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Clinicobiological Profile and Evolution of Patients with Acute Kidney Injury Requiring Emergency Hemodialysis in an Ivorian Referral Hospital

Profil clinicobiologique et évolutif des patients hémodialysés en urgence pour une insuffisance rénale aiguë dans un hôpital de référence de Côte d'Ivoire

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ABSTRACT

Introduction. Due to late referral of the pads to the nephrologist and the lack of medical follow-up, many patients are admitted with complications from kidney disease requiring the urgent start of hemodialysis. The aim of this work was to study the clinico-biological and evolutionary profile of patients with Acute Kidney Injury (AKI) who underwent emergency hemodialysis in a referral hospital of Ivory Coast. **Methods.** This was a retrospective, descriptive and analytical study which took place from January 1 to December 31, 2016, in the Nephrology Department at the University Teaching Hospital of Yopougon in Ivory Coast. All patients who received an emergency hemodialysis session during the study period were identified through the registry. Those who were at their first session for AKI, at least 16 years old and whose clinical records were available were selected. **Results.** We collected 36 medical records of patients with an average age of 41.31 ± 13.93 years. Patients past medical history showed high blood pressure (HBP) (27.78%), herbal medicine consumption (80.56%) and HIV infection (19.44%). The main clinical signs were Elevated BP (38.89%), neurological disorders (41.66%), edema (22.22%) with sometimes acute pulmonary edema (2,78%) and anuria (19.44%). Organic AKI accounted for more than 80% of cases. The main indications of hemodialysis were: uremic encephalopathy (41.67%), other severe uremic complications (25%), persistent anuria (19.44%) and threatening hyperkalemia (11.11%). Death occurred in 30.55% with sepsis as the main cause (72.72%). **Conclusion.** AKI requiring hemodialysis is associated with high mortality and deaths were more often caused by sepsis.

RÉSUMÉ

Introduction. Le retard accusé pour leur prise en charge fait que nombreux sont les patients souffrant d'insuffisance rénale qui arrivent dans les hôpitaux avec des complications sévères nécessitant des séances d'hémodialyse en urgence. Le but de ce travail était d'étudier le profil clinico-biologique et évolutif des patients atteints de lésion rénale aiguë (LRA) et hémodialysés en urgence dans un hôpital de référence en Côte d'Ivoire. **Méthode.** Il s'est agi d'une étude rétrospective, descriptive et analytique qui s'est déroulée du 1^{er} janvier au 31 décembre 2016 dans le service de néphrologie du CHU de Yopougon en Côte d'Ivoire. Tous les patients qui étaient à leur première séance d'hémodialyse pour une LRA et âgés de plus de 16 ans ont été inclus dans l'étude. **Résultats.** Nous avons colligé 36 patients avec un âge moyen de 41.31 ± 13.93 ans. Les principaux antécédents des patients étaient une HTA (27,78 %), une consommation de médicaments traditionnels (80,56 %) et une infection au VIH (19,44 %). Les principaux signes cliniques étaient l'HTA (38,89 %), les troubles neurologiques (41,66 %), les œdèmes (22,22 %) avec l'OAP (2,78 %) et l'anurie (19,44 %). La LRA était organique dans plus de 80 % des cas. Les principales indications de l'hémodialyse étaient l'encéphalopathie urémique (41,67 %), les autres complications urémiques (25 %), l'anurie persistante (19,44 %), l'hyperkaliémie menaçante (11,11 %). La mortalité était de 30,55 % et le sepsis en était la principale cause. **Conclusion.** La LRA nécessitant une hémodialyse en urgence était associée à une forte mortalité et le sepsis le plus souvent incriminée.

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Keywords: Acute kidney injury, Hemodialysis, Emergency

Mots clés : Insuffisance rénale aiguë, Hémodialyse, Urgence

INTRODUCTION

Acute kidney injury (AKI) is a clinico-biological disorder defined as an abrupt decline in glomerular filtration rate (GFR) with a 0.3 mg/dl (or 26.5 μ mol/l) increase in serum creatinine (SCr) or more within 48 hours or an increase in SCr to 1.5 times baseline or more within the prior 7 days;

or Urine volume < 0.5 ml/kg/h for 6 hours according to Kidney Disease: Improving Global Outcomes (KDIGO) 2012 guideline [1, 2].

The treatment of AKI often involves hemodialysis, which can supplement the functions of uremic toxin removal and

fluid balance, thus improving their prognosis [3,4]. The incidence of AKI requiring dialysis is increasing [4]. In Canada, the incidence of acute kidney injury requiring dialysis increased from 0.8% to 3% from 1996 to 2010 [5]. In Senegal in 2016, a hospital study noted that 84.7% of patients in a hemodialysis center had benefited from emergency sessions and that 34.2% of these patients had acute renal failure (ARF) [6]. Despite these therapeutic advances since the 1950s, the mortality of patients with renal damage requiring emergency dialysis remains high, ranging from 15 to 60% in hospitals [5, 7].

In Ivory Coast, the State has made hemodialysis available since the 1990s and the care of patients is subsidized. Secondly, private hemodialysis centers have opened to supplement the public centers. Acute kidney injury has been identified by the International Society of Nephrology (ISN) as an important preventable cause of death in the world. In addition, this society has set the goal of "eliminating preventable and treatable deaths due to acute kidney injury worldwide by 2025"[5,8]. The aim of this work was to study the clinico-biological and evolutionary profile of patients with AKI who underwent emergency hemodialysis (HD) in a referral hospital of Ivory Coast in order to facilitate decision-making in such a setting. The time it has taken to publish this study was taken for different author's contributions and preparation process to submission. As there still have lack of data in that area in our setting we thought that it was useful even few years later to publish the outcomes of this work.

METHODS

This was a retrospective, descriptive and analytical study that took place from January 1 to December 31, 2016, in the Nephrology Department of the Yopougon University Teaching Hospital in Abidjan, Ivory Coast. All patients who received an emergency hemodialysis session during the study period were identified through the registry. Those who were at their first session for AKI, at least 16 years old and whose clinical records were available were selected for the study.

The generators used were Gambro ARTIS. The first sessions lasted typically 2 hours and 30 minutes, double lumen catheters were used in femoral or jugular. The dialysate pump was set at 500ml/min, blood pump rate, ultrafiltration and use of heparin were set according to each patients.

Data were collected using a survey sheet. Demographically, age, sex, education level, and patient origin were recorded. Clinically, history of hypertension (defined as BP ≥ 140/90 mmHg), diabetes, chronic kidney disease (CKD), human immunodeficiency virus(HIV) infection, and drug use, as well as consciousness, hydration, and blood pressure were recorded. In terms of pre-dialysis biology, the full blood count, serum urea, serum creatinine, C Reactive Protein and blood ionogram were recorded. Hyperkalemia was defined as kalemia greater than 5.5 mEq/l. In addition, the type of AKI (functional, obstructive, organic), indication for HD (uremic encephalopathy, Pulmonary edema and/or anuria, threatening hyperkalemia, uremic intolerance), the approach, the number of sessions, transfusion, antibiotic therapy as well as evolution were specified.

Functional AKI has been retained in the presence of a factor of renal hypoperfusion (diarrhea, vomiting, low cardiac output) or in front of signs of extracellular dehydration without any evidence of organic or obstructive mechanism; Obstructive AKI was retained in the presence of bilateral dilatation of the pyelocaliceal cavities;

Organic AKI was retained after exclusion of functional and obstructive AKI. Renal biopsy was not performed in cases with indication because of resource-limited setting. Clinical and paraclinical arguments allowed us to classify the types of nephropathy into glomerular, vascular, tubular and tubulointerstitial.

Data were entered on a computer using Microsoft Excel and analyzed using SPSS version 20 software. Means of continuous variables were compared by Student t test and percentages were compared by chi-square test. The significance level was p less than 0.05 for a 95% confidence interval. The study was approved by the institutional ethics board.

RESULTS

During the study period, 213 patients underwent emergency dialysis in the department. Among them, 67 patients were excluded because they were not on their first hemodialysis session. Amongst the 146 remaining patients, 110 were diagnosed with CKD and 36 patients (24.66%) with AKI were retained for the study (figure 1).

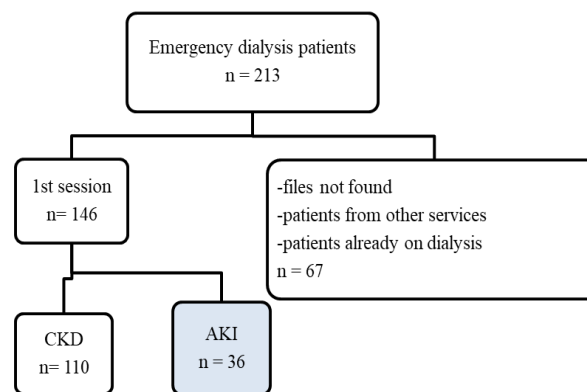


Figure1: Flow chart of medical files selection
CKD: Chronic Kidney Disease, AKI: Acute Kidney Injury

Socio-demographic aspects

The average age of the patients was 41.31±13.93 years. The age range of [25,45[years was the most represented with 63.90%. The male sex represented 58.33% of the patients. Most of the patients (80.56%) were hospitalized in nephrology. High school was the most represented educational level with 36.11% as shown in Table I.

Clinical and biological aspects

Fifteen patients (41.66%) had neurological disorders. One patient (2.78%) had hypotension and BP was elevated in 38.89% (Table I). Acute pulmonary edema (APE) was found in 2.78% of patients. Hyperkalemia was found in 36.10% and was severe in 16.67% of patients. HIV 1 was positive in 19.44% of patients, a biological inflammatory syndrome (CRP > 6 mg/l) was found in 97.22% and 2.78% of patients had known chronic kidney disease. Organic AKI

accounted for more than 80% of cases, obstructive AKI (11.11 %) and prerenal AKI (5.56 %).

Table I: Socio-demographic and clinical parameters of patients

Parameters	Number n= 36	Percentage (%)
Gender		
Male	21	58.33
Female	15	41.67
Age(years)		
< 25	2	5.50
[25, 45[23	63.90
[45, 65[9	25.00
≥ 65	2	5.50
Origin of the patients		
Nephrology hospitalization	29	80.56
Medical Emergencies	4	11.10
Resuscitation unit	2	5.56
Gastrology	1	2.78
Level of education		
Secondary	13	36.11
Illiteracy	9	25.00
Primary	9	25.00
Superior	5	13.89
Comorbidities/Past Medical History		
Herbal medicine consumption	29	80.56
Hypertension	10	27.78
Sepsis	8	22.22
HIV positive	7	19.44
Taking NSAIDs	3	8.33
Using ICM	2	5.55
Main clinical signs		
Neurological disorders (coma, agitations)	15	41.66
Edema	8	22.22
Anuria	7	19.44
Hypotension	1	2.78
Normal BP	21	58.33
Elevated BP	14	38.89

NSAIDs: non-steroidal anti-inflammatory drugs, ICM: iodinated contrast media; HIV: Human Immunodeficiency Virus, BP: Blood Pressure

Hemodialysis

Patients received an average of 2.89 ± 1.38 hemodialysis sessions. The average length of hospital stay was 14.22 ± 8.40 days. The different indications for hemodialysis are illustrated in Figure 2. Femoral vein catheterization was the main approach used with 77.78%.

Evolution

Death was noted in 30.55% of cases, 41.6% of patients completely recovered their renal function and 27.78% did not fully recover. Deaths were more often caused by sepsis in 72.72% and followed by anemia (due to haemorrhage) for the remaining cases. No significant difference was found between deceased patients compared to survivors in terms of socio-demographic or clinic-biological parameters. Number of hemodialysis sessions and hospital length of stay were significantly lower in deceased patients (p=0.04 and 0.005 respectively) as shown in Table II.

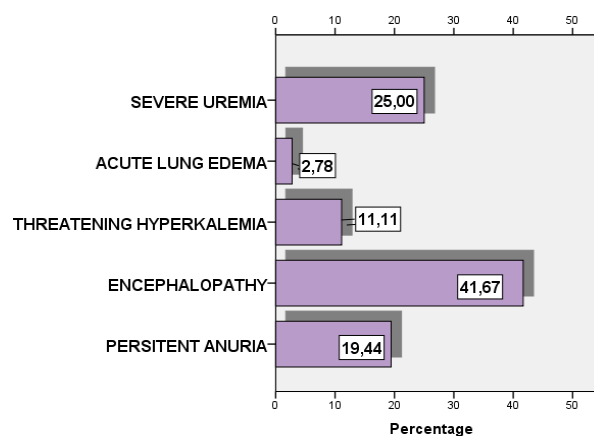


Figure 2: Indications for hemodialysis

Discussion

Socio-demographic aspects

Patients were young with an age of 41.31±13.93 years and the age group [25, 45[years was the most represented (63.90%) with a male predominance. Similar results have been found by most authors in developing countries [9,10]. Therefore, patients were older in developed countries [4,11]. The youth of the African population in general could explain this situation.

Clinical and biological aspects

Comorbidities and past medical history were dominated by herbal medicine consumption (80.56%), hypertension (27.78%), sepsis (22.22%) and HIV infection (19.44%). Igraneza et al [9] found relatively the same comorbidities. Similarly, Tukaram et al. in India found in a metanalysis a predominance of infectious pathologies in the comorbidities [10]. However, in developed countries, comorbidities are dominated by cardiovascular diseases and diabetes [4,11]. Infectious diseases still occupy the first place in our context compared to developed countries where so-called non-communicable diseases are more frequent.

The pathophysiological mechanism was dominated by organic AKI (83.33%) followed by obstructive AKI (11.11%) and functional AKI (5.56%). This predominance of the organic mechanism of AKI and especially the responsibility of infections has been found by several authors in Sub-Saharan Africa [12-14]. Infections in general and malaria in particular are frequent in our countries. They can cause AKI either by direct damage of the parasites or their components on the renal parenchyma or indirectly by their complications or the drugs used for their treatment. Moreover, in our context, these infections are generally treated by self-medication (modern and/or phytotherapy) or by prescriptions combining anti-malarial drugs and certain antibiotics. This can be the cause of AKI as shown by Adu Dwomoa et al. in Ghana who found that sepsis and intravascular hemolysis due to antibiotics and traditional medicines were the main causes of AKI in adults in Africa [12]. We reported acute hemodialysis in 2 patients (5.56%) with prerenal AKI. Hemodialysis in prerenal AKI is exceptionally performed; the patients in our series presented at the entrance severe AKI with life-threatening uremic complications.

Table II: Patient survival by socio-demographic and clinico-biological parameters

	Total n (%)	Deaths n (%)	Survivors n (%)	p
	36(100 %)	11(30.55 %)	25(69.45 %)	
Average age (years)	41.31±13.93	46.33±16.10	39.08±12.5	0.15
Male gender	21(58.33)	7(63.64)	14(56.00)	0.66
Past History of HBP	10(27.78)	2(18.18)	8(32.00)	0.39
HIV positive	7(19.44)	3(27.27)	4(16.00)	0.43
herbal medicine consumption	29(80.56)	10(90.90)	19(76.00)	0.29
Presence of coma	15(41.66)	7(63.64)	8(32.00)	0.07
Average SBP(mmHg)	134.17±30.27	123.64±20.60	138.80±32.95	0.17
Average DBP(mmHg)	82.39±18.10	75.45±12.13	85.44±19.61	0.12
Mean creatinine (mg/L)	215.21±115.73	246.06±153.93	201.64±95.03	0.29
Average Urea (g/L)	2.55±1.16	2.63±1.15	2.55±1.19	0.78
Average kalemia (mmol/L)	4.89±1.39	5.10±1.85	4.79±1.17	0.54
Average hemoglobin level (g/dL)	8.39±2.27	8.21±2.20	8.45±2.34	0.77
Organic AKI	30(83.33)	9(81.81)	21(84)	0.87
CRP (mg/L)	80.25±58.18	75.81±65.87	82.37±55.59	0.76
Average number of HD sessions	2.89±1.38	2.18±1.32	3.20±1.32	0.04
Blood transfusion	20(55.55)	5(45.45)	15(60)	0.41
Average length of stay	14.22±8.40	8.73±8.49	16.64±6.77	0.005

HBP: High Blood Pressure, SBP: Systolic Blood Pressure, DBP: Diastolic Blood Pressure, CRP: C reactive Protein, AKI: Acute Renal Failure, HIV: Human Immunodeficiency Virus, HD: Hemodialysis

That was the same situation with those presenting obstructive AKI who also received a specific urological procedure to remove the blockage of the urinary tract.

Mortality and poor prognostic factors

We found a mortality rate of 30.55%. This mortality rate is similar to that reported by most authors [9,13,15,16]. No significant difference was found between deceased patients compared to survivors in terms of socio-demographic or clinic-biological parameters. Number of hemodialysis sessions and hospital length of stay were significantly lower in deceased patients (p=0.04 and 0.005 respectively). This finding could be explained by the fact that deceased patients arrived late in the nephrology department with more often multivisceral failures prompting the death and reducing hospital length of stay. In addition, the difficult accessibility of dialysis centers not only due to the insufficiency of nephrology and dialysis services in our context but also to the high cost of the hemodialysis session could explain this situation. Other authors have shown that, depending on the stay in the intensive care unit, an early start of renal replacement therapy was associated with lower mortality compared to a late start[17]. Igiraneza et al[9] had found that hyperkalemia and less than five hemodialysis sessions were factors of poor prognosis. In a meta-analysis, Gaudry et al [15] had found that there was no significant difference in mortality between early and late initiation of dialysis in case of severe AKI and in the absence of indication for emergency dialysis. In case of severe AKI, it is reasonable to stick to the indications for emergency dialysis which are: Acute lung edema resistant to diuretics; Hyperkalemia ≥ 6.5 mmol/L; Anuria of more than 24 hours; Metabolic acidosis with pH< 7.1; Complications of uremia > 50 mmol/L (pericarditis, coma, hemorrhage) [9].

Limitations of the study

Our study had limitations due to its retrospective nature. The information sought in the clinical records of patients was sometimes not complete.

CONCLUSION

AKI requiring hemodialysis concerned young patients with a male predominance. The majority of patients were on traditional drugs, the AKI was mostly organic and in a context of sepsis. Mortality was high and patients died more within the first 10 days of hospitalization. Early management is essential to improve the vital prognosis of patients.

Competing interests

The authors declare that they have no competing interest.

Funding

This research did not receive any specific grant

Authors' contributions

Conception and study design: François Pegdebamba Kissou, Mohamed Ibrahim Alex Moudachirou and Abdoulaye Togo. Data collection: François Pegdebamba Kissou, Data analyse and interpretation: François Pegdebamba Kissou, Monlet Cyr Guei, Hubert Kouame Yao and Marius Djoumbissie Tchoupé. Manuscript Drafting: François Pegdebamba Kissou and Marius Djoumbissie Tchoupé. Manuscript revision: Aoua Semde and Patrick Sery Diopoh. All the authors have read and agreed to the manuscript.

REFERENCES

1. Levin A, Stevens PE. Summary of KDIGO 2012 CKD Guideline: behind the scenes , need for guidance , and a framework for moving forward. *Kidney Int.* 2013 ;85(1) :49-61.

2. Koza Y. Acute kidney injury: current concepts and new insights. *J inj violence res.* 2016;8(1):58-62.
3. Eckardt KU, Bansal N, Coresh J, Evans M, Grams ME, Herzog CA et al. Improving the prognosis of patients with severely decreased glomerular filtration rate (CKD G4+): conclusions from a Kidney Disease: Improving Global Outcomes (KDIGO) Controversies Conference. *Kidney Int.* 2018 Jun;93(6):1281-1292.
4. Garnier F, Couchoud C, Landais P, Moranne O. Increased incidence of acute kidney injury requiring dialysis in metropolitan France. *PLoS One.* 2019 Feb 7;14(2): e0211541.
5. Mehta RL, Cerdá J, Burdmann EA, Tonelli M, García-García G, Jha V et al. International Society of Nephrology's Oby25 initiative for acute kidney injury (zero preventable deaths by 2025): a human rights case for nephrology. *Lancet.* 2015 Jun 27;385(9987):2616-43. doi: 10.1016/S0140-6736(15)60126-X. Epub 2015 Mar 13. PMID: 25777661.
6. Yaya K, Mokhtar Mbacké LM, Moussa Tondi ZM, Tall LA, Maria F, Moustapha CM et al. Décentralisation De La Dialyse Au Sénégal: Expérience D'1 An Du Centre De Tambacounda A l'Est Du Pays. *European Scientific Journal* 2016;12(36): 164-73
7. Petitclerc T. Chronic hemodialysis: technical aspects and organizational modalities in Thervet E. *Traité de Néphrologie.* Paris, Editions Lavoisier Médecine Sciences 2017 p 597-601.
8. Safari S, Hashemi B, Forouzanfar MM, Shahhoseini M. Epidemiology and Outcome of Patients with Acute Kidney Injury in Emergency Department; a Cross-Sectional Study. *Emergency.* 2018;6(1):1-7.
9. Igiraneza G, Ndayishimiye B, Nkeshimana M, Dusabejambo V, Ogbuagu O. Clinical Profile and Outcome of Patients with Acute Kidney Injury Requiring Hemodialysis: Two Years ' Experience at a Tertiary Hospital in Rwanda. *Biomed Res Int.* 2018 Mar 27;2018:1716420.
10. Jamale TE, Hase NK, Kulkarni M, Pradeep KJ, Keskar V, Jawale S et al. Earlier-start versus usual-start dialysis in patients with community-acquired acute kidney injury: a randomized controlled trial. *Am J Kidney Dis.* 2013 Dec;62(6):1116-21.
11. Barbar SD, Clere-Jehl R, Bourredjem A, Hernu R, Montini F, Bruyere R, Lebert C, Bohe J, Badie J, Eraldi JP, et al. Timing of renal-replacement therapy in patients with acute kidney injury and sepsis. *N Engl J Med.* 2018;379(15):1431-42.
12. Adu D, Okyere P, Boima V, Matekole M, Osafo C. Community-acquired acute kidney injury in adults in Africa. *Clinical Nephrology* 2016;86:48-52.
13. Bello B, Busari A, Amira C, Raji Y, Braimoh R. Acute kidney injury in Lagos: Pattern, outcomes, and predictors of in-hospital mortality. *Niger J Clin Pract.* 2017;20(2):194-9.
14. Lengani A, Kargougou D, Fogazzi GB, Laville M. Acute renal failure in Burkina Faso. *Nephrol Ther.* 2010;6(1):28-34.
15. Gaudry S, Hajage D, Benichou N, Chaïbi K, Barbar S, Zarbock et al. Delayed versus early initiation of renal replacement therapy for severe acute kidney injury: a systematic review and individual patient data meta-analysis of randomised clinical trials. *Lancet.* 2020 May 9;395(10235):1506-15.
16. Charles S Ilboudo, Harouna Doro, Ismael Guibla, Farid Belem, Soumana Konate, Aoua Semdé et al. *Prognosis of emergency hemodialysis patients in the nephrology and dialysis department of the Souro Sanou University Teaching Hospital (Bobo Dioulasso).* Health Sci. Dis: Vol 22(6) June 2021 pp11-14.
17. Vanmassenhove J, Kielstein J, Jörres A, Biesen WV. Management of patients at risk of acute kidney injury. *Lancet.* 2017 May 27;389(10084):2139-2151.