

Pattern of Childhood Renal Diseases in Aba, South East Nigeria

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Abstract: *Background:* Renal diseases are currently posing a great health concern worldwide. Proper documentation, knowledge of renal disease burdens, and established renal registries will provide data to guide stake-holders in future planning and resource allocation. This study aims at documenting the pattern and outcome of childhood renal diseases admitted at our centre. *Methods:* This was a prospective study of all childhood renal diseases admitted into the pediatrics wards of the Abia State University Teaching Hospital, Aba, from October 2013 to October 2018. The demographic characteristics of the patients, ingestion of herbal concoctions, clinical presentation, laboratory investigations, diagnosis and management outcomes were documented, and analysed. *Result:* A total of 6108 children were admitted into the paediatric wards during the study period. One hundred and four (104) of them had renal diseases, accounting for 1.7% of paediatric admissions. There was male preponderance (55.8%) with a Male: Female ratio of 1.3:1. Sex had significant association with renal diseases (p -Value=0.025). The age range was 0.5 – 16 years with a mean age of 7.9 ± 4.5 years. Majority (40.4%) of the patients were aged 5-10 years (p -Value 0.021). Nephrotic Syndrome (47.1%), Acute Kidney Injury (10.6%) and Acute Glomerular Nephritis (10.6%) were the commonest causes of admission. Proteinuria (39.4%), Oedema (39.4%) and Oliguria (26.9%) were the most frequent clinical presentations. Progressive increase in yearly diagnosis of renal diseases was observed. More than 90% of the patients took herbal remedies before presentation (p -Value=0.001). Mortality rate was 4.8%. Causes of death were Chronic Kidney Disease (40%), Acute Kidney Injury (20%), Wilms tumour (20%), and HIVAN (20%). *Conclusion:* The prevalence of childhood renal diseases in Aba is 1.7%. Nephrotic syndrome is the commonest cause of renal admission in our centre. Ingestion of herbal concoctions by our cohort was high. There was an annual increment in the number of renal disorders in our centre. Preventive nephrology should be adopted to curb the morbidity and mortality from renal diseases worldwide.

Keywords: Childhood, Renal Diseases, Aba, Nigeria

1. Introduction

Kidney diseases are a growing problem worldwide and constitute one of the major public health threats globally [1]. In Sub-Saharan Africa (SSA), common childhood renal disorders include acute glomerulonephritis (AGN), nephrotic syndrome (NS), acute kidney injury (AKI), chronic kidney disease (CKD), and urinary tract infections (UTI) [2-4].

Diseases like septicemia, diarrhoea, malaria, and hemolytic uremic syndrome have been documented as some of the most frequent causes of AKI in SSA [5-8]. AKI can progress to CKD, thereby worsening disease outcome [8-10].

In developing countries, diseases like schistosomiasis, post infectious and chronic glomerulonephritis, Human Immunodeficiency Virus (HIV) related nephropathy, sickle cell disease and urologic malformations (especially posterior

urethral valves) cause damage to the young kidneys with subsequent progression to CKD [11-15]. This is contrary to the situation in developed countries where congenital anomalies of the kidney and urinary tract cause 50% or more of CKD in children [4]. Risk factors for pediatric kidney disease are common in Africa [13].

Current trends, both in and outside Nigeria, have shown increasing incidence of renal diseases in children, with increased prevalence of CKD globally [5, 15-18].

Ladapo *et al* [4] in Lagos, Nigeria, noticed that the prevalence of paediatric renal diseases doubled within the 3 years of their study period. Also, Asinobi *et al* [14] documented an overall upward trend in paediatric renal disorders with an increase in the hospital incidence from 1.5 to 2.2 per 100 pediatric admissions and an increase in the average yearly admission from 43 to 103.

Previous studies on paediatric renal diseases from different parts of Nigeria have reported varied patterns with a prevalence rate ranging from 1.1% to 8.9% [2-4, 6, 8, 12, 14, 19-22].

Bhimma *et al* at South Africa [23] also stated that the percentage of renal-related admissions to secondary and tertiary hospitals varies widely from 3.5 to 8.9% among different African countries. A prevalent rate of 3.0% and 6.98% were seen at Libya [5] and Nepal [24] respectively. These are other African countries outside Nigeria.

Outside Africa, Barman *et al* recorded 6.7% for paediatric renal diseases in India [25].

Proper documentation of childhood renal disorders, with established renal registries often provides data for better management protocols and also guides disease stakeholders in fiscal planning and health resource allocation.

No such documentation has been done among children presenting with renal disorders to our health facility. The only related study was a renal audit among the adult population.

This study was therefore aimed at documenting the paediatric renal admissions at the Abia State University Teaching Hospital (ABSUTH), Aba, with a view to determining their patterns, as well as outcome.

The data generated from this study will help in further research, improved management and health resource allocation.

2. Methodology

This was a prospective study of all childhood renal diseases admitted into the pediatric wards of our hospital, over a 5-year period (October 2013 to October 2018). This study was done at the Paediatric Nephrology Unit of the Abia State University Teaching Hospital, Aba. This Teaching Hospital is the only tertiary health institution located in the metropolis of Aba, Abia state.

ABSUTH serves as a general/referral centre for patients resident in Aba metropolis, and adjoining cities and communities in Abia state, including some parts of Akwa Ibom, Rivers and Imo states respectively.

The Department of Paediatrics of ABSUTH is manned by 6 consultants, 12 registrars and 10 house officers (who do 3 months posting in paediatrics before proceeding to other departments). The nephrology unit is run by a consultant paediatric nephrologist, one senior registrar, one junior registrar and a house officer. The nephrology unit consults every Thursday of the week and attends to all renal cases both at the children emergency room and the paediatric wards. The resident doctor doing nephrology posting is the first on call for paediatric renal consults.

Children diagnosed and admitted with kidney disorders in our nephrology unit during the study period were consecutively enrolled into the study.

The demographic characteristics of the patients, ingestion of herbal concoctions, clinical presentation, laboratory investigations, diagnosis and management outcomes were documented, and analysed.

The investigations done for the renal patients in our centre include: dipstick urinalysis, urine microscopy/culture/sensitivity, serum electrolytes/urea/creatinine, 24-hour urinary protein, spot urine protein/creatinine ratio, serum proteins, serum lipid profile, erythrocyte sedimentation rate, antistreptolysin O titre, Human immunodeficiency viral (HIV) screening, hepatitis B surface antigen, hepatitis C Antigen test, hemoglobin genotype, full blood count, blood film for malaria parasite and renal ultrasonography. Micturating cystourethrography is done only when indicated.

2.1. Definition of Terms

The diagnosis of renal disorders was based on standard case definition as stated below:

1. NS was diagnosed in the presence of a combination of massive proteinuria (3+ and above on dipstick urinalysis, or a 24-hr urinary protein of $>40\text{mg/m}^2/\text{hr}$), hypoalbuminemia (serum albumin of $<25\text{g/L}$), edema and hyperlipidemia [26].
2. AKI was diagnosed in patients with Kidney Disease Improving Global Outcome (KDIGO) stage 3 or pediatric RIFLE (pRIFLE) failure stage (sudden and rapid deterioration of kidney function manifesting as oliguria of $<0.3\text{ml/kg/hr}$ for more than 24hrs or anuria of $>12\text{hrs}$ or tripling of baseline creatinine greater than $353.6\mu\text{g/dl}$ or initiation of renal replacement therapy, or a decrease in eGFR to $<35\text{ml/min/1.73m}^2$) [27].
3. Chronic kidney failure (CKD stage 5) diagnosis was made when the GFR was $<15\text{ml/min/1.73m}^2$ or need for dialysis in patients with clinical or radiologic features of background chronic kidney disease [28].
4. Acute nephritic syndrome or Acute Glomerulonephritis (AGN) was diagnosed in children manifesting with sudden onset of features of glomerular injury, which include hematuria, mild-moderate proteinuria, hypertension, edema, oliguria, and varying degrees of renal insufficiency [29].
5. Primary Hypertension (HTN) was diagnosed in the presence of blood pressure measurements that are equal

to or greater than the 95th percentile for age, gender, and height, where no secondary causes could be found [30].

6. UTI was diagnosed in the presence of significant bacteriuria which was not secondary to any structural or functional defect [31].

2.2. Ethical Clearance and Data Analysis

Ethical clearance was obtained from the Ethics Committee of ABSUTH, Aba; before commencing on the study.

The data was analyzed using SPSS (Statistical Package for the Social Sciences) software, version 24.0. Frequency tables were generated for all major variables of interest. Chi Square test was used to test for significance of association between renal disorders and other variables like age, sex and herbal concoction. A confidence interval of 95% was used, and for all analyses, p -value < 0.05 was taken as statistically significant.

3. Results

A total of 6108 children were admitted into the paediatric wards during the study period. One hundred and four (104) of them had renal diseases, accounting for 1.7% of paediatric admissions. There was male preponderance (55.8%) with a Male: Female ratio of 1.3:1 (Table 1). Sex had significant association with renal diseases (p -Value=0.025). The age range was 0.5 – 16 years with a mean age of 7.9 ± 4.5 years. Majority (40.4%) of the patients were aged 5-10 years (p -Value 0.021).

Proteinuria (39.4%), Oedema (39.4%) and Oliguria (26.9%) were the most frequent clinical presentations (Table 2).

Table 1. Sex and Age Distribution of the study population.

Age	Sex		Total
	Male	Female	
< 5	18 (17.3)	10 (9.6)	28 (26.9)
5-10	24 (23.1)	18 (17.3)	42 (40.4)
>10	16 (15.4)	18 (17.3)	34 (32.7)
Total	58 (55.8)	46 (44.2%)	104 (100.0)

Table 2. Common presenting features of the renal disorders.

Clinical Features	Frequency	Percentage
Proteinuria	41	39.4
Oedema	41	39.4
Oliguria	28	26.9
Ascitis	22	21.2
Abdominal Pain	18	17.3
Hypertension	15	14.4
Haematuria	6	5.8
Frequency	4	3.8
Dysuria	4	3.8
Vomiting	3	2.9

Nephrotic Syndrome (47.1%), Acute Kidney Injury (10.6%) and Acute Glomerular Nephritis (10.6%) were the commonest causes of admission (Table 3). Sex was significantly associated with renal disorders ($X^2=21.943$, p -value=0.025) in this study.

Table 3. Types of renal disorders diagnosed among the study population.

Diagnosis	SEX		Total n (%)
	Male n (%)	Female n (%)	
NS	25 (24.0)	24 (23.1)	49 (47.1)
AGN	6 (5.7)	5 (4.8)	11 (10.6)
AKI	5 (4.8)	6 (5.8)	11 (10.6)
UTI	5 (4.8)	3 (2.9)	8 (7.7)
PUV	6 (5.7)	0 (0.0)	6 (5.7)
CKD	5 (4.8)	0 (0.0)	5 (4.8)
Renal Stones	0 (0.0)	5 (4.8)	5 (4.8)
HIVAN	1 (1.0)	2 (1.9)	3 (2.9)
Wilms Tumour	3 (2.9)	0 (0.0)	3 (2.9)
PCKD	1 (1.0)	0 (0.0)	1 (1.0)
CGN	1 (1.0)	1 (1.0)	2 (1.9)
Total	58 (55.7)	46 (44.3)	104 (100.0)

NS=Nephrotic syndrome, AGN=Acute glomerulonephritis, AKI=Acute kidney injury, UTI=Urinary tract infections, PUV=Posterior urethral valve, CKD=Chronic kidney Disease, HIVAN=Human immunodeficiency virus associated nephropathy, CGN=Chronic glomerulonephritis, PCKD=Polycystic kidney disease.

The age distribution of the different types of renal disorders is shown in Figure 1 below.

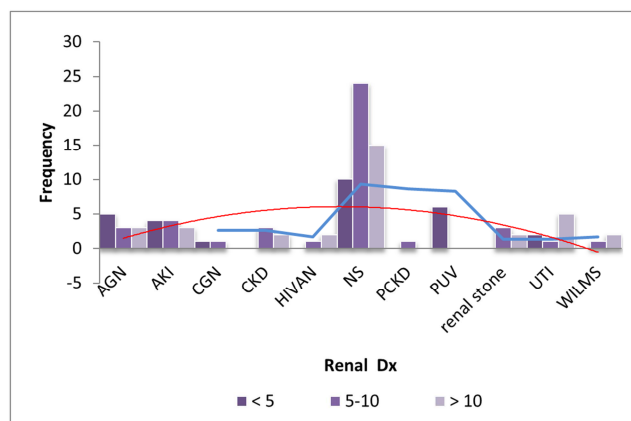


Figure 1. Prevalence of the renal diseases among the different age groups.

More than 90% of the patients took herbal remedies before presentation ($X^2=47.248$, p -Value=0.001). The intake of herbal concoctions by the study population is shown in Table 4 below.

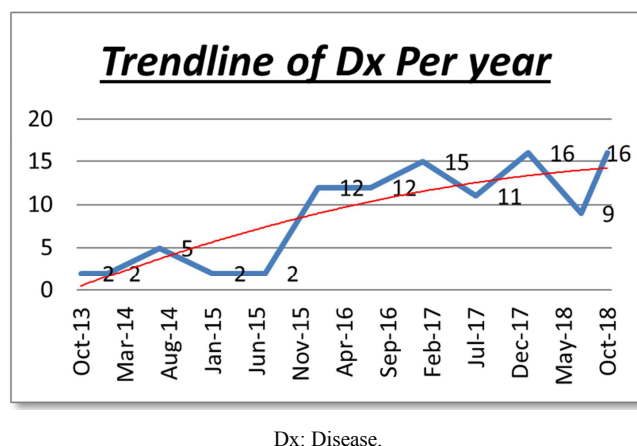
Table 4. Intake of herbal concoction by the study population according to diagnosis.

Type of renal disorder	Total Number of Patients (%)	Number of Patients that took Herbal Concoctions (%)
NS	49 (47.1)	19 (18.3)
AGN	11 (10.6)	2 (1.9)
AKI	11 (10.6)	4 (3.8)
UTI	8 (7.7)	1 (1.0)
PUV	6 (5.8)	1 (1.0)
CKD	5 (4.8)	5 (4.8)
Renal Stones	5 (4.8)	0 (0.0)
HIVAN	3 (2.9)	3 (2.9)
WILMS Tumour	3 (2.9)	0 (0.0)
CGN	2 (1.9)	2 (1.9)
PCKD	1 (1.0)	0 (0.0)
Total	104 (100.0)	37 (100.0)

A progressive increase in yearly diagnosis of renal

diseases was observed during the study period (see Figure 2 below).

Mortality rate was 4.8% (Table 5). Causes of death were Chronic Kidney Disease (40%), Acute Kidney Injury (20%), Wilms tumour (20%), and HIVAN (20%).



Dx: Disease.

Figure 2. Yearly trend in the prevalence of renal disorders.

Table 5. Outcome of management of the study population.

Outcome	Number	Percentage
Discharged	94	90.4
Referred	3	2.9
DAMA	2	1.9
Died	5	4.8
Total	104	100.0

DAMA: Discharge against Medical Advice.

4. Discussion

A progressive increase in yearly diagnosis of childhood renal diseases was observed during the study period. Our paediatric renal unit was established in 2013, and since then it has witnessed a steady upgrade in terms of better diagnostic tools, equipment and trained manpower as much as the hospital can afford. Our commencement of both haemodialysis and peritoneal dialysis for children also brought the unit to the limelight. This has attracted more patient turn ups and referrals from peripheral hospitals over the years. These could explain the annual increment in the number of renal cases seen within the study period. A progressive annual rise in paediatric renal disorders was also the finding by Ladapo *et al* [4] and Asinobi *et al* [14] respectively.

The overall prevalence of renal disorders in this study is lower than reported from other centres in and outside Nigeria [3, 4, 21, 32-37]. It is however higher than the 1.1% and 1.3% from Rivers [42] and Delta [2] states, in eastern Nigeria respectively. The various prevalence rates may be due to differences in study methodology and availability of renal care services in those centres. Again, our cohort were all admitted patients unlike in other studies [3, 4, 21, 33] where both admitted and non-admitted patients were included in their study. The prevalence of renal disease in the index study is, therefore, not a true reflection of the burden of the disease in

our centre, because of the exclusion of non-admitted patients.

Male predominance in the index study is in keeping with previous studies [5, 32, 23]. It has been documented that male children are more susceptible to most diseases compared to female children [39]. This was attributed to the stronger T-helper 1 immune responses in females compared to males [39].

The spectrum of renal disorders in our study was similar to findings from most centres [2-4, 21, 32-34] in Nigeria, although wide variations in disease frequency existed. This may be explained by the effect of nutritional, climatic and economic bearing on specific diseases among children from same geographical location.

In the index study, nephrotic syndrome remained the leading renal disorder, which is in consonance with most previous studies [3, 4, 33, 34]. The gross oedema of nephrotic syndrome prompts parents to present children earlier to the hospital, compared to other renal disorders with less obvious symptoms. Hence patients with nephrotic syndrome may present more frequently to the hospital than other renal diseases. This finding again buttresses the fact that NS is the most common chronic glomerular disease in children [40].

Post-infectious AGN (PAGN) is the 2nd most frequent renal disorder in this study. The prevalence of PAGN is also high in other centres within Nigeria. It is the leading childhood renal disorder in Calabar [34] and Zaria [20], but assumes the second most frequent kidney disease in centres like Jos [21] and Enugu [6]. This reflects the role of infections in the burden of childhood renal diseases in sub-Saharan Africa. Infection control as one of the strategies to reduce the burden of renal diseases in developing countries cannot be overemphasized [8].

AKI is a topical issue of global concern because of the high mortality associated with it in the developing world [8]. The prevalence of 10% from AKI in the index study is higher than the 2.8-7.4% from some centres in Nigeria [6, 19, 20, 34]. The aforementioned studies may not have used RIFLE criteria for diagnosis which includes earlier stages of AKI in the count. Another reason could be the increased access to dialysis in our hospital where children are offered both peritoneal and haemodialysis. This encourages early referral of AKI from other nearby centers.

The higher prevalence rates of 20% and 39.1% for AKI from Lagos [4] and Jos [21] respectively may be a reflection of longer standing health facilities with newer diagnostic tools, and increased manpower in the management of kidney diseases. These cities are also bigger than the index study location by every standard.

The prevalence of UTI in this study is in consonance with studies from Enugu [6], Calabar [34] and Zaria [20], but lower than the report from PH [39], Jos [21] and Benin [40]. Higher values of 22%, 32.8% and 68.9% were recorded from Umuahia [33], Benin [41] and PH [39]. These higher rates from the later centres may be due to inclusion of patients from the children's out-patient clinic where children were routinely screened for UTI. The general variations in the

different prevalent rates of UTI may be due to environmental, cultural and geographical factors. UTI is a preventable disease. Therefore, there is need for public enlightenment and health education on the prevention of UTI in children. This can reduce its contribution to the burden of renal diseases to a minimal.

The prevalence of Wilms tumour is lower in our centre compared to other studies [4, 6, 19, 20, 34]. This could be explained by the absence of an established paediatric oncology unit in our centre. We end up referring most of our oncology cases to centres with better resources and manpower.

PUV was the most frequent congenital anomaly of the kidney and urinary tract, which is in keeping with most reports [3, 21, 33]. It was also the cause of >90% of the CKD cases in this study. Early detection of PUV (including the use of intrauterine screening) and early intervention will reduce all the morbidity and the long-term sequelae of CKD associated with it. The place of public enlightenment and health education concerning PUV cannot be over-emphasized, in view of its easy amenability to surgical intervention when patients present early to the hospital.

The prevalence of CKD was 4.8% in this study. This concurs with findings by Abdurrahman et al [20] and Ladapo et al [4], but higher than reports from Enugu [6] and PH [38]. CKD is almost a death sentence in Nigeria. CKD accounted for 40% of the mortality in this study. This is because the cost of management for CKD is prohibitive and there is no social security system or functional health insurance schemes to reduce the financial burden for patients. Chronic renal replacement therapy in Nigeria for children is almost non-existent, and where available, it is almost non-affordable. This is different from what is obtained in the developed world where there are national health insurance schemes to help the masses bear cost of treatment. There is an urgent need for the government to focus on prevention of kidney diseases and also to institute functional health insurance schemes in SSA.

The prevalence of HIVAN is low in this study. This is a similar finding in Umuahia [33] and Enugu [42]. This may be due to the ongoing success in the management of retroviral disease with subsequent reduction in its complications globally.

Majority of our patients took herbal concoctions to treat their disease before presenting to our hospital. The extent to which such native formulations influenced disease complication and outcome in such patients was not ascertained. Toxins from herbal concoctions can be an extra insult to an already diseased kidney. The use of herbal concoctions as complementary or alternative medication for diseases is on the rise in our society [43]. There is need to enlighten the public on the dangers of self-medication and use of herbal concoctions.

Our mortality rate of 4.8% is lower than the 5.1% from Umuahia [4], 6.5% from Asaba [43], 10% from Gusau [36], 14.4% from Lagos [4], and 26.9% from Ibadan [14]. The reason for our low mortality compared to other centres is not

very clear. However, the management of childhood renal diseases in our centre improved greatly with the establishment of a paediatric renal unit, employment of a trained paediatric nephrologist and commencement of both peritoneal and hemodialysis for children with AKI.

Compared to the western and developed nations, the morbidity and mortality of childhood renal disease in Nigeria is widely unacceptable. Focus on preventive nephrology should be the way forward.

5. Conclusion

The prevalence of childhood renal diseases in Aba is 1.7%. There is an annual rise in the cases of childhood renal diseases in our centre with nephrotic syndrome being on the lead. There was a high intake of herbal concoction among our cohort. Male sex is significantly associated with renal disorders. The need for the government to provide expertise, management facilities, health insurance schemes, and screening programmes for childhood renal disorders in the nation cannot be over-emphasized. Preventive nephrology should be embarked on, to curb the morbidity and mortality from renal diseases worldwide.

Limitation of the Study

Some investigations e.g complements (C3 and C4) assays, Antinuclear Antibody tests, anti-neutrophil cytoplasm antibody test (ANCA) and genetic testing were not done in our centre during the study period. These would have helped our records on aetiology. Complement assay tests started recently in our laboratory, and will benefit future patients.

The small sample size of our cohort is another major limitation. Our study populations were only admitted patients. There were also patients with renal disorders who were managed on outpatients' basis not requiring admission. A future research on all children with renal disorders (both admitted and non-admitted) will fill in the gap.

Also, as a hospital based study, it may not be a true reflection of the prevalence of renal diseases in the community. However, the study still represents a reasonable burden of the disease in the environment, because our centre is the only tertiary health facility in the city.

Finally, some renal diseases seen often in the developed world, like hyperoxaluria, cystinosis, nephronophthisis and tubulopathies may not have been reflected in this study probably because of lack of diagnostic facilities and low index of suspicion.

Authors' Contributions

Okoronkwo N C conceived and designed the manuscript, helped in acquisition of data, analysis and interpretation of data, and also wrote the manuscript.

Chappjumbo A U contributed in the interpretation of the analyzed data, revision of the manuscript, and gave final approval of the version to be published.

Onyire B N contributed in the interpretation of the analyzed data, revision of the manuscript, and gave final approval of the version to be published.

Ekpemo S C helped interpretation of the analyzed data, revision of the manuscript, and gave final approval of the version to be published.

Ijeoma S N contributed in the design of the manuscript, helped in acquisition of data, writing of the manuscript, and gave final approval of the version to be published.

Competing Interest

Authors declared they have no conflicts of interest.

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