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Determinants of in-Hospital Mortality in a Gastroenterology Unit in Côte d'Ivoire (West Africa): An Advocacy for a Social Security Policy

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Authors' contributions

This work was carried out in collaboration between all authors. Author AKM designed the study, wrote the protocol, managed the literature searches, performed the statistical analysis and wrote the first draft of the manuscript. Author ADB collected the data, drafted the manuscript. Author HYK drafted the manuscript. Author DA collected the data and approved the final version of the manuscript. Authors SD, MFYB, AKA, TANY approved the final version of the manuscript. All authors read and approved the final manuscript.

Research Article

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ABSTRACT

Background: The in-hospital mortality is a major concern in Africa. The study is aimed at providing the determinants of in-hospital mortality of patients admitted in the gastroenterology and medicine unit (GMU) of the teaching hospital of Yopougon (Abidjan, Ivory Coast).

Patients and Methods: A retrospective cohort of 341 patients (males: 53%, mean age: 43 years) admitted in the GMU during 2009 were studied. Socio-demographic, clinical, biological characteristics of patients were retrieved. Survival probability and determinants of in-hospital mortality were respectively determined by the Kaplan Meier curve and Cox model.

Results: Among the 341 patients admitted, 79 (23.2%) died in the GMU. The in-hospital

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mortality rate was 4.3 (95%IC: 3.3-5.2) death per 100 patients-day. The main diagnoses were HIV/AIDS (15%), cirrhosis (14.4%), hepatocellular carcinoma (13.5%), tuberculosis (12.6%) and gastroenteritis (7.9%). Survival probabilities were higher in patients with Financial support (FS) to face medical fees (log rank test = 10.7, $P=.001$), with no comorbidities (log rank test= 4.5, $P=.03$) compared to those without, and when diagnoses were established than unknown (log rank test=11. 5, $P=.001$). In multivariate analysis, prothrombin time <65% (aHR=2.6, $P=.02$), creatinine level (aHR: 1.02, $P=.02$), HIV/AIDS or tuberculosis (aHR=0.44, $P=.01$), non malignant digestive diseases (aHR=0.34, $P=.01$) and FS (aHR=0.45, $P<.02$) were significantly associated with mortality in GMU.

Conclusion: This study demonstrated that patients with HIV/AIDS or tuberculosis, non malignant digestive diseases or FS had a better outcome. However those with impairment of renal and liver functions had a high risk of death in the GMU.

Keywords: Mortality; hospital; gastroenterology unit; Africa.

1. INTRODUCTION

Africa is facing a high level of mortality among the population, mainly related to the high prevalence of epidemic diseases and increasing noncommunicable diseases such as cardiovascular diseases and diabetes mellitus. Thus, public health policies are implemented to reduce the mortality rate by improving living conditions and better health education [1-2].

In developed countries, reducing in-hospital mortality rate is a permanent challenge for health care workers and hospital administrators. In fact, authorities have introduced in western countries hospitals, policies including a high level of medical care, sensitization of patients and healthcare workers, the acquisition of up-to-date medical devices and lessening of nosocomial infections that allow reducing the mortality rate and increasing life expectancy of patients [3].

However in developing countries, the in-hospital mortality rate remains high as these policies are somewhat difficult to be implemented. The cut of health budget, lack of medical infrastructures and highly skilled healthcare workers, the inadequacy between the need of patients and health policies, beliefs and cultural behaviours are factors that maintained a high rate of in-hospital mortality in Africa [2,4-7].

Most studies of in-hospital mortality in Africa report global mortality rate that involved all adult patients admitted in hospital ward [2,5]. Studies depicting all causes of death in hepatology and gastroenterology units are so far not published.

This study was conducted to determine the mortality rate and its determinants of patients admitted to the Gastroenterology unit and medicine unit (GMU) of the teaching hospital of Yopougon, a northern suburb of the economic capital of Côte D'Ivoire, Abidjan.

2. MATERIALS AND METHODS

2.1 Setting

The GMU is part of the care units of the teaching hospital of Yopougon, inaugurated in 1997, located in the biggest suburb of Yopougon in Abidjan, and it provides tertiary health care for almost 1 million inhabitants.

The unit has a capacity of 30 beds. One sub-unit is dedicated to patients living with HIV/AIDS, acting as a referral unit providing medical support and treatment free of charge. This sub-unit is affiliated to ACONDA-VS program (an Ivorian non government organization providing care to patients living with HIV/AIDS) and receives medications and technical support granted by international institutions (US President's Emergency Plan for AIDS Relief) and the government of Côte D'Ivoire [8].

Côte d'Ivoire is a low income country without any social security [9]. In this country, the fees of all medical acts in public hospitals such as the stay, laboratory, radiology analyses and medications for treatment are not free of charge. All the costs are supported by patients or health insurance organism that patients have subscribed before. For example, a hospital stay costs 10 US dollars per day, a complete blood count: 7 US dollar, abdominal ultrasonography: 20 US dollar. Medications are provided at a low price by the pharmacy of the hospital when available otherwise by a private pharmacy at the market price and purchased by the patient.

2.2 Patients

A retrospective cohort of all patients admitted in GMU of the teaching hospital of Yopougon from January 1st to December 31st, 2009 was studied.

All medical records and diagnoses assessed before the discharge of the patient were retrieved in the medical register of the patients. Data collected were, sex, weight, date of birth, date of admission in the unit, the main clinical signs and comorbidities of the patient at admission, date of discharge, the diagnosis assessed or the reasons for discharge, the status of the patient at the end of hospitalization (discharged or died), the duration of hospital stay, the primary cause of death (underlying disease), and biological records (white blood cells, hemoglobin, platelet count, prothrombin time, creatinine).

Death notification in the medical register of the patient was reviewed in the death register of the hospital for reliability.

As the cost of paraclinical investigations and treatment is not free of charge, the appreciation of the capability of the patient (or through familial assistance or health insurance coverage) to face the fees of medical acts was based on the completion of paraclinical investigations and the regularity of the administration of the treatment. We considered patient as having financial support (FS) when the completion of paraclinical investigations was achieved without any discontinuation of treatment (whatever the reasons than medical) mentioned in the medical register during hospitalization. Patients with no FS were assisted by the social assistance office of the hospital that furnished minimum medications and laboratory examinations free of charge after inquiry.

Diagnoses were assessed by clinical, biological, histological and radiological methods and using the international classification of disease (ICD10) adapted according to local facilities [10]. Diagnoses were grouped into 6 categories to facilitate data analysis: HIV/AIDS and tuberculosis, cirrhosis, Nonmalignant digestive diseases (hepatitis, gastritis, colitis, cholecystitis, peptic ulcer, parasitosis, liver abscess, diarrhea not related to HIV/AIDS and other non life threatening diseases), Malignant digestive diseases (hepatocellular carcinoma, pancreatic cancer, biliary cancer and other digestive tract malignancies). Non digestive diseases (neurological, cardiovascular, hematologic, metabolic, septicemia) and unknown diseases that mean any diagnosis was assessed at the time of discharge or death.

HIV/AIDS and tuberculosis were combined because they are the leading causes of death among population in Côte d'Ivoire and patients harbouring these diseases receive medical aid from the Ivorian government or institutional organizations [8,10,11]

2.3 Data Analysis

Continuous variables were expressed as means and standard deviation while categorical variables as number and percentage. Student T test and Chi squared tests (or Fisher test if appropriate) were used to compare respectively continuous and categorical variables. Mortality was calculated and expressed as a number of deaths per 100 persons - day with a confidence interval. The Kaplan Meyer curves were plotted to describe survival probabilities and compared with the log rank test among subgroups of patients. Univariate and multivariate Cox proportional regression model was used to determine adjusted hazard ratio (aHR) between outcome (died or discharged) and covariates [12]. All statistical analysis were two tailed with significant level at .05 and computed using SAS v9. 1 (SAS v9. 1 (SAS Institute Inc., Cary, NC, USA).

3. RESULTS

Baseline characteristics of patients are detailed in Table 1. A total of 341 patients (males: 54%, mean age 43 years) were admitted in 2009 in the GMU of the teaching hospital of Yopougon, 262 (76.8%) were discharged of whom 25 (9.5%) were transferred to another care unit. The main clinical signs at admission were weight loss (14%), oedema or ascites (12%), hepatomegaly or splenomegaly (11%) and fever (11%). Most of these patients had no comorbidities conditions (88.6%) whereas 5%, 2% and 5% of them had respectively cardiovascular disease, chronic liver disease and diabetes. The distribution of the diagnoses assessed in the GMU is depicted in Table 2. Diagnoses assessed at discharge were mainly HIV/AIDS (15%), cirrhosis (14.4%), hepatocellular carcinoma (13.5%) and tuberculosis (12.6%) However diagnosis was not assessed in 14 patients during hospitalization, among them 8 patients were discharged at their own request arguing their incapability to pay the fees of medical acts (5 patients) or for cultural beliefs (3 patients). The mean (SD) duration of hospital stay was 5.4 (6.1) days and, 79 (23.2%) patients died during hospitalization. The overall rate of mortality was 4.3 per 100 person-days (95%CI: 3.3-5.2) and those with unknown diseases experienced the highest rate of mortality (Table 3).

Table 1. Characteristics of patients admitted in the gastroenterology and medicine unit

Patients characteristics	Outcome			n/N (%)	P
	All patients (n=341)	Discharged (n=262)	died (n=79)		
Sex (male) [n (%)]	184(54)	143(54.8)	42(51.9)	100	.7
Age (years) [mean (SD)]	43(16)	42(15.5)	46.9(18.7)	98.5	.06
Weight (kg) [mean (SD)]	57(13)	56.8(12.8)	55.3(12.9)	71.3	.6
Creatinine (mg/L) [mean (SD)]	15(15)	14.2(14.3)	18.9(18.2)	74.2	.1
Haemoglobin (g/dL)[mean (SD)]	9(3)	9.3(3)	9.5(3)	86.5	.7
WBC (cells/mm ³) [mean (SD)]	8747(9024)	8516(8556)	9556(10533)	87.1	.4
Platelet count (x10 ³ /mL)[mean (SD)]	212(135)	219(134)	188(136)	86.5	.1
Prothrombin time (%) [mean (SD)]	67(35)	70.8(35.8)	51.3(25.3)	86.5	.001
Main clinical signs at admittance [n (%)]				97.1	.9
fever	37(11)	28(10.7)	9(11)		
anaemia	13(4)	11(4.2)	2(2.5)		
oedema/ascites	42(12)	33(12.6)	9(11)		
digestive tract hemorrhage	38(11)	34(13)	4(5)		
encephalopathy	12(4)	4(1.5)	8(10)		
diarrhoea	34(10)	27(10)	7(8.9)		
jaundice	24(7)	17(6.5)	7(8.9)		
hepatomegaly/splenomegaly	39(11)	27(10.3)	12(15.2)		
abdominal pain	23(7)	21(8)	2(2.5)		
weight loss	44(14)	33(12.6)	16(20.3)		
Cough/dyspnea	12(4)	10(3.8)	2(2.5)		
Others (hypertension, cerebral stroke, diabetes)	8(2)	7(2.7)	1(1.3)		
Comorbidities conditions				99.8	.04
absent	301(88.3)	237(90.5)	64(81)		
cardiovascular disease	17(5)				
(hypertension, heart disease)		12(4.6)	5(6.3)		
liver disease	16(4.7)				
(chronic hepatitis)		8(3.1)	8(10.1)		
metabolic diseases (mainly diabetes)	6(1.8)	4(1.5)	2(2.5)		
Diagnosis [n (%)]				95.9	.001
cirrhosis	49(14.4)	35(13.4)	14(17.7)		

HIV/AIDS and tuberculosis	94(27.6)	75(28.6)	19(24.1)	
Malignant digestive disease	54(15.8)	34(13)	20(25.3)	
Non malignant digestive disease	90(26.4)	82(31.3)	8(10.1)	
Non digestive disease (neurologic, metabolic, nephrologic disorders)	40(11.7)	28(10.7)	12(15.2)	
Unknown diseases	14(4.1)	8(3.1)	6(7.6)	
Financial support (yes)	205(60.1)	164(62.6)	41(51)	.001
Duration of stay (in days) [mean (SD)]	5.4(6.1)	5.4(6)	5.5(6.3)	100 .9
Died in hospital [n (%)]	79(23.2)	-	-	

SD: standard deviation. N/M: percentage of non missing data. WBC: white blood cells. Clinical signs at admittance were categorized in two groups: those with gastroenterological signs (ascites, digestive tract haemorrhage, encephalopathy, jaundice, diarrhoea abdominal pain, clinical splenomegaly or hepatomegaly) compared to those without.

Table 2. Distribution of diagnoses at discharge

Type of diseases	All	Outcome	
	N (341)	Discharged n(262)	Died n(79)
Cirrhosis	49(14.4)	35(13.4)	14(17.7)
Tuberculosis	43(12.6)	28(10.7)	15(19)
Gastroenteritis	27(7.9)	23(8.8)	4(5.1)
Hepatocellular carcinoma	46(13.5)	29(11.1)	17(21.5)
Peptic Ulcer	12(3.5)	12(4.6)	0
Liver abscess	8(2.4)	8(3.1)	0
Cholecystitis	1(0.3)	1(0.4)	0
Gastritis (acute, hemorrhagic)	21(6.2)	21(8)	0
Stomach cancer	3(0.9)	1(0.4)	2(2.5)
HIV/AIDS	51(15)	47(17.9)	4(5.1)
Hepatitis (acute, chronic and liver injury)	21(6.2)	17(6.5)	4(5.1)
Neurological disease (Cerebral stroke)	11(3.2)	2(0.8)	9(11.4)
Cardiovascular disease (Heart insufficiency, hypertension)	11(3.2)	11(4.2)	0
Diabetes	1(0.3)	1(0.4)	0
Malaria	9(2.6)	9(3.4)	0
Mesenteric tumour	1(0.3)	0	1(1.3)
Septicaemia	3(0.9)	1(0.4)	2(2.5)
Pancreatic cancer	2(0.6)	2(0.8)	0
Peritoneum cancer	2(0.6)	2(0.8)	0
Nephropathy	5(1.5)	4(1.5)	1(1.3)
Unknown diseases	14(4.1)	8(3.1)	6(7.6)

n=number of patient in each group. Patients with chronic hepatitis were admitted for liver biopsy. Eight patients were discharged at their own request before the completion of paraclinical investigation. Twenty five were transferred to other units. The percentage exceeds 100% because of rounding.

Table 3. Mortality rate according to the diagnosis at discharge

	n	Person days	Rate/100	95%CI
Cirrhosis	14	228	6.1	2.9-9.4
HIV/AIDS and tuberculosis	19	689	2.8	1.5-4
Malignant digestive diseases	20	337	5.9	3.3-8.5
Nonmalignant digestive diseases	8	404	2	0.6-3.5
Non digestive diseases	12	147	8	3.5-12.8
Unknown diseases	6	35	17.1	3.4-30.9

Rate expresses as number of deaths per 100 person days at risk. n: number of deaths, CI : confidence interval.

In univariate analysis the median (95%CI) survival time in the GMU was 16 (14-43) days (Fig. 1).

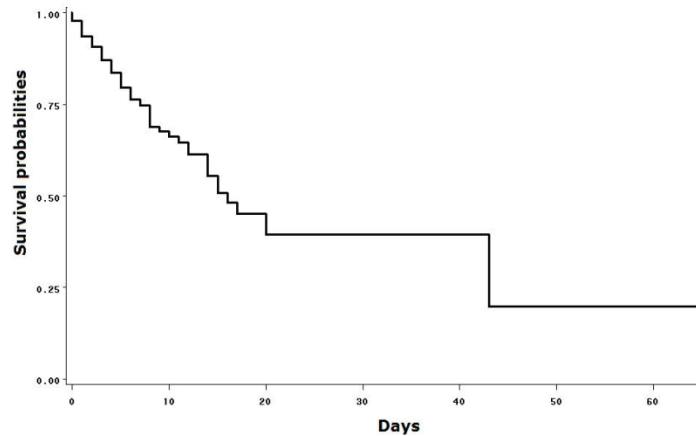


Fig. 1. Kaplan Meyer curve of survival probabilities of all patients during hospitalization in the gastroenterology and medicine unit

Survival probabilities were higher in patients with FS (log rank test = 10.7, $P=.001$, Fig. 2),

With no comorbidities (log rank test= 4.5, $P=. 03$) compared to those without, and when diagnoses were established than unknown (log rank test=11. 5, $P=. 001$).

Patients with HIV/AIDS and tuberculosis and those with non malignant digestive diseases had higher survival probabilities than those with others or unknown diseases (log rank test: 27.7, $P<. 0001$, Fig. 3).

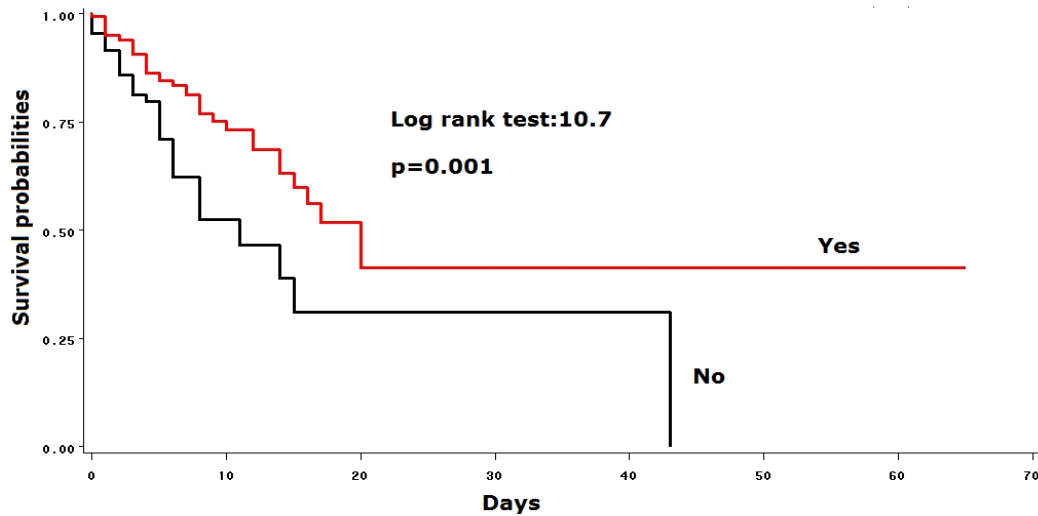


Fig. 2. Kaplan Meyer curves of survival probabilities of patients during hospitalization and according financial support in the gastroenterology and medicine unit

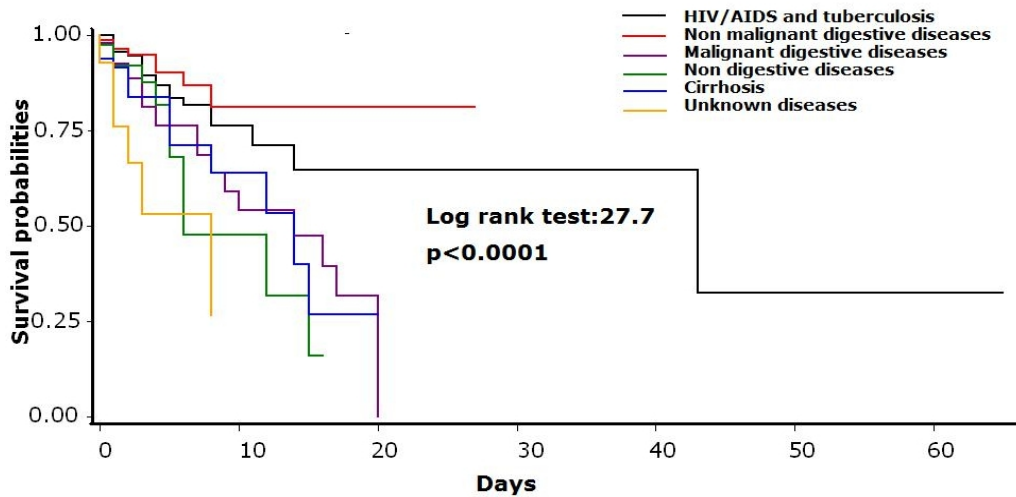


Fig. 3. Kaplan Meyer curves of survival probabilities of patients during hospitalization and according to the group of diseases in the gastroenterology unit and medicine unit

Patient died during hospitalization had low prothrombin time (51.3 vs 70.8; $P=.001$), more comorbidities conditions (19 vs 9.5%; $P=.02$) and less FS (51.9 vs 62.6%; $P=.001$) compared to those discharged. Moreover, patients with FS had more established diagnoses (99 vs 91.2%, $P<.0003$) and longer mean duration of hospital stay (6.2 vs 4.2 days, $P=.002$) compared to those without.

In multivariate analysis (Table 4), prothrombin time <65% (aHR=2.6, $P=.02$), creatinine level (aHR: 1.02, $P=.02$), HIV/AIDS or tuberculosis (aHR=0.44, $P=.01$), non malignant digestive diseases (aHR=0.34, $P=.01$) and FS (aHR=0.45, $P=.02$) were independent factors associated with mortality in GMU.

Table 4. Cox regression multivariate analysis of factors associated with mortality in the gastroenterology unit

	aHR	95%CI	P
Prothrombin time (%)			
< 65 vs ≥ 65	2.6	1.2-5.9	.02
Creatinine (mg/L)	1.02	1.0-1.03	.04
HIV/AIDS and tuberculosis (yes vs no)	0.44	0.23-0.83	.01
Nonmalignant digestive diseases (yes vs no)	0.34	0.16-0.76	.01
Financial support (yes vs no)	0.45	0.25-0.82	.02

aHR: adjusted hazard ratio CI: confidence interval, prothrombin time was dichotomized by the median value. Any interaction was found.

4. DISCUSSION

This study reports for the first time the rate of mortality in a gastroenterology unit of an African country. This higher rate of mortality in our unit could be explained by the fact that some patients arrived at the hospital in critical conditions or at the end-stage of their disease and died before any investigations or appropriated treatment could be started as previously reported [5,7]. For most patients (or their families) the reasons of the delayed admission in the hospital were their incapability to pay the fees of medical acts, beliefs and cultural behaviours as reflected by our study, in which 3.1% were discharged without any diagnosis assessed during hospitalization. However patients living with HIV/AIDS or tuberculosis were less at risk of death in our unit. In fact, HIV/AIDS and tuberculosis are a major concern in Côte d'Ivoire, and health policy is implemented to provide medical care free of charge to patients harbouring these diseases through government or institutional organization supports [8,11,13]. Our results reflected probably the positive impact of this health policy to reduce the burden of HIV/AIDS and tuberculosis in Côte d'Ivoire.

We found in multivariate analysis, that patients with FS had a better outcome during hospitalization than those who did not have it. These patients had also longer duration of stay in hospital. In fact the lack of FS or cultural behaviour were factors of shortening the duration of stay in hospital as mentioned in 8 patients discharged for these reasons in our study and in accord with that reported in Nigeria [2,7].

However, besides this explanation, we do not deny that practitioners were sometimes not able to ensure a proper diagnosis or to provide better treatment to patients because of lack of appropriate technical infrastructures in the teaching hospital of Yopougon that probably alter the quality of care in our unit as in most hospitals in Africa [4].

Those with non malignant diseases were not at risk of death because they suffered principally from acute diarrhea, hepatitis, gastritis cholecystitis, peptic ulcer that are mostly non life-threatening diseases and do not necessitate a multitude paraclinical investigations and costly treatments.

Others risk factors of in-hospital mortality found in our study were prothrombin time and serum creatinine level. We previously reported that cirrhotic patients died in our unit had high Child-Pugh-Turcotte or MELD scores and high serum creatinine level [14]. This finding suggests that beyond cirrhotic patients, the impairment of renal and liver functions of patients attending our unit must be considered as an indicator of bad prognosis. Obviously, liver impairment was more present in patients attending our unit as a third of them had cirrhosis or hepatocellular carcinoma mostly related to the high prevalence of hepatitis B virus in West Africa [15].

We acknowledge that this study had several limitations. First we did not use a standardized measurement of mortality as recommended by others [16]. Another limitation was probably the introduction of classification bias for patients transferred to another unit for more specialized cares or discharge without diagnosis as the final outcome was not reported [12]. Moreover, we have in this study, relatively high rate of missing data of prothrombin time and creatinine level which were not systematically performed mainly in those with no life-threatening disease. However this study provided better understanding of the causes of mortality in the GMU. The high survival probability of patients living with HIV/AIDS or having tuberculosis and those with FS suggests that a medical aid provided to all patients through a social security policy could reduce the mortality rate in our unit or elsewhere in others care units in Côte d'Ivoire.

5. CONCLUSION

This study reported the determinants of in-hospital mortality of a single centre. Further studies are needed in other gastroenterology units of Africa to provide consistent information about the determinants of mortality which take into account others specificities of population and health policies.

CONSENT

Not applicable.

ETHICAL APPROVAL

All authors hereby declare that all experiments have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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