Haemodialysis Treatment among Children with Kidney failure in North-Western Nigeria: A Three-Year Review

[1]*Obiagwu Patience N.,* [2]*Abdu Aliyu and* [3]*Abubakar Nana D*

[1]Department of Paediatrics, Aminu Kano Teaching Hospital, Kano.
[2.]Department of Medicine, Aminu Kano Teaching Hospital, Kano.
[3.]Haemodialysis Unit, Aminu Kano Teaching Hospital, Kano.

ABSTRACT

Background: Chronic kidney disease (CKD) is on the increase worldwide and leading to a rise in the number of children requiring renal replacement therapy (RRT). Optimal management of these children continues to be a challenge in resource-limited settings where majority has no access to any form of RRT. This study reviews the clinical and laboratory characteristics of children who had haemodialysis at Aminu Kano Teaching Hospital (AKTH) over a three-year period.

Materials and Methods: The case notes and dialysis records of all children who had undergone haemodialysis from December 2008 to December 2011 were reviewed. Information retrieved included their ages at presentation, blood pressures, laboratory characteristics on admission, time to initiation of dialysis and frequency of dialysis sessions.

Results: Twenty-eight children underwent haemodialysis during the period. The age range was 6 to 15 years with a mean age of 11.8 years. Twenty children (71.4%) had chronic kidney disease and 8 (28.6%) had acute kidney injury. The mean serum urea concentration was 34.5mmol/L (range: 17.6 – 68.4) while the mean serum creatinine concentration was 1202.4µmol/L (range: 758 – 2564) on admission. Twenty-three children (82.1%) had severe anaemia at presentation. The average duration of time from admission to commencement of dialysis was 6 days (range: 2 – 11 days). Of the children with CKD, only two (10%) could afford more than 2 haemodialysis sessions per week. No patient had renal transplantation.

Conclusion: Haemodialysis in children continues to be a challenge in resource-limited settings. Most children present late, with poor outcomes. Early referral and improved health insurance systems may help overcome these problems.

Keywords: *haemodialysis, paediatrics, Kano*

INTRODUCTION

The number of children requiring renal replacement therapy (RRT) is on the rise. Haemodialysis is the most commonly used modality of RRT worldwide, including in sub-Saharan Africa and Nigeria [1-4]. The other options (peritoneal dialysis and renal transplantation) are largely uncommon due to the extremely exorbitant cost, lack of facilities and manpower, and the predominantly urban location of the renal care centres [2, 4, 5].

The Nigerian National Health Insurance Scheme does not cover the cost of renal replacement therapies and most patients have to pay for such treatment out of their pockets. Such costs are

Corresponding author: Obiagwu Patience N.

Department of Paediatrics, Aminu Kano Teaching Hospital, Kano. emegwalu_pat@yahoo.com

prohibitive considering the fact that majority of the population lives below the poverty line [6].

The situation is worse in the Northwestern region of Nigeria where there is a very high poverty level, high birth rates and very few centers who offer the paediatric haemodialysis service. Optimal dose of dialysis is often unachievable with such situations, leading to poor outcomes. As a result, optimal management of these children continues to be a challenge in these settings. This study reviews the sociodemographic, clinical and laboratory characteristics of 28 children who underwent haemodialysis at AKTH over a 3-year period.

METHODS

This retrospective study reviewed the admissions of all children seen at the haemodialysis unit of AKTH from December 2008 to December 2011. The dialysis unit commenced paediatric services in 2007 and receives paediatric haemodialysis referrals from all states in the Northwestern region and beyond. The unit has several functional haemodialysis machines with some of them dedicated to dialyzing patients who have Hepatitis B, Hepatitis C and HIV infections. The caregivers of the patients usually gave informed consent before being commenced on therapy and understood that the service delivery depended on their ability to pay. The case notes of all patients seen were utilized for the purpose of this study. Information retrieved from the records included the socio-demographic data, clinical characteristics including blood pressure, haematocrit levels, biochemical parameters, time lapse between admission and commencement of dialysis, frequency of dialysis sessions and outcome as far as the dialysis unit is concerned. For purposes of this review, chronic kidney disease (CKD) is defined as kidney damage e" 3 months as defined by structural or functional abnormalities of the kidney, with or without decreased GFR OR GFR < 60mL/min/1.73m2 for e"3 months with or without kidney damage; while acute kidney injury is a clinical spectrum characterized by a rapid reduction in kidney function resulting in a failure to maintain fluid, electrolyte and acid-base homoeostasis.

The data obtained were entered into a spreadsheet and analyzed using the SPSS software version 16.0 for Windows. Ratios, percentages and means were calculated where appropriate.

Categorical variables were compared using either the uncorrected chi square test or Fisher's exact test. Statistical significance level was set at $p < 0.05$.

RESULTS

Twenty eight children, comprising fourteen males and fourteen females, underwent haemodialysis during the study period. Male to female ratio was 1:1. Median age at initiation of dialysis was 12 years with a range of 6 - 15 years. Twenty children (71.4%) had chronic kidney disease (CKD) while eight children (28.6%) had acute kidney injury (AKI). The commonest identified cause of chronic kidney disease was chronic glomerulonephritis while for acute kidney injury; the commonest identified cause was acute glomerulonephritis. The various causes of kidney disease in the study population are shown in Table I. Twenty children (71.4%) presented with blood

Table 1: Causes of kidney disease in the study population

Aetiology	Number (%)
Chronic Kidney Disease (n=20)	
• Chronic glomerulonephritis	12 (60.0)
• Nephrotic syndrome	4 (20.0)
• Unidentified cause	4 (20.0)
Acute Kidney Injury (n=8)	
• Acute glomerulonephritis	4 (50.0)
• Severe sepsis	2 (25.0)
• Unidentified cause	2 (25.0)

pressures above their 95th percentiles while twenty-three children (82.1%) had severe anaemia on admission. The baseline characteristics of the children at the time of first admission are shown in Table 2.

Table 2: Baseline characteristics of study population at the time of first admission

Characteristic	Result
Mean (SD) PCV (%)	18.9 (3.7)
Mean (SD) serum urea (mg/dL)	29.7 (10.6)
Mean (SD) serum creatinine (µmol/L)	1202.4 (520.2)
Mean (SD) serum calcium (mmol/L)	1.7 (0.8)
Mean (SD) serum phosphate (mmol/L)	2.8 (0.6)
Mean (SD) serum albumin (g/L)	26.4 (6.2)
Mean (SD) serum cholesterol (µmol/L)	4.8 (2.1)
Mean (SD) systolic blood pressure (mmHg)	136.7 (33.5)
Mean (SD) diastolic blood pressure (mmHg)	93.0 (25.2)

PCV, packed cell volume;   SD, standard deviation

Table 3: Characteristics at admission among study population by outcome status

Variable	Number (%)				P value
	Died	**(n=6)**	**LTFU**	**(n=22)**	
Age range					0.166
• 6 – 9 years	0	(0)	6	(100)	
• 10 – 12 years	3	(33.3)	6	(66.7)	
• >12 years	3	(23.1)	10	(76.9)	
Gender					0.049*
• Male	4	(28.6)	10	(71.4)	
• Female	2	(14.3)	12	(85.7)	
Blood pressure					0.067
• Hypertension	4	(20)	16	(80)	
• Normal or pre-HTN	2	(25)	6	(75)	
Packed Cell Volume					0.069
• Low	5	(21.7)	18	(78.3)	
• Normal	1	(20)	4	(80)	
Indication for dialysis					0.067
• CKD	4	(20)	16	(80)	
• AKI	2	(25)	6	(75)	
Delay (days)#					0.008*
• >5	4	(36.4)	7	(63.6)	
• 3 – 5	1	(10)	9	(90)	
• <3	1	(14.3)	6	(85.7)	
Sessions per week					0.046*
• <3	6	(23.1)	20	(76.9)	
• ≥3	0	(0)	2	(100)	
Follow up			0.	(118)	
• <2 months	5	(26.3)	14	(73.7)	
• 2 – 4 months	1	(14.3)	6	(85.7)	
• 4 – 6 months	0	(0)	2	(100)	
• >6 months	0	(0)	0	(0)	

LTFU, Lost to follow up; CKD, chronic kidney disease; AKI, acute kidney injury

Delay# = Time from diagnosis to initiation of dialysis

Statistically significant

Of the 28 children who had haemodialysis, only two children had dialysis for more than four months while none was seen after six months. Most children were lost to follow-up and their actual outcomes could not be ascertained. There were six deaths recorded during dialysis (21.4%). All deaths occurred in children who had less than 3 haemodialysis sessions per week. Two-thirds of the cases of death occurred in males, in children who had an admitting diagnosis of chronic kidney disease and in those who had delays in commencing haemodialysis. There were no statistically significant differences in age, blood pressure, packed cell volume, indication for haemodialysis and duration of follow up (Table 3).

DISCUSSION

This study showed a mortality of 21.4 percent among children who had haemodialysis in AKTH during the study period. Considering the fact that most patients were lost to follow up within 6 months of first dialysis, this rate could be much higher as a significant number could have died at home. Several factors including late presentation, unaffordability and lack of health insurance could account for this. Financial constraint has been documented by various studies as a major impediment to renal replacement therapy in developing countries. Ijoma *et al* [7] concluded that the cost of treatment of ESRD was exorbitant and far beyond the reach of the average Nigerian. Children, who depend on adults for provision of care, usually bear the brunt of the situation. There is a paucity of local data in children for comparison. However, Hari *et al* [8] in a study in India reported a mortality rate of 15.1% and a dropout rate of 49.1% on account of financial reasons.

This study found that a large proportion of the patients had delays from time of diagnosis to initiation of dialysis. These were attributable to the difficulties incurred in getting the available funds to pay for the service. Added to this is the fact that

most patients presented at the late stages as evidenced by the very high serum urea and creatinine levels, very high blood pressures as well as pre-dialysis anaemia on admission. This could be explained by the practices of attempting alternative treatments such as spiritual healing and traditional/native healers mainly because of reasons related to accessibility and affordability of health care services. This finding has been reported by other authors [9, 10].

Most patients in this study had sub-optimal dialysis of less than three haemodialysis sessions per week. Low dialysis frequency, which is usually due to inability to pay for the service, has been found to be a major predictor of mortality in studies done in countries with similar health indices [11-13]. Even in resource rich settings, non-adherence among dialysis patients including skipping as little as a dialysis session per month increases the risk of mortality by 14 to 30 percent [14-17].

In most centers, patients and caregivers are often informed about the cost implications of the therapy before initiation of dialysis. In spite of this, they opt for the initial treatment but are unable to sustain therapy in the long term, thus contributing to poor outcomes and high dropout rates [8]. Renal transplantation is the preferred mode of treatment for most children with ESRD. Ideally, chronic dialysis is usually undertaken only if renal transplantation is an option. However, it must be re-emphasized that the cost implications cannot be borne by the average Nigerian.

CONCLUSION

Outcome of paediatric haemodialysis is poor. The emphasis should be on nephron-prevention through health education. Early diagnosis and prompt referral/ institution of management modalities may improve outcomes. Since our health insurance schemes do not cover renal replacement therapy, the private corporate and industrial sectors could be of assistance in developing financial supports towards this end. Ultimately, subsidizing the cost of haemodialysis and subsequent renal transplantation through national health insurance schemes could help improve the outcomes especially in patients with dialysis-dependent chronic kidney disease.

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