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ORIGINAL RESEARCH

Factors associated with mortality in cirrhosis: data from a hospital cohort in Burkina Faso

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Objective: This study aimed to determine the factors associated with mortality in cirrhotic patients hospitalised in the Hepato-Gastroenterology Department of the Sourô Sanou University Hospital Centre in Bobo-Dioulasso.

Materials and methods: This retrospective cohort study was based on the usable records of cirrhotic patients hospitalised in the Hepato-Gastroenterology Department of the Sourô Sanou University Hospital Centre in Bobo-Dioulasso from 1 January 2023 to 31 December 2024. The variables collected were sociodemographic, clinical, and biological. The search for associated factors used logistic regression. The significance threshold for the *p*-value was 5% for statistical analyses.

Results: We included 293 patients, with a mean age of 49.3 ± 14.9 years. The sex ratio was 2.4. Abdominal pain (63.4%) and distension (40.1%) were the most common reasons for admission. The most frequent clinical signs were asthenia (96.6%), anorexia (87.3%), and hepatomegaly (71.1%). Liver failure affected 88.4% of patients. Viral hepatitis B was the predominant aetiology (66.9%). The mortality rate for cirrhosis was 41.6%. After multivariate analysis, the factors associated with mortality were urban residence (adjusted odds ratio [aOR] 3.1, 95% confidence interval [CI] 1.5 to 6.6), anorexia (aOR 4.6, 95% CI 1.4 to 15.2), hyperleucocytosis (aOR 2.7, 95% CI 1.3 to 5.3), hepatic encephalopathy (aOR 6.5, 95% CI 3.1 to 13.4), and ascitic fluid infection (aOR 3.4, 95% CI 1.21 to 9.3).

Conclusion: The mortality rate from cirrhosis remains high in our context. Most of the factors associated with mortality often result from late diagnosis and treatment.

Keywords: cirrhosis, associated factors, mortality, viral hepatitis, Burkina Faso

Introduction

Cirrhosis is the ultimate outcome and one of the most feared complications of chronic liver disease.[1] It is one of the major public health problems worldwide due to its high morbidity and mortality rates.[2] Globally, the number of incident cases of cirrhosis was estimated at 58 417 006 in 2021.[3] Its aetiologies are numerous and varied, depending on the region. The most common causes of cirrhosis worldwide are infection with hepatitis B virus (HBV) and hepatitis C virus (HCV), alcoholic liver disease, metabolic steatopathy, and haemochromatosis. A variety of other, less common diseases can also be causative. In sub-Saharan Africa, the most common identified causes are HBV (48.9–55%), alcohol (13%), and HCV (6–7.8%), with unknown causes in 22% of cases.[4]

Cirrhosis is a condition that is often pauci- or asymptomatic at onset, which is why it is often diagnosed at the stage of complications.[5] It is said to be decompensated when it presents with ascites, gastrointestinal haemorrhage, jaundice, or hepatic encephalopathy (HE).[6] Its complications are potentially serious, adversely affecting its natural history and leading to high mortality.[7] In 2023, cirrhosis and chronic liver disease were among the 10 leading causes of death in Africa, South-East Asia, Europe, and the eastern Mediterranean. Globally, the number of deaths related to cirrhosis was estimated at 1 425 142 in 2021.[3] While epidemiological data are well known in developed countries, data in Africa are sparse.[8]

The prognosis for patients with cirrhosis depends on several factors.[5] In Burkina Faso, cirrhosis is the most common hepatobiliary disease and constitutes a major public health problem due to its high mortality rate.[9] Several descriptive studies have examined the sociodemographic, clinical, and paraclinical profiles of cirrhotic patients, as well as the causes of cirrhosis.[10-12] However, few analytical studies have been conducted on the factors associated with mortality in cirrhotic patients in our daily practice. Hence, this study aims to determine the factors associated with mortality in cirrhotic patients in the Hepato-Gastroenterology (HGE) Department of the Sourô Sanou University Hospital Centre (SSUHC) to improve patient care and prognosis.

Materials and methods

Study setting

Our study was conducted in the HGE of the SSUHC in Bobo-Dioulasso, a third-level national referral hospital covering the main health regions of Hauts-Bassins, Cascades, Boucle du Mouhoun, and Sud-Ouest.

Study type and period

This was a retrospective cohort study conducted over 24 months, from 1 January 2023 to 31 December 2024.

Study population and sampling

Patients hospitalised for a digestive disorder in the HGE Department of the SSUHC constituted the target population. The source population consisted of those who had been admitted for cirrhosis. A consecutive census was conducted. All patients aged above 15 years, hospitalised in the HGE Department, who had been diagnosed with cirrhosis based on clinical and/or paraclinical diagnostic criteria, and whose medical records were available for analysis, were included in our study.

Study variables

The variables studied were sociodemographic (age, gender, area of residence, occupation), clinical (reason for admission, history/comorbidities, lifestyle, general and physical signs), biological (presence of hepatocellular failure, cytolysis, cholestasis or renal failure, platelet count, haemoglobin, white blood cell count, alpha-fetoprotein, hepatitis B surface antigen [HBsAg], total anti-hepatitis B core antibodies, anti-HCV antibodies, anti-hepatitis Delta virus antibodies), and progressive (Child–Pugh class, cirrhosis complications, including HE, gastrointestinal haemorrhage, ascitic fluid infection, refractory ascites, hepatocellular carcinoma [HCC]/hepatorenal syndrome, length of hospitalisation, reason for discharge, including death, against medical advice, or normal discharge).

Operational definitions

The diagnosis of cirrhosis was made based on the following:

- Clinical indications, such as signs of hepatocellular insufficiency (HCI) (jaundice, asthenia, clubbing), signs of portal hypertension (collateral venous circulation, splenomegaly), a normal-sized or atrophic liver, or firm hepatomegaly with a sharp lower edge.
- Paraclinical indications, such as biological (prolonged prothrombin time, hypoalbuminaemia), ultrasound (hepatic dysmorphia in size and contours, nodular echostructure, portal vein dilatation > 12 mm), and endoscopic (presence of oesophageal varices, gastric varices, and/or portal hypertension gastropathy).
- HCC diagnosis was clinical (hard and painful hepatomegaly) and paraclinical (alpha-fetoprotein level > 400 IU/ml in blood tests, presence of intrahepatic nodules or tissue masses on ultrasound scan with characteristic contrast enhancement in the arterial phase and washout in the portal phase, known as the wash-in/washout effect on computed tomography scan).
- We considered the following parameters:
- Rural areas (villages and urban areas) and all urban municipal capitals.
- HCI as a low prothrombin ratio (< 70%) and hypoalbuminaemia as < 35 g/L.
- Cytolysis is indicated by elevated aspartate aminotransferase/alanine transaminase levels (> 35 IU).
- Cholestasis is characterised by elevated gamma-glutamyl transpeptidase/alkaline phosphatase levels (> 32 IU), and/or increased total bilirubin, and hyperleucocytosis as an elevated white blood cell count > 10 000/mm^3.
- Thrombocytopaenia is a platelet count < 150 000/mm^3.
- Anaemia is defined as a haemoglobin level ≤ 10 g/dl.
- Renal failure is indicated by a creatinine level above the upper limit of normal.

Data source and collection

A structured data collection form was created, and data were collected from hospital admission records and the clinical files of patients admitted to the HGD of the CHUSS during the study period. The data were entered into KoboToolbox.

Statistical data analysis

IBM SPSS Statistics version 31.0.1.0 was used for data analysis. A descriptive analysis was performed on sociodemographic, clinical, and biological data using proportions, means, minimum, maximum, and standard deviations. The case fatality rate was calculated by dividing the cumulative number of deaths by the total number of patients included.

To analyse the factors associated with death, we first used the chi-square test to determine the link between death and the various sociodemographic, clinical, and biological covariates. All covariates associated with death at a *p*-value < 20% were then selected for multivariate logistic regression to estimate the strength of the association between each and death using odds ratios. We reduced these covariates using a stepwise, downward strategy. The Akaike information criterion was used to identify the best reduced model, and a receiver operating characteristic curve was used to evaluate its performance. The significance threshold for the *p*-value was 5% for all statistical analyses.

Ethical and regulatory considerations

Approval was obtained from representatives of the CHUSS Institutional Ethics Committee before the study began. Data were collected while respecting patient anonymity and their confidentiality; their information was used solely for the study. This study did not involve any risk to patients. The results obtained will enable statistics to be updated and improve the care of patients with cirrhosis at the CHUSS.

Results

During the study period, 1 197 patients were hospitalised, with 487 cases of cirrhosis (40.7%). From these, 293 cirrhosis cases were included in the study.

Sociodemographic characteristics

Patients' average age was 49.3 ± 14.9 years, ranging from 17 to 94 years. The 36–45 age group was the largest, representing 27.0% of patients. Our sample consisted of 207 men (70.6%),

with a sex ratio of 2.4. Most patients (142, 48.5%) were farmers. In our sample, 163 patients (55.6%) lived in rural areas. The sociodemographic characteristics are presented in Table I.

Table I: Sociodemographic characteristics of patients (n = 293)

Variables	*n*	%
Age group (years)		
≤ 35	185	18.4
36–45	117	27
46–55	25	22.9
56–65	24	15
> 65	20	16.7
Gender		
Male	207	70.6
Female	86	29.4
Residence		
Urban areas	130	44.4
Rural areas	163	55.6
Occupation		
Cultivator	142	48.5
Housewife	52	17.7
Civil servant	31	10.6
Trader	25	8.5
Employee	21	7.2
Unemployed	15	5.1
Informal sector	7	2.4

Clinical characteristics

All our patients reported at least one clinical sign. Abdominal pain (63.4%) and abdominal distension (40.1%) were the most common reasons for admission. Hypertension was the most common comorbidity, affecting 30.3% of patients. The most common general and physical signs were asthenia (96.6%), anorexia (87.3%), hepatomegaly (71.1%), and ascites (66.7%). Table II shows the distribution of patients by clinical characteristics.

Biological characteristics

Liver failure was present in 88.4% of patients, cholestasis in 61.4%, and anaemia in 44.1%. Viral serology B was positive in more than two-thirds of patients (66.9%). Table III shows the distribution of patients according to biological characteristics.

Complications and cirrhosis severity

The average hospital stay was 8 ± 5 days, with extremes of 1 and 33 days. During the disease, HCC (73.3%) and HE (39.6%) were the main complications. Patients were in encephalopathy stages 1 (16.4%), 2 (32.8%), 3 (36.2%), and 4 (14.6%). Regarding the Child–Pugh classification, more than half of patients (54.6%) were at stage C. Table IV shows the distribution of patients according to complications and Child–Pugh class.

Table II: Clinical characteristics of patients (n = 293)

Variables	*n*	%
Reason for admission		
Abdominal pain	185	63.4
Abdominal distension	117	40.1
Jaundice	25	8.6
Oedema	24	8.2
Digestive haemorrhage	20	6.8
Mass in the right hypochondrium	16	5.5
Altered consciousness	15	5.1
Comorbidities		
High blood pressure	30	30.3
Diabetes	8	8.1
HIV infection	3	3.0
Heart disease	3	3.0
Sickle cell disease	1	1.0
Lifestyle		
Alcoholism	76	29.7
Smoking	57	57.6
General signs		
Asthenia	281	96.6
Anorexia	254	87.3
Oedema	160	54.6
Altered general condition	128	43.7
Jaundice	105	36.0
Undernutrition	67	23.7
Anaemia	61	20.8
Dehydration	43	15.2
Disturbance of consciousness	32	10.9
Physical signs		
Hepatomegaly	207	71.1
Ascites	194	66.7
Collateral venous circulation	99	34.0
Melena	29	10.0
Splenomegaly	10	3.4

HIV – human immunodeficiency virus

The lethality of cirrhosis

We recorded a total of 122 deaths among the 293 cases of cirrhosis included in this study, representing an in-hospital mortality rate of 41.6%.

Factors associated with mortality in cirrhotic patients

Several complications were identified in deceased patients: infections ($p < 0.0001$), gastrointestinal bleeding ($p < 0.0001$), dehydration ($p = 0.04$), electrolyte imbalance (hyponatraemia) with or without renal failure ($p < 0.001$), and worsening of the liver disease itself (such as cirrhosis, HCC).

In multivariate analysis, the factors associated with death were area of residence (aOR 3.1, 95% CI 1.5 to 6.6), anorexia (aOR 4.6, 95% CI 1.4 to 15.2), hyperleucocytosis (aOR 2.7, 95% CI 1.3 to 5.3), HE (aOR 6.5, 95% CI 3.1 to 13.4), and ascitic fluid infection (aOR

Table III: Distribution of patients according to biological characteristics (n = 293)

Variables	*n*	%
Hepatocellular insufficiency	259	88.4
Cytolysis	180	61.4
Cholestasis	71	24.2
Alpha-fetoprotein > 400 UI/ml	136	58.4
Renal failure	35	12.0
Anaemia (≤ 10 g/dl)	129	44.1
Hyperleucocytosis	116	39.6
Thrombocytopaenia (< 150 000/mm^3)	100	34.1
HBsAg positive	196	66.9
Antibodies HBc positive*	124	42.5
Antibodies anti-HCV positive	71	24.4
Antibodies anti-HDV positive	2	0.7

* Nucleocapsid antibodies.
HBsAg – hepatitis B surface antigen, HCV – hepatitis C virus, HDV – hepatitis Delta virus

Table IV: Distribution of patients according to complications and cirrhosis severity (n = 293)

Variables	*n*	%
Complications		
Hepatocellular carcinoma	170	73.3
Hepatic encephalopathy	116	39.6
Ascitic fluid infection	35	15.4
Digestive haemorrhage	34	15.0
Hepatorenal syndrome	23	10.0
Refractory ascites	7	3.1
Child–Pugh class		
A	33	11.3
B	100	34.1
C	160	54.6

3.4, 95% CI 1.21 to 9.3). Table V presents the factors associated with death in cirrhotic patients.

Discussion

Sociodemographic characteristics

In our series, the average age was 49.3 years, with the 36–45 age group being the most represented. This result is similar to those reported by Bignoumba et al.[6] in Gabon, Hamidine et al.[13] in Niger, Okon et al.[14] in the Ivory Coast, and Razafindrazoto et al.[15] in Madagascar, ranging from 49 to 51.1 years. However, the average age is lower than reported by Cuko et al.[16] in Albania (58.7 years) and Fialla et al.[17] in Denmark (56.4 years). Mamoon et al.[18] reported a predominant age group of 41–50 years. These results highlight that working populations are most affected in sub-Saharan Africa and in areas of high endemicity. This is consistent with the fact that viral hepatitis is the leading cause of cirrhosis in low-income countries, where universal HBV vaccination is not yet effective. These infections are mainly acquired through mother-to-child transmission or in childhood within families through the sharing of toiletries. In contrast, in

Table V: Factors associated with death in cirrhotic patients in multivariate analysis

Variables *n* (%)	Death (n = 122)	aOR (95% CI)	*p*-value
Residence			
Rural area	53 (32.5)	1	
Urban area	69 (53.1)	3.1 (1.5 to 6.6)	**0.003**
Occupation			
Cultivator	50 (35.2)	1	
Housewife	22 (42.3)	1.0 (0.4 to 2.7)	0.925
Civil servant	13 (52.0)	0.8 (0.2 to 2.5)	0.661
Trader	17 (54.8)	3.0 (0.7 to 12.0)	0.137
Employee	7 (33.3)	0.6 (0.1 to 2.2)	0.414
Unemployed	9 (60.0)	3.5 (0.7 to 17.3)	0.122
Jaundice			
No		1	
Yes	13 (52.0)	1.4 (0.7 to 2.8)	0.393
Anorexia			
No		1	
Yes	114 (44.9)	**4.6 (1.4 to 15.2)**	**0.012**
Hepatomegaly			
No		1	
Yes	94 (45.4)	1.6 (0.7 to 3.8)	0.248
Hyperleucocytosis			
No		1	
Yes	68 (58.6)	**2.7 (1.3 to 5.3)**	**0.005**
Hepatic encephalopathy			
No		1	
Yes	83 (71.5)	**6.5 (3.1 to 13.4)**	**0.000**
Ascitic fluid infection			
No		1	0.428
Yes	22 (62.9)	**3.4 (1.2 to 9.3)**	**0.020**
Refractory ascites			
No		1	
Yes	1 (14.3)	0.3 (0.0 to 7.0)	0.486
Hepatocellular carcinoma			
No		1	
Yes	83 (48.8)	1.4 (0.6 to 3.2)	0.459

aOR – adjusted odds ratio, CI – confidence interval

Western countries, the leading cause of cirrhosis is alcoholism, meaning it appears at a more advanced age.

In our study, there was a predominance of males, probably due to the high seroprevalence of HBV and HCV in males compared with females, with cirrhosis being one of their main complications.[19] This finding is similar to that of Somé et al.[9] in Burkina Faso, with a sex ratio of 2.7, and other authors in Africa, such as Nga et al.[4] in Cameroon (1.3) and Dovonou et al.[20] in Benin (3.76).

In our study, 53.6% of patients resided in rural areas, a finding consistent with other studies in the African Sahelian sub-region in Mali and Niger, but differing from that of Mamoon et al.[18] in Bangladesh, where the majority of patients were from urban areas

(60%).[13,21] The majority of the Burkinabe population is rural and agricultural, living primarily in areas where agro-sylvo-pastoral activities take place. Thus, farmers (48.5%) and housewives (17.7%) were the most represented socio-professional categories. This result is consistent with those reported by Somé et al.[12] and Kondé et al.[21] On the one hand, the shortages of specialists in hepatology and technical facilities in peripheral health services lead to many referrals to the SSUHC. On the other hand, the low level of education of the majority of patients in these categories, combined with a lack of knowledge about viral hepatitis, leads to prior consultation with traditional medicine practitioners and, therefore, delayed recourse to health services.

Clinical characteristics

Abdominal pain (63.4%) and abdominal distension (40.1%) were the most common reasons for admission. These reasons were also reported by Traoré,[11] Somé et al.[12] and Razafindrazoto et al.[22] The predominant general and physical signs were asthenia (96.6%), anorexia (87.3%), hepatomegaly (71.1%), and ascites (66.7%). Asymptomatic in the compensated phase, cirrhosis is often discovered at the stage of complications. The development of ascites is a feature of decompensation in cirrhosis, and the presence of abdominal pain may indicate carcinomatous degeneration or spontaneous bacterial peritonitis. These symptoms reflect late consultation at advanced stages, often after prior traditional treatments.

Biological characteristics

In our sample, 88.4% of patients had liver failure, 61.4% had cholestasis, and 44.1% had anaemia. These characteristics are manifestations of decreased hepatocyte functions (synthesis, purification, biliary) during cirrhosis and are signs of complications. HBV (66.9%) was the most common aetiology. Several studies in Africa have reported the predominance of HBV as the cause of cirrhosis, with proportions ranging from 67.5% in Guinea to 87.5% in Benin.[13,20,23,24]

Viral hepatitis is the leading cause of cirrhosis in developing countries. With an overall 9.1% prevalence of HBV infection in the general population, Burkina Faso is located in an area of high viral endemicity.[19] A lack of awareness about HBV and HCV infections, low screening rates, and low vaccination coverage in several regions delays diagnosis and early treatment of these liver diseases, leading to complications such as cirrhosis and HCC.[12,25] In Asia, Solanki et al.[26] in India and Maskey et al.[27] in Nepal reported alcohol as the cause of cirrhosis in 34.5% and 86% of cases, respectively. We still encounter difficulties in our context in diagnosing cases of alcoholic cirrhosis due to insufficient testing.

Complications and cirrhosis severity

More than half of patients (54.6%) were Child–Pugh class C. Complications were dominated by HCC (73.3%) and HE (39.6%). Most patients were in HE stages ≥ 2. Our results are similar to those reported by Elias et al.[28] in Ethiopia and Hamidine et al.[13] in Niger. HCC and HE are serious and common complications of cirrhosis. This result can be explained by the fact that, in our context, patients are seen at a very advanced stage of cirrhosis and HCC due to a lack of awareness or geographical and financial inaccessibility to health services. The universal health insurance scheme currently being implemented will likely provide support to the population and improve consultation times.

The lethality of cirrhosis

In our study, the in-hospital mortality rate was 41.6% out of 293 patients. This rate is significantly higher than reported in Burkina Faso by Sawadogo et al.[10] in 2012 (13.8%) and Traoré in 2013 (36.8%).[11] Although there are more specialists available to make diagnoses, it is still often made too late for curative treatment.

Factors associated with mortality in hospitalised cirrhotic patients

In univariate analysis, 15 factors were significantly associated with death: areas of residence, deterioration in general condition, jaundice, impaired consciousness, dehydration, anorexia, hyperleucocytosis (> 10 000/mm^3), presence of renal failure, HE, gastrointestinal haemorrhage, ascitic fluid infection, refractory ascites, HCC, hepatorenal syndrome, and Child–Pugh class. Similarly, Charif et al.[29] and Okon et al.[14] found in their series that jaundice, ascites, hyperleucocytosis, renal failure, and HE were factors associated with mortality in cirrhotic patients in univariate analysis.[14,29]

In multivariate analysis, and according to the model selected, the factors associated with death were living in an urban area (aOR 3.1, 95% CI 1.5 to 6.6), anorexia (aOR 4.6, 95% CI 1.4 to 15.2), hyperleucocytosis (aOR 2.7, 95% CI 1.3 to 5.3), HE (aOR 6.5, 95% CI 3.1 to 13.4), and ascitic fluid infection (aOR 3.4, 95% CI 1.21 to 9.3). In our study, patients from urban areas (53.1%) were 3.1 times more likely to die than patients from rural areas (32.5%). Limited financial resources due to a lack of third-party payment often led to patients leaving the hospital against medical advice, reducing their in-hospital mortality rate.

Anorexia was associated with mortality, with a 4.6-fold increase in the risk of death among patients presenting with this symptom. Anorexia is part of a deterioration in general health, reflecting an advanced disease stage. It leads to a more fragile and deficient condition. Hypoglycaemia, a common complication in anorexic patients, is also a factor in poor prognosis.

Patients with HE had a higher mortality rate than patients without it. Most patients were in HE stages ≥ 2. The main precipitant factors identified in this study were infections, gastrointestinal bleeding, dehydration, electrolyte imbalance (hyponatraemia) with or without renal failure, and worsening of the liver disease itself (cirrhosis and HCC). HE is reported by several authors as an important predictor of mortality. These include Charif et al.[29] in Morocco, Elias et al.[28] in Ethiopia, Okon et al.[14] and Yao-Bathaix[30] in the Ivory Coast, and Razafindrazoto et al.[22] in Madagascar. HE is indicative of the severity of HCI in cirrhosis. It is often exacerbated by complications such as gastrointestinal haemorrhage and infections, which adversely affect the prognosis.

Patients with hyperleucocytosis had a 2.7 times higher risk of death, and those with ascitic fluid infection had a 3.4 times higher risk of death compared with those without it. In our cohort, the most likely cause of leucocytosis was spontaneous bacterial peritonitis, characterised by fever, abdominal pain, and impaired general condition. Some authors, such as Charif et al.[29] in Morocco, Masood et al.[31] in Pakistan, and Paul et al.[32] in India, also reported hyperleucocytosis as a factor associated with mortality in cirrhosis. Infections are common in cirrhotic patients and are a leading cause of death. Cytopaenias, due to hypersplenism and the immune dysfunction syndrome associated with cirrhosis, lead to increased susceptibility to infections. There are many routes of contamination, such as urinary and pulmonary, and during repeated during repeated paracentesis of ascites under suboptimal aseptic conditions.

Study limitations

Our study limitations include its retrospective nature, missing data in clinical records, such as patient history, ascitic fluid appearance and abundance, and the lack of assessment of tobacco and alcohol consumption. Moreover, the unavailability of specific additional test results due to patients' geographical and financial inaccessibility was another limiting factor.

Conclusion

Cirrhosis is a condition that most commonly affects men aged an average of 49 who live in rural areas. The main cause is HBV. Patients seek medical attention too late, at the stage of decompensation, leading to a high mortality rate. The factors associated with mortality in cirrhotic patients hospitalised in our setting were urban residence, anorexia, hyperleucocytosis, HE, and ascitic fluid infection. The fight against cirrhosis relies mainly on the fight against viral hepatitis. Preventing HBV through universal vaccination could make a difference for future generations.

Conflict of interest

The authors declare no conflict of interest.

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Ethical approval

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