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Circumstances of Initiation of Hemodialysis: Importance of Nephrological Follow-Up

Moussa Traore*, Soriba Bangoura, Mohammed Lamine Tegui Camara, Sèmèvo Géàvanie Dannon, Foussény Diakite, Mamadou Saliou Balde, Aly Traore, Mohammed Camara, Marthe Sidibe, Mouctar Diallo, Aminata Diallo, Mohammed Lamine Kaba

Nephrology-Hemodialysis Department, Donka University Hospital, Conakry, Guinea
Email: *mousa11traore@gmail.com, docteurbangus@gmail.com, teguicamara@gmail.com, geovaniedannon@gmail.com, fdiak70@gmail.com, ms2balde@yahoo.fr, alytraore066@gmail.com, drmcamara28@gmail.com, sidibemarthe72@gmail.com, mouctardiary794@gmail.com, amizod2005@yahoo.fr, kabalamin@yahoo.fr

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Abstract

Introduction: The timing of initiation of renal replacement therapy (RRT) depends not only on the level of residual renal function, estimated by calculating glomerular filtration rate (GFR), but also on patients' clinical condition and local medical practices. The aim of this study was to investigate the value of early nephrological follow-up for patients during and after initiation of hemodialysis. **Patients and Methods:** prospective descriptive and analytical study lasting 3 months, from September 01 to November 30, 2022, on chronic hemodialysis patients at Donka National Hemodialysis Center. Two groups were included, according to the period of follow-up prior to initiation of hemodialysis: the first, known as "early referral", included patients who had been followed for a minimum of six months prior to initiation of "planned hemodialysis"; the second, known as "late referral", included patients who had had less than six months of nephrological follow-up prior to initiation of "emergency hemodialysis". **Results-Discussion:** We noted 70 cases of CKD. The mean age was 46.43 ± 14.7 years, with extremes of 17 and 75 years. Females were predominant, with a sex ratio M/F = 0.7. Clinical signs on admission were dominated by anemia syndrome (100%) and uremic syndrome (74.3%). Mean creatinine clearance was 5.475 ± 3.4 ml/min/1.73 m^2. The majority of our patients had been referred late (81.4%), while 18.6% had been referred early before being placed on hemodialysis. Apart from six cases of permanent central catheterization, all our patients (91.4%) had started their iterative hemodialysis on a temporary central catheter (femoral or jugular). After bivariate analysis, we found that late referral was significantly linked to certain factors, such as diabetes comorbidity (p = 0.02), uremic intoxication (p = 0.02), and temporary central catheterization (femoral with p = 0.001 and jugular

with p = 0.013). Permanent or tunneled central catheterization was also significant, with identical rates in both groups. Mean creatinine levels were significantly higher in the early referral group (198.270 ± 101.2 mg/L; p = 0.020). However, the late referral group was more prone to excess mortality during the first three months of dialysis initiation, although there was no statistically established link between referral mode and mortality. **Conclusion:** Early nephrological referral is still beneficial for a better quality of life in iterative hemodialysis.

Keywords

Circumstances, Hemodialysis Initiation, Early Nephrological Follow-Up

1. Introduction

End-stage renal disease (ESRD) is a progressive and irreversible loss of renal function, resulting in a fall in glomerular filtration rate (GFR) to below 15 ml/min/1.73 m^2. It is a major public health problem due to its severity and its medico-economic impact on the healthcare system. In most cases, chronic kidney disease (CKD) remains asymptomatic until it reaches an advanced stage.

The timing of the initiation of renal replacement therapy depends not only on the level of residual organ function (which is estimated by glomerular filtration rate), but also on the patient's clinical condition and local medical practices.

Hemodialysis is most often used on an emergency basis, as the diagnosis of CKD is usually made late. In the end stage, this pathology requires long-term renal replacement therapy, either through extra-renal purification (peritoneal dialysis or hemodialysis) or through renal transplantation or grafting. Hemodialysis is the most widespread and accessible method of renal replacement. It is a detoxification method based on blood filtration through an artificial membrane [1] [2]. Starting dialysis on a planned basis remains a challenge for many patients. Previous studies have shown that late patient referral (LR) to a nephrologist is associated with emergency dialysis, and that patients starting emergency dialysis are more prone to severe comorbidities [3]. According to many authors, this LR to the nephrologist is responsible for the increased mortality of dialysis patients, in association, of course, with other known causes: advanced age, the severity of comorbidities (notably cardiovascular), uremia-induced impairment of immune defenses and nutritional status... [4] [5]. Early referral (ER) with early management (by the nephrologist) of kidney disease and the factors associated with its progression can delay initiation of replacement therapy, reduce the frequency of emergency dialysis, improve survival after dialysis and better prepare for the possibility of renal transplantation [6].

In North America, in a multicenter study published in 2014, D. C. Crews *et al.* [7] noted that 35.4% of patients had benefited from late initiation of dialysis.

In France, P. Tuppin *et al.* [6] in 2017 reported that 33% of their patients started hemodialysis as emergencies.

In Senegal, in a single-center study of emergency hemodialysis carried out in 2020, Diawara *et al.* [8] reported a prevalence of 40.68% in the nephrology-hemodialysis department of Centre Hospitalier de Thiès.

In Guinea, in a single-center study of emergency hemodialysis published in 2023, F. Diakité *et al.* reported a prevalence of 59.16% at "Donka National Hemodialysis Center", with a mortality rate of 16.9% [9].

Given the difficulties associated with emergency dialysis, as well as the high morbidity and mortality rates among patients undergoing this type of dialysis in our country, we undertook this study with the aim of elucidating the conditions under which dialysis is initiated at Donka National Hemodialysis Center, and then to compare the advantages of early versus late nephrological follow-up for the evolution of hemodialysis patients.

It should be noted that the value of this study lies in the fact that it would raise awareness of the need for early specialized follow-up of CKD patients in our sub-Saharan African regions, where the frequency and quality of dialysis are already poor. As we have shown above with data from the literature, the resulting corrective measures would probably reduce morbidity and mortality in hemodialysis.

2. Patients and Methods

This was a prospective descriptive and analytical study lasting 3 months, from September 01 to November 30 2022, carried out in the Hemodialysis Center at Donka National Hospital.

The target population consisted of all patients with renal failure, regardless of type or stage. These patients were either already on hemodialysis, hospitalized or being followed as outpatients.

All patients with CKD who had been followed in the department for at least six months prior to planned hemodialysis were included. Also included were patients with confirmed evoluted CKD who had been followed for less than six months, or who were not known to the department at all, and who were taken for emergency hemodialysis in the presence of one or more indications.

Not included were all inpatients or outpatients with a diagnosis other than renal failure, those diagnosed with acute renal failure, and CKD cases not yet at the hemodialysis stage during the study period.

The recruitment method was characterized by an exhaustive consideration of all patients with advanced CKD followed in the department, those on hemodialysis, all meeting our selection criteria explained above. A pre-established survey form was used to collect the necessary data from patients. Qualitative variables were expressed as proportions and quantitative variables as means ± standard deviation.

Quantitative variables included: age, biological parameters such as hemoglobin, leukocyte and platelet levels, creatinine levels, creatinine clearance, calcium levels, natremia and kalemia.

Qualitative variables included: gender, pathological history (Arterial hyperten-

sion, diabetes, phytotherapy, urinary tract infection), patient's general condition (divided into unsatisfactory, impaired and coma), indications for dialysis (acute lung edema, hyperkalemia, uremic poisoning, metabolic acidosis, uremic pericarditis, coma) and finally initial nephropathy (Chronic glomerulonephritis, diabetic, vascular, tubulointerstitial and undetermined nephropathy).

The following definitions have been adopted for these expressions:

-Emergency hemodialysis: Or unscheduled hemodialysis, necessary when the patient's vital prognosis is threatened (acute lung edema, threatening hyperkalemia, metabolic acidosis, etc.).

-The opposite of this expression is programmed hemodialysis.

-Early referral: Referral of patients with CKD to the Donka University Hospital Nephrology Department at least 6 months before the start of dialysis.

-Late referral: Late referral of patients with CKD to the Donka UHC Nephrology Department, less than 6 months before the start of dialysis; again emergency referral of a patient never known to the department, requiring immediate dialysis treatment.

Data entry and the design of tables and figures were carried out using Word and Excel software from Pack Office 2019. Results were analyzed using Epi-info software version 7.2.3.1. The Chi-square statistical test was used to compare proportions, and the p value was considered statistically significant when less than 0.05.

The information obtained was used for purely scientific purposes, and the confidentiality of each patient was respected.

3. Results

Of a selection of 78 cases of renal failure starting hemodialysis during the study period, 70 had CKD, *i.e.*, 89.7%.

The sex ratio M/F was 0.7 in favour of women, who accounted for 58.6% of cases.

Among patients initiated on hemodialysis during our study period, the most common age group was 50 - 60 (27.1%), followed by 28 - 38 (24.3%). The mean age of the patients was 46.4 ± 14.7 years, with extremes of 17 and 75 years.

Hypertension was by far the most common medical history, at 84.3% of cases.

Main clinical signs on admission: anemia syndrome in 100% of cases, uremic syndrome (74.3%) and peripheral edema (20%).

About general condition: 47.1% had altered general condition, 41.4% had unsatisfactory general condition and 11.4% presented disorders of consciousness ranging from obnubilation to coma.

Mean kalaemia was 5.462 ± 1.512 mmol/l.

Mean creatinine clearance was 5.475 ± 3.368 ml/min/1.73m^2.

In terms of hemoglobin level, 91.8% had a level < 10 g/dl, 12.5% had between 5 and 6.9 g/dl.

Initial kidney disease: chronic glomerulonephritis was the main cause of CKD

(45.7%).

The main indications for hemodialysis: uremic intoxication (74.3%), hyperkalemia (31.4%).

Initial vascular approach: femoral catheterization (75.7%), simple jugular catheterization (15.7%), tunnelled jugular catheterization (8.6%).

Of 57 late referrals: temporary catheterization = dominant vascular access (54 cases), mainly femoral catheterization (84.2%) because patients came in with life-threatening complications. Here, only 3 cases of tunneling.

On 13 early reference cases (generally more stable patients): the difference between permanent and temporary vascular approaches could be demonstrated by the following percentages: 76.9% vs 23.1%.

Bivariate analysis:

✓Diabetes history (p value = 0.02): more in the late than early group 7 (58.3%) vs 5 (41.7%);

✓Uremic intoxication (p value = 0.02): more frequent in the late group 39 (75.0%);

✓Hypercreatininaemia was statistically significant (p = 0.02), much higher in the early reference group (198.270 ± 101.230 mg/L).

✓Temporary vascular approach: femoral catheterization (p value = 0.001) and simple jugular catheterization (p value = 0.013).

✓Permanent vascular approach: tunnel catheterization (p value = 0.03), with 3 cases of late referral and 3 cases of early referral.

The late reference recorded deaths (4 cases) during the first 3 months of dialysis, although there was no statistical link between the reference mode and mortality (p = 2).

4. Discussion

We conducted a prospective descriptive and analytical study lasting three (3) months, from September 01 to November 30, 2022. We collected 78 cases of renal failure initiated on hemodialysis during the study period. Among them, eight (8) were suffering from acute renal failure of various types, and therefore not to be included in the study; 70 were CKD patients, *i.e.*, a frequency of 89.7%. These were the subjects of our study (**Figure 1**).

The M/F sex ratio of our sample was 0.7 in favor of females, who accounted for 41 subjects, or 58.6% of cases (**Figure 2**). This result differs from that reported by S. Cheikh *et al.* who, in their work published in 2021 on 371 patients admitted to nephrology for emergency hemodialysis at Ibn Rochd University Hospital in Casablanca, noted a M/F sex ratio of 1.16 [10]. We found no explanation for this difference in gender predominance.

The mean age of the patients was 46.4 ± 14.7 years, with extremes of 17 and 75 years (**Table 1**). Our result is lower than that of T. Mesbahi *et al.* [11] in Tunisia in 2020, who, in their study of 229 chronic renal failure patients initiated on hemodialysis, noted a mean age of 60.2 ± 15.3 years.

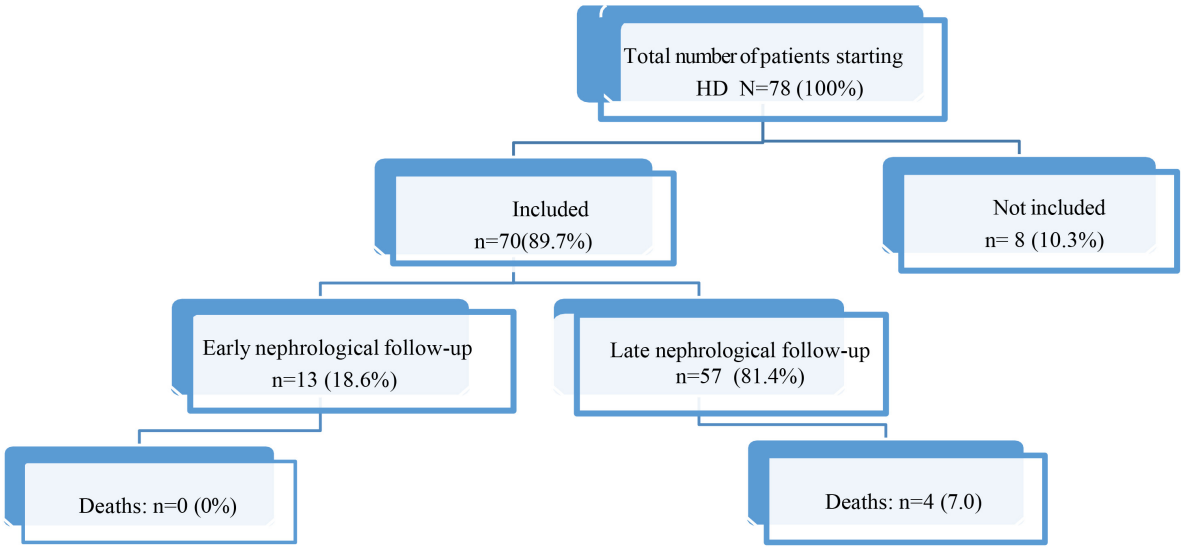

Figure 1. Flow chart of early and late follow-up in CKD patients initiated on hemodialysis.

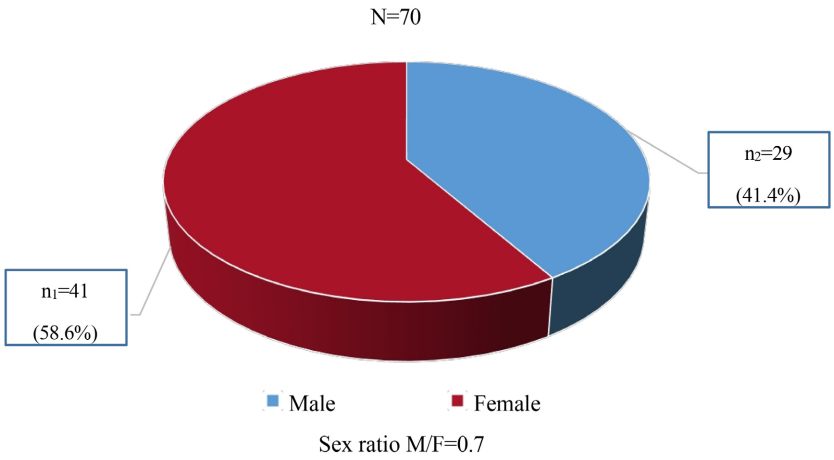

Figure 2. Gender distribution of 70 CKD patients initiated on hemodialysis.

Table 1. Age distribution of 70 CKD patients initiated on hemodialysis.

Age Brackets (in years)	Numbers (N = 70)	Percentages (%)
17 - 27	7	10
28 - 38	17	24.3
39 - 49	15	21.4
50 - 60	19	27.1
61 - 71	10	14.3
72 - 80	2	2.9
Total	70	100

Mean age: 46.4 ± 14.7 years; Extremes: 17 years and 75 years.

Hypertension was the most common CKD comorbidity, accounting for 84.3% of cases (Table 2). Our results are similar to those of M. T. Yawovi *et al.* [12] in

Togo in 2021, who found that hypertension and diabetes were present in 61.6% and 44% of their patients respectively. These results corroborate data from the literature, which reports that hypertension and diabetes are traditionally dominant risk factors for CKD [13].

Table 2. Breakdown of 70 CKD patients initiated on hemodialysis, by medical history.

History	Numbers	Percentages (%)
High blood pressure	59	84.3
Diabetes	12	17.1
Phytotherapy/NSAIDs	11	15.7
Recurrent urinary tract infection	1	1.4

Clinical signs on admission were dominated by anemia syndrome in 100% of cases, followed by uremic syndrome (74.3%) and peripheral edema (20%). Consequently, 47.1% of our patients had an altered general condition, 41.4% had an unsatisfactory general condition and 11.4% presented disorders of consciousness ranging from obnubilation to coma (**Table 3**). Our results are not far from those of D. E. Sinomono *et al.* [14] in their study on "Initiation of dialysis in Brazzaville" published in 2018 who had found anemia in 91.4% of their patients, uremic syndrome in 72.7% and hydrosodium overload in 2.4%.

Table 3. Comparison of data between monitored and unmonitored CKD patients at the start of hemodialysis.

	Initiation		p value
	Late (N = 57)	Early (N = 13)	
Gender			
-Male	24 (82.8%)	5 (17.2%)	0.53
-Female	33 (82.8%)	8 (19.5%)	
-Average age	45.7 ± 15.1	49.5 ± 13.1	0.32
Pathological history			
-Arterial Hypertension	47 (79.7%)	12 (20.3%)	0.37
-Diabetes	**7 (58.3%)**	**5 (41.7%)**	**0.02**
-Phytotherapy	10 (90.9%)	1 (9.1%)	0.37
-Urinary tract infection	1 (100%)	0 (0%)	0.81
General condition			
-Unsatisfactory general condition	22 (75.9%)	7 (24.1%)	0.31
-Impaired general condition	27 (81.8%)	6 (18.6%)	0.93
-Coma	8 (100%)	0 (0%)	0.34

Continued

Hemodialysis indications			
-Acute lung edema	5 (100%)	0 (0%)	0.26
-Hyperkalemia	18 (81.8%)	4 (18.2)	0.95
-Uremic poisoning	**39 (75.0%)**	**13 (25.0%)**	**0.02**
-Metabolic acidosis	3 (75.0%)	1 (25.0%)	0.56
-Uremic pericarditis	2 (100%)	0 (0%)	0.66
-Coma	8 (100%)	0 (0%)	0.34
Biology (mean value)			
-Hemoglobin level (g/dl)	8.8 ± 7.6	8.5 ± 1.6	0.756
-Creatininemia (mg/l)	**134.2 ± 62.6**	**198.3 ± 101.2**	**0.02**
-Urea (mmol/l)	139.4 ± 92.9	34.3 ± 23.0	0.220
-GFR (ml/min/1.73m^3)	5.9 ± 3.4	3.7 ± 3.0	0.095
-Calcium (mg/dl)	8.1 ± 1.5	8.3 ± 1.1	0.747
-Sodium (mEq/l)	132.7 ± 10.2	133.1 ± 4.1	0.92
-Potassium (mEq/l)	5.4 ± 1.5	5.9 ± 1.7	0.38
-White blood cells (10^3/ml)	8980.5 ± 7319.3	7343.3 ± 4380.5	0.71
-Platelets (10^3/ml)	270522.0 ± 210638.3	272000.0	0.99
Initial nephropathy			
-Diabetic nephropathy	5 (62.5%)	3 (37.5%)	0.14
-Vascular nephropathy	19 (86.4%)	3 (13.6%)	0.47
-Chronic glomerular nephropathy	29 (80.6%)	7 (19.4%)	0.84
-Tubulointerstitial nephropathy	6 (85.7%)	1 (14.3%)	0.75
-Undetermined nephropathy	0 (0%)	1 (100%)	0.18
Vascular approach			
-Femoral catheter	**48 (90.6%)**	**5 (9.4%)**	**0.001**
-Jugular catheter	**6 (54.5%)**	**5 (45.5%)**	**0.013**
-Tunneled catheter	**3 (50%)**	**3 (50%)**	**0.03**

All this points to the late admission of patients with complications. In many African countries, the diagnosis of CKD is often made at the terminal stage, with access to dialysis being difficult due to its high cost and the limited presence of dialysis centers. This is also in line with literature data explaining complications in all organs and organ systems as renal function deterioration progresses [14] [15].

Mean kalemia was 5.462 ± 1.512 mmol/l (**Table 3**). In the work of S. Cheikh *et al.* [11], emergency hemodialysis was undertaken for threatening hyperkalemia in 46% of cases, acute lung edema in 20%, poorly tolerated uremic syndrome and anuria were the indications in 16% and 12% respectively, malignant hypercalcemia in 4% and acidosis in 2%.

Hyperkalemia is one of the often-threatening complications associated with CKD and is maintained by metabolic acidosis [16].

The mean creatinine clearance was 5.475 ± 3.368 ml/min/1.73 m^2 (**Table 3**). These results corroborate those of B. Saad *et al.* [5] in Morocco in 2016, who found a mean of 6.337 ± 0.616 ml/min/1.73 m^2. However, they remain lower than those of F. Bernadette *et al.* [17] in Colmar, France, who found an average of 9.27 ± 2.69 ml/min/1.73 m^2. Here, we note an approximation between the figures for the two African countries, which remain lower than those for a region of France. This constitutes biological proof of the much more pronounced delay in initiating hemodialysis in African regions compared with developed countries.

In terms of hemoglobin level, 91.8% of our patients had a level < 10 g/dl, 12.5% had between 5 and 6.9 g/dl (**Table 3**). In 2011 in Côte d'Ivoire, B. Ouattara *et al.* [18] found that the mean hemoglobin level in their patients was 7.6 ± 2.2 g/dl. The anemia of CKD patients could be explained by erythropoietin deficiency, the intra-dialytic blood loss, during everyday events (e.g. road accidents), advanced uremia, vitamin B_{12} and folate deficiency [18]-[20].

In relation to initial kidney disease, chronic glomerulonephritis was the main cause of CKD in our study (45.7%), followed by vascular nephropathy (25.7%), and then diabetic nephropathy (11.4%) (**Table 3**). These results concur with those of F. G. Sane *et al.* [21] in Senegal in 2019, who identified chronic glomerulonephritis (45.5%) and nephroangiosclerosis (26.5%) as the main causes of CKD. Undetermined nephropathy was noted in only one of our patients (**Table 3**). This result is much lower than that of F. G. Sane *et al.* [21], who reported 12.5% of cases. Our results differ from those of B. Saad *et al.* [5] in Morocco, who reported in their study that diabetic nephropathy was the most frequent cause of CKD, accounting for 41% of cases, followed by other glomerular and tubular nephropathies. The initial nephropathy was not known in 13% of cases, due to late discovery of CKD. Our results show a clear reduction in the rate of undetermined nephropathy. This is probably due not only to a better knowledge of kidney pathologies by medical staff, but also to an improvement in the means of exploring these pathologies in our country. We must also bear in mind that our sample was small and the study was limited in time, which could constitute a bias that would prevent us from drawing any conclusions.

In the management of end-stage renal disease, the main problem is the late referral of patients to specialist consultations. Outside our case, not only is this situation frequent, with rates varying from one country to another and from one series to another (between 20% and 82%), but it also depends on the local definition of "late referral". [19]

In our study, only 18.6% of patients were followed up early before hemodialysis, giving a late referral rate of 81.4% (**Table 3**). This rate of late referral (LR) is higher than that of other European and American series published after 1995 [22] [23], which ranged from 20% to 60%. Our result is also higher than that of M. Raffray *et al.* [24] in their study on "...the determinants of an emergency start of dialysis" published in 2017, who reported that 30% of patients with end-stage chronic renal failure (ESRD) in France started hemodialysis in an emergency.

This high rate of ESRD in our study can be explained, on the one hand, by the refusal of some patients to accept the diagnosis, thus delaying treatment, and, on the other, by the high level of poverty among our populations in relation to the cost of paraclinical examinations or treatments, or by the lack of functioning dialysis centers in Guinea, both public and private, which are all concentrated in Conakry apart from one small center in the north-east of the country. All these factors led patients to seek treatment only in cases of extreme urgency.

The main indication for hemodialysis in our study was uremic intoxication (74.3%), followed by hyperkalemia (31.4%) (**Table 3**). The same trend was noted in the study by Diawara *et al.* [8] with 50.47% for poorly tolerated uremia and 40.19% for threatening hyperkalemia.

These results corroborate data from the literature, for which uremic intolerance, hyperkalemia and acute lung edema are among the main indications for extra-renal purification [19]. The presence of these complications at the start of hemodialysis in our patients could be explained not only by the delay in consultation with the nephrologist, but also by the quality of follow-up, with patients in some cases lost to sight of one another in the pre-terminal or terminal period of the disease, and finally by the remoteness of dialysis centers from the populations of the interior of the country, these functional centers being concentrated in Conakry for the time being.

In our study, 100% of patients were initially managed using a central catheterization vascular approach. Two types of temporary vascular approach were the main way used in 57 cases of late referral patients: femoral and simple jugular catheterization (84.2% and 10.5% respectively). Thus, only 3 early and 3 late referrals were treated by tunneled jugular catheterization, which was the only permanent vascular approach used in our study. For the remaining 10 early referral patients, there were 5 cases of femoral catheterization versus 5 cases of simple jugular catheterization (**Table 3**). Although some patients with old arteriovenous fistulas (AVFs) continued to undergo hemodialysis at the center, there were no cases of new fistulas during our study period, either because our patients' free choice was not favorable, or because the quality of the vascular capital was poor, or because there were financial difficulties for the surgery, the costs being borne by the patient. It should be noted that there is no competence for prosthetic catheterization locally. Our results are similar to those of Y. Kane *et al.* [25] in Senegal published in 2017, for whom 91.7% of patients had had a central venous catheter as their first vascular approach. Similarly, in the work by Abdelaali Behadi *et al.*

[26] in Morocco published the same year, only 105 patients (33%) had received specialized nephrological follow-up, and in almost two-thirds of cases, hemodialysis had been started using a temporary, mainly femoral, central venous catheter.

According to DOQI recommendations [27], the proportion of AVFs used as first vascular access in subjects starting hemodialysis should be 50%. The DOQI's revised hemodialysis good practice guide of 2000 [28] sets a target of less than 20% temporary central catheters in a hemodialysis unit. With the statistics listed above, it is clear that the majority of our African regions are still a long way from meeting these recommendations.

Indeed, the health policy of most countries in the south of the Sahara is like that of Guinea, which we know more about. It explains the high frequency of late referral of already complicated CKD patients to specialist facilities. As a consequence of these health policies, there's no state provision for these already poor populations, and the health insurance systems are almost non-functional. This de facto should explain the high proportion of temporary catheterization, particularly femoral catheterization for initiation of dialysis. This type of vascular approach is the easiest, least prone to complications during the surgery, and least costly, making it suitable for emergency dialysis [29] [30].

In the bivariate analysis, with regard to comorbidities, there were more diabetic patients in the late than early group (7 (58.3%) vs 5 (41.7%); p value = 0.02) (**Table 3**). However, according to the work of M. Hoffmann *et al.* [31], diabetics are the most at-risk chronic kidney disease patients, followed by a nephrologist, and they should receive optimized specialized care. This was not the case with our diabetic patients, the majority of whom were in the late referral group, having started dialysis without prior long-term follow-up.

Uremic intoxication was more frequent in the late referral group (39 (75.0%); p value = 0.02) (**Table 3**).

Hypercreatininemia was statistically significant, much higher in the early reference group (198.270 ± 101.230 mg/L; p = 0.020) (**Table 3**). We found no explanation for this trend towards higher hypercreatininemia in early referrals compared with late referrals.

With the exception of six, all our patients started hemodialysis on a temporary vascular approach of the femoral (p value = 0.001) and simple jugular (p value = 0.013) catheterization type. As shown above, the only permanent vascular approach used in our patients during the study period for initiation of hemodialysis was tunnel catheterization, with three cases of late referral and three cases of early referral (**Table 3**). There were no cases of arteriovenous fistula (AVF), arteriovenous bypass (AVB) or prosthetic goretex (PTFE) bypass at the start of hemodialysis.

To conclude this part, therefore, we will say this: after bivariate analysis, it was found that there were statistically significant associations between late referral and certain factors such as diabetes comorbidity (p = 0.02), uremic intoxication (p = 0.02), temporary central catheterization (femoral with p = 0.001 and jugular with

p = 0.013). Permanent central catheterization or tunneled catheterization was also statistically significant, with identical p values in both groups (p = 0.03) (Table 3).

Finally, the late referral group was significantly more exposed to mortality (4 cases vs. 0 cases) during the first three months of dialysis, although there was no established statistical link between referral mode and mortality (p = 2) (Table 4). M. Raffray *et al.* [24] noted in a 2017 study in France that emergency start-up of dialysis increased the risk of morbidity and mortality, and reduced patients' quality of life. As for M. Hoffmann *et al.* [31], in their work published in 2006, mortality among dialysis patients is said to have "remained high and relatively constant over the last ten years". Among the many causes put forward, one of the most incriminating factors was late referral to the nephrologist. This late referral of CKD patients was associated with early excess mortality limited to the first three months post-dialysis. It accounted for around 20% of the patients managed on dialysis each year.

Table 4. Impact of early and late follow-up on mortality in CKD patients initiated on hemodialysis.

	Initiation		p Value
	Late	Early	
Favorable	53 (93%)	13 (100%)	0.3
Deaths	4 (7%)	0 (0%)	2

We should also point out that our study only covered a three-month period. It may be possible to obtain different results (in terms of morbidity and mortality) in the future if the same study, perhaps multicentric, is repeated one day on our premises or elsewhere, with larger numbers and over a longer period.

5. Conclusion

Early nephrological follow-up is of fundamental importance for the smooth initiation of hemodialysis. Late referral of patients to the nephrologist, most often in a highly uremic state, has a serious impact not only on their quality of life, but also on medium and long-term morbidity and mortality. In the future, repeating this study with larger numbers and a sufficiently long study period will enable us to reach a more reliable conclusion.

Conflicts of Interest

The authors declare that they have no conflict of interest in the publication of this article.

References

[1] Deloumeaux, J., Samut, G., Rochemont, D., Merault, H., Dufresne, R., Galantine, V., *et al.* (2018) Contexte initial de prise en charge et qualité de vie à 3 mois des patients dialysés pour insuffisance rénale chronique terminale dans deux départements fran-

çais d'Amérique. *Néphrologie & Thérapeutique*, **14**, 467-473. https://doi.org/10.1016/j.nephro.2017.12.002

[2] Delimann, C. (2019) Décision d'initiation de la dialyse chez les patients insuffisants rénaux chroniques stade terminal, en incapacité de donner leur consentement. Ethique. https://dumas.ccsd.cnrs.fr/dumas-02399892/document

[3] Ben Kaab, B., Ridene, D., Mbarek, M., Ben Halima, M., Ben Fatma, L., Boudiche, S., *et al.* (2002) Hémodialyse en urgence chez les patients hospitalisés en cardiologie. *Revue tunisienne de cardiologie*, **18**, 84-90.

[4] Bahadi, A., El Farouki, M.R., Zajjari, Y. and El Kabbaj, D. (2017) La mise en hémodialyse au Maroc: Intérêt du suivi néphrologique. *Néphrologie & Thérapeutique*, **13**, 525-531. https://doi.org/10.1016/j.nephro.2017.02.012

[5] Benali, S., *et al.* (2016) Intérêt du suivi précoce des insuffisants rénaux chroniques avant le traitement de suppléance rénale: À propos de 318 cas/2016/Maroc. http://toubkal.imist.ma/handle/123456789/19400

[6] Tuppin, P., Cuerq, A., Torre, S., Couchoud, C. and Fagot-Campagna, A. (2017) Prise en charge des patients avant l'initiation d'un traitement de suppléance de l'insuffisance rénale chronique terminale en 2013 en France. *Néphrologie & Thérapeutique*, **13**, 76-86. https://doi.org/10.1016/j.nephro.2016.07.446

[7] Crews, D.C., Scialla, J.J., Boulware, L.E., Navaneethan, S.D., Nally, J.V., Liu, X., *et al.* (2014) Comparative Effectiveness of Early versus Conventional Timing of Dialysis Initiation in Advanced CKD. *American Journal of Kidney Diseases*, **63**, 806-815. https://doi.org/10.1053/j.ajkd.2013.12.010

[8] Diawara, M.S., Kane, Y., Cissé, M.M., Lemrabott, A.T., Faye, M., Bop, M.C., *et al.* (2020) L'Hémodialyse en Situation d'Urgence: Une Étude de 107 cas au Centre d'Hémodialyse du CHR de Thiès (Sénégal). *Health Sciences and Diseases*, **21**, 48-52. https://www.hsd-fmsb.org

[9] Diakité, F., Traoré, A., Camara, M.L.T., Camara, M., Bangoura, S., Bah, A.O. and Kaba, M.L. (2023) Hémodialyse en Urgence: Facteurs de risque de mortalité au Centre National d'Hémodialyse de Donka. *Health Sciences and Diseases*, **24**, 40-44. https://www.hsd-fmsb.org

[10] Cheikh, S., Lefriekh, S., Sayah, M., Mtioui, N., Khayat, S., Zamd, M., *et al.* (2022) L'hémodialyse en situation d'urgence au service de néphrologie du CHU Ibn Rochd de Casablanca: À propos de 371 cas. *Néphrologie & Thérapeutique*, **18**, 425. https://doi.org/10.1016/j.nephro.2022.07.070

[11] Mesbahi, T., Barbouch, S., Jebali, H., Smaoui, W., Karoui, C., Rais, L., *et al.* (2020) Circonstances de l'initiation de l'hémodialyse: Intérêt du suivi néphrologique précoce. *Néphrologie & Thérapeutique*, **16**, 286. https://doi.org/10.1016/j.nephro.2020.07.091

[12] Tsevi, Y.M., Dolaama, B., Tona, K.G., Tevi, A.A., Affanou, E.C., Amede, A.D., *et al.* (2021) Insuffisance rénale chronique et hémodialyse à Lomé: L'hémodialysé et son entourage sont-ils bien informés? *Pan African Medical Journal*, **39**, Article No. 85. https://doi.org/10.11604/pamj.2021.39.85.26685

[13] Serge, N.M., Philippe, C.M., Olivier, M.K., Christian, K.N., Cédrick, S.M., Pascal, N.T., *et al.* (2017) Maladie rénale chronique: Facteurs associés, étiologies, caractéristiques clinique et biologique à Lubumbashi en République Démocratique du Congo. *Pan African Medical Journal*, **28**, Article 41. https://doi.org/10.11604/pamj.2017.28.41.9810

[14] Eyeni Sinomono, D., Missamou, A.F.S., Gassongo Koumou, G.C. and Loumingou, R. (2018) Initiation de la dialyse à Brazzaville. *Néphrologie & Thérapeutique*, **14**, 307.

https://doi.org/10.1016/j.nephro.2018.07.133

[15] Avorn, J., Winkelmayer, W.C., Bohn, R.L., Levin, R., Glynn, R.J., Levy, E., *et al.* (2002) Delayed Nephrologist Referral and Inadequate Vascular Access in Patients with Advanced Chronic Kidney Failure. *Journal of Clinical Epidemiology*, **55**, 711-716. https://doi.org/10.1016/s0895-4356(02)00415-8

[16] Sakandé, J., Sawadogo, M., Nacoulma, E.W.C., Sidikath, E.S., Kabré, E., Sawadogo, S., *et al.* (2006) Profil biologique de l'insuffisance rénale chronique. *Annales de Biologie Clinique du Quebec*, **43**, 3-8.

[17] Faller, B., Genestier, S. and Chiron, S. (2000) Initiation de l'hémodialyse et de la dialyse péritonéale. *Le BDP*, **10**, 14-19.

[18] Ouattara, B., Kra, O., Yao, H., Kadjo, K. and Niamkey, E.K. (2011) Particularités de l'insuffisance rénale chronique chez des patients adultes noirs hospitalisés dans le service de médecine interne du CHU de Treichville. *Néphrologie & Thérapeutique*, **7**, 531-534. https://doi.org/10.1016/j.nephro.2011.03.009

[19] HAS (2023) Guide du parcours de soins—Maladie rénale chronique de l'adulte (MRC). Juillet 2021, mise à jour septembre.

[20] Brunet, P. (2023) Argumentaire pour le bilan et la surveillance d'une anémie en hémodialyse. *Néphrologie & Thérapeutique*, **19**, 287-289. https://doi.org/10.1684/ndt.2023.33

[21] Charriere, S., Rognant, N., Chiche, F., Cremer, A., Deray, G. and Priou, M. (2009) Insuffisance rénale chronique et maladie cardiovasculaire. *Annales de Cardiologie et d'Angéiologie*, **58**, 40-52. https://doi.org/10.1016/j.ancard.2008.07.010

[22] Flamant, M., Boulanger, H., Azar, H. and Vrtovsnik, F. (2010) Mesure et estimation du débit de filtration glomérulaire: Quels outils pour la prise en charge de la maladie rénale chronique? *La Presse Médicale*, **39**, 303-311. https://doi.org/10.1016/j.lpm.2009.05.010

[23] Winkelmayer, W.C., Owen, W.F., Levin, R. and Avorn, J. (2003) A Propensity Analysis of Late versus Early Nephrologist Referral and Mortality on Dialysis. *Journal of the American Society of Nephrology*, **14**, 486-492. https://doi.org/10.1097/01.asn.0000046047.66958.c3

[24] Raffray, M., Pladys, A., Gao, F., Couchoud, C., Vigneau, C. and Bayat, S. (2020) Les parcours de soins pré-dialyse des insuffisants rénaux chroniques terminaux: Quels types de parcours et déterminants d'un démarrage de la dialyse en urgence? *Revue d'Épidémiologie et de Santé Publique*, **68**, S22. https://doi.org/10.1016/j.respe.2020.01.047

[25] Kane, Y., Lemrabott, A.T., Faye, M., Cissé, M.M., Seck, S.M., Ka, E.H.F., *et al.* (2017) État des lieux des abords vasculaires chez les hémodialysés chroniques au Sénégal. *Néphrologie & Thérapeutique*, **13**, 312. https://doi.org/10.1016/j.nephro.2017.08.103

[26] Bahadi, A., El Farouki, M.R., Zajjari, Y. and El Kabbaj, D. (2017) La mise en hémodialyse au Maroc: Intérêt du suivi néphrologique. *Néphrologie & Thérapeutique*, **13**, 525-531. https://doi.org/10.1016/j.nephro.2017.02.012

[27] Schwab, S.J., Besarab, A., Beathard, G., *et al.* (1997) National Kidney Foundation DOQI Clinical Practice Guidelines for Hemodialysis Vascular Access Working Group. *American Journal of Kidney Diseases*, **30**, S154-S196.

[28] Schwab, S., *et al.* (2001) NKF-K/DOQI Clinical Practice Guidelines for Vascular Access: Update 2000. *American Journal of Kidney Diseases*, **37**, S139-S181.

[29] OMS Bureau Régonal de l'Afrique (2012) Systèmes de santé en Afrique: Perceptions et perspectives communautaires. Rapport d'une étude multipays, 8-58.

[30] Noppen, M. (2023) Information pour le patient: Le cathéter de dialyse en tant que passerelle vers la circulation sanguine. UZ Brussel Brussels Health Campus, 1-8. https://www.uzbrussel.be

[31] Hoffmann, M., Binaut, R., Maisonneuve, N., Bacri, J., Fleury, D., Vanhille, P., *et al.* (2006) Suivi néphrologique et niveau de prise en charge des patients en insuffisance rénale terminale. *Néphrologie & Thérapeutique*, **2**, 15-23. https://doi.org/10.1016/j.nephro.2005.08.004