10.79 days which is statistically significant ($p<0.001$). Patients with AGN present with hypertension, hematuria and elevated creatinine in significantly higher percentage than in NS.

In general, regarding the outcome, 122(69.7%) discharged improved, 13(7.4%) DAMA, 11(6.3%) referred, 13(7.4%) progressed to CKD and 8(4.6%) death. The most common cause of death was AGN 3(1.7%) followed by AKI (Table 7).

8. Discussion

This study was the first to determine the pattern and outcome renal disease in a tertiary care setting teaching hospital in Ethiopia, Addis Ababa but this may not reflect the true pattern of renal disease in the country because of the lack of national registry and current referral system. The reported prevalence of renal disease over 3 years' period in this study was 5.5% of all pediatric admissions which is higher than previous report of 3.3% in Ethiopia¹¹, 1.15 % in Egypt²⁰, 3.8% in Abuja, Nigeria⁸, 3.2% in Gusau, north-west Nigeria²¹ and Lower than Dharan, Nepal report(6.98%)², and Lagos , Nigeria 8.9%¹⁰ this variations in prevalence rate may be related to socioeconomic, genetic or environmental factors which are said to play a major role globally.² The triads of body swelling (74.3%), decreased urine output (61.1%) and urine color change (58.9%) are the main presenting features and hypertension was found in (70.5%) this finding was similar with studies done in Nigeria²¹, Nepal² and bangladesh⁵ although varying in frequencies.

Table 6. Outcome of management

Renal disease	Discharged improved	DAMA	Referred	Death	Progressed to CKD	Total(%)
AGN	61	2	3	3	4	73(41.7)
NS	28	1	0	1	2	32(18.3)
AKI	8	4	7	2	1	22(12.6)
CKD	9	0	0	0	0	9(5.1)
HUS	2	4	0	1	1	8(4.6)
lupus nephritis	1	1	0	1	2	5(2.9)
HSP nephritis	2	0	0	0	0	2(1.1)
UTI	9	0	0	0	0	9(5.1)
CAKUT	7	0	1	0	2	10(5.7)
Others	3	1	0	0	1	5(2.9)
percentage of outcome	122(69.7)	13(7.4)	11(6.3)	8(4.6)	13(7.4)	175(100)

The most common renal disease requiring admission in this study was AGN (41.7%) this observation was similar to Dharan, Nepal report (37.7%)². A relatively lower percentage (12.3%) of AGN has been reported by another center in our country¹¹. In many other studies AGN was the third and fourth common renal disease reported in variable frequency.^{4 5 8 10 22 23} The high prevalence of AGN in this study may be because of the hospital is the only hemodialysis and transplant center in Ethiopia and all patients referred to this hospital from different regions of the country. The cause of AGN was post infectious (86.3%) this signifies the high prevalence of infectious disease in the region and the role of control of infectious diseases as a strategy for reduction of the burden of pediatric renal disease should be emphasized.

Nephrotic syndrome was found to be the second most common renal disease in children in this study accounted (18.3%) among this (31.3%) were SRNS, 21.8% were SSNS and (18.7%) were SDNS. This finding was similar as reported by D. shimelis et al¹¹ (16.9%) but majority 76.3% were SSNS this difference was most patients with SSNS was managed as outpatient and SRNS and FRNS were managed as in patient. Qader A. et al⁵ found the incidence of Nephrotic syndrome to be 76% (Among this, about 95% patients were steroid sensitive and 5% steroid resistant). The mean age of presentation were 7.8 years which was similar with the previous reports 7.4years.⁵

There were 12.6% of cases presenting with AKI at presentation in this study with no gender difference which is higher than the previous reports¹¹ and more than half (54.3%) of patient had renal replacement. CKD was reported in 5.1% of renal admission and majority 77.8 % was in the age group 11-15 years. D. shimelis et al¹¹ and El-Tigani et al²² reported a relatively lower incidence of CKD 4% each. Other studies reported higher incidence.^{8 23}

UTI was relatively less common reported 5.1 % in this study whereas it was the most common cause of childhood renal diseases in Abuja, Nigeria (30.7%)⁸, Dharan, Nepal (21.3%)² and Sudan[17] (30%)²². The lower rate found in the study could be explained by the fact that most of the patients were treated at primary hospital and health centers.

CAKUT was reported in 5.7% of cases of which (50%) was PUV and (60%) occurs less than 1 year which was similar with other reports⁸. 2(20%) patients with PUV progressed to CKD this may be because of lack of prenatal ultrasound screening and late presentation.

The majority of patients discharged improved (69.7%) probably because most of them had treatable disease especially when presentation and diagnosis were made early, similar findings

were made Abuja, Nigeria (68.1%). The overall mortality of renal disease in this study (7.4%) which was higher than the previous reports of 2.9% in Ethiopia¹¹, Dharan, Nepal (5%)², 6.7% in Sudan²² and lower than the reports in Abuja, Nigeria (14.1%)⁸. Eleven (6.3%) of patients discharged against medical advice which is higher than (1.3%)¹¹ in Ethiopian report and lower than Nigerian report (10.4%)⁸. On follow up 13(7.4%) of patients progressed to CKD this makes our CKD rate higher than other in Abuja, Nigeria (6.7%)⁸, Iraq (6.7%)²⁴ the may be because of late presentation, lack of interventional measures including renal replacement therapy and Twenty three (13.1%) of the cases were subjected to readmission.

9. Limitation of the study

This is a retrospective study in which accuracy of data could be doubted, some children may have been inadvertently excluded from the register or charts maybe lost, in addition emergency visits were excluded this undermines the magnitude of the problem.

10. Conclusion and Recommendation

This study brings insight into the pattern and outcome of pediatric renal disease in tertiary care setting. Acute glomerulonephritis was the most common renal disease in this study followed by nephrotic syndrome which is different from most of other African studies. Majority of the causes of AGN were post infectious this signifies the high prevalence of infectious disease in the region and the role of control of infectious diseases as a strategy for reduction of the burden of pediatric renal disease should be emphasized. There is high incidence of Steroid resistant nephrotic syndrome and CKD in this study, the late presentation and referral system might be an important cause which results in increased morbidity and mortality. Most of these renal morbidities and mortalities can be prevented with early diagnosis and referral. This can be achieved by practicing preventive nephrology, effective referral systems, trainings of pediatric nephrologists, strengthening training programs of health workers at primary and secondary levels and improving health care financing are advocated.

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APPENDIX 1

Check list

MRN_____

Date of admission_____

Referral a) yes No) If Yes _____

A. Demographic data

1. Age _____

2. Sex a. male b. Female

3. Address a. Addis Ababa b. out of Addis Ababa

B. clinical presentation

4. Duration of symptoms _____

5. Presenting symptoms (more than one answer possible)

- | | |
|--|-------------------------|
| a. Body swelling | g. fever |
| b. Urine color change | h. fatigability |
| c. Decreased urine output | i. headache |
| d. Urinary symptoms (burning micturition, poor urinary stream, frequency, dribbling) | j. ABM |
| e. Skin rash | k. change in mentation |
| f. vomiting | l. others specify _____ |

6. Presenting signs

- | | |
|-----------------------------------|-------------------------------------|
| a. Hypertension at admission | e. Anasarca |
| i. Normal | f. ascites |
| ii. Prehypertension | g. Bruises, Purpura |
| iii. Stage I | h. Pallor |
| iv. Stage II | i. Joint / bone pain and tenderness |
| b. Growth | j. Comma |
| i. Normal | k. Other specify_____ |
| ii. Mild stunting | |
| iii. Moderate | |
| iv. sever | |
| c. Abdominal tenderness | |
| d. Pedal edema, Facial puffiness, | |

7. Investigation

- a) urine dipstick for protein =
 - i. +1 ii. +2 iii. +3 IV= +4 V=neg
- b) urine dipstick for blood
 - i. +1 ii. +2 iii. +3 iv) Neg
- c) Scr _____ urea _____
- d) Hgb/Hct _____
- e) ASO _____
- f) ANA _____
- g) other pertinent _____

C. Pattern and outcome

8. Pattern of renal disease diagnosed

9. Nephrotic syndrome

- a. SSNS
- b. SDNS
- c. SRNS
- d. FRNS
- e. unknown

1. Acute glomerulonephritis (AGN) = etiology _____

2. AKI etiology _____

3. RRT done a) yes b) No

12.1 if yes hemodialysis/peritoneal dialysis

12.2 Renal recovery i. Complete ii. Partial iii. Progressed to CKD iv. Unknown

13 CKD causes _____

14 Urinary tract infection

15 Urolithiasis

16 CAKUT: Specify _____

17 others specify _____

18. Length of hospital stay _____

19. Outcome of management

- a. Discharged improved
- b. Death
- c. DAMA
- d. referred
- e. progressed to CKD

20. Readmission a. yes b. no

Statement of Declaration

By my signature below, I declare and affirm that this thesis is my own original work in partial fulfillment of the requirements for the certification of pediatric and child health specialty. I have followed all ethical principles of scholarship in the preparation, data collection, data analysis and completion of this thesis. All the sources of the materials used for this thesis and all people who gave support for this work are fully acknowledged.

I affirm that I have cited and referenced all sources used in this document. Every effort has been made to avoid plagiarism in the preparation of this thesis.

Requests for permission for extended quotations from, or reproduction of, this thesis in whole or in part may be granted by the Head of the Department or the adviser of the thesis when in his judgment the proposed use of the material is in the interest of scholarship and publication. In all other instances, however, permission must be obtained from the author of the thesis.

STUDENT

Dr. Befekadu Molla Signature: _____ Date: _____

RESEARCH ADVISOR:

Dr. Tewodros Gullema signature: _____ Date: _____