

## Estimated glomerular filtration rate at initiation of hemodialysis in a Nigerian Tertiary Centre

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### Abstract

**Background:** Renal replacement therapy is indicated for patients with end-stage renal disease (ESRD). The glomerular filtration rate (GFR) of ESRD patients at initiation of hemodialysis vary depending on several factors including comorbidities, physicians' practice and geographical region amongst others.

**Aim:** We determined the levels of estimated GFR of ESRD patients at initiation of hemodialysis in a single tertiary centre in Nigeria

**Method:** This was a retrospective study. Records of all ESRD patients dialysed over a 12 month period were collated. Patients with acute kidney injury (AKI) or acute-on-chronic kidney disease were excluded. GFR was estimated using CKD-EPI formula. Early dialysis was defined as dialysing at an estimated GFR of >10ml/min.

**Results:** A total of 78 patients initiated haemodialysis during the period of review. Mean age was 45±18 years while male to female ratio was 1.2: 1. Serum creatinine concentration ranged

from 4.8-19.4mg/dl with a median of 10mg/dl while estimated GFR ranged from 2-12ml/min with a median of 5ml/min. Seventy-one out of 78 (91%) ESRD patients dialysed late while only 9% dialysed early; early initiation of dialysis was commoner in patients with human immuno-deficiency virus-associated nephropathy (HIVAN) and obstructive uropathy. Among the patients with HIVAN and obstructive nephropathy, 50% and 66% respectively dialysed early (p=0.003).

**Conclusion:** Majority of ESRD patients in the centre dialysed late. Patients with HIVAN and obstructive uropathy tend to dialyse early compared to ESRD due to other aetiologies. Further research geared towards identifying possible predictors of early dialysis among ESRD patients is required.

**Keywords:** estimated glomerular filtration rate, haemodialysis initiation, HIVAN, obstructive uropathy.

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### Introduction

Decreasing glomerular filtration rate (GFR) generally depicts a declining renal function and renal replacement therapy is indicated in patients with end-stage renal disease (ESRD). Dialysis is the most accessible form of renal replacement therapy in Nigeria<sup>1,2</sup>, and in sub-Saharan Africa<sup>3</sup>; however there seems to be a lack of consensus on the timing of dialysis initiation i.e. early versus late initiation.

The GFR at initiation of dialysis varies depending on factors including, abnormal laboratory results, presence of symptoms/co-morbidities, physicians' practice and geographical region amongst others<sup>4</sup>. Over the last decade, there has been an increasing trend of early dialysis initiation. However, the landmark Initiating Dialysis Early And Late (IDEAL) trial demonstrated that early dialysis (defined as initiation at

GFR 10-14ml/min) did not improve patient outcomes but rather increased costs of treatment<sup>5,6</sup>. In a study using data from the US Renal Data System (USRDS), Wright et al<sup>7</sup> examined 896,546 dialysis patients and found a dose-dependent increase in mortality associated with earlier dialysis initiation. Those initiating dialysis with estimated GFR (eGFR) higher than 15 ml/min/1.73m<sup>2</sup> had a 66% higher risk of death when compared to individuals who started dialysis when the eGFR fell below 5-ml/min/1.73 m<sup>2</sup><sup>7</sup>.

Guidelines from professional societies are widely seen as promoting early dialysis. The 1997 National Kidney Foundation Kidney Disease Quality Outcomes Initiative (KDOQI) clinical practice guidelines suggested that initiation of dialysis be considered when the arithmetic mean of the urea and creatinine clearances fall below approximately 10.5 ml/min/1.73m<sup>2</sup> except in well nourished, asymptomatic patients<sup>8</sup>. The 2006 updated guideline however suggests that when the eGFR fall below 15 ml/min/ 1.73m<sup>2</sup> the 'nephrologist should evaluate the benefits, risks and disadvantages of beginning kidney replacement therapy'<sup>8</sup>. The guidelines also acknowledge that certain signs/symptoms may justify initiating dialysis at a GFR >15ml/min.

Data on the time of dialysis initiation across Nigeria is limited. Bello et al studied haemodialysis patients in

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South-West Nigeria and reported a mean GFR of  $7.5 \pm 4.9$  ml/min at initiation of haemodialysis thus suggesting late initiation<sup>9</sup>. A peculiarity in developing countries like Nigeria is the late presentation of patients. ESRD patients often present with florid symptoms leaving little room for smooth transition to renal replacement therapy<sup>1,2,3</sup>. Since these patients mostly have advanced clinical symptoms, one may by extension assume that there is generally a late initiation of dialysis (GFR 5-7ml/min) among ESRD patients in Nigeria, but there is insufficient evidence to support this. Again, as was mentioned above certain patients may have symptomatic indications for dialysis at a higher GFR probably due to an acute insult. The aim of this study, therefore, was to determine the levels of eGFR of ESRD patients at initiation of hemodialysis and there from determine the prevalence of early and late dialysers. The study also aims to determine the association between variables such as sex, age, comorbidities on one hand and time of initial dialysis on the other.

### Materials and Methods

This hospital-based retrospective analytical study was carried out in Delta State University Teaching Hospital (DELSUTH), Oghara, a modern tertiary institution that has a significant pool of renal cases in the State and also receives referral cases from neighboring States. The Health, Ethics and Research Committee of the institution gave ethical approval for the study.

All adult ESRD patients who initiated hemodialysis over the one-year period from November 2011- October 2012 were studied. Standard haemodialysis prescription for ESRD patients in the centre is 3 times weekly, with a dialysate flow rate of 500ml/min and blood flow rate ranging from 200-400ml/min depending on patients haemodynamic state and vascular access. All cases of acute kidney injury were excluded. Socio-demographic data, information on health status, aetiology of ESRD and laboratory data such as serum creatinine and eGFR at initiation of hemodialysis were collated from patients' hospital records. GFR was estimated using CKD-EPI<sup>10</sup> formula and diagnosis of ESRD was based on the KDOQI guidelines for diagnosis and classification of chronic kidney disease (CKD). Early dialysis was defined as initiating dialysis at an estimated GFR of  $>10$  ml/min<sup>3,4</sup>.

Data was analyzed using SPSS version 22<sup>11</sup>. The mean and standard deviations or median was used to describe continuous variables while categorical variables were described using proportions. The primary outcome was the estimation of the prevalence of early and late dialysers among ESRD patients during the study period. Odds ratios were used to test for any significant association between the timing of dialysis initiation

(early vs. late) on one hand and patient's socio-demographic, health status or laboratory data.

### Results

A total of 78 newly diagnosed ESRD patients were dialyzed during the study period. Male to female ratio was 1.2: 1 while mean age was  $45 \pm 18$  years with the majority of the patients in the young age group. Majority of the patients (77%) dialysed once weekly or less.

Table 1: Characteristics of 78 ESRD Patients

CHARACTERISTICS	Frequency (%) or Mean $\pm$ SD
SEX	
Male	45 (57.7)
Female	33 (42.3)
AGE	
Mean	$45 \pm 18$ yrs
Young	37 (47.4)
Middle-aged	26 (33.3)
Elderly	15 (19.2)
AETIOLOGY OF ESRD	
Chronic glomerulonephritis	23 (29.5)
Hypertension	19 (24.3)
Diabetes nephropathy	16 (20.5)
HIV Associated Nephropathy	10 (12.8)
Obstructive uropathy	5 (6.4)
Lupus nephritis	2 (2.6)
Toxic nephropathy	2 (2.6)
Adult Polycystic Kidney Disease	1 (1.3)
FREQUENCY OF HAEMODIALYSIS	
0-1 weekly	60 (77)
2-3 weekly	18 (23)
LABORATORY INVESTIGATIONS	Mean $\pm$ SD or Median
Haemoglobin (g/dl)	$21.0 \pm 4.4$
Serum creatinine (mg/dl)	10
Serum Urea (mg/dl)	207
Serum potassium (mmol/l)	$5.0 \pm 1.2$
eGFR (ml/min)	5

The frequency of hypertension and diabetes among patients was 57.7% and 20.5% respectively. The commonest cause of ESRD was chronic glomerulonephritis (29.5%), hypertension was the primary cause of ESRD in 23.7% of patients while diabetes and human immuno-deficiency virus associated nephropathy (HIVAN) was the cause in 20.5% and 12.8% respectively (Table 1).

All the patients were anemic with a haemoglobin concentration 10g/dl while 37.2% had haemoglobin concentration less than 7g/dl. Mean serum potassium

was  $5.1 \pm 1.2$  mmol/l and 38.5% had hyperkalaemia. Serum creatinine concentration ranged from 4.8-19.4mg/dl with a median of 10mg/dl while estimated GFR ranged from 2-12ml/min with a median of 5mg/dl.

Table 2: Association of Characteristics with Time of Dialysis Initiation

Characteristics	ALL n (%)	Early Dialysis n(%)	Late Dialysis n (%)	OR	CI	P value
Male	43 (100.0)	4 (10.2)	39 (89.8)	0.59	0.05-4.45	0.6855
Age >50years	31 (100.0)	3 (9.6)	28 (90.4)	0.63	0.07-5.12	0.6771
Diabetes mellitus	16 (100.0)	1 (6.2)	15 (93.8)	1.31	0.13-66.33	>0.9999
HIVAN	10 (100.0)	1 (10.0)	9 (90.0)	0.71	0.06-37.4	0.5739
Obstructive uropathy	5 (100.0)	1 (20.0)	4 (80.0)	0.29	0.02-17.35	0.3372
Hypertensives	45 (100.0)	5 (11.1)	40 (88.9)	0.25	0.00-2.43	0.2346
Anaemia (PCV <20%)	37 (100.0)	2 (5.4)	35 (94.6)	2.12	0.28-24.67	0.6741
Hyperkalaemia	30 (100.0)	1 (3.3)	29 (96.7)	4.1	0.37-210.9	0.35554

PCV=packed cell volume, OR=Odds ratio, CI=Confidence interval

Seventy-two out of 78 (92.3%) ESRD patients dialyzed late while only 7.7% dialysed early. Early initiation of dialysis was commoner in patients with obstructive uropathy (20%), hypertension (11.1%) and HIVAN (10%). More males than females dialysed early (10.2% versus 6.0%). There was no significant association between age, sex-, presence of hyperkalaemia, degree of anemia-, aetiology of ESRD- on one hand and time of dialysis initiation- on the other (Table 2).

## Discussion

The high burden and peculiarities of CKD/ESRD in disadvantaged populations is a concern to the global community. This study confirms the late presentation of ESRD patients for renal replacement therapy. Although, the eGFR (5.0ml/min) of patients in this study is slightly lower than 7.5ml/min and 8.2ml/min reported by Bello et al<sup>9</sup> and Alasia et al<sup>12</sup> respectively, all these reports indicate late initiation of dialysis among Nigerian ESRD patients. The slight variations may be due to the different equations used in the studies to estimate GFR; nevertheless these observations are easily explainable as most patients with CKD present for the first time to nephrologists with florid clinical features of advanced ESRD often necessitating urgent dialysis.

This study revealed that a higher proportion of male patients, those with hypertension, patients with HIVAN and those with obstructive uropathy dialyzed early compared to other patients, although this did not reach statistical significance. All the patients had symptomatic

as well as biochemical indications for dialysis implying that they were already symptomatic at higher GFR. HIVAN is an indicator of advanced HIV infection characterized by severely ill patients with multiple comorbidities and these patients may have a symptomatic need for dialysis at higher GFR. Obstructive uropathy on the other hand often times occur in older men with prostatic disease. Both categories of patients are most times old, tend to be more ill, have comorbidities associated with the primary disease and all these factors may play a part in earlier initiation of dialysis. Hypertension is a common presentation in patients with ESRD; it is often severe and may result in complications such as acute pulmonary oedema which of itself is an indication for haemodialysis sometimes at a higher GFR. A higher proportion of early dialysis among patients with obstructive uropathy may have contributed to the similar trend seen in males compared to females.

Earlier reports have shown that in developing countries compared to more advanced countries, CKD is more prevalent in the young and economically productive age group<sup>13,14</sup>. Some of the reasons given for this trend is the overall reduced average life span in these regions and the higher incidence of infectious disease in childhood that may be a risk for glomerular disease later in life<sup>2,14</sup>. This study also confirms the higher prevalence of ESRD in the young. In addition to the reasons given by earlier reports for this high prevalence, it is also possible that there is more emotional attachment and family support for young people especially when they become ill, families tend to seek medical attention more readily for their young members than for the old.

Results of this study are in consonance with earlier reports that chronic glomerulonephritis, hypertension, diabetes mellitus and HIVAN remain the commonest causes of ESRD in most regions on Nigeria. Hypertension was present in 57.7% of the ESRD patients studied but it was the primary cause of ESRD in 24.3% of the patients. In some studies hypertension has been reported as the more prominent cause<sup>2,9,12,13,14</sup>.

The findings of this study confirm that CKD patients in Nigerian initiate haemodialysis at very low GFR often associated with advanced complications; the implications of this are poor quality of life, high morbidity and mortality among dialysis patients. This underscores the need for early referral of CKD patients to nephrologists for active conservative management, adequate physical and psychosocial preparation to ensure a smooth transition to dialysis.

This study was retrospective using the dialysis register as the source of data therefore limitations such as missing and incorrectly entered data were encountered. For the same reason, not all possible determinants of the timing of dialysis initiation were studied. The sample

size was small due to the short period of review, however this is a reflection of the low population of haemodialysis patients in the centre and many Nigerian institutions due to the high cost of treatment.

### Conclusion

Majority of ESRD patients in the centre dialysed late. Patients with hypertension, HIVAN and obstructive uropathy tended to dialyse early compared to those with ESRD due to other aetiologies. Further local research geared towards identifying other possible predictors of the timing of dialysis initiation and determining the long-term outcome of ESRD patients based on their time of dialysis initiation is required.

### Disclosure

All authors declare no conflict of interests.

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