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In-hospital mortality and associated factors among patients with cirrhosis in Martinique and Kinshasa: a retrospective comparative cohort study

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In hospital mortality and associated factors among patients with cirrhosis in Martinique and Kinshasa

A retrospective comparative cohort study

Original Article | Hepatology

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Author contributions

Christian NGOY DJUBA: study conception and design, data acquisition and analysis, and manuscript drafting. Christian KISOKA LUSUNSI: data analysis and methodological review. Salvatore METANMO: methodological review. Amélie BIRON: co-supervision. Jean-Robert MAKULO: manuscript review. Antoine TSHIMPI WOLA: co-supervision. Charles MBENDI NLOMBI: supervision. Statistical collaboration: Christian NGOY DJUBA and Christian KISOKA LUSUNSI.

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In hospital mortality and associated factors among patients with cirrhosis in Martinique and Kinshasa

A retrospective comparative cohort study

Abstract

Background and objectives: We compared in-hospital mortality and associated factors among patients with cirrhosis at Martinique University Hospital (CHUM), France, and the University Clinics of Kinshasa (CUK), Democratic Republic of the Congo.

Methods: This retrospective cohort included adults hospitalised during 2019–2024 at CHUM and 2019–2025 at CUK. One selected admission per patient was analysed. Mortality proportions, Kaplan–Meier estimates, cumulative incidence with discharge alive as a competing event, and exploratory centre-specific Cox models were examined.

Results: Among 404 patients, 302 were treated at CHUM and 102 at CUK. Patients at CHUM were older and had more comorbidities. Alcohol-related cirrhosis predominated at CHUM; viral hepatitis and undetermined aetiologies were more frequent at CUK. Mortality was 42.1% versus 42.2% (absolute difference 0.1 percentage points, 95% confidence interval [CI] −10.6 to 11.2; p = 0.985). Day-28 cumulative mortality was 36.1% versus 37.3%. At CHUM, chronic kidney disease (adjusted hazard ratio [aHR] 2.06, 95% CI 1.34–3.15), pneumonia (aHR 2.04, 95% CI 1.21–3.43) and Child–Pugh C versus A (aHR 3.44, 95% CI 1.14–10.38) were associated with death. At CUK, hepatic encephalopathy retained an adjusted association (aHR 3.81, 95% CI 1.42–10.20).

Conclusions: Mortality was high in both centres, without a statistically significant difference in proportions. The findings support early evaluation of hepatic severity, renal function, infection and neurological status.

Keywords: cirrhosis; in-hospital mortality; chronic kidney disease; hepatic encephalopathy; Martinique; Kinshasa.

Introduction

Cirrhosis is an advanced stage of chronic liver disease characterised by diffuse fibrosis, regenerative nodules and distortion of the hepatic architecture [1, 2]. Its clinical course is shaped by hepatic insufficiency and portal hypertension, with ascites, variceal bleeding, hepatic encephalopathy, infection and hepatocellular carcinoma representing major prognostic events. Progression from compensated to decompensated disease marks a substantial deterioration in survival [3, 4]. Cirrhosis also accounts for a considerable burden of mortality and healthcare utilisation worldwide [5, 6].

The epidemiology of cirrhosis varies across geographical settings. Alcohol-related liver disease, chronic viral hepatitis and metabolic liver disease contribute in differing proportions to the populations requiring hospital care [7, 8]. In French hospital practice, alcohol is frequently implicated, as illustrated by a multicentre survey of general hospitals [9]. In sub-Saharan Africa, chronic hepatitis B remains a major cause of cirrhosis and hepatocellular carcinoma [10]. Hospital-based studies from West and Central Africa, including Kinshasa, document the prognostic importance of hepatic severity and decompensation [11, 12, 13].

Hospital outcomes depend on both hepatic reserve and the acute clinical episode. Renal dysfunction, infection and organ failure may precipitate deterioration, including acute-on-chronic

liver failure (ACLF) [4, 14]. These relationships make it useful to examine comorbidity, complications and liver disease severity together when describing in-hospital mortality. The timing of death also provides information beyond the final proportion of patients who die. Because discharge alive precludes subsequent in-hospital death during the selected admission, competing-event analyses complement conventional survival estimates [15].

We therefore compared in-hospital mortality among adults with cirrhosis at Martinique University Hospital (CHUM) and the Department of Internal Medicine of the University Clinics of Kinshasa (CUK). Secondary objectives were to describe differences in patient profiles, identify factors associated with death within each centre, characterise documented circumstances of death and examine time to in-hospital death.

Methods

Study design and setting

We conducted a retrospective comparative cohort study in two university hospital settings: CHUM in Martinique, France, and the Department of Internal Medicine at CUK in Kinshasa, Democratic Republic of the Congo. The inclusion periods were 1 January 2019 to 31 December 2024 at CHUM and 1 January 2019 to 31 December 2025 at CUK. The additional year at CUK was included to increase the sample size available from the archives.

Participants and case ascertainment

Eligible patients were aged at least 18 years and had been hospitalised with cirrhosis recorded as a primary or associated diagnosis. Cirrhosis was established from the medical record using concordant clinical, laboratory and radiological findings consistent with advanced chronic liver disease. Histological confirmation was not mandatory when non-invasive findings were

concordant [2, 16]. Records were excluded when cirrhosis had been ruled out and/or the variables required for the study were unavailable.

At CHUM, potentially eligible records were identified through the French hospital discharge information system, the Programme de médicalisation des systèmes d'information (PMSI), followed by manual review of paper and electronic records. At CUK, all accessible paper records meeting the eligibility criteria were included. Data were extracted manually into Excel databases. One observation was retained per patient, corresponding to the admission designated as the last hospital stay in the database. The admission and discharge dates of that stay defined follow-up. Study size was determined by the eligible records available. Separate centre-specific analyses and common-period sensitivity analyses addressed differences between the populations and observation periods.

Variables and outcomes

Data included age, sex, comorbidities, cirrhosis aetiology, Child–Pugh class, complications, admission and discharge dates, vital status at discharge and recorded causes or circumstances of death. Complications were recorded over the entire admission, encompassing both those present initially and those documented subsequently. Diagnoses were those entered in the clinical records. Alcohol-related aetiology was based on the documented clinical attribution, and aetiological categories were non-exclusive to accommodate coexisting causes.

The primary outcome was all-cause death during the selected hospital admission. Mortality was expressed as the number of deaths divided by the number of included patients at each centre. Secondary outcomes included time from admission to death, associations between recorded clinical characteristics and death, and documented circumstances of death. Circumstances of

death were assessed only among deceased patients and were classified into non-exclusive categories; they were distinct from the occurrence of a complication anywhere during admission.

Statistical analysis

Continuous variables were summarised as mean ± standard deviation or median and interquartile range. Welch t tests compared mean age. Categorical comparisons used Pearson chi-squared or two-sided Fisher exact tests; the Fisher–Freeman–Halton test compared Child–Pugh distributions at CUK. Mortality proportions used Wilson 95% confidence intervals (CIs), and absolute differences used Newcombe CIs. Two-sided $p < 0.05$ defined statistical significance; no multiplicity adjustment was applied.

Kaplan–Meier analysis censored discharge alive and used log-rank comparisons. Aalen–Johansen cumulative incidence treated discharge alive as a competing event at days 7, 14 and 28 [15]. With all outcomes recorded and no administrative censoring, cumulative incidence equalled observed events divided by initial cohort size. Sixteen same-day admissions were assigned 0.5 days. Centre-specific Cox models used Breslow ties and Wald CIs; age was expressed per 10 years, with Child–Pugh B and C entered separately against A. Extended models contained 12 coefficients at CHUM and seven at CUK. Reduced models included age, sex, chronic kidney disease and Child–Pugh class. Complete-case analyses and proportional-hazards checks were performed. Technical details and sensitivity analyses appear in the Supplementary Methods.

Ethics

The protocol and retrospective use of clinical records were approved by the ethics committees of CHUM and the Kinshasa School of Public Health. The CHUM approval reference reported in the study documents is IRB 2025/040. Data were anonymised before analysis and handled

confidentially. Under the framework approved by both committees, no individual non-objection procedure was required.

Results

Study population and baseline characteristics

At CHUM, 542 records were reviewed and 302 patients were included; 240 records were not retained because cirrhosis had been ruled out and/or required variables were unavailable. At CUK, 102 eligible records were included, yielding a total cohort of 404 patients. Mean age was 62.43 ± 14.18 years, and 308 patients (76.2%) were men.

Patients at CHUM were older than those at CUK (65.27 ± 12.04 versus 54.01 ± 16.56 years; $p < 0.001$) and more frequently male (80.5% versus 63.7%; $p < 0.001$). Hypertension, diabetes, cardiovascular disease and chronic kidney disease were more frequent at CHUM. Child–Pugh class C accounted for 52.6% of patients at CHUM and 42.2% at CUK, while class A accounted for 13.6% and 3.9%, respectively; the overall distribution differed between centres ($p < 0.001$).

Alcohol-related cirrhosis predominated at CHUM (77.2% versus 21.6%). Hepatitis B (27.5% versus 6.0%), hepatitis C (16.7% versus 8.9%) and undetermined aetiology (35.3% versus 5.6%) were more frequent at CUK. Baseline characteristics are presented in Table 1; detailed comparisons by discharge status are provided in Supplementary Tables S1 and S2.

In hospital mortality and timing of outcomes

Overall, 170 of 404 patients died during admission, corresponding to mortality of 42.1% (95% CI 37.4–46.9). Mortality was 42.1% at CHUM (127/302; 95% CI 36.6–47.7) and 42.2% at CUK (43/102; 95% CI 33.0–51.9). The absolute difference for CUK minus CHUM was 0.1 percentage

points (95% CI −10.6 to 11.2; p = 0.985). The crude ratio of mortality proportions was 1.00 (95% CI 0.77–1.30). Discharge alive was recorded for 175 patients at CHUM and 59 at CUK.

Median observed length of stay was 8 days (IQR 3–16) at CHUM and 12 days (IQR 5–22) at CUK. Kaplan–Meier median survival, with discharge alive censored, was 19 days (95% CI 17–28) and 24 days (95% CI 18–70), respectively. The log-rank test indicated a difference between curves ($\chi^2 = 4.92$; p = 0.027). Restricted mean Kaplan–Meier survival through day 28 was 18.21 days at CHUM and 19.57 days at CUK.

With discharge alive treated as a competing event, day-28 cumulative mortality was 36.1% at CHUM (109/302; 95% CI 30.9–41.7) and 37.3% at CUK (38/102; 95% CI 28.5–46.9). The absolute difference was 1.2 percentage points (95% CI −9.2 to 12.2; p = 0.833). By day 28, cumulative discharge alive was 54.3% and 47.1%, respectively; 29 patients at CHUM and 16 at CUK remained hospitalised after that day. Selected cumulative-incidence estimates are shown in Supplementary Table S3 and Figure 1.

Clinical characteristics by discharge status

At CHUM, chronic kidney disease was more frequent among patients who died than among those discharged alive (73.2% versus 32.6%; p < 0.001). Mean age did not differ significantly by discharge status (66.6 ± 12.7 versus 64.3 ± 11.5 years; p = 0.115). At CUK, patients who died were older (59.5 ± 15.0 versus 50.0 ± 16.6 years; p = 0.003) and more frequently had chronic kidney disease (27.9% versus 5.1%; p = 0.001).

Child–Pugh class C was more frequent among patients who died in both centres: 74.0% versus 37.1% at CHUM and 69.8% versus 22.0% at CUK. The distributions across all three classes differed by discharge status in each centre (both p < 0.001). No aetiological category differed

significantly by discharge status at CHUM. At CUK, undetermined aetiology was less frequent among patients who died than among survivors (18.6% versus 47.5%; p = 0.003).

Ascites was the most common complication at both centres, affecting 65.2% of patients at CHUM and 92.2% at CUK. At CHUM, patients who died more frequently had variceal bleeding, hepatocellular carcinoma, sepsis or septic shock, ascites, pneumonia, pulmonary embolism, hepatic encephalopathy and hepatorenal syndrome. At CUK, hepatic encephalopathy was particularly frequent among patients who died (83.7% versus 18.6%; p < 0.001); the other recorded complications did not differ significantly by discharge status (Table 2).

Factors associated with in hospital death

The CHUM extended Cox model included 302 patients and 127 deaths. Chronic kidney disease (aHR 2.06, 95% CI 1.34–3.15; p < 0.001), pneumonia (aHR 2.04, 95% CI 1.21–3.43; p = 0.008) and Child–Pugh class C versus A (aHR 3.44, 95% CI 1.14–10.38; p = 0.028) retained adjusted associations with death. The global proportional-hazards test yielded p = 0.921 (Table 3).

The CUK model included 102 patients and 43 deaths. Hepatic encephalopathy retained an adjusted association with death (aHR 3.81, 95% CI 1.42–10.20; p = 0.008). The adjusted estimates for Child–Pugh classes B and C versus A were 0.20 (95% CI 0.02–1.77; p = 0.147) and 0.31 (95% CI 0.03–2.93; p = 0.306), respectively. Four patients at CUK were classified as Child–Pugh A, including one who died. The global proportional-hazards test yielded p = 0.381 (Table 4).

Reduced models and sensitivity analyses are presented in Supplementary Tables S4–S6. The principal adjusted associations were similar with Efron handling of ties and after exclusion of same-day admissions or records with chronological differences. In the common 2019–2024 period, CUK contributed 64 patients and 26 deaths (40.6%); the comparison of mortality

proportions yielded p = 0.833 and the log-rank comparison p = 0.012. No values were missing for the variables included in the principal tables and models; additional data characteristics are summarised in Supplementary Table S7.

Recorded circumstances of death

Complications of cirrhosis were documented among the circumstances of death in 67 of 127 deceased patients at CHUM (52.8%) and 41 of 43 at CUK (95.3%). Hepatic encephalopathy was recorded in 24.4% and 76.7%, variceal bleeding in 22.0% and 20.9%, and ascitic fluid infection in 6.3% and 25.6%, respectively. Cancer of any recorded type was mentioned in 22.8% at CHUM and 27.9% at CUK (Table 5). At least two broad categories were recorded for 37 deaths at CHUM and 16 at CUK, counting the overall cirrhosis-complication indicator once.

Discussion

This comparative cohort documents substantial in-hospital mortality among patients with cirrhosis in Martinique and Kinshasa. Approximately two in five patients died during the selected admission in each centre. Mortality proportions and day-28 cumulative mortality were close, despite pronounced differences in age, comorbidity burden and aetiological distribution. The centre-specific analyses identified chronic kidney disease, pneumonia and advanced Child–Pugh class at CHUM, and hepatic encephalopathy at CUK, as characteristics associated with death after adjustment.

The different aetiological profiles support locally adapted prevention: integrated alcohol-related care at CHUM, and viral hepatitis screening, vaccination and antiviral access at CUK [10, 9, 13].

Chronic kidney disease was associated with in-hospital death at CHUM in both the extended and reduced models. It was present in nearly three-quarters of deceased patients at that centre.

Reduced renal reserve may become clinically important during infection, bleeding or haemodynamic disturbance in cirrhosis. The ADQI–ICA consensus describes the close interaction between circulatory dysfunction, inflammation and acute kidney injury, and highlights early recognition and management tailored to the underlying cause [17]. Our findings place the assessment of chronic renal disease alongside the evaluation of hepatic severity when characterising the hospital prognosis.

Pneumonia was also associated with mortality at CHUM after adjustment. Bacterial infection may precipitate acute decompensation and organ failure in advanced cirrhosis. Arvaniti and colleagues reported a marked association between infection and mortality in cirrhotic populations, while Hung and colleagues described high mortality in patients with cirrhosis, ascites and pneumonia [18, 19]. The present findings support systematic attention to respiratory infection during admission, in conjunction with the broader evaluation of infection and organ dysfunction recommended for decompensated cirrhosis [4, 14].

At CUK, hepatic encephalopathy was strongly represented among deceased patients and remained associated with death in the extended model. Its clinical importance extends beyond neurological manifestations alone. Infection, gastrointestinal bleeding, electrolyte disturbances and renal dysfunction can accompany or precipitate encephalopathy and require coordinated assessment. EASL guidance emphasises the identification and treatment of precipitating factors as part of its management [20]. The prominence of encephalopathy in this cohort therefore supports close neurological surveillance and a structured search for associated clinical disturbances.

Child–Pugh class C was more frequent among deceased patients in both centres and retained an adjusted association at CHUM. At CUK, the adjusted comparison against class A was not

statistically significant, while the descriptive association between advanced class and discharge status remained apparent. The reference category comprised only four CUK patients. Child–Pugh assessment remains clinically accessible and captures complementary laboratory and clinical dimensions of hepatic dysfunction. African cohort evidence and comparative reviews of Child–Pugh and MELD support the prognostic relevance of structured severity assessment [12, 21, 22]. Such assessment can be combined with renal, infectious and neurological evaluation rather than interpreted in isolation.

The time-to-event analyses add a distinct perspective to the comparison. Kaplan–Meier curves differed by log-rank testing, with shorter estimated median survival at CHUM, while the final mortality proportions and day-28 cumulative incidences were close. These measures address different aspects of hospital outcomes. Kaplan–Meier analysis censored discharge alive, whereas cumulative incidence incorporated it as a competing event. Consequently, the Kaplan–Meier estimates describe survival under their censoring framework and should be read alongside the observed probability of death before discharge [15]. The competing-event results provide a common-horizon description of mortality and discharge patterns in the two hospitals.

The recorded circumstances of death further illustrate the range of terminal clinical events. Cirrhosis-related complications, encephalopathy and ascitic fluid infection were more frequently mentioned at CUK, while variceal bleeding was recorded at similar proportions in both centres. Multiple conditions could coexist, including cancer and infection. These categories describe documented circumstances of the terminal episode and do not constitute mutually exclusive, adjudicated underlying causes of death.

Strengths and limitations

The study combines two geographically distinct hospital populations and provides detailed clinical information for 404 patients. Separate centre-specific analyses preserve the characteristics of each population, while mortality proportions, cause-specific Cox models and competing-event estimates provide complementary descriptions of outcome. Sensitivity analyses further describe the consistency of the principal associations.

The retrospective design reflects the information available in clinical records. Sample sizes and inclusion periods differed between centres, and the precise onset of complications, timing of Child–Pugh assessment and outcomes after transfer were not systematically available. Complications recorded over the entire stay were analysed as fixed characteristics, so their associations do not establish that they preceded clinical deterioration or represent causal effects. Some categories were small, particularly Child–Pugh A at CUK. The absence of a statistically significant mortality difference does not establish equivalence between centres. The findings apply to the selected hospital admissions, and prospective multicentre follow-up with common definitions and assessment times would extend this comparison.

Conclusions

In-hospital mortality among patients with cirrhosis was high at both CHUM and CUK, with no statistically significant difference in mortality proportions. The populations differed substantially in age, aetiology and comorbidity burden. Chronic kidney disease, pneumonia and Child–Pugh class C were associated with death after adjustment at CHUM, while hepatic encephalopathy retained an adjusted association at CUK. These findings support early, repeated evaluation of hepatic severity, renal function, infection and neurological status, together with prevention and treatment adapted to the clinical profiles encountered in each centre.

Declarations

Funding: This study received no funding.

Competing interests: No competing interests relating to this work were declared.

Data availability: Individual-level data are not publicly available because of confidentiality. Any sharing is subject to ethical and institutional authorisations and patient protection.

Ethical approval and consent: Approval was granted by the ethics committees of CHUM (IRB 2025/040) and the Kinshasa School of Public Health. Records were anonymised before analysis. No individual non-objection procedure was required under the approved framework.

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Table 1 Baseline characteristics

Characteristic	Overall (n = 404)	CHUM (n = 302)	CUK (n = 102)	p
Age, years, mean ± SD	62.43 ± 14.18	65.27 ± 12.04	54.01 ± 16.56	< 0.001
Sex				< 0.001
Men	308 (76.2)	243 (80.5)	65 (63.7)	
Women	96 (23.8)	59 (19.5)	37 (36.3)	
Comorbidities				
Hypertension	131 (32.4)	114 (37.7)	17 (16.7)	< 0.001
Diabetes mellitus	109 (27.0)	94 (31.1)	15 (14.7)	0.001
Cardiovascular disease	57 (14.1)	52 (17.2)	5 (4.9)	0.002
Chronic kidney disease	165 (40.8)	150 (49.7)	15 (14.7)	< 0.001
Child–Pugh class				< 0.001
Class A	45 (11.1)	41 (13.6)	4 (3.9)	
Class B	157 (38.9)	102 (33.8)	55 (53.9)	
Class C	202 (50.0)	159 (52.6)	43 (42.2)	
Aetiologies				
Alcohol-related cirrhosis	255 (63.1)	233 (77.2)	22 (21.6)	< 0.001
Hepatitis B	46 (11.4)	18 (6.0)	28 (27.5)	< 0.001
Hepatitis C	44 (10.9)	27 (8.9)	17 (16.7)	0.030
Autoimmune	13 (3.2)	13 (4.3)	0 (0.0)	0.045 *
Biliary	17 (4.2)	17 (5.6)	0 (0.0)	0.009 *
Undetermined (cryptogenic)	53 (13.1)	17 (5.6)	36 (35.3)	< 0.001
Mixed	39 (9.7)	36 (11.9)	3 (2.9)	0.008
Other recorded aetiology	18 (4.5)	16 (5.3)	2 (2.0)	0.264 *

Values are n (%) unless otherwise stated. SD, standard deviation. Welch t test for age; Pearson chi-squared or Fisher exact tests (asterisk) for categorical variables. Aetiologies are non-exclusive. CHUM, Martinique University Hospital; CUK, University Clinics of Kinshasa.

Table 2 Complications by discharge status CHUM

Characteristic	Total (n = 302)	Discharged alive (n = 175)	Died (n = 127)	p
Variceal bleeding	68 (22.5)	27 (15.4)	41 (32.3)	< 0.001
Hepatocellular carcinoma	42 (13.9)	17 (9.7)	25 (19.7)	0.013
Sepsis or septic shock	36 (11.9)	6 (3.4)	30 (23.6)	< 0.001
Ascites	197 (65.2)	99 (56.6)	98 (77.2)	< 0.001
Pneumonia	25 (8.3)	7 (4.0)	18 (14.2)	0.002
Pulmonary embolism	13 (4.3)	1 (0.6)	12 (9.4)	< 0.001
Hepatic encephalopathy	126 (41.7)	47 (26.9)	79 (62.2)	< 0.001
Hepatorenal syndrome	20 (6.6)	5 (2.9)	15 (11.8)	0.002

Values are n (%) unless otherwise stated. Within-centre comparisons use two-sided Pearson chi-squared or Fisher exact tests (asterisk). Complications may coexist. Sepsis and septic shock were recorded together. Initial and incident complications were grouped.

Table 2 Complications by discharge status CUK

Characteristic	Total (n = 102)	Discharged alive (n = 59)	Died (n = 43)	p
Variceal bleeding	20 (19.6)	9 (15.3)	11 (25.6)	0.195
Hepatocellular carcinoma	37 (36.3)	22 (37.3)	15 (34.9)	0.803
Sepsis or septic shock	4 (3.9)	1 (1.7)	3 (7.0)	0.307 *
Ascites	94 (92.2)	53 (89.8)	41 (95.3)	0.462 *
Pneumonia	5 (4.9)	2 (3.4)	3 (7.0)	0.648 *
Pulmonary embolism	1 (1.0)	1 (1.7)	0 (0.0)	1.000 *
Hepatic encephalopathy	47 (46.1)	11 (18.6)	36 (83.7)	< 0.001
Hepatorenal syndrome	4 (3.9)	1 (1.7)	3 (7.0)	0.307 *

Values are n (%) unless otherwise stated. Within-centre comparisons use two-sided Pearson chi-squared or Fisher exact tests (asterisk). Complications may coexist. Sepsis and septic shock were recorded together. Initial and incident complications were grouped.

Table 3 Associations with in hospital death at CHUM

Variable	Unadjusted HR (95% CI)	p	Adjusted HR (95% CI)	p
Chronic kidney disease	2.61 (1.75–3.89)	<0.001	2.06 (1.34–3.15)	<0.001
HCV-related cirrhosis	2.19 (1.27–3.80)	0.005	1.57 (0.84–2.95)	0.155
Hepatic encephalopathy	1.93 (1.35–2.77)	<0.001	1.19 (0.75–1.88)	0.463
Portal vein thrombosis	1.79 (1.07–2.99)	0.025	1.73 (0.95–3.18)	0.075
Variceal bleeding	1.80 (1.24–2.61)	0.002	1.25 (0.83–1.88)	0.288
Hepatocellular carcinoma	1.75 (1.13–2.72)	0.012	1.58 (0.89–2.81)	0.117
Sepsis or septic shock	1.75 (1.16–2.65)	0.008	1.07 (0.68–1.68)	0.759
Ascites	1.59 (1.05–2.42)	0.029	0.81 (0.50–1.31)	0.393
Pneumonia	2.06 (1.25–3.40)	0.005	2.04 (1.21–3.43)	0.008
Child–Pugh B versus A	1.97 (0.69–5.62)	0.204	1.63 (0.55–4.79)	0.378
Child–Pugh C versus A	4.40 (1.62–11.98)	0.004	3.44 (1.14–10.38)	0.028
Chronic smoking	1.67 (1.11–2.51)	0.014	1.29 (0.83–2.02)	0.257

HR, hazard ratio; CI, confidence interval. Extended model: 302 patients, 127 deaths and 12 coefficients. All listed covariates were included simultaneously. Child–Pugh A was the reference. Breslow ties and Wald inference were used. Complications were recorded during admission. Discharge alive was censored.

Table 4 Associations with in hospital death at CUK

Variable	Unadjusted HR (95% CI)	p	Adjusted HR (95% CI)	p
Age, per 10 years	1.33 (1.10–1.61)	0.003	1.17 (0.94–1.46)	0.161
Chronic kidney disease	3.78 (1.89–7.55)	<0.001	1.55 (0.73–3.30)	0.257
Chronic smoking	2.37 (1.03–5.44)	0.042	1.55 (0.59–4.07)	0.370
Alcohol-related cirrhosis	2.63 (1.32–5.26)	0.006	1.64 (0.75–3.63)	0.218
Hepatic encephalopathy	5.87 (2.60–13.25)	<0.001	3.81 (1.42–10.20)	0.008
Child–Pugh B versus A	0.37 (0.05–2.91)	0.345	0.20 (0.02–1.77)	0.147
Child–Pugh C versus A	1.24 (0.17–9.20)	0.835	0.31 (0.03–2.93)	0.306

HR, hazard ratio; CI, confidence interval. Extended model: 102 patients, 43 deaths and 7 coefficients. All listed covariates were included simultaneously. Child–Pugh A was the reference. Breslow ties and Wald inference were used. Complications were recorded during admission. Discharge alive was censored.

Table 5 Recorded causes or circumstances of death

Recorded cause or circumstance	CHUM n/127 (%)	CUK n/43 (%)	Missing CHUM / CUK
Cirrhosis complications, overall indicator	67 (52.8)	41 (95.3)	0 / 0
Variceal bleeding	28 (22.0)	9 (20.9)	0 / 0
Hepatic encephalopathy	31 (24.4)	33 (76.7)	0 / 0
Hepatorenal syndrome	9 (7.1)	3 (7.0)	0 / 0
ACLF	22 (17.3)	5 (11.6)	0 / 0
Ascitic fluid infection	8 (6.3)	11 (25.6)	0 / 0
Cancer, any recorded type	29 (22.8)	12 (27.9)	0 / 0
Sepsis or septic shock	27 (21.3)	4 (9.3)	0 / 0
Postoperative course	1 (0.8)	0 (0.0)	0 / 0
Respiratory distress	15 (11.8)	1 (2.3)	0 / 0
Other recorded causes (non-zero code)	25 (19.7)	3 (7.0)	0 / 0

Denominators: 127 deaths at CHUM and 43 at CUK. Categories are non-exclusive and may overlap with the overall cirrhosis-complication indicator. Cancer includes any recorded tumour type. ACLF, acute-on-chronic liver failure.

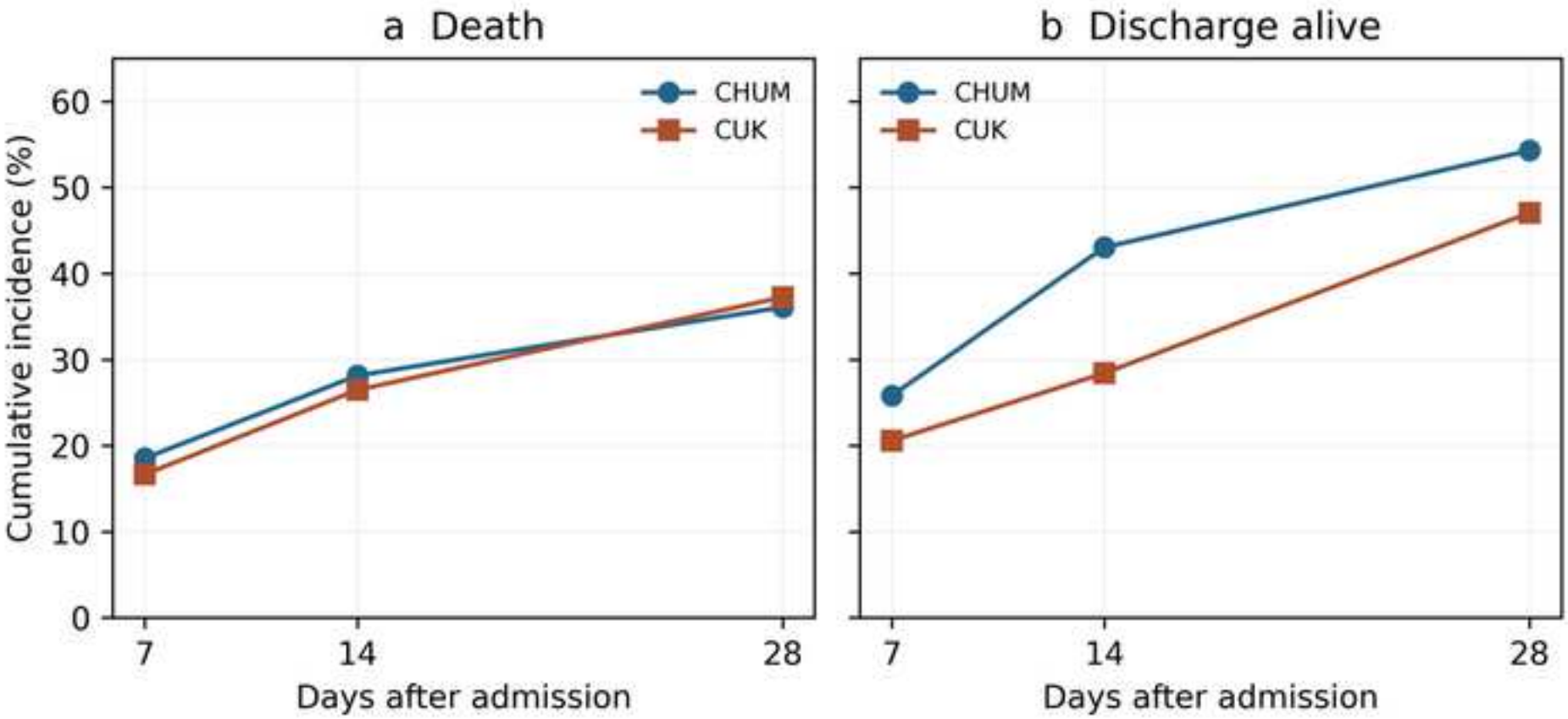
Figure legends

Figure 1. Cumulative incidence of death (a) and discharge alive (b) at days 7, 14 and 28. Outcomes were competing events. Points reproduce the day-specific estimates in Supplementary Table S3; connecting lines are visual guides, not the full event-time step functions. Prepared using Matplotlib from the numerical results of the dissertation.

Figure 2. Graphical abstract summarising the retrospective cohort, hospital mortality and principal adjusted associations. This online-only graphical abstract is supplied separately.

Figure

Figure 1. Cumulative incidence of in-hospital events



(a) Death; (b) discharge alive. CHUM: Martinique; CUK: Kinshasa.

Supplementary Files

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- 04IJGSupplementaryInformation1.docx