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# Abstract

**Background:** Septic states (sepsis and septic shock) remain serious because they are lead to high mortality. Digestive origins are the second cause of sepsis and septic shock in the world.

*Aim:* To describe the epidemiological, clinical and evolutionary profile of septic states during perioperative emergency digestive surgery at the CHU-JRA.

*Method:* In a retrospective study, over a period of 36 months (January 2019 to December 2021), all patients over the age of 18, undergoing emergency digestive surgery, presenting with a septic state (perioperatively) were included. Excel® v2211software was used for data processing.

**Results:** Seventy patients were included, aged 41 [18-80] years, mostly men (sex ratio 1,7). Acute intestinal obstruction represented 52% (n= 42). The qSOFA score was used. The time to progression of the disease (from the appearance of the first signs until the date of consultation and admission to the emergency room) was less than 7 days in 46 patients. Firty-four patients were operated in less than six hours. Sixty patients were treated with dual antibiotic therapy, and 44 patients benefited of nor-epinephrine (0,3 [0,1-0,5] µg/kg/min) for 2 [1-3] days. On leaving the surgical emergency unit, 21 patients (27%) died of a state of septic shock.

*Conclusion:* Septic states are frequent in the perioperative of emergency digestive surgeries. Early diagnosis as well as rapid management are the criteria for a good evolution. An improvement in the quality of care is therefore necessary.

*Keywords:* Digestive system surgical procedure; Mortality; Sepsis; Septic shock; q-SOFA

# Introduction

Sepsis and septic shock are common in intensive care units. They constitute a major public health problem, especially in developing countries [1]. These pathologies are responsible for a high hospital mortality rate of more than 40% [1-3]. The digestive origin constitutes the second cause of sepsis and septic shock in the world [4, 5]. Due to the great variability of the digestive symptomatology and the richness of pathogens (gram-negative bacilli, gram-positive bacilli, anaerobes, yeasts), the management of septic states related to digestive surgical emergencies remains difficult [5]. The evolution of these digestive pathologies can thus be severe in the absence of adequate management.

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At the Joseph Ravoahangy Andrianavalona University Hospital (CHU JRA), digestive emergencies occupy the first place in surgical emergencies. The objective of this study was to describe the epidemiological and clinical profile of sepsis in perioperative emergency digestive surgery.

# Method

This is a retrospective, descriptive study over three years, from January 2019 to December 2021, conducted in the Surgical Emergency Department of the JRA University Hospital, Antananarivo, Madagascar. All patients over 18 years of age, undergoing emergency digestive surgery by median laparotomy, classified ASA I to IV according to the classification of the "American Society of Anesthesiologists" were included. The incriminating surgical pathology was benign, without chemotherapy or neo-adjuvant surgery. Patients included were those with sepsis or septic shock either on admission or during the entire hospitalization in the emergency department. Patients who opted for discharge against medical advice or were in a bedridden state or incomplete records were excluded.

The variables assessed were: (i) epidemiological parameters (age, gender, ASA class, medical-surgical history, toxic history), (ii) initial clinical presentation (from the q-SOFA or quick Sepsis-related Organ Failure score preoperatively), (iii) nature of the pathology (time to disease progression, diagnosis), (iv) medical treatments undertaken (time to management, (iv) the medical treatments undertaken (time of management, preoperative vascular filling, antibiotic molecules administered, use of noradrenaline) and (v) the postoperative evolution (aggravation into a state of septic shock or not, duration of hospitalization in the emergency surgical unit, evolution after stay in the emergency surgical unit). The onset of sepsis during the management of the emergency room and in the intensive care unit of the emergency room was evaluated and considered as the main criterion of judgment (to evaluate the frequency of septic states). Its progression to septic shock or its improvement and the outcome of patients after resuscitation from the emergency department were the secondary endpoints (to assess its severity).

Data were collected on an Excel ® v2211 table. A test of normality of the sample was performed before data analysis. As the study population did not follow a normal distribution, quantitative data were expressed as median with their extremes [minimum-maximum], qualitative data as frequency.

The interpretation of the results of the present study must be limited to its retrospective character, with the exclusion of incomplete files; thus, not representative of the digestive surgical emergencies admitted in the hospital center. However, the study period was spread over three years, showing the general epidemiological-clinical aspect of septic states admitted to the surgical emergencies of the Joseph Ravoahangy Andrianavalona University Hospital, Antananarivo.

#### Results

During the study period, 1027 charts of surgical emergency admissions for digestive emergencies were reviewed. Of the complete charts with sepsis that were included, 25% (n= 78) were included. No charts were excluded.

The patients were 41 [18-80] years old. Male gender predominated at 63% (n= 49, sex ratio 1.7). Patients classified II in the ASA classification were in the majority (n= 36, 46%) followed by those in class III. Eight patients (10%) had a history of digestive surgery (four patients had a colectomy on colonic tumor, one patient had a flattening-irrigation of a liver abscess in his history, two patients had an appendectomy, and one patient had a previous operation for splenectomy). Six patients (8%) had a history of hepato-gastroenterology with recurrent epigastralgia. Thirty-eight patients (49%) were regular users of alcohol and tobacco. Table 1 shows the distribution of patients according to epidemiological profile.

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17

18

Parameters		n	%
Age (years)	- [18- 25]	08	10
	- [25- 35]	22	28
	- [35- 45]	14	18
	- [45- 55]	19	25
	- [55- 65]	10	13
	- [65- 75]	04	5
	- ≥75	01	1
Gender	- male	49	63
	- female	29	37
Class ASA*	- I	06	8
	- II	36	46
	- III	28	36
	- IV	08	10
Medical and surgical history	- none	38	48
	- digestive surgery	08	10
	- hepato-gastroenterology	06	8
	- other (hypertension, stroke)	26	34
Toxic history	- none	35	45
	- caffeine	05	6
	- éthylo-tobacco	38	49

* American Society of A	Anesthesiologists	classification
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Table 1: Distribution according to epidemiological profile.

Table 2 represents the distribution of patients according to q-SOFA score and preoperative clinical presentation. The disease progressed in 5 [1-90] days. Acute intestinal obstruction was the most encountered pathology in 53% (n= 41), followed by acute generalized peritonitis (n= 32, 41%).

Parameters		n	%
q-SOFA	- 1	47	60
	-≥2	31	40
Time to disease progression	- <7 days	46	59
	- ≥7 days	32	41
Type of pathology	- acute uncomplicated appendicitis	02	3
	- acute intestinal obstruction	41	53
	- acute generalized peritonitis	32	41
	- abscess (hepatic, superinfected hematoma)	03	3

Table 2: Distribution of patients according to initial clinical presentation.

Following management, all patients underwent emergency digestive surgery via laparotomy within 4 [0.5 -24] (Table 3). Preoperative vascular filling at 18 [8-50] ml/kg with crystalloids was administered. Antibiotic therapy was performed in all patients, but the drug combination ranged from dual therapy (n= 60) to quadritherapy (n= 05). Perioperative norepinephrine was required in 44 patients at a dose of 0.3 [0.1-0.5]  $\mu$ g/kg/min for 2 [1-3] days.

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Parameters		n	%
Time to care (hours)	- <6	54	69
	- [6 -12]	13	17
	-≥12	11	14
Preoperative vascular filling	- < 30 ml/kg	67	86
	- [30- 40[ ml/kg	10	13
	- ≥ 40ml/kg	01	01
Antibiotic therapy	- bitherapy*	60	77
	<ul> <li>triple therapy**</li> </ul>	13	17
	<ul> <li>quadruple therapy***</li> </ul>	05	6
Noradrenaline	- none	34	44
	- yes	44	56

\* dual therapy: 3rd generation cephalosporins + imidazoles.

 $\ ^{**} triple \ therapy: \ 3rd \ generation \ cephalosporins \ + \ imidazoles \ + \ aminogly cosides.$ 

\*\*\* quadruple therapy: 3rd generation cephalosporins + imidazoles + aminoglycosides + quinolones.

Table 3: Distribution of patients according to perioperative management.

In the immediate postoperative period, all patients were hospitalized in the emergency surgical unit for 21 [7-96] hours until stabilization and then transferred to the surgical resuscitation sector or service if their condition so required. At discharge from the emergency surgical unit, 27% of the patients (n=26) died of septic shock. Table 4 shows the postoperative evolution of the patients.

Parameters			%
Length of stay in emergency department (hours)	- <24	57	73
	- [24- 48[	14	18
	- ≥48	07	9
Evolution at the end of resuscitation	- survival	57	73
	- death	21	27

Table 4: Postoperative evolution.

# Discussion

In the present study, a young age of patients with perioperative sepsis was found, with a male predominance (sex ratio of 1.7). In the literature, the median age of patients with sepsis admitted to intensive care or resuscitation units is variable (ranging from 35 to 70 years) [1, 2, 5-7]. Several of these studies have focused on sepsis in intensive care, all etiologies combined (medical and surgical) [1, 7]. However, more specific studies in developed countries have found an older study population compared to those in developing countries [5, 7, 8]. This distribution can be explained by the ageing of the population in general in these advanced countries, and with this the increase in comorbidities making these sites fragile.

In the literature, the q-SOFA score is recommended to predict in-hospital mortality of patients with suspected infections [2]. Compared to the SOFA score, the risk of mortality determined from the q-SOFA is similar to that obtained from the SOFA score [4]. This same score was used in the study since it is part of the current recommendations, easier and quicker to assess by the clinic [9]. The assessment of the severity of sepsis by the SOFA score was not feasible in the context of the study. Indeed, the prescription of biological tests, especially blood gases, was not available in the country. The other biological tests (bilirubinemia, platelets, creatinemia) were not available to everyone (because families and patients pay for their own health care, due to lack of social security). And even if these tests were prescribed, it took at least 10 hours to receive the results.

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19

20

According to Lafon T et al [8], the delay in consulting the emergency room, particularly for digestive diseases, remains long in Africa. The delay found in the present study ranged from 1 to 90 days, but surgical management was performed as soon as they were admitted. On the one hand, patients are only alarmed and come for consultation in the presence of signs of severity or at the advanced stage of the disease [10]. On the other hand, in developing countries, traditional practices (massage, decoction) still play an important role in the belief of patients as healing remedies. In a study carried out in Benin in 2020 [11], patients arrived in consultation after 72 hours of the evolution of the disease after having used traditional treatments. Delayed management of sepsis is known to be a risk factor for mortality [5, 10, 12].

In the present study, acute intestinal obstruction and acute generalized community-acquired peritonitis were the most represented etiologies. In the literature, a disparity between countries has been noted [13]. A study carried out in Belgium showed that secondary peritonitis was the cause of most digestive septic states [5]. In Africa, acute community-acquired peritonitis was the most common cause of sepsis in urgent digestive surgery [2, 8, 10, 12, 14]. A prolonged hospital stay due to decompensation of comorbidities in the elderly population could explain this high frequency of septic states due to secondary peritonitis in developed countries. Long-term treatment of these patients for their associated defects would also determine their precariousness.

In the presence of a septic state, recommendations insist on early empirical antibiotic therapy associated with vascular filling and early support with vasopressors [4, 5, 8]. In the literature, in the case of urgent digestive diseases, patients were given an empirical dual antibiotic therapy based on 3rd generation cephalosporins and imidazoles [13]. In this study, this attitude was adopted. Empirical antibiotic therapy was started, without secondary adaptation since the patients had not taken a microbiological sample. The prescription was carried out but often, due to financial difficulties and/or delays in obtaining the results, the same antibiotic treatment was maintained until the end of the treatment, unless it deteriorated. In addition to these therapeutic principles, the use of bolus hydrocortisone and ascorbic acid would reduce the mortality of septic patients according to the literature [4, 7]. In the present study, since the patients were operated on for digestive tract surgery and were hemodynamically unstable, no patient benefited from ascorbic acid. The presentation in injectable ampoule was not available. Bolus hydrocortisone was only administered intraoperatively to prevent postoperative nausea and vomiting and/or bronchospasm.

Following the postoperative course, in the present study, 44 patients were in septic shock. A postoperative mortality rate of 27% was observed. According to the literature, the mortality rate of septic states remained high [3, 6]. The postoperative mortality rate of sepsis (all etiologies combined) ranged from 10 to 44% [10]. For septic shock, this rate varied between 30 and 40% [2, 3, 12]. According to Touré AO et al [15] in a study of postoperative septic states in digestive surgery, the mortality rate was 24.5%. In another African study, the mortality rate of digestive surgical emergencies related to septic shock was 22.3% [14]. Other complications besides septic shock have been identified in studies conducted in developing countries [8]. These complications are related to undernutrition and delayed wound healing [10].

The present study reported the reality found in a national surgical referral hospital in Madagascar. It reports a difference in the management and outcome of patients with perioperative sepsis between advanced and developing countries; but also a similarity with what happens in Africa. However, the study was limited to the early perioperative period, not reflecting the full perioperative course of patients admitted for GI surgery. Follow-up evaluation of patients throughout their hospitalization would provide a reflection of the overall morbidity and mortality of perioperative sepsis in digestive surgical emergencies.

#### Conclusion

Sepsis remains a current problem in intensive care units. They are the main serious acute perioperative complications of digestive surgical emergencies. Mortality related to septic states remains high.

Improved management by administering adequate and sufficient vascular filling would improve the outcome of these patients. In addition, early identification of conditions predisposing to the development of septic shock would be of interest in order to anticipate management and reduce mortality secondary to septic shock.

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21

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