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Haemodialysis Experience with Chronic Kidney Failure Patients at the University of Port-Harcourt Teaching Hospital: An Analysis of Data of the First Year of Operation

F. S. Wokoma and H. U. Okafor

Department of Medicine Renal Unit University of Port Harcourt Teaching Hospital (UPTH). Port- Harcourt, Nigeria

ABSTRACT

The haemodialysis experience with chronic kidney failure patients who needed haemodialysis treatment, during the first year of operations,(January to December,2007) at the haemodialysis unit the of University of port Harcourt Teaching hospital were retrospectively studied.They were 55 patients (35 males,20 females, M/F=1.8:1). Their mean age was 46.16 ±17.68(12-78) years with the peak age of occurrence in the 50-59 year age group. At first presentation, they had a mean e-CLcreat. of 6.22 ± 5.8(2.7-34.3) mls/min, a mean blood urea of 32.9 ± 10.2(28-49) mmol/l , mean plasma creatinine of 1224.9 ± 557.4(245-2505) umol/l and a mean haematocrit of 20.9 ± 6.8 (10-35)% respectively. Chronic glomerulonephritis,20(36.4%), Hypertensive - nephropathy,13(13.6%) and Diabetic nephropathy,12(21.8%) were the leading disorders underlying chronic kidney disease, collectively constituting 81.8% of the patients. Clinical status at first presentation for dialysis was poor. Twenty-two patients(40%) and 14(25.5%) patients presented with advanced uremia with severe haemodynamic instability and uraemic encephalopathy respectively. Exposure to dialysis was very poor. The mean duration on dialysis was 5.2 ± 2.6(1-36.7)weeks. The mean total number of dialysis sessions attained was 4.3 ±4.2(1-21) sessions. Similarly, measures of dialysis adequacy were poor. The mean URR was 48.75%(8-88%). The mean Kt/v was 0.94±0.4(0.5-1.9). A total of 15(27.2%)patient complications of dialysis were observed with hypoglycaemia-4(7.2%) being the most frequently observed. As at the end of the one year study period only 6(10.9%) of the patients were surviving and dialyzing, 22(40%) had died, and 23(41.8%) absconded and presumed dead. Four(7.2%) patients were referred out of the country for kidney transplantation and all returned after successful transplant. The haemodialysis exposure, performance and outcomes of chronic kidney failure patients receiving haemodialysis treatment at the University of Port Harcourt Teaching Hospital were very poor. Late presentation and financial inability to access regular dialysis treatment were the dominant factors of poor outcome. A call is made for urgent Government subsidy for haemodialysis treatment in Nigeria.

Keywords: *Haemodialysis experience, Chronic kidney failure, University of Port Harcourt Teaching Hospital.*

INTRODUCTION

The global incidence and prevalence of chronic kidney disease(CKD) and end -stage kidney failure(ESKF) are on the increase, especially in the resource poor developing countries of the world such as Nigeria.

Correspondence to: **Dr F.S. Wokoma**

Consultant Nephrologist, Department of Medicine, Renal Unit University of Port Harcourt Teaching Hospital (UPTH) Port Harcourt.E-mail: friwoks2006@yahoo.com.

Globally it is estimated that well over 500million people have some kind of chronic kidney disease and the figure is on the increase every year[1].

About 455 persons per million in the United States of America and about 216 persons per million in the United kingdom are on one form of renal substitution therapy or the other [2,3]. In Nigeria 3 to 8 percent of adult medical admissions are as a result of chronic kidney disease.[4,5]

Maintenance haemodialysis and kidney transplantation are the therapeutic modalities available for the management of advanced chronic kidney failure and end stage kidney failure. Whereas both modalities of therapy have been well developed in the advanced countries of North America and Europe [2, 3] with very good survival rates and high quality of life indices, they are yet to be properly developed in most resource poor countries such as Nigeria.

In recent times , in Nigeria, a number of public and private health institutions have opened haemodialysis facilities and a few centers have initiated kidney transplant efforts.

Reports of the experiences from the few haemodialysis centers have been characterized by poor patient out comes [6, 7]

This report is one such experience with chronic kidney failure patients who needed haemodialysis and commenced treatment at the newly established haemodialysis unit of the University of Port Harcourt Teaching hospital, in the first year of operation.

AIM AND OBJECTIVES

To evaluate the haemodialysis performance and outcomes of chronic kidney failure patients who commenced haemodialysis treatment during a one year period at the University of Port Harcourt Teaching hospital

To identify factors contributing to poor haemodialysis out comes of chronic kidney failure patients in our environment.

To proffer suggestions for the adequate care of chronic kidney failure patients in Nigeria and other resource poor African countries.

MATERIALS AND METHODS

The data for analysis were retrospectively obtained from the individual haemodialysis and clinical case records of all patients who commenced long term (maintenance) haemodialysis treatment in the haemodialysis unit of the hospital from January to December 2007.

From the records the following data were obtained for subsequent analysis using a pre-designed data acquisition format.

The patients bio-data,the primary underlying kidney disease as registered by the nephrologist in charge of the patient, duration of chronic kidney disease(CKD), the estimated CL_{creat}. at entry, date of first dialysis in the unit and the date of last dialysis before or up to the 31st of December, 2007 as well as the total number of dialysis sessions received between 1stJanuary and 31st December, 2007.

Other data include, the parameters of each haemodialysis session done during the period under study. These include the date of each dialysis, the immediate pre- and post dialysis haematocrit and biochemical parameters(sodium,potassium,urea,creatinine and, bicarbonate),duration of each dialysis session in hours, peak blood flow rate achieved, ultra-filtration volume, the mean blood pressure of the patient during the index dialysis as well as any patient compilations and dialysis machine alarms or faults that occurred during the index dialysis session.

From the primary data, the following derived data were generated. The estimated creatinine clearance(e-$CL_{CREAT.}$) for each patient was calculated using the Cockcroft and Gault [8] formula, the average number of dialysis sessions per week attained by each patient(obtained by dividing the total number of dialysis sessions attained by the patient, by the total period(in weeks) during which patient received dialysis).

The Urea reduction ratio(URR) achieved during each dialysis session was calculated as :

$$\left\{1 - \frac{\text{UREA (POST-DIALYSIS)}}{\text{UREA(PRE-DIALYSIS)}}\right\} \times 100.$$

The value is expressed as a percentage. Blood samples for the determination of immediate pre-dialysis urea were collected just before cannulation of the patient, while the sample for the determination of immediate post dialysis urea were collected in the first minute of stopping the blood pump, in accordance with NKF/DOQI [9] guidelines. Both pre and post dialysis samples were sent to the central laboratory of the hospital for subsequent analysis.

The Kt/v attained by each patient after a period of dialysis was derived for each patient using the " Kt/v VS R- logarithmic relationship curve"[10] derived from formal urea kinetic modeling .(R=post dialysis blood urea/pre-dialysis blood urea.)

The value of R for each patient was found on the X-axis of the curve, and extrapolated to intersect with the curve. The corresponding Kt/v is read off by extrapolation from the point of intersection to the Y-axis.

The basis for commencement of haemodialysis treatment for each patient were as follows :

1. Evidence of established chronic kidney disease according to the NKF/DOQI criteria[9] for diagnosis and classification of chronic kidney disease. All 55 patients satisfied this criteria.
2. NKF/DOQI clinical stages 4 and 5 disease. Fifty-four patients (98.2%) had e-CL_{CREAT}. values less than 15ml/min and were deemed to have end-stage kidney failure.

Only one patient(1.8%) had e-CL_{CREAT}. value of 34.3mls/min. He was a 45 years old man with malignant hypertension and renal failure who exhibited dialysis dependence.

Fifty-three out of the 55 patients (96.4) were dialyzed using temporary vascular access (femoral catheter), the other two patients(a male and a female) had permanent access created in the united states of America.

The diagnosis of the underlying primary kidney disease were based on the final diagnosis made by the managing renal physician, as reflected in the patients clinical case file.

Also studied were the final outcome of the patients by the end of the study period. The possible outcomes include the following: patient alive and still receiving dialysis in the unit, absconded, confimed dead (within or outside the hospital) or referred for kidney transplant.

DATA MANAGEMENT

The data were analyzed with the aid of Epi-info computer based statistical package.

Averages are presented as mean $\pm$ standard deviation. Pearson's correlation coefficient(r) was used to establish relationship between quantitative variables, while Student t-test was used to measure statistical significance between variables, with p-values set at 0.05.Tables and figures were used as appropriate.

RESULTS

During the period under study (January to December, 2007) a total of fifty-five(55) chronic kidney failure received haemodialysis treatment at the University of Port Harcourt Teaching hospital.

They constituted 6.14% of the 895 patients admitted in the medical wards of the hospital during the period under study. They were 35 males and 20 females (M/F=1.8:1) with a mean age of 46.16 $\pm$ 17.68 years (range12-78 years). Though the peak age occurred in the 50-59 year age group there seem to be an even spread across the age groups from the 20-29 to the 60-69 year age groups.

Table 1, shows the distribution of the primary underlying kidney disorders in the patients. Chronic glomerulonephritis (CGN) was the commonest underlying kidney disorder accounting for 20(36.4%) of the patients. This was followed by Hypertensive nephrosclerosis (HTN) 13(23.6%) and Diabetic nephropathy (DN), 12(21.8%) as the leading underlying primary kidney disorders in the patients. The three conditions being responsible for 81.8% of the cases.

The estimated creatinine clearance of the patients ranged from 2.7 to 34.3 mls per minute with a mean of 8.22 $\pm$ 5.8 mls per minute.Only one patient had the estimated creatinine clearance of34.3mls/min.This was a 45 year old man presenting with malignant hypertension ,anaemia and renal failure. All attempts to wean him off dialysis proved abortive. The remaining 54 patients had e-$CL_{CREAT.}$ of less than 15mls /min. and were in end –stage kidney failure.

Anaemia was quite prevalent, with a mean haematocrit level was 20.8 $\pm$6.8 %(range 10-35%),mean blood urea concentration of 32.9 $\pm$36.2mmol/l(18-56.3mmol/l),mean plasma creatinine concentration of 1224.9 $\pm$ 557.4 mmol/l (245-2505mmol/l),mean plasma potassium of 4.66+

Table 1: Distribution of primary kidney disorders.

Primary Kidney Disease	Number	Percentage
Chronic glomerulonephritis.	20	36.4
Hypertensive nephropathy.	13	23.6
Diabetic nephropathy.	12	21.8
Obstuctive uropathy.	4	7.3
Multiple myeloma.	1	1.8
Inadvertent nephrectomy.	1	1.8
Poory defined.	4	7.3
Totals	55	100.0

Table 2: Baseline Parameters at commencement of maintenance haemodialysis

Parameter	Mean values	Range
Creatinine Clearance (mls/min)	6.22 ± 5.8	2.7 - 34.3
Haematocrit (%)	20.9 ± 6.8	10 - 35
Sodium (mmol/l)	134.8 ± 6.0	122 - 149
Potassium (mmol/l)	4.7 ± 1.0	3.0 -7.0
Bicarbonate (mmol/l)	19.4 ± 7.8	8 - 27
Urea (mmol/l)	32.9 ± 10.2	28 - 49
Creatinne(umol/l)	1224.9 ± 557.4	245 - 2505
Total Proteins (g/dl)	60.7 ± 4.0	57 - 65
Albumin (g/dl)	32.0 + 9.8	25 - 39
Systolic Blood - Pressure (mmHg)	171.2 + 31.9	107 - 240
Diastolic Blood-Pressure (mmHg)	102.5 + 27.4	70 - 140

1.04mmol/l(3-7mmol/l) and mean bicarbonate level of 19.43mmol/l(8-27mmol/l) respectively, (Table 2). Hypertension was quite common and severe. The mean systolic blood pressures was 171.17 ± 31.9 mmHg(107-240mmHg) and mean diastolic blood pressure of 102.25 ±27.42mmHg(70-140mmHg) respectively. Only seven patients (12.7%) patients had normal blood pressures while 10 patients each(18.2%),had mild and moderate hypertension respectively. Twenty-six(47.3%) patients had severe hypertension. Of the 55 patients, only19 (34.5%) patients presented in a relatively stable clinical state. The other 36 patients (65.5%) presented late, in advanced uraemic State (characterized by gross oedema, moderate to severe hypertension, haemodynamic instability and pulmonary oedema.) with 14 of them(25.5%) presenting for the first time in a state of uraemic encephalopathy.

Table 3: Duration on haemodialysis in weeks Duration on

Haemodialysis in weeks	No.	Percentage
1 -9	49	89.1
10-19	4	7.3
20-29	1	1.8
30-39	1	1.8
> 39	0	0.0
Total	55	100.0

Mean duration on dialyses in weeks: 5.18 + 7.59 weeks. Range - 1-36.7 weeks

The mean duration of period spent by the patients on dialysis during the period under study was 5.2 ± 7.6 weeks. The longest dialyzed patient dialyzed for 36.7 weeks, while the least dialyzed patient dialyzed for less than one week. Table- 3 shows the distribution of the patients according to the duration

Table 4: Number of dialysis sessions attained

Dialysis Sessions	No	Percentage
1- 5	40	72.7
6 -9	9	16.4
10-14	4	7.3
15-19	1	1.8
20-24	1	1.8
Total	55	100.0

Mean number of dialysis sessions attained: 4.27 ± 4.27(range 1-21)

of the period on dialysis. Forty-nine(89.1%) of the patients dialyzed for a period of less than 10 weeks,4(7.3%) patients dialyzed from 10 to 19 weeks while no patient dialyzed beyond 39 weeks.

The mean number of dialysis sessions attained per (table 4) was 4.3 ± 2.2 (range 1-21sessions) during the period under study. The mean number of dialysis sessions per week attained was 1.2 ± 0.7(range 0.3-3) sessions per week.

The mean Urea reduction ratio(URR) attained by the patients was 48.7 ± 22.%(range,8-88%). Ten patients (18.2%) attained URR of 65 percent or above while 45(81.8%) had URR values lower than 65%.

The mean Kt/v attained by the patients was 0.94 ± 0.4(range, 0.5-1.9). Ten patients achieved Kt/v values 1.2 and above while 45(81.2%) patients had Kt/v values lower than 1.2.

The relationship between age of patient, duration of patient on dialysis and the mean blood flow rate attained during dialysis, with measures of dialysis adequacy i.e URR and KT/V were determined using Pearson's correlation coefficient in a two tailed test.

Patients age correlated negatively with both URR(r = -0.17;p=0.283) and kt/v(r = -0.14;p =0.282) respectively. Duration on dialysis showed weak positive correlation with both URR(r = +0.33;p =0.06) and with kt/v(r = +0.39; p =0.11) respectively. Mean blood flow rate correlated negatively with both URR(r = -0.059; p = 0.715) and kt/v (r = 0.519; p = 0.326) respectively. There was however a very strong positive correlation between URR and KT/V(r =0.885;p < 0.001)

A total of 15 patient related complications were recorded in the 55 patients who collectively received a total of 232 sessions of haemodialysis during the period under study (table-5). This gives an aggregate patient complication rate of 27.2% and a dialysis-session patient complication rate of 6.4% .

The commonest complication was hypoglycemia occurring four times in the 55 patients (7.2%) during the 232 dialysis sessions i.e 1.7%per session. This was followed by blood transfusion reactions observed in two of the 55 patients(3.6%) in 232 dialysis sessions i.e. 0.9% per session . Others include hypotensive shock, headache, pruritus,pyrexia,acute rise in blood pressure,twitching,vomiting,pain at catheter site, and restlessness, each occurring once (1.8%) or 0.4% per dialysis session.

During the total of 232 haemodialysis sessions, a total of 8 technical hitches were recorded giving a technical complication rate of 3.4 %. The most frequent problem were power -outage and venous pressure alarm each occurring four times (1.7%) each. The others which occurred once (0.43%) each, include air-leak alarm, water supply alarm, trans-membrane pressure (TMP) alarm and conductivity alarm respectively.

By the 31st of December 2007, out of the 55 patients under consideration only 6(10.9%) were still receiving haemodialysis. These were late entrants. Twenty-two patients(40%) had died either in hospital or outside hospital,23 patients(41.8%) were no longer coming for dialysis or attending the out-patient renal clinic and were presumed dead. Four patients (7.2%)

Table 5: Patient complications of haemodialysis.

Patient Complications	Frequency	Percentage per Patients (n=55)	Percentage per Dialysis Session. (n=232)	Percentage per Compliccation. (n=15)
HYPOGLYCAEMIA	4	7.3	1.72	26.6
BLOOD TRANSFUSION	2	3.6	0.86	13.3
REACTION				
ACUTE RISE OF BLOOD-	1	1.8	0.43	6.7
PRESSURE	1	1.8	0.43	6.7
HEADACHE	1	1.8	0.43	6.7
PRURITUSP	1	1.8	0.43	6.7
YREXIA	1	1.8	0.43	6.7
RESTLESSNES	1	1.8	0.43	6.7
SHYPOVOLEMIC-				
SHOCK	1	1.8	0.43	6.7
TWITCHING	1	1.8	0.43	6.7
VOMITNG	1	1.8	0.43	6.7
PAIN AT CATHETER SITE	1	1.8	0.43	6.7
TOTALS	**15**	**27.0**	**6.45**	**100.0**

who could afford it, were variously referred for renal transplant in India were they had successful live-donor transplants. They had since returned and receiving post transplant care in our renal clinic.

DISCUSSIONS

The results from this study show that advanced and end stage kidney failure is common in Port Harcourt and environs as evidenced by the number of such patients seen within a one year period in our centre. The medical admission prevalence rate of 6.14% for these cases is similar to the hospital prevalence rate of 3-8% [4,5] observed in previous studies in other teaching and specialist hospitals in Nigeria.

The epidemiologic and the clinical characteristics of the patients in this series are not significantly different from previous observations. [11,12] The mean age and the peak age of occurrence of 46.2 years and 50-59 year age group respectively observed in this series and in previous series show that end stage kidney failure predominantly afflict persons in the middle age bracket in Nigeria. This is in contradistinction with the situation in Europe and N.America where the peak age of occurrence is in the older (60-70 year)age group. [2,3]

The common primary kidney disorders or the co-morbid predisposing conditions causing end stage kidney failure i.e. chronic glomerulonephritis, hypertensive nephrosclerosis, diabetic-nephropathy and obstructive uropathy as observed in this study are quite similar with recent trends in Nigeria.[13]

Although infection- related conditions such as post-streptococcal nephritis, malarial-nephropathy,schistosomal nephropathy etc, [11,12] still play significant roles in the incidence and prevalence of end-stage kidney failure in developing countries ,a gradual shift towards the non-communicable disorders such as hypertension, diabetes etc is an emerging trend.

This trend as previously observed in the developed countries of Europe and N.America have been attributed to the widespread availability of and use of antibiotics, immunization against some infectious diseases, the emerging high prevalence of hypertension,diabetes,and the metabolic syndrome [14,15]. Also, the increase in the population of elderly persons due to improvements in life -expectancy in developing [16] countries contribute to the trend.

The haemodialysis performance and the outcome of the patients in this study was abysmally poor characterized by very poor access to haemodialysis and grossly sub optimal dialysis adequacy.

For optimal and adequate dialysis a patient on maintenance dialysis (as recommended by the NKF/DOQI guidelines) [9], should be dialyzed three times weekly with a minimum treatment time of 10-12 hours a week. The patient should attain a URR value of not less than 65% and an average kt/v level of at least 1.2 at all times.

In our series the average no of dialysis sessions per week was one session per week, which is far lower than the NKF/DOQI guideline of a minimum of three, 4-hour sessions/week.The most frequently dialyzed patient was on dialysis for 36.7 weeks and received a total of 21 dialysis sessions only, instead of a minimum of 110 sessions expected during the 37 week period. Over 70% of the patients had less than five dialysis sessions before exiting from the program either through death or absconsion.The bulk of the patients 89.1% sustained dialysis for less than 9 weeks before exit.

The mean URR attained by the patients was 48.7% as against a minimum of 65% recommended by NKF/DOQI guidelines. Only 10% of the patients attained a URR of 65% and above. Similarly the mean kt/v achieved by the patients was 0.94 as against the 1.2 recommended by the NKF/DOQI guidelines. Only 10% of the patients achieved a kt/v of 1.2 or more.

Clearly these indicators of dialysis adequacy in these patients confirm grossly inadequate dialysis exposure and severe sub-optimal dialysis. Thus, the attendant very high mortality rate of 40 percent and an absconsion rate of 41.8 percent was not surprising. Indeed the patients who absconded, would be presumed dead as the likelihood of survival in the absence of a renal replacement therapy is almost nil. Including the absconded cases among the confirmed dead cases would make the overall mortality rate of 81.8 percent within one year of entry into the maintenance dialysis program.

Most of the deaths occurred within three months of commencement haemodialysis. This is similar with the experience in Lagos [6], Ibadan [7] and in other parts of Nigeria.

Three factors were found to be responsible for the very poor dialysis performance and the attendant poor patient outcomes after

commencement of maintenance haemodialysis amongst our patients.

First was late presentation of patients for the first time in poor clinical state. Such delays in presentation occur as a result of ignorance and associated superstitious beliefs. Because of the insidious onset and slow progression of chronic kidney disease, most cases are not recognized and often attributed to the handiwork of enemies or the devil, so a lot of time is spent consulting, spiritualists, herbalists and faith based organisations.Late presentation has been found to adversely affect outcome of dialysis.[17,18]. Commencement of maintenance dialysis before the establishment of the uraemic state is currently being advocated.

Second, was the low index of suspicion and thus late diagnosis of chronic kidney disease by most general medical practioners and some non-nephrology specialist clinicians.

Most patient attending medical clinics and even hospitalized patients, are rarely screened for kidney disease. It is only when a patient develops oliguria, anuria or gross peripheral oedema that attention is paid to the kidneys.

Third. and most important was the lack of the financial ability to sustain long term dialysis. An analysis of patients receiving haemodialysis in our centre (unpublished data) showed that 70.2% of the patients were of the lower socio-economic brackets. They were mainly,students ,un-employed, junior public servants, artisans ,petty traders and full-time house wives. This pattern is similar to the situation in other centers in Nigeria.

The per- capita income in Nigeria is less than 300 US-dollars per annum and over 70% of Nigerians live on earn less than one dollar a day.[16] At an annual cost of about N1.8 million naira(14,400.0 US-dollars)per annum for maintenance haemodialysis in Nigeria, [19] only less than 1% Nigerians can afford to pay for maintenance dialysis .

Whereas as the rich Western countries with high per-capita income of over 3000 UD-dollars , have their Governments providing renal support services(dialysis and transplantation) to their citizens almost free, via the End-stage renal disease(ESRD) program in the USA [20] and the NHS-TRUST [3] in the United Kingdom;ESRD patients in Nigeria, who are poorer, do not have any form of government supported kidney care programme.

The very poor performance and outcome of patient on maintenance dialysis as observed in this study and previous studies in Nigeria have led to the advocacy for "early kidney transplant programme" for end-stage renal disease patients in resource poor countries. As a result a few private and public health institutions in Nigeria have started some kidney transplant programs.

Though kidney transplant is much more expensive on the short term, studies have shown that on the long- term, kidney transplant is much more cost effective and less dislocating in patient's lifestyle with a better quality of life [21].

Early kidney transplant is however not a substitute for the need for a properly organized maintenance dialysis service in resource poor countries or anywhere. This is so because effective dialysis is a pre- requisite for a successful renal transplant program. Pre-operatively, transplant patients must be adequately dialyzed and in the event of graft failure, the patient will require dialysis support while on treatment for rejection or while awaiting another graft.

Besides, not every patient would be suitable candidate for transplant ,for a number of medical contraindications. [22]. For these reasons, African countries must emulate the developed economies to put in place viable, highly subsidized or free Renal support(dialysis and transplantation) program.

This is the major way in which the highly unacceptable poor dialysis performance and outcomes of our ESRD patients, who have a right to life, can be reduced to an acceptable minimum. The other is the need for the development of effective preventive nephrology program, in resource poor African countries such as Nigeria.

CONCLUSION

As had been previously observed in other centers in Nigeria, long term dialysis therapy in Nigeria is characterized by very poor dialysis exposure, gross dialysis inadequacy, with consequent very high one - year mortality rates.

The major factors responsible for this state of affairs are late presentation in near moribund clinical states, and most importantly the inability to financially support maintenance haemodialysis services as a result poverty and the lack of government support.

While the advocacy for "early kidney transplant program" as a solution to the state of affairs is reasonable, an efficient and accessible haemodialysis & transplant program remains the key to a successful renal support program. African governments including Nigeria are called upon to establish subsidized renal support programs for their citizens as is the case with developed countries.

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