Scientific Research Publishing

Predictors of Mortality in Chronic Kidney Disease Patients with Covid-19 in Togo

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Abstract

Background: Coronavirus disease mortality is high in people with chronic kidney disease. **Method:** we present the characteristics and factors associated with mortality of patients hospitalized for Covid-19 and with chronic kidney disease in a descriptive and analytical cross-sectional study of CKD patients admitted to the Lomé Commune Regional Hospital Center (CHR-LC) from March 2020 to August 2021. **Results:** A total of 127 patients met our inclusion criteria. We found a mortality rate of 48.8% in Lomé (Togo). Factors associated with this mortality in our study were severity of Covid-19 (p < 0.0001), length of hospital stay (p < 0.0001), pulse oxygen saturation (p < 0.0014), GFR stage (p = 0.0003), existence of hyperglycemia (p = 0.0036) and use of corticosteroids (p = 0.0336). **Conclusion:** Mortality is very high in CKD patients with Covid-19.

Keywords

Mortality, Covid-19, CKD, Togo

1. Introduction

Coronavirus disease (Covid-19), a declared pandemic since 2020, affects all segments of the population, regardless of the underlying pathologies. Some of these pathologies have been described as risk factors for the occurrence of severe forms of Covid-19 and death [1]. Patients with chronic kidney disease (CKD), especially those receiving renal replacement therapy (dialysis or transplantation), are part of this frail patient population at high risk of severe complications during Covid-19 [2] [3]. Indeed, for different types of infectious diseases, mor-

tality and morbidity rates remain consistently higher in the chronic kidney disease population than in the general population [4]. In the USA, in a multicentric study, mortality was 10% in Covid-19 with CKD [5]. In Brazil, Pio-Abreu finds 27.7% of mortality in hemodialysis patients with Covid-19 [6]. In Sub-Saharan Africa, CKD was recognized as a mortality factor [7]. There is no study about mortality in Covid-19 with CKD in Sub-Sahara Africa. In Togo, after the onset of the pandemic, the activities of the country's nephrologists were more focused on the follow-up and treatment of patients with Covid-19 other than those with kidney disease. In view of the lack of data concerning mortality and its factor in patients Covid-19 with CKD, we have decided to carry out this study. In this single-center national study in Togo, we present the characteristics and factors associated with mortality of patients hospitalized for Covid-19 and with chronic kidney disease.

2. Patients and Methods

This was a descriptive and analytical cross-sectional study of CKD patients admitted to the Lomé Commune Regional Hospital Center (CHR-LC), a national reference center for the care of patients suffering from coronavirus disease (Covid-19). The study period was 18 months from March 2020 to August 2021. The study population was composed of subjects who had been diagnosed positive for Covid-19 by the PCR test from a nasopharyngeal swab. We included all patients hospitalized, aged over 18 and whom presented CKD. Patients with acute kidney injury were excluded. Data were collected from the patients' medical records through the Kobo Toolbox platform, which is the national Covid-19 platform set up to contain all data on Covid-19 positive patients. The variables studied were sociodemographic, clinical and biological parameters.

Definitions:

- The diagnosis of chronic kidney disease (CKD) was classified according to the Kidney Diseases Improving Global Outcomes 2012 criteria [8]. Glomerular Filtration Rate (GFR) was estimated using the Modification of Diet in Renal Disease (MDRD) formula [9];
- Hyperglycemia was defined as a venous glucose level greater than 1.1 g/L;
- Hepatic cytolysis was defined as AST > 40 IU/l.
- Hyperkalemia was defined as kalemia greater than 5.3 mmol/l.
- Anemia was defined as a hemoglobin level below 12 g/dl in women and below 13 g/dl in men.
- Severity criteria for Covid-19: The presentation of the disease can vary from no symptom (asymptomatic patient), to severe pneumonia and death. Symptomatic patients are classified as mild or moderate, severe and critical. Thus we have distinguished 4 clinical presentations according to "Directives nationales de la surveillance et de risposte au Covid-19 de la République Togolaise" [10]:
- Asymptomatic;

- mild or moderate symptomatic;
- severe symptomatic;
- Critical symptomatic.

Data were analyzed using R Studio 2022.02.2-485 software. This involved giving the means, standard deviation, minimum, maximum for quantitative variables and percentages for binary and qualitative variables. Subsequently, a univariate analysis by comparison of groups constituted according to the main judgement criterion was carried out by applying Pearson's Chi 2 test or Fischer's exact test for categorical variables and Student's test for continuous variables. The p-value < 0.05 was defined as the significance threshold. Administrative authorizations were obtained and patient anonymity was respected.

3. Results

A total of 127 patients met our inclusion criteria. The male/female sex ratio was 2.1. The average age was 56 years +/− 17. Patients over 60 years of age were the most represented at 58%. The mean temperature was 37.24°C and 37% had hyperthermia. The mean hemoglobin level was 11.26 g/dl with extremes of 3.9 and 18.40 g/dl. Mean blood glucose was 1.51 g/l with extremes of 0.35 and 4.85 g/l. The mean AST level was 217 IU/l with extremes of 19 and 3970 IU/l. Death occurred in 48.8% of patients. All (100%) patients with a critical stage of Covid-19 had died. Seventy-one-point four percent (71.4%) of patients with end stage of renal disease died and 52.9% of patients who received hemodialysis treatment had died. Table 1 shows that the majority (53.4%) of patients over 60 years old died. There is more patients who died in patients with diabetes, oxygen saturation less than 92% and with critical severity of Covid-19. The other characteristics are described in Table 1.

Table 1. Characteristics of CKD patients with Covid-19 in Lome.

Characteristics	Total		Deceased		Living	
	n	%	n	%	n	%
Age (years) Mean (standard deviation)	56 years (17)		58 years (17)		54 years (17)	
Age range (years)						
≤30	9	7.3	2	22.2	7	78.2
]30 - 60]	57	46	26	45.6	3	54.4
≥60	58	46.8	31	53.4	27	46.6
Sex						
Female	40	31.5	22	55	18	45
Male	85	66.9	39	45.9	46	54.1
Comorbidities						
HTA	61	48	27	44.3	34	55.7
Diabetes	44	34.6	26	59.1	18	40.9

Continued

Obesity	8	6.3	3	37.5	5	62.5
STROKE	12	9.4	6	50	6	50
Cardiopathy	7	5.5	1	14.3	6	85.7
Clinical parameters						
Fever	47	37	25	53.2	22	46.8
Dyspnea	71	55.9	36	50.7	35	49.3
Hypotension	5	4.7	2	40	3	60
SaO$_2$ (%) < 90	44	39.6	30	68.2	14	31.8
Impaired GC	56	44.1	35	62.5	21	37.5
Covid Severity						
Asymptomatic	3	2.4	0	0	3	100
Mild	7	5.5	1	14.3	6	85.7
Moderate	42	33.1	13	31	29	69
Severe	41	32.3	28	68.3	13	31.7
Critical	12	9.4	12	100	0	0
eGFR (ml/min/1.73m^2)						
>90	2	1.6	0	0	2	100
]60 - 90]	22	17.9	5	22.7	17	77.3
]45 - 60]	16	13	4	25	12	75
]30 - 45]	18	14.6	7	38.9	11	61.1
]15 - 30]	23	18.7	12	52.5	11	47.8
≤15	42	34.1	30	71.4	12	28.6
Other parameters						
Hyperglycaemia	22	21.4	16	72,7	6	27.3
Hepatic cytolysis	96	82.1	49	51	47	49
Anaemia	60	50.8	33	55	27	45
Hyperkalaemia	17	12.5	12	70.6	5	29.4
Antibiotics	114	89.8	55	48.2	59	51.8
Corticosteroids	39	30.5	25	64.1	14	35.9
Anticoagulant	88	69.3	47	53.4	41	46.6
Dialysis	17	13.4	9	52.9	8	47.1
Length of hospitalization < 7 days	55	47.4	43	78.2	12	21.8

Stroke: cerebrovascular accident; HTA: high blood pressure; GC: general condition; eGFR: estimated glomerular filtration rate, SaO$_2$: oxygen saturation.

There was a statistically significant difference between mortality and severity of Covid-19 (p < 0.0001), length of hospital stay (p < 0.0001), pulse oxygen saturation (p < 0.0014), GFR stage (p = 0.0003), existence of hyperglycemia (p = 0.0036) and use of corticosteroids (p = 0.0336) as shown in Table 2. Patients

Table 2. Univariate analysis according to the death of CKD patients with Covid-19 in Lomé.

Characteristics	n/N	OR [95% CI]	p-value
Age range			0.2225
≤30	2/9	0.28 [0.04 - 1.18]	
]30 - 60]	26/57	2.93 [0.64 - 20.86]	
≥60	31/58	4.01 [0.88 - 28.54]	
Sex			0.7196
Female	22/40		
Male	39/85	0.84 [0.03 - 21.91]	
Comorbidities			
HTA	27/61	0.70 [0.34 - 1.41]	0.3240
Diabetes	26/44	1.88 [0.90 - 4]	0.0935
Obesity	3/8	0.70 [0.34 - 1.41]	0.7182
STROKE	6/12	1.05 [0.31 - 3.55]	0.9315
Cardiopathy	1/7	0.16 [0 - 0.98]	0.0955
Fever	25/47	1.32 [0.64 - 2.73]	0.4503
Dyspnea	36/71	1.18 [0.58 - 2.40]	0.6323
Hypotension	2/5	0.59 [0.07 - 3.71]	0.6675
Impaired GC	35/56	1.88 [0.78 - 4.60]	0.1667
SaO$_2$	30/44	2.14 [1.15 - 4.16]	0.0014
Covid-19 severity			<0.0001
Asymptomatic	0/3	-	
Mild	1/7	9 [0.21 - 2.52]	
Moderate	13/42	3.29 [1.08 - 2.83]	
Severe	28/41	4.30 [1.44 - 3.77]	
Critical	12/12	9331 [0 - +∞]	
eGFR (ml/min/1.73m^2)			0.0003
> 90	0/2	0.01 [0 - +∞]	
]60 - 90]	5/22	0.43 [0.43 - 1.35]	
]45 - 60]	4/16	0.49 [0.43 - 1.7]	
]30 - 45]	7/18	0.93 [1.03 - 2.92]	
]15 - 30]	12/23	1.60 [0.54 - 1.25]	
≤15	30/42	2.50 [1.33 - 5.07]	
Hyperglycemia	16/22	4.53 [1.67 - 13.80]	0.0036
Hepatic cytolysis	49/96	0.59 [0.19 - 1.70]	0.3395
Anemia	33/60	1.85 [0.89 - 3.90]	0.1018
Hyperkalemia	12/17	0.38 [0.09 - 1.29]	0.1107
Antibiotics	55/114	0.79 [0.24 - 2.54]	0.7750

Continued

Corticosteroids	25/39	2.46 [1.14 - 5.47]	0.0336
Anticoagulant	47/88	1.83 [0.85 - 4.02]	0.1291
Dialysis	9/17	1.20 [0.43 - 3.44]	0.7973
Length of hospitalization < 7 days	43/55	3.58 [1.95 - 7.10]	<0.0001

Stroke: cerebrovascular accident; HTA: high blood pressure; GC: general condition; eGFR: estimated glomerular filtration rate.

with moderate and severe Covid-19 had a higher risk of death with an odd ratio (OR) of 3.29 and 4.3 respectively. Patients with a GFR less than 15 ml/min/1.73m^2 had a higher risk of death with an OR of 2.5 [95% CI = 1.33 - 5.07] and p < 0.0001 (Table 2). A GFR between 30 and 45 ml/min was a protective factor against death (OR = 0.93; 95% CI = 1.03 - 2.92; p < 0.0001); pulse oxygen saturation below 90% was associated with death (OR = 2.14; 95% CI = 1.15 - 4.16: p = 0.0014) (Table 2). Length of hospitalization less than 7 days was associated with death (OR = 3.58; 95% CI = 1.95 - 7.10; p < 0.0001) (Table 2). The majority of patients (66.2%) had moderate to critical Covid-19 severity. No patient with asymptomatic and mild Covid-19 severity had been dialyzed. However, there was no statistically significant difference between Covid-19 severity levels and dialysis or not (p = 0.2585) (Table 2).

4. Discussion

To our knowledge, this is the first ever study in West Africa on predictors of mortality in chronic kidney disease patients admitted for Covid-19. Findings show that severity of Covid-19, oxygen saturation, length of hospital stay, GFR stage, existence of hyperglycemia, and use of corticosteroids were significantly associated with mortality. We reported a death rate of 48.8% of cases. Mortality in CKD patients admitted for Covid-19 is variable in the literature. Abrishami *et al.* [11] found a mortality of 13.15% while Dirim *et al.* [12] in Istanbul reported a mortality of 28.6% in their series. This difference could be explained on the one hand by the difference in the fact that their sample size was small but also by the absence of a cutting-edge technical platform in intensive care in our country. So, in Togo, critical patients were cared for in conventional hospitalization rooms; this could lead to high mortality in patients Covid-19 with CKD in Togo.

Mortality and severity of Covid-19

We found that mortality was associated with the severity of Covid-19 (p < 0.0001). Indeed, since the onset of the Covid-19 pandemic, all patients in general and with CKD in particular have been shaken both psychologically and morally [2] [13]. Patients developed conceptions that coronavirus disease meant the end of the world. Misinformation circulating on social media has worsened patients' mindsets about the disease. A climate of distrust has developed between not only CKD patients and the medical profession, but also with policies based on conspiracy theory [14]. Indeed, for CKD patients, Covid-19 was perceived as caus-

ing more harm than the diseases they were supposed to treat. This climate of mistrust has led people to disbelieve in coronavirus disease and the complications that can arise from it. All these hesitations led to a delay in consultation once the first signs of the disease appeared [15]. The patients were then admitted mostly in critical conditions with a poor prognosis on admission.

Mortality and severity of CKD

In our cohort, mortality was associated with glomerular filtration rate (p = 0.0003). Patients with CKD, during Covid-19, have greater risk of death than those without CKD especially if they develop AKI [16]. Indeed, hospitalization for Covid-19 in patients with CKD was associated with a higher risk of hospitalization in continuing care units and intra-hospital death [4]. A study of over 20,000 patients in UK hospitals found that those with CKD and with SARS-CoV-2 infection had a 28% increased risk of death compared to those without CKD [5]. We did not find a significant relationship between mortality and hemodialysis treatment in our series. Dialysis patients are particularly vulnerable to the risk of severe Covid-19 due to their multiple comorbidities (diabetes, cardiovascular damage, hypertension, etc.) [1] [5] [17]. There is also relative immunosuppression related to dialysis treatment. Finally, the impossibility of carrying out confinement for those requiring hemodialysis in a center in our country, would significantly increase their risk of being infected with SARS-CoV-2 during transport between home and the center and during their dialysis session.

Mortality and comorbidities

We also found that hyperglycemia (p = 0.0036) and the use of corticosteroids (p = 0.0336) were associated with death. The hospital frequency of CKD in Togo is around 93.7% [18] and the patients concerned very often accumulate numerous co-morbidities, the most important of which are diabetes, hypertension and cardiovascular diseases [4]. In addition to this high prevalence of comorbidities, one point worth highlighting that could theoretically increase their risk of contracting a severe form of Covid-19 is their relative immunodepression.

Limitations of the study

One of the main weaknesses of this study is the absence of some data related to the parameters of interest. It should also be noted that the small size of our sample may also influence the results insofar as it did not make it possible to identify potential associations between the variables. The lack of some date made not easy to have multivariate analysis which could be extrapolate.

5. Conclusion

Mortality is very high in CKD patients with Covid-19. Our study conducted in the only reference center for the care of patients with Covid-19 included 127 patients. We found a mortality rate of 48.8% in Lomé (Togo). Factors associated with this mortality in our study were mortality and severity of Covid-19, length of hospital stay, pulse oxygen saturation, GFR stage, existence of hyperglycemia, and use of corticosteroids.

Acknowledgements

We thank the director of the Lomé-Commune Regional Hospital.

Contribution of the Authors

Tsevi Yawovi Mawufemo collected the data and wrote the manuscript

Bawe Lidaw Déassoua carried out the data analysis and wrote the result

Dolaama Badomta provided relevant criticism for the drafting of the research protocol, corrected the manuscript

Tona Komlan Georges participated in the data entry and the correction of the descriptive analysis

Amekoudi Eyram Yoan Makafui reviewed the manuscript in order to provide relevant criticisms concerning the method, the bibliographical review

Djibril Awalou Mohaman participated in the drafting of the protocol, the drafting of the results and the correction of the manuscript.

Ethical Considerations

The authorizations of the medical director of Lomé-Commune Regional Hospital, the National Center for the Care of Covid-19 in Togo, had been obtain. The anonymity of the patients was respected.

Summary at a Glance

The findings of this study demonstrate that the severity of Covid-19, oxygen saturation, length of hospital stay, GFR stage, existence of hyperglycemia, and use of corticosteroids were significantly associated with mortality.

Conflicts of Interest

The authors declare no conflict of interest.

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