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Kidney Diseases and Use of Hemodialysis in Intensive Care at the Cnhu-Hkm of Cotonou from 2015-2019

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Abstract

Introduction: Intensive care units are often confronted with the management of kidney diseases.

Objective: To study kidney diseases in the intensive care unit of the CNHU-HKM of Cotonou from 2015 to 2019.

Methods: This is a retrospective study with descriptive and analytical aims. We included all patients older than 18 years with acute kidney injury (AKI) or chronic kidney disease (CKD) and/or proteinuria, hematuria, leukocyturia ≥ one cross. AKI being defined by an increase in creatinine level ≥ 26μmol/L (3 mg/L) in 48 h or ≥ 50% in 7 days with or without diuresis ≤ 0.5 ml/kg/h for 6 to 12 h and CKD by an estimated glomerular filtration rate (GFR) <60 ml/min evolving for more than 3 months. Risk factors for death were searched by logistic regression; significance level p <5%.

Results: Out of 4049 admissions, 372 had presented with kidney damage, representing 9.19%. AKI predominated with 63.40%, against 35.50% for CKD. Proteinuria was observed in 08.60% and hematuria in 2.69%. A female predominance was observed with a sex ratio of 0.69. The mean age was 42.50 ± 18.60 years. KDIGO3 stage constituted 48.18% of AKIs. End stage of CKD accounted for 68.18%. Hemodialysis was prescribed in 25.30% of cases, but only 57.40% of patients had access to it. Mortality accounted for 66.10% of overall patients. The use of hemodialysis (p=0.002) and blood transfusion (p=0.003) appeared to be protective factors, whereas the use of respiratory assistance (p <0.0001) and vasoactive amines (p <0.00001) were risk factors for death.

Conclusion: Kidney diseases are relatively common in intensive care units, with an excessively high mortality. Hemodialysis, which reduces this mortality, is not sufficiently accessible to the population. It is important to make the use of hemodialysis free.

Keywords: Kidney disease • Hemodialysis • Intensive Care • Cotonou

Introduction

Intensive care and resuscitation units specialize in the management of patients with life-threatening conditions and visceral failures. These include renal diseases and the cohort of complications and comorbidities that characterize them. The health care burden of chronic kidney disease (CKD) is increasing [1]. Indeed, Jonny J, et al. [2] found that the incidence of acute kidney injury (AKI) in the ICU ranged from 6 to 70% of admissions [2]. In an Australian study over a 7-year period including 476 ESRD patients, 20% required admission to an intensive care unit [3]. These frequencies of renal diseases in the ICU are bound to evolve in proportion to the strong increase in renal diseases observed in the general population over the last 30 years, especially in low-income countries. Indeed, studies of Arulkumaran N, et al. [4], in 2012 and Stanifer in 2014 estimate that in 2030 more than 70% of CKD patients will live in low-income countries, particularly in Sub-Saharan Africa [5].

In addition, these frequencies of renal damage in the ICU are accompanied by a very high mortality rate ; between 25 and 90% of patients with AKI and 9 to 26% of patients with ESRD according to researches by Ostermann M and Chang R [6].

One of the determinants of the reduction of this mortality related to renal diseases in ICU is the use of renal replacement therapies and mainly haemodialysis as demonstrated in the study by Ostermann M and Chang R [6]. According to Rimelle, hemodialysis represented between 10 and 15% of intensive care activities in 2018 [7].

Studies on renal replacement therapies in sub-Saharan Africa show that hemodialysis is the first choice treatment. However, although it is subsidized by some countries, its cost is such that less than 1% of CKD patients are able to afford their treatment for more than 3 months [5,8]. Peritoneal dialysis remains rare because of the difficulties associated with importing the necessary fluids and the increased risks of infections in the local hospital environment [5,9].

Olowu WA, et al. [10], noted in 2018 that in sub-Saharan Africa, of the 70% of patients with AKI who were indicated for haemodialysis, only 33% were able to access dialysis, increasing the mortality rate from 32% of patients actually dialysed to 86% of patients who did not receive dialysis.

In Benin, we lack reliable data on the use of hemodialysis in intensive care. That is why the present study was initiated.

Objectives

General objective: To study kidney diseases in patients admitted to the ICU from 2015 to 2019.

Specific objectives:

- Calculate the hospital incidence of kidney diseases in the ICU;
- Determine the therapeutic aspects of kidney diseases in the ICU;

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- To determine the frequency of hemodialysis use in the ICU ;
- To identify risk factors for death in patients with kidney diseases in the ICU.

Study Framework and Methods

Our study took place in the Polyvalent Service of Anesthesia - Reanimation (SPAR) of the National University Hospital - Hubert Koutoukou Maga (CNHU-HKM) of Cotonou.

This is a retrospective study with descriptive and analytical aim. Data collection was conducted over a period from November 20, 2020 to January 10, 2021.

Our study population consisted of all adult patients with kidney disease admitted to SPAR between 2015 and 2019 who met the inclusion criteria. Were included, all patients aged 18 years or older with kidn²ey disease who were admitted to SPAR between January 1st 2015 and December 31, 2019. Patients without usable records especially in the absence of creatinine measurement or daily diuresis quantification were not included. We conducted a comprehensive recruitment of all cases meeting the criteria of our study. A pre-established, pre-tested and validated survey form was used for data collection. Data collection was carried out by a team of 10 people, all students in their 6th year of general medicine, who had been trained on the survey forms. Patient admission records were used to identify cases and usable medical records were used to complete the survey forms.

The dependent variable was kidney disease defined as follows:

- AKI: Increase in creatinine ≥ 2 6µmol/L (3 mg/L) in 48h or ≥ 50% in 7 days or diuresis ≤ 0.5 ml/kg/h for 6 to 12 h [11]
- CKD: Estimated GFR < 60ml/min evolving for more than 3 months [12]
- And/or the presence of proteinuria or hematuria or nitrituria or leukocyturia ≥ + (one cross).

The independent variables were socio-demographic (age, sex, ethnicity, occupation, marital status, place of residence, health coverage); clinical (reason for admission, place of referral, history and comorbidities, renal signs, extra-renal signs, aetiology of the renal disease, associated pathologies, associated visceral failures); paraclinical (uremia, creatininemia, GFR on admission, glycemia, blood ionogram, calcemia, phosphoremia, proteinuria, renal ultrasound, abdominal or pulmonary radiography, 24-hour proteinuria, urinary sediment, fundoscopic examination); therapeutic (hydration, blood transfusion, antibiotics, use of haemodialysis, time between the indication and the actual implementation of haemodialysis, number of haemodialysis sessions carried out, use of mechanical ventilation, use of vasoactive amines, other molecules, length of hospitalisation) and evolutionary (favourable evolution, transition to chronicity, worsening of the CKD, death).

First, we consulted the various registers to identify the numbers of the target files. We then proceeded to remove the files from the archives, selected the eligible files and put away the rejected files. We then recorded the information contained in the usable files of the selected patients on the survey forms. The forms were checked as we went along, to ensure the validity and completeness of the data collected.

Data entry was done in a mask generated using CS Pro version 7.2 software. Data processing and analysis was done with R software version 3.5 using the RStudio environment. We then proceeded to check the consistency of our results and then they were entered as text in Microsoft Word 2016. The graphs were made in Microsoft Excel 2016.

A descriptive analysis of the study variables was done. Thus, for the qualitative variables, frequencies and proportions were determined while the quantitative variables were expressed as mean and standard deviation. To study the influence of the explanatory variables on the vital prognosis of the patients, a uni-variate analysis was first performed. Significance was assessed using the Pearson Chi2 test with a p threshold set at 0.05. We then performed a multivariate analysis using a logistic regression model to identify the risk factors. We included in this analysis the variables that had a p-value <0.05 in univariate analysis. Odds Ratios (ORs) with their 95% confidence intervals were estimated to quantify the strength of associations. A significant variable in the analysis was considered a risk factor when its OR was superior to 1. It was considered a protective factor when its OR was inferior to 1. The required approvals were obtained for this study. The information obtained in this survey was kept strictly confidential. The anonymity of the patients was scrupulously respected..

Results

General characteristics of the population

Out of the 4049 patients admitted to SPAR during the period of our study, 372 were included in our study. The mean age of the patients was 42.50 ± 18.60 years with extremes of 18 and 92 years. The most represented age group was 18 to 30 years with a percentage of 32.80%. There were 152 men (40.90%) and 220 women (59.10%), giving a sex ratio of 0.69. Retailers were the most common occupation (34.40%). The majority of patients were from urban areas (79.60%). Most of the patients had no medical coverage (81.70%). Majority of the patients in our study (58.60%) had pathological medical history. Arterial hypertension was the most common history (39.78%). Oligo-anuria was the most common renal functional sign with 39.78% of patients. Anemia was observed in 77.95%. Table 1 shows the general characteristics of patients who presented with renal disease in the ICU of CNHU-HKM from 2015 to 2019.

Incidence of renal injury in the ICU 2015-2019

Out of the 4049 patients admitted to SPAR during the period of our study, 372 were included in our study, representing 9.19% of kidney diseases. The hospital incidences of AKI and CKD in relation to total ICU admissions were 5.93% and 3.26% respectively. Of the 372 patients with kidney disease, 64.52% had AKI and 35.48% had CKD. The urine dipstick was available in only 8.60% of patients. Of these, 87.5% had pathological proteinuria. Of the 240 patients with AKI, 49.17% were at KDIGO3 stage. Out of 132 patients with CKD; 68.18% were in stage 5 (end stage CKD) of chronic kidney disease. Table 2 shows the distribution of patients according to the kidney disease.

Therapeutic aspects

Of the 372 patients in our series, management required blood transfusion in 176 (47.31%), respiratory assistance in 304 (81.72%) patients, vasoactive amines in 194 (52.15%), hydration in 262 (70.40%), surgery in 44 (11.82%) The most represented lengh of hospitalization was between 48h and 72h with a percentage of 37.10% of patients. Table 3 shows the distribution of patients according to treatment in the intensive care unit.

Frequency of hemodialysis use

Hemodialysis was prescribed for 94 patients (25.27%). Among them, 54 patients (57.45%) had actually received hemodialysis sessions. The average delay before the first dialysis session was 16.60 ± 23.60 hours. The vast majority of patients (74.07%) received their first dialysis session within the first 24 hours of the prescription. More than half (51.85%) of the patients who actually used hemodialysis had only one session. Table 4 shows the characteristics of hemodialysis use.

Risk factors for death in patients with renal impairment in the ICU

The mortality rate of our sample was 66.13% of cases, i.e., 246 deaths distributed as follows 152 (40.86%) among cases of AKI and 94 (25.27%) of cases among CKD. Among the causes of death found, respiratory distress, hyperkalemia and septic shock with respectively 17.07%, 11.38% and 7.32% were the most frequent After multivariate analysis by logistic regression, the risk factors for death identified were: use of hemodialysis (p=0.002), use of blood transfusion (p=0.003), use of respiratory assistance (p <0.0001), use of vasoactive amines (p <0.00001).

Table 1. General characteristics of patients with renal disease in the ICU at CNHU-HKM between 2015 and 2019.

Variables	Number (n=372)	Percentage (%)
Male gender	152	40.86
High blood pressure	148	39.78
History of known CKD[1]	46	12.36
Diabetes mellitus	44	11.82
HIV[2]	14	03.76
Sickle cell disease	10	02.69
Oliguria /anuria	148	39.78
Dysuria	34	09.14
Gross hematuria	10	02.69
Burning on urination	12	03.22
Fever	158	42.47
Lower limb edema	56	15.05
Neurological failure	224	60.21
Respiratory failure	148	39.78
Acute pulmonary edema	68	18.27
Dehydration	26	06.98
HELLP[3] syndrom	20	05.37
Hemorrhagic shock	20	05.37
Chronic Glomérulonéphritis	4	01.07

[1]Chronic Kidney Disease; [2]Human Immunodeficiency Virus; [3]Hemolysis Elevated Liver Enzyme Low Platelets Count

Table 2. Distribution of patients according to kidney disease in the intensive care unit at CNHU-HKM between 2015 and 2019.

Variables	Number (n=372)	Percentage (%)
AKI[1]	240	5.93
KDIGO1	50	20.83
KDIGO2	72	30.00
KDIGO3	118	49.17
CKD[2]	132	3.26
Stage 1 : GFR[3] ≥ 90 ml/min/1,73m^2	4	3.03
Stage 2 : GFR=60-89 ml/min/1,73m^2	13	9.85
Stage 3 : GFR =30-59 ml/min/1,73m^2	9	6.82
Stage 4 : GFR =15-29 ml/min/1,73m^2	16	12.12
Stade 5 : GFR : <15 ml/min/1,73m^2	90	68.18
Positive proteinuria	28	07.53
Positive hematuria	10	02.68
Positive nitrituria	10	02.68
Positive leukocyturia	4	01.07

[1]Akute Kidney Injury; [2] Chronic Kidney Disease ; [3]Glomerular Filtration Rate

Table 3. Distribution according to treatment of patients with renal injury in the ICU at CNHU-HKM between 2015 and 2019.

Components	Number (n=372)	Percentage (%)
Red blood cell	116	31.18
Fresh frozen plasma	40	10.75
OTI*+ Mechanical Ventilation	148	39.78
Goggle oxygen therapy/HCM**	128	34.41
Non invasive ventilation	28	7.53
Hydration	262	70.43
Antibiotics	260	69.89
Preventive anticoagulants	244	65.59
Proton pump inhibitors	136	36.56
Diuretics	112	30.11
Anti-hypertensives	100	26.88
Insulin	18	4.84
Anticoagulants at curative dosing	12	3.22
Laparotomy	30	8.06
Obstacle lifting	14	3.76

* Orotrachéale Intubation; **High Concentration Mask

Patients who received hemodialysis or blood product transfusion had a lower risk of death (OR=0.21; CI (95%) : 0.07 - 0.55 and OR=0.35; CI (95%) : 0.16 - 0.69, respectively) while those whose treatment required the use of vasoactive amines had a higher risk of death (OR=25.55; CI (95%) : 12.4 - 57.80). Table 5 shows the risk factors for death.

Discussion

We conducted a retrospective, descriptive and analytical study. The census of all patients with kidney disease in the ICU between January 1st, 2015 and December 31, 2019 was exhaustive.

The operational definition of AKI and CKD was based on the latest recommendations, namely:

- AKI: Increase in creatinine ≥ 26 µmol/L (3 mg/L) in 48h or ≥ 50% in 7 days or diuresis ≤ 0.5 ml/kg/h for 6 to 12 h [11] ;

- CKD: Estimated GFR <60ml/min evolving for more than 3 months [12].

The data analysis was performed by an experienced statistician. All these precautions ensure the validity of the results.

Incidence of kidney damage in the ICU

In our study the frequency of renal impairment was 9.19%. AKI represented 5.93% of admissions and CKD 3.26%. Our results were similar to those of Uchino S, et al. [13] in Brazil in 2005 who found an incidence of 5.7% for AKI through an international and multicenter study concerning patients admitted to intensive care units. Clermont G, et al. [14] in the USA found an incidence of 3.72% for AKI.

Wonnacott A, et al. [15], found among patients admitted to two district general hospitals in the UK, an incidence of AKI of 6.4%, close to our result. Our results are slightly lower than those published by Vigan J, et al. [16] in Benin in 2021 who found a frequency of 11.77% of AKI in a prospective study. Jonny J, et al. [2] reported in 2020 a frequency of AKI of 43% in an intensive care unit in Indonesia.

On the other hand, Aylward RE, et al. [17] in South Africa in 2019 had reported a much higher incidence of AKI than ours 58.5%. This is a prospective study that collected patients admitted in 2017 to the multidisciplinary intensive care unit at Livingstone Hospital.

Akolly E, et al. [18] in Togo in 2019 had reported a much lower incidence equal to 2.40% for AKI in children. Apel M, et al. [19] in 2013 found 1.5% of patients with end-stage CKD in a surgical intensive care unit.

Therapeutic aspects

The most used therapeutics were hydration (70.43%) and antibiotic therapy (69.89%) in our study. These results were close to those reported by

Table 4. Characteristics of hemodialysis use among patients with renal injury in the ICU at CNHU-HKM between 2015 and 2019.

Variables	CKD (%)	AKI (%)	Total (%)
Prescription of HD			
Yes	56 (15.05)	38 (10.22)	94 (25.27)
No	76 (20.43)	202 (54.30)	278 (74.73)
Effective use of HD			
Yes	34 (36.17)	20 (21.28)	54 (57.45)
No	22 (23.40)	18 (19.15)	40 (42.55)
Delay before implementation of HD			
<12h	8 (14.81)	8 (14.81)	16 (29.63)
[12h; 24h]	20 (37.04)	4 (7.41)	24 (44.44)
[24h; 48h]	0 (0.00)	2 (3.70)	2 (3.70)
[48H; 72h]	2 (3.70)	0 (0.00)	2 (3.70)
> 72h	4 (7.41)	6 (11.11)	10 (18.52)

CI= Confidence Interval; ART=Highly Active Anti-Retroviral Therapy; IQR=Interquartile Range

Table 5. Risk factors for death in multivariate analysis of patients with renal injury in the ICU at CNHU-HKM between 2015 and 2019.

	Vital prognosis(%)		ORadjusted [IC (95%)]	p-value
	Favourable	Death		
Effective use of hemodialysis				0.002
No	6 (1 5.0)	34 (85.0)	1	
Yes	24 (44.4)	30 (55.6)	0.21 [0.07 – 0.55]	
Use of blood transfusion				0.003
None	46 (24.5)	142 (75.5)	1	
Red blood cell	48 (42.1)	66 (57.9)	0.35 [0.16 – 0.69]	
FFP[1]	10 (26.3)	28 (73.7)	0.12 [0.35 - 3.65]	
Whole blood	10 (50.0)	10 (50.0)	0.36 [0.08 – 1.65]	
Use of vasoactive amines				<0.00001
No	98 (57.6)	72 (42.4)	1	
Yes	16 (8.4)	174 (91.6)	25.55 [12.4 – 57.80]	
Use of respiratory assistance				<0.0001
None	34 (50.0)	34 (50.0)	1	
Oxygen[2]	52 (40.6)	76 (59.4)	1.73 [0.75 – 4.13]	
OTI + MV[3]	30 (20.3)	118 (79.7)	4.45 [1.86 – 11.09]	
NIV[4]	10 (35.7)	18 (64.3)	6.91 [1.49 – 41.58]	

[1] Fresh Frozen Plasma ; [2] Goggle or High Concentration Mask Oxygen therapy; [3] Orotracheal Intubation + Mechanical Ventilation ; [4]Non-invasive Ventilation

Keita Y [20]. in Dakar who found a frequency of 72% for hydration and 70% for antibiotics. Vigan J, et al. [16] reported a higher use of hydration (84.05%) in patients only suffering from AKI.

The treatment of a large majority of patients in our study (81.72%) required the use of mechanical ventilation. This was 83.90% of patients with AKI and 77.28% of patients with CKD.

These numbers were higher than those reported by Jonny J, et al. [2] in Indonesia in 2020 and Aylward RE, et al. [17] in South Africa in 2019, who found respective frequencies of use of mechanical ventilation of 49.6% and 64.8% for AKI. In patients with CKD, Goswami J, et al. [21] in 2018 found a frequency of use of mechanical ventilation of 57%. Dara SI, et al. [22] in 2004 observed a frequency of use of mechanical ventilation of 28% in patients with end-stage CKD. The high rate that we find can be explained by the late consultation of our populations, the patients arriving in the ICU at an already very advanced stage of their disease requiring the use of heavier therapies.

The treatment of majority of the patients in our study (52.15%) had required the use of vasoactive amines. This was 58.47% of patients with AKI and 44.42% of patients with CKD.

These numbers were higher than those reported by Jonny J, et al. [2] in Indonesia in 2020 and Aylward RE, et al. [17] in South Africa in 2019, who found respective frequencies of use of vasoactive amines of 11% and 38.8% for AKI. Similarly, in patients with end-stage CKD, Dara SI, et al. [22] in 2004 found a frequency of use of vasoactive amines of 8%. On the other hand, Goswami J, et al. [21] in 2018 reported a higher frequency (67%) of use of vasoactive amines. The high rate we found can also be explained by the late use of health facilities by our populations. Uchino S, et al. [13] observed a use of mechanical ventilation in 73.7% and a use of vasoactive amines in 36.8% of patients with end stage CKD.

The use of hemodialysis

In our series, hemodialysis was prescribed in 25.27% of cases. This figure is consistent with that of Jonny J, et al. [2] who reported 24.6%. Masewu A,et al. [23] in Congo and Simour A, et al. [24], in Morocco in 2016, found 24.30% and 28.71% respectively.

Halle MP, et al. [25], in Cameroon in 2015, Thongprayoon C, et al [26]. in 2015 in the USA and Heung M and Yessayan L [27], in 2017 reported 10.10%; 5.7% and 5% respectively as the frequencies of prescription of haemodialysis use. This can be explained by the fact that their samples were larger than ours. On the other hand, Bello BT, et al. [28], in Nigeria in 2016 and Olowu WA, et al. [10], in 2016 found 88.90% and 70% prescriptions respectively. The sample sizes of the latter two studies were smaller.

The use of hemodialysis was effective in 57.45% of the patients for whom it was prescribed, which represents 14.51% of the study population. This result is close to those reported by Masewu A, et al. [23] Skarupskiene I, et al. [29] in Lithuania in 2016 and Aylward RE, et al. [17] in South Africa in 2019 who found 10.85%; 11.07% and 17.71% respectively.

Abosaif Y, et al. [30] in the United Kingdom found a rate of 58% and El Khayat SS, et al. [31] in Morocco found a rate of 40.30%. This can be explained by the availability of equipment and the subsidy of hemodialysis by the western countries health systems, thus facilitating its access to populations.

Halle MP, et al. [25], in Cameroon in 2015 observed 7.3% of use of hemodialysis in internal medicine and intensive care unit of Douala General Hospital.

Risk factors for death

The mortality rate found in this study was 66.13%. It was close to the rate found in the meta analysis conducted by Maoujoud O, et al. in 2014 [32] in resuscitation wards in developing countries, i.e., 68.5%. The studies by Jonny J, et al. [2] Masewu A, et al. [23] and Simour A, et al. [24] conducted in intensive care units, found results close to ours with respectively 58%, 58% and 60% of deaths.

In contrast, the studies by Bello BT, et al. [28], Olowu WA, et al. [10], and Halle MP, et al. [25], which were not conducted in an intensive care units, had lower mortality rates than ours, namely 29.6%, 32% and 44% respectively.

After multivariate analysis by logistic regression, the risk factors for death were: use of hemodialysis (p=0.002), use of blood transfusion (p=0.003), use of mechanical ventilation (p <0.0001), use of vasoactive amines (p <0.00001). Akbaş T, et al. [33] in 2014 showed that the independent predictors of ICU mortality were the use of invasive mechanical ventilation [odds ratio (OR), 14.8; 95% CI, 5.47-40.05; p ≤ 0.001] and the presence of normal renal function prior to ICU admission (OR, 2.8; 95% CI, 1.04-7.37; p = 0.041).

The use of hemodialysis or blood products transfusion appeared to be protective factors for death (OR = 0.21; CI (95%) : 0.07 - 0.55 and OR = 0.35; CI (95%) : 0.16 - 0.69). Waikar S, et al. [34] showed over a period from 1988 to 2002 that mortality decreased steadily in patients with AKI (40.4 to 20.3%; P <0.001) and in those with AKI under dialysis (41.3 to 28.1%; P <0.001). Bello BT, et al. [28] also observed that when dialysis was indicated, patients who were not dialyzed had a higher risk of death (58.3% *vs*. 41.7% [P = 0.02]).

Goswami J, et al. [21] had shown that mortality was significantly high in patients treated with continuous hemodiafiltration compared to patients treated with intermittent hemodialysis [21]. In addition, the use of mechanical ventilation and vasoactive amines was significantly higher in patients who died compared to those who survived (p = 0.001).

In our study, the use of vasoactive amines is a risk factor for death, and patients who received vasoactive amines had more than a 25-fold risk of death (OR = 25.55; CI (95%) : 12.4 - 57.80).

Aylward RE, et al. [17] found, in addition to the use of vasoactive amines (p=0.003) and mechanical ventilation (p=0.003), age (p=0.01), sepsis (p=0.03) and prolonged hospital stay (p=0.004) as risk factors for death in multivariate analysis after adjustment for co-morbidities.

Conclusion

From our study, it appears that almost one tenth of the patients admitted to the ICU between 2015 and 2019 suffered from renal diseases with a clear predominance of AKI. Advanced stages of renal disease were the most recurrent, these were KDIGO stage 3 for AKI and stage 5 for CKD. Hemodialysis was prescribed in a quarter of the cases, but only a portion of the patients had actually benefited from it. However, 74.07% of the patients who were able to effectively access to hemodialysis, benefited from at least one dialysis session in the 24 hours following the prescription. The mortality rate remains high with nearly two thirds of deaths recorded, mainly in patients with AKI. The use of hemodialysis (p=0.002) and blood transfusion (p=0.003) had a protective role against death. The use of respiratory assistance (p <0.0001) and the use of vasoactive amines (p <0.00001) were risk factors for death.

It is important to provide free haemodialysis for patients with kidney disease.

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