

# Single-Centre Descriptive Epidemiological Study of Emergency Haemodialysis Patients in the Haemodialysis Unit of the CHU Point G (Mali)

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## Abstract

**Introduction:** Haemodialysis is an exchange of solutes and water between the patient's blood and a dialysis solution with a composition close to that of normal extracellular fluid, through a semi-permeable membrane. It is used in the treatment of acute or chronic renal failure. The aim was to study the clinical and paraclinical aspects and the outcome of patients starting dialysis treatment for renal failure in an emergency setting. **Method:** This was a prospective study from 1 January to 31 July 2020, with a sample of 62 patients receiving haemodialysis in an emergency setting in the nephrology department of the Point G University Hospital. **Results:** The study showed that the sex ratio was 1.38 in favour of men and that the mean age of patients was 36.82 years. The group of patients with a low socio-economic standard of living dominated, accounting for 71% of cases. Hypertension and anaemia were the predominant risk factors in 77.4% and 87.3% respectively. Hyperphosphataemia, hypocalcaemia and secondary hyperparathyroidism accounted for 94.7%, 98.2% and 97.7% respectively. Left ventricular hypertrophy was 29.27% on electrocardiogram and 22% on cardiac ultrasound. Isolated cardiomegaly was found in 30.76% of patients. The main indications for dialysis



were uraemic syndrome (69.2%), pericardial friction (27.4), anuria for 48 hours (20.1%), hyperkalaemia (17.7%) and acute lung oedema (16.1%). The mean duration of haemodialysis was less than one month in one out of two cases. There was no significant association between age and time on dialysis ( $p = 0.178$ ). The death rate was 20.97%. Case fatality was higher in patients whose duration of dialysis was less than one month than in the others ( $p = 0.0006$ ). **Conclusion:** CKD is a public health problem in Mali. It affects young people, especially males. Low economic income is an obstacle to the management of this disease.

## Keywords

Haemodialysis, Emergency, CHU Point G

## 1. Introduction

Chronic kidney disease (CKD) has become a public health problem because of its increasing frequency as life expectancy increases. There are over 2 million people with kidney failure in France. Age-related vascular nephropathy is the leading cause of kidney destruction leading to dialysis [1]. In the past, treatment consisted of dietary advice, drug therapy and periodic biological monitoring on an outpatient basis, organised jointly by the general practitioner and the nephrologist. Age-related vascular nephropathy has become the leading cause of kidney destruction leading to dialysis. Kidney transplants are being offered to older and older people, and living organ donation has been extended to a larger number of the recipient's relatives. Renal failure in older adults is now better detected than in the past, opening up new prospects for preventing end-stage renal disease (ESRD) [2] [3] [4]. The start of treatment by extra-renal purification (EPR)—haemodialysis (HD) or peritoneal dialysis (PD)—represents a radical change in the management of patients with chronic renal failure.

Until then, treatment consisted of dietary advice, medication and periodic biological monitoring on an outpatient basis, organised jointly by the general practitioner and the nephrologist. In comparison, treatment with EER requires more exclusive nephrological management, with HD usually requiring three weekly sessions of 4 to 6 hours, and DP requiring sessions divided into several daily cycles or automated at night. In the pre-dialysis phase, patients are prepared psychologically and physically in order to minimise the need for replacement therapy in an emergency situation [5] [6] [7]. In our context, no study has been carried out in the department to evaluate emergency management in haemodialysis. The aim was to study the clinical and paraclinical aspects and the outcome of patients starting dialysis treatment for renal failure in an emergency setting.

## 2. Method

This was a prospective, descriptive study from 01 January to 31 July 2020. Pa-

tients with chronic end-stage renal disease who received haemodialysis for the first time in an emergency setting at the haemodialysis unit of the Point G University Hospital in Bamako during our study period were included. Patients not dialysed in an emergency, renal failure patients followed at the unit for more than 3 months, and patients with incomplete records were not included.

Operational definitions:

Emergency haemodialysis: any first haemodialysis session occurring immediately within 24 hours of a nephrological assessment.

Indications for emergency haemodialysis [7]: Indications of principle (clearance < 10 ml/min in non-diabetics and 15 ml/min in diabetics), indications of necessity (uncontrollable hyperkalaemia or metabolic acidosis, anuria over 48 h, RHD/OAP refractory to diuretics, uraemic syndrome with pericardial friction, uraemic neuropathy, uraemic encephalopathy, frequent vomiting, malnutrition, marked asthenia). Chronic renal failure (CRF) is defined as an irreversible reduction in glomerular filtration rate (GFR) to less than 60 ml/min/1.73m<sup>2</sup> for more than 3 months.

The diagnosis of CKD was based on the following factors [8]: slow rise in creatinemia over several months or even years, atrophic kidneys on ultrasound, normocytic normochromic anaemia, and hypocalcaemia.

The parameters studied were: socio-demographic data, socio-economic level (group I = senior government and/or private sector executives and import-export traders, group II = government employees and/or private sector employees and medium-sized traders, group III = manual workers, farmers, retail traders, and casual urban workers, origins), data on vascular access routes, survival on haemodialysis.

Data were collected from patients' individual medical records. Data were entered and analysed using SPSS 20 French version, Excel 2016 and Word 2016. The statistical test used was the chi-square test, a P value less than or equal to 0.05 was considered significant.

Ethical considerations:

The free and informed consent of each participant was obtained with strict respect for anonymity on the survey form.

### 3. Results

1) Epidemiological and demographic data:

Our study involved 62 patients who met the inclusion criteria. The sex ratio was 1.38 for men. The mean age of the patients was 36.82 years (14 and 64 years) and 67.8% were aged < 40 years. A low socio-economic standard of living predominated, accounting for 71% of cases.

2) Clinical data:

Hypertension was the most common classical risk factor (77.4%) (**Table 1**). Anemia was the dominant specific risk factor for CKD (87.3%). CKD was due to chronic glomerular nephropathy (35.4%), nephro-angiosclerosis (32.3%), chronic

interstitial nephritis (22.6%), diabetic nephropathy (8.1%), and undetermined nephropathy (1.6%). The most common digestive manifestations of uraemic syndrome were vomiting in 80.6% of cases (Table 2). Neurological manifestations, in particular headaches, accounted for 77.4% of cases. Pallor was the cutaneous-mucosal manifestation in 95.1% of cases.

### 3) Paraclinical data:

The majority of patients (48.3%) had a haemoglobin level of less than 8 g/dl. The mean haemoglobin level was 7.02 g/dl with extremes of 3.9 and 11.6 g/dl. Hyperphosphataemia, hypocalcaemia and secondary hyperparathyroidism accounted for 94.7%, 98.2% and 97.7% respectively. The decrease in calcaemia or the increase in phosphoremia was associated with an increase in PTH ( $p = 0.002$ ) (Table 3).

Urinary tract infection was found in 41.6% of patients. The most common germ was *Escherichia coli* (60%). Proteinuria was less than 1 g in 33.3% of patients. Left ventricular hypertrophy was the most frequent echocardiographic abnormality (22%). Isolated radiological cardiomegaly was found in 30.76% of patients.

Uremic syndrome was the most frequent indication for dialysis (69.2%) (Table 4). The right femoral catheter was used in 79.03% of our patients. The number of patients using more than one catheter was 19.4%. The mean duration of haemodialysis was less than one month in one out of two cases (Table 5). The death rate was 20.97%. Case fatality was higher in patients whose duration of dialysis was less than one month than in the others ( $p = 0.0006$ ) Table 6.

**Table 1.** Breakdown by traditional cardiovascular risk factor.

Risk factor	Frequency	Percentage
<b>HIGH BLOOD PRESSURE</b>	48	77.4
<b>Cigarette smoking</b>	15	25
<b>Alcohol</b>	10	16.6
<b>Diabetes</b>	6	16
<b>Obesity</b>	1	16

**Table 2.** Breakdown by digestive disorder.

Event	Number	Percentage
<b>Vomiting</b>	50	80.6
<b>Anorexia</b>	36	62.9
<b>Ascites</b>	11	17.7
<b>Abdominal pain</b>	9	14.5
<b>Nausea</b>	8	12.9
<b>Hepatomegaly</b>	3	4.8
<b>Haematemesis</b>	1	1.6

**Table 3.** Relationship between serum calcium, serum phosphorus and PTH.

Calcemia/ Phosphoremia	PTH				
	Normal	Number	Total %	Increased Number	Total %
Calcaemia	Decreased	0	0.0	39	62.9
	Normal	0	0.0	1	1.6
Phosphorimia	Decreased	0	0.0	1	1.6
	Normal	1	1.6	0	0.0
	Increased	0	0.0	38	61.3

$X^2 = 9.2436$ ;  $ddl = 1$ ;  $P = 0.002$ .

**Table 4.** Breakdown by dialysis indication.

Indications	Workforce	Percentage
Uremic syndrome	36	69.2
Pericardial friction	17	27.4
Anuria $\geq 48$ H	13	20.1
Hyperkalaemia	11	17.7
OAP	10	16.1
Metabolic acidosis	9	14.5
Fluid retention	7	11.2
Uremic encephalopathy	4	6.4

**Table 5.** Breakdown by duration of haemodialysis.

Duration in months	Workforce	Percentage
<1 month	35	56.4
1 - 2 months	11	17.7
2 - 3 months	3	4.8
3 - 4 months	4	6.5
4 - 5 months	5	8.1
>5 months	4	6.5

**Table 6.** Relationship between time on dialysis and progression of the disease.

Change	Duration of dialysis					Total
	<1 mois	2 à 3 mois	3 à 4 mois	4 à 5 mois	>5 mois	
Living	3	1	0	3	6	13
DCD	30	8	3	1	1	43
Withdrawn from dialysis	3	2	0	0	1	6
<b>TOTAL</b>	36	11	3	4	8	62

$X^2 = 11.52$ ;  $ddl = 1$ ;  $P = 0.0006$ .

## 4. Discussions

During our study we compiled 62 medical records of patients who had undergone haemodialysis in an emergency setting. The study was not without its limitations: Inadequate completion of patient records, low level of technical facilities (laboratory, medical imaging), low socio-economic level of patients, lack of dialysis machines in the units, lack of staff and professionalism in the dialysis units, difficulties in therapeutic management, high cost of the first 2 dialysis sessions and of the dialysis catheter, high cost of making the arteriovenous fistula at the Point G University Hospital.

### Sociodemographics

The male sex was dominant, *i.e.* 58% of cases with a sex ratio of 1.38 in favour of men, compared with 60% (sex ratio of 1.5) in Ahmed [3] in 2005 in the same department. This male predominance could be explained by the high frequency of certain causes of renal failure in men, such as IgA nephropathy, and risk factors such as smoking and alcoholism. The mean age of our patients was 36.82 years, with extremes of 14 and 64 years. This is close to that reported by Ahmed [3] in 2005. Patients under the age of 40 accounted for 67.8% of cases. Kidney disease can occur at any age. The high incidence in young adults is explained by the hypothesis that environmental factors, in particular smoking, alcoholism and occupational exposure, play a role in the onset and/or progression of initial pathologies [3]. In Burkina Faso, the average age was 36 [4]. In Senegal, 43.6% of patients were under 46 [5]. In Côte d'Ivoire, 57.3% of patients were under 45 [6]. It can be said that in Africa in general, and in Mali in particular, renal failure tends to affect young, economically active adults, whereas in developed countries more than 50% of patients are over 60 years of age [7]. This discrepancy could be explained by greater access to healthcare and the ageing of the Western population. The majority of patients (71%) had low incomes. Other studies carried out in the same department by Fongoro *et al.*, Togo, and Amekoudi reported 49.30%, 60% and 65% of cases respectively [7] [8] [9]. Low socio-economic status was a barrier to consultation and management in emergency dialysis.

### Clinical

The clinical signs of uraemia were dominated by vomiting (80.6%) compared with 65.7% in Amekoudi [7] in 2011 in the same department. In Burkina Faso, Lengani found asthenia and vomiting to be signs of uraemia in 78.2% and 63.2% of cases respectively [4]. The other signs were pallor (95.1%) and arterial hypertension (77.4%). This can be explained by the fact that the majority of our patients consulted at the end-stage of renal failure (87.1%). Chronic glomerular nephropathy was the initial nephropathy frequently found, accounting for 35.4% of cases. In several African countries, chronic glomerulonephritis predominated [10] [11] [12] [13]. However, in Senegal, Diouf *et al.* found nephro-angiosclerosis in 52.32% of patients. The difference with the Dakar study could be explained by the mean age, which was 50.86 years compared with 36.8 years in our study [14]. In terms of comorbidity, diabetes was the most common, accounting for 9.7% of

cases. Comorbidities and disabilities are more frequent when dialysis is started urgently. Type 2 diabetes is generally confined to the elderly [15]. In Morocco, diabetes accounted for 15% of cases [16] compared with 38.3% of emergency dialysis patients in France [17]. The difference could be explained by the higher average age of patients in France and Morocco.

#### Paraclinical

In our study, proteinuria was  $>1$  g/24h in 33.3% of cases. It was associated with leukocyturia in 43.3% of cases, and haematuria in 18.3% of cases. Other studies carried out in the same department reported similar results—43.3% and 46.7% [3] [18]. Urinary tract infection was noted in 41.6% of cases. *Escherichia coli* was the most common germ, accounting for 60% of cases. In the same department, Fongoro *et al.* in 2003 and Coulibaly in 2010 found this same germ in 22.53% and 36.9% of cases respectively [19] [20]. In Morocco, it was present in 58.3% of patients [21]. Anemia was the dominant specific cardiovascular risk factor in 95.16% of cases, compared with 87.3% [9] for Fongoro *et al.* [8]. Normocytic normochromic anaemia was present in 48.27% of cases. In Senegal, anaemia was also predominant (95.34%) in the Thiès region [14].

The frequency of radiological cardiomegaly was 30.76%. Elhousseine and Amekoudi found 75% and 94% respectively [7] [22]. The predominance of left ventricular hypertrophy on electrocardiogram is classic. It was confirmed in our study with 29.27% of cases. Cardiac echography revealed 22% of cases of left ventricular hypertrophy. This predominance has been reported by other authors [22] [23]. Left ventricular hypertrophy in uraemic patients is probably multifactorial. Decreased kidney size ( $<80$  mm) is one of the major criteria for chronic renal failure [15]. 75.2% of our patients had bilateral renal atrophy on renal ultrasound. Our results are similar to those of Keita and Amekoudi, who found 85%, 83.6% and 84.6% renal atrophy respectively [7] [18] [23]. In principle, any patient with CKD with a clearance of less than 10 ml/min should be managed by a replacement therapy, in particular dialysis or renal transplantation. The patient is also dialysed as an emergency measure if there are signs of life-threatening illness [15]. Uraemic syndrome was the most frequent indication for dialysis (69.2%) in our study, compared with 100% in Keita's 2007 study [23]. On the other hand, Amekoudi found hydro-sodium overload, particularly acute lung oedema, to be the main indication for dialysis (66.67%) in the same department [7]. In Côte d'Ivoire, CKD was the main indication for catheterisation in 74.8% of cases [24]. This predominance of uraemic syndrome can be explained by the fact that the majority of our patients had creatinine clearance of less than 5 ml/min (87.1%).

The right femoral vein was the most commonly used insertion site (79.03%). The frequent use of this site was noted in an Ivorian study [24]. More than half of our patients had less than one month with the catheter. The mean duration of the catheter was 46.24% days, with extremes of 176 and 5 days. In Côte d'Ivoire it was 24.5 days with extremes of 1 to 90 days [24]. This difference could be explained by the difficulties in performing AVF and the fact that a patient could

use several catheters. The average time taken to create an arteriovenous fistula was 69.7 days, with extremes of 8 and 156 days. In France, 12.6% of AVFs were made in emergency haemodialysis within 30 days [17]. This difference could be explained by the size of the sample.

Progression on dialysis:

HD and PD started as emergencies are associated with a high percentage of deaths. 69.35% of our patients died on dialysis. In France, the death rate was 26% [17] compared with 62.4% [24] in Côte d'Ivoire. The causes of death were cardiovascular, hydroelectrolytic and infectious complications.

The study showed that 84% of patients on their first month of dialysis had a cardiac ultrasound abnormality. Of the living patients, 20.97% continued on haemodialysis and 9.68% were withdrawn from dialysis after their renal function improved and residual diuresis was maintained. The high death rate could be explained by several factors: inadequate technical facilities and staff.

## 5. Conclusion

CKD is a public health problem in Mali. It affects young people, especially males. Low economic income is an obstacle to the management of this disease. Efficient and effective management of deficiencies will help to reduce the rate of deaths on dialysis.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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