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Predictor's factors of mortality during fasting post-operative digestive surgery in Kinshasa

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Abstract
Objective: The objective of this study was to determine the incidence and predictors of mortality during postoperative fasting (POF) in conventional digestive surgery.
Methods: This was a prospective, multicenter and interventional cohort study before and after surgery carried out in 3 hospitals in Kinshasa from January 2 to September 30, 2016.
Results: Of 303 operated patients included, 51% were men. The average age of those operated on was 35.1 ± 9.6 years. The frequency of weight loss (body mass index (BMI) <18.5 kg / m²) was 22.4% before surgery and 36.6% after. The mean duration of POF was 5.3 ± 1.9 days (JS) and the hospital stay ≥14 JS in 55.8% of operated patients with 7.3% of deaths in the series. In univariate analysis, female gender, excess alcohol, physical inactivity (PI), postoperative peritonitis (PPO) (HR = 3.2IC95% 1.6-6.5; p <0.001), surgical site infection, late oral feeding (LOF) and age ≥60 years were predictors of mortality. While in the Cox multivariate regression, only the female sex (HR = 4.4 CI 95% 1.2-15.5; p = 0.023), the PI (HR = 6.1 CI 95% 2.4-15, 5; p <0.0001), postoperative peritonitis (POP) (HR = 3.2 95% CI 1.6-6.5; p <0.001) and AOT (HR = 5 95% CI 2.5-10.4; p <0.0001) were the significant predictors of mortality.
Conclusion: In view of the worsening of the leanness and the extent of mortality in this work, preoperative measures aimed at correcting undernutrition and alcohol withdrawal, promoting early oral post-operative feeding and the practice of l exercise is necessary especially in the elderly and women.

Keywords: Post-operative fasting, conventional digestive surgery, mortality, Kinshasa/DRC

Introduction
The prescription of post-operative fasting (POF) after conventional digestive surgery is a historical habit which is based on the concept of resting the digestive tract when digestive sutures have been performed [1].
And yet, this POF is deleterious, a source of imbalance in the perioperative nutritional status and controversies as to its appropriateness and duration [2].
It has been criticized by experts in wealthy environments given the benefits of early oral refeeding in terms of reducing morbidity and mortality post-operatively [1].
The delay in this oral refeeding is variable and depends on the surgeon's habits, the type of digestive surgery performed and the patient's digestive tolerance [3].
In conventional digestive surgery, the duration of POF remains poorly coded. To our knowledge, there are no publications specifically dealing with POF in a hospital environment in Kinshasa/ DRC, despite the relevance of the subject, in a context of scarcity and inaccessibility of parenteral nutrition. Hence the initiation of this study, the aim of which was to determine the incidence and predictive factors of mortality during POF in conventional digestive surgery

Methods
It was a prospective multicenter cohort study, before and after conventional digestive surgery, carried out in 3 hospitals in Kinshasa (Reference Hospital General Provincial of Kinshasa (RHGPK), Reference Hospital General of Kintambo (RHGK), Hospital of Amitié Sino-Congolaise (HASC)), from January 2 to September 30, 2016.
The choice of these hospitals was made randomly simple on the list of all public hospitals in Kinshasa.

All patients having an operation on the digestive tract consented to participate, had been followed according to the Declaration of Helsinki, during the study period, after authorization from the ethics committee of the School of Public Health of the University of Kinshasa / DRC.

Using a data collection sheet, the parameters of interest sought in a structured and standardized manner were: the age (years) of the patients, the gender, the body mass index (BMI) before surgery and then, before oral refeeding, the preoperative diagnosis, the duration of the POF (in days), the progress of patients and the hospital stay.

SECA 761 mechanical scales (Hamburg, Germany, dimensions (WXHXD): 303x118x470 mm, net weight 3.5 Kg, calibration class III with an accuracy of 100 grams) and local stadiometers (with an accuracy of 0, 5 cm) were used to collect the weight (P) and height (T) respectively of the patients on admission to these hospitals.

In the post-operative period, only the P was removed before oral refeeding.

The operated patients were classified into two groups according to the duration of the JPO: any operated patient who had duration of the JPO ≤ 2 Days (JS) was classified in the batch of early feeding (not exposed); the operated patients having had duration of JPO> 2 JS were placed in the late feeding group (exposed).

The nutritional status of the patients was obtained on the basis of BMI (BMI = P in kg / (T in m) ² where leanness <18.5kg / m² against overweight / total obesity with BMI ≥25kg / m² and P normal with BMI = 18.5-24.9 kg / m²)

Similarly, the operated patients were divided into two groups according to the mobilization time (= physical activity / physical exercise):

- Group 1 = active = operated vertically within 48 hours of surgery (PO);
- Group 2 = inactive = operated patients who are bedridden beyond 48 hours in PO.

Operational definitions

Physical activity / physical exercise = any bodily movement produced by the contraction of skeletal muscles and resulting in an increase in energy expenditure compared to the expenditure of rest.

Physical inactivity (PI) / sedentary lifestyle = state in which skeletal movements are reduced to a minimum and energy expenditure close to that of rest.

Operating site infection (ISO): It was defined according to the criteria established by the Centers for disease control and prevention (CDC) in 1992/1999 and is located in one or in all the layers of tissue affected by the intervention: we differentiate superficial and deep infections of surgical wounds and organ or cavity infections. (Annex)

Excess alcohol: Consumption of excess alcohol in the present study was the consumption of at least 5 glasses of beer per day or at least one glass of alcoholic drink of artisanal manufacture per day in humans or in wife.

Appendix: Diagnostic criteria for an infection of the operating site established by the CDC

Superficial surgical wound infection

The infection manifests itself up to 30 days after the operation and the infection concerns only the skin or the subcutaneous tissues of the incision and at least one of the following criteria:

- Purulent secretion, with or without microbiological confirmation, of the superficial incision;
- Isolation of organisms in a culture of fluid or tissue from the superficial incision obtained under asepsis;
- At least one of the following signs or symptoms of infection: spontaneous pain or palpation, localized swelling, redness, or heat and superficial incision deliberately opened by the surgeon, unless the culture of the microbiological samples of the incision is negative;
- Diagnosis of a superficial infection of the surgical wound made by a surgeon or the doctor involved.
- Do not consider as superficial wound infection:
- an abscess in the stitches (i.e. minimal inflammation and
- Secretions limited to stitches);
- infection of an episiotomy or circumcision site of a newborn baby;
- infection of a burn wound;
- an infection of the surgical wound which extends into the fascia and the muscular layers (see infection of deep surgical wound).

Deep surgical wound infection

- The infection manifests itself up to 30 days after the intervention (if no implant) or up to a year (if presence of implant) and the infection seems linked to the operation and the infection involves deep soft tissue (e.g. fascia, muscle layers) of the incision and at least one of the following:
- purulent secretion from the deep incision, but not from an organ or deep cavity that is part of the operating site;
- spontaneous dehiscence of a deep incision or deliberate opening by the surgeon if the patient has at least one of the following signs or symptoms: fever (L 38 ° C), localized spontaneous or palpation pain, unless the culture of the samples microbiological of the surgical site is negative (sterile sample);
- abscess or other evidence of infection which involves a deep incision on direct evaluation, during re-intervention, or on histopathological or radiological examination;
- diagnosis of a deep infection of the surgical wound made by a surgeon or the doctor involved.
- Infection of the organ or cavity operating site
- The infection manifests itself up to 30 days after the intervention (if no implant) or up to a year (if presence of implant) and the infection seems linked to the operation and the infection involves any part of the surgical site (for example, organ or cavity), outside of the incision, which was opened or manipulated during the operation and at least one of the following:
- purulent secretion through a drain through the skin into an organ or cavity;
- presence of organisms in a culture of liquid or tissue of an organ or cavity obtained aseptically;
- abscess or other evidence of infection involving the organ or cavity detected during a direct assessment, reoperation or by histopathological or radiological examination;
- diagnosis of an organ or cavity infection of the operating site established by a surgeon or the doctor involved.

Statistical analyzes

The categorical variables were expressed in frequencies (counts or numbers = n) and in proportions (%). Quantitative / continuous or discrete variables were summarized as mean ± standard deviation (SD) in the case of a normal distribution (symmetric), otherwise in the form of mean ± standard error of the mean (SEM) or in the form of median in case abnormal

distribution (asymmetric) with extreme values.
The information obtained was reported in Tables and Figures.
The means of the general characteristics were compared between 2 groups after calculation of the non-parametric Mann-Whitney U test (independent samples). The Chi-square test was used to compare the proportions of complications between those operated on in the 3 hospitals in the study: RHGPK, RHGK, HASC.
Kaplan Meier's survival curves estimated incident rates of PO complications by yes or no status, cumulative survival, standard error, cumulative events and the number without events. Thus, the Log rank test was constructed under the following null hypothesis (Ho): the instantaneous probabilities of PO complications are the same in the 2 groups (before and after resumption of oral feeding) for all operated on the digestive tract (Ot) in whom a complication has occurred, the proportion of expected complications is the same in the 2 groups without interaction of the factor studied over time. Multivariate Cox regression analysis for proportional relative risk (RR or Hazard ratio or HR) with its 95% CI was used to determine the independent association between the variables of interest and specific mortality. The probability *P* <0.05 was used as the threshold of statistical significance in the comparisons between the groups.
All statistical analyzes were carried out using IBM * SPSS (Statistical Package of Social Sciences) software on Windows version 23 (New York, USA).

Patients recruitment was carried out on the basis of free and informed consent in accordance with the Helsinki recommendations. The study protocol was submitted for analysis and approval to the Ethics Committee of the School of Public Health at the University of Kinshasa. The confidentiality and ethical rules were respected by the members of the research team when collecting the data.

Results

1. General and clinical characteristics of patients

Of 303 operated patients (HGPRK n = 145, HGRK n = 97, HASC n = 61) included in the study, 51% (n = 155) were male. The average age of these patients was 35.1 ± 9.6 years with extremes from 2 to 89 years. The frequency of weight loss was 22.4% (n = 68) before surgery, but 36.6% (n = 111) in PO for a total of 59% (n = 179) of weight loss during treatment. charge. The mean duration of the JPO was 5.3 ± 1.9 JS, with extremes of 2 to 10 JS. The hospital stay was prolonged (≥ 14 JS) in 55.8% (n = 169) of the operated patients, with 7.3% (n = 22) of the deaths in the series.

2. Associations

Except the management hospital, cigarette smoking and weight loss (*P*> 0.05), female sex, excess alcohol, PI, ISO, late resumption of oral feeding and age ≥60 years were the univariate and significant predictors of mortality (Table 1).

Table 1: Factors prédictors of mortalité specific

	Incidence of mortality		P
	%(n)	RR (95% CI)	
Independantes Variables			
Sex			<0.001
Female	37.6(44)	7.8(3.9-15.3)	
Male	4.8(9)	1	
Driking alcohol			<0.001
Yes	28(42)	3.9(2.1-7.3)	
No	7.2(11)	1	
Exercise level			<0.001
Inactive	50(47)	17.4(7.7-39.3)	
Active	2.9(6)	1	
PPO			<0.001
Yes	54.7(29)	5.7(3.6-9)	
No	9.6(24)	1	
Resumption of oral feeding			<0.001
Late	40(18)	3(1.8-4.7)	
Early	13.6(35)	1	
Age ≥60 years			0.003
Yes	28.4(46)	5.7(2.7-12.3)	
No	5(7)	1	

The mortality rate varied unevenly but significantly (P = 0.023) between the different hospital units in the study: the highest, intermediate and lowest rates were observed for HASC, HGRK, HGPRK (Figure 1).

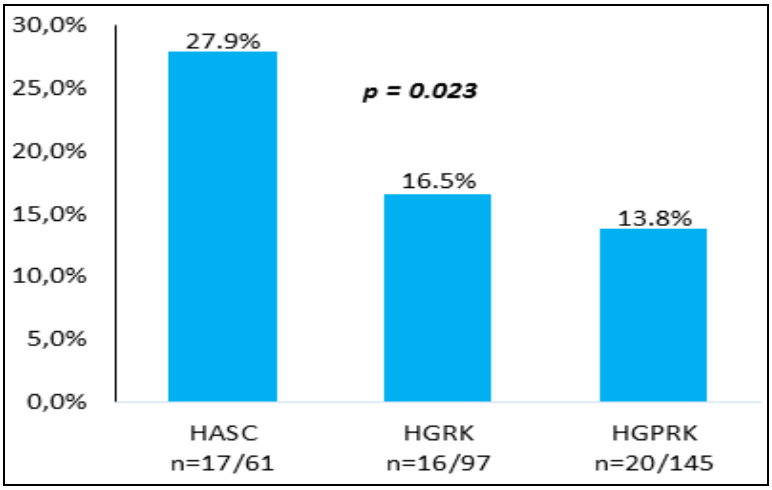

Fig 1: Distribution of mortality rates between hospitals.

As expected, mortality rates were more frequent (trend P =0.017) in cases of undernutrition than in cases of total overweight / obesity and normal P (Figure 2).

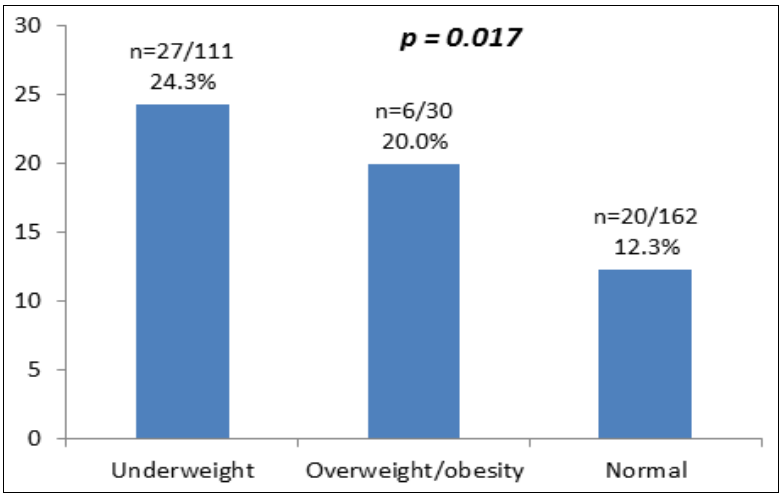

Fig 2: Distribution of mortality rates according to nutritional status

Mortality rates varied unequally and very significantly (p <0.001) between the age groups: age ≥60 years (advancement in age) being more vulnerable than the age group 40-59 years and age <40 years (Figure 3).

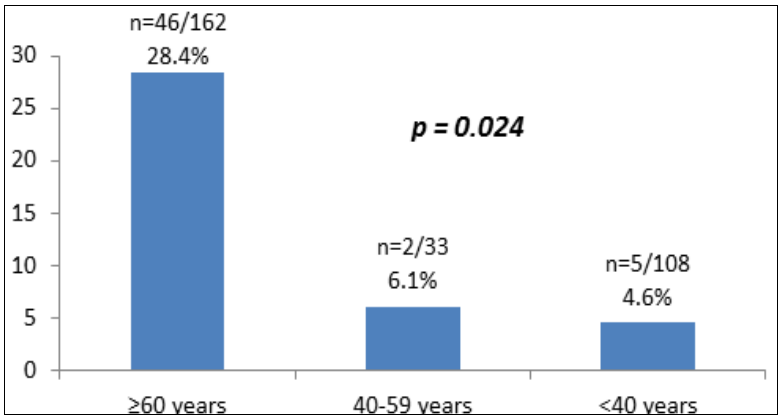

Fig 3: Distribution of mortality rates between age

And after adjustment for the confounding variables (types of hospital training, nutritional status, excess alcohol, ISO, evisceration), only the female sex (HR = 4.4 95% CI 1.2-15.5; p = 0.023), PI (HR = 6.1 95% CI 2.4-15.5; p <0.001), PPO (HR = 3.2 CI 95% 1.6-6.5; p <0.001) and AOT (HR = 5 95% CI 2.5-10.4; p <0.001) were the independent and significant predictors of mortality after the multivariate Cox regression analysis (Table 2).

Table 2: Independent predictors of specific mortality (Lethality)

	Coefficients not standardized		Wald	aHR (95%CI)	p
	B	ES			
Independants variables					
Sex					0.023
Female	1.470	0.648	5.154	4.4(1.2-15.5)	
Male				1	
Exercise level					<0.001
Inactive	1.811	0.474	14.581	6.1(2.4-15.5)	
Active				1	
PPO					<0.001
Yes	1.161	0.360	10.367	3.2(1.6-6.5)	
No				1	
Resumption of oral feeding					<0.001
Late	1.654	0.351	22.249	5(2.5-10.4)	
Early				1	

Kaplan Meier's survival curves were drawn according to the stratification of sex (Female probability of survival = 95% CI 12.7-13.8 JS, Log Rank Test, Chi square = 59.361; *p* <0.001), PPO (Presence cumulative probability of survival = 60%, median duration = 8JS; 95% CI 6.4-9.6 JS versus absence cumulative probability of survival = 90%, median duration = 12.5 JS; 95% CI 11.9-13.1 JS, Log Rank test, Chi square = 19.980; *p* <0.001) and the delay in resuming oral feeding (Late probability cumulative survival = 28.9%, median duration = 7.1 JS; 95% CI 5.2-9.1 versus pre this cumulative probability of survival = 90.4%, median duration = 12.9 JS; 95% CI 12.4-13.4, Log Rank Test, Chi square = 44.184; p <0.001) (Figures 4-7).

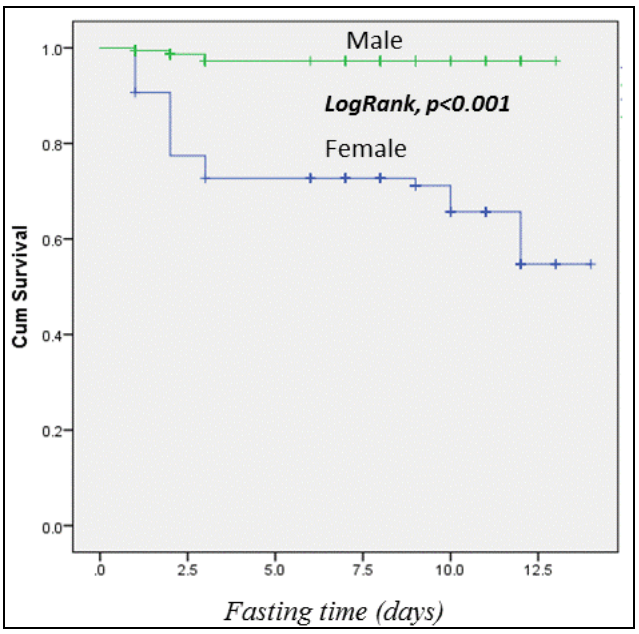

Fig 4: Kaplan Meier survival curves by sex stratification.

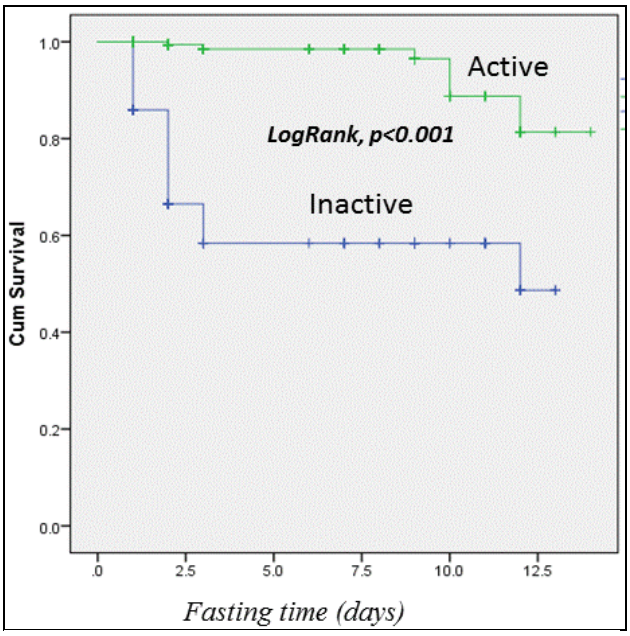

Fig 5: Kaplan Meier survival curves according to the stratification of the level of physical activity.

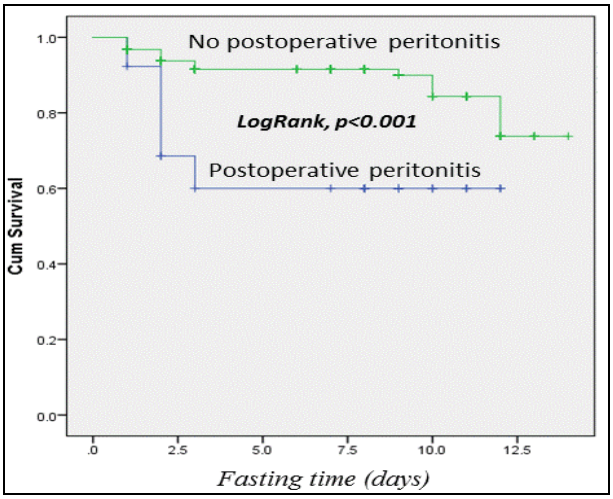

Fig 6: Kaplan Meier survival curves according to the stratification of the POP.

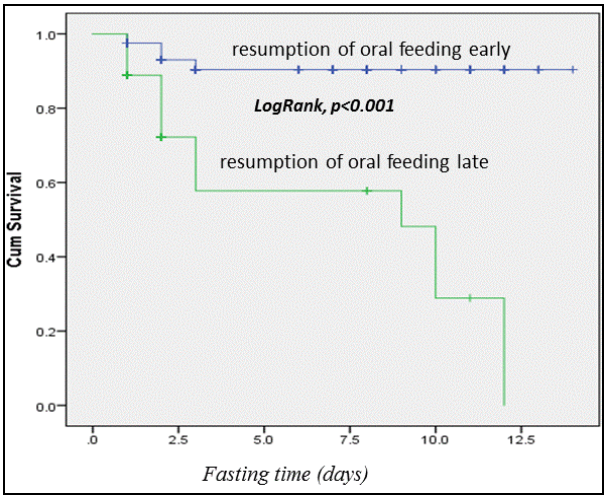

Fig 7: Kaplan Meier survival curves according to the stratification of the resumption of oral feeding.

Discussion

The present study estimated a significant rate of hospital mortality close to 10%, undernutrition in the majority of patients operated on in public hospitals representative of the city province of Kinshasa. HASC, females, excess alcohol, PI, ISO, AOT, and age ≥60 years were the significant predictors of mortality in patients with digestive surgery.

Physical activity and conventional digestive surgery

This study also highlighted the perilous operative suites of patients who remained bedridden for more than 2 days after conventional digestive surgery procedures. Indeed, the beneficial effects of physical activity in perioperative do not meet with any magnitude in terms of publications compared to their protective effects against certain chronic pathologies (type 2 diabetes mellitus, cancers, cardio-respiratory diseases) [4]. It has been established that the practice of physical activity limits fattening, combats stress, fatigue and improves the quality of life, particularly in elderly patients [5].

Improving tissue perfusion by practicing minimal physical activity (mobilization of the patient, getting up, walking) should theoretically provide the digestive patient with favorable results. The paralytic ileus PO would be combated, guaranteed wound healing, and stress ulcers prevented [6]. By preventing stasis in the splanchnic territory, regular practice of moderate physical activities in OP of Digestive Surgery is beneficial in preventing thromboembolic disease and respiratory complications [7]. This mobilization of the patient from the day of the intervention is one of the pillars of improved rehabilitation, alongside the resumption of oral feeding on the same day of the operation (unless surgical contraindication), multimodal analgesia and prevention of nausea and vomiting [8]. In the light of these notions, bed rest in the post-operative period of patients in this series would have had a share, through the induced PO complications, in the morbidity and mortality of patients. Leitzmann M. reveals in a 2007 study the benefits of physical activity in reporting the high risk of death among inactive people compared to active people [9]. Myers reports in a 2002 study the benefits of physical exercise in reducing mortality and cardiovascular risk in humans, even with a history of heart disease [10]. In the perioperative phase of conventional digestive surgery, the physical inactivity of the patient is a source of discomfort and can cloud the prognosis of a surgical procedure deemed successful [9]. The recommendations of the high authority of health of France on the perioperative rehabilitation underline the importance of the early verticalization of patients in OP to limit the complications.

Post-operative fasting and mortality in conventional digestive surgery

This study highlighted the consequences of prolonged JPO on the evolution of patients with digestive tract surgery in terms of mortality, in the absence of parenteral nutrition, in the three study hospitals. The historical character of the JPO in conventional digestive surgery until the resumption of transit is topical and has supporters in the surgical circles of Kinshasa. It is supported by the old dogma which advocates the rest of the digestive tract to protect the digestive sutures [1]. In the absence of digestive intolerance and at the time of evidence-based medicine, this JPO has no rational basis because the digestive tract has never been empty. The digestive glands discharge their exocrine secretions there [8]. Lewis evokes in a meta-analysis relating to 13 randomized trials, the uselessness of JPO, and highlights the beneficial effects, in terms of reduction of mortality in PO, complications POP and hospital stay, of the resumption of l oral feeding during the first 24 hours PO, depending on the patient's tolerance, unless surgical contraindication [2]. Indeed, the presence of nutrients in the small intestine promotes blood flow into the splanchnic territory, thus facilitating the healing process in the event of intestinal suturing [11]. The causes of suture disunity should be investigated at the technical and field level [12]. A badly made intestinal suture or anastomosis is doomed to failure [12]. Starving the digestive system in the hope of achieving healing is nonsense. Prolonged JPO can aggravate or create existing undernutrition [2]. The malnutrition rate of 22.4% noted preoperatively is found in the range of 20 to 50% of malnourished in the same operative period in the series of Corish CA [13] and Adébayo Cossi Alassan [14]. The present study has rather established the deleterious nature of the prolonged JPO in spite of the controversies surrounding the standardization of its duration in the various hospitals of interest. The duration of JPO reported in this study varied from practitioner to practitioner. In the absence of parenteral nutrition, the inherent consequence of prolonged JPO is an increase in the catabolism characteristic of the PO period, thus explaining the observed complications and mortality. Prolonged JPO is a known factor in imbalance in nutritional status [15], and there is a correlation between undernutrition and PO morbidity and mortality [16]. Undernutrition exposes the patient to the risk of dehiscence of digestive sutures and anastomoses, ISO, nosocomial infections, long hospital stay and death [17]. Lewis' meta-analysis highlights the benefit of an enteral diet started within 24 hours after surgery in terms of lowering the risk of dehiscence in digestive anastomoses [17]. In the absence of signs of digestive intolerance and parenteral nutrition, the JPO should be a topic of discussion in Kinshasa surgery. Its inappropriateness, reported in the literature, should be a source of information for the change in mentality of Kinshasa practitioners in the management of those operated on the digestive tract on the nutritional side. Switching off the digestive tract is a source of discomfort and morbidity and mortality. All the digestive sutures and anastomoses in this series were manual.

The HASC, serving more than 3 million inhabitants with chaotic urbanization, in a particular context of poverty, justified the highest case fatality rate (27.9%). This rate is higher than that of 22% reported in Algeria by Féthi Merad-Boudia, over a period of 12 years, in heavy digestive surgery [18]. This observation confirms the state of dilapidation of the sanitary circuit of the city of Kinshasa / DRC province, in terms of quality assurance of care and the state of impoverishment of the population served.

Post-operative peritonitis and mortality

The link established between PPO and the fatal outcome of patients in the present study is current worldwide, where PPO mortality rates vary from 30 to 50% depending on the series [19]. Compared to a low incidence of around 2 to 3% in developed countries [20], this study rather reported an epidemic rate of PPO around 54.7% explained by undernutrition, poverty of the population, the delay in the care of patients, the prolonged JPO, the lack of technical platform and qualification of practitioners. Indeed, the majority of the surgical activities reported in this study were performed by general practitioners; specialists are junior and few in these study hospitals. The literature establishes a link between the qualification and or the experience of the surgeon and the occurrence of infectious complications in OP of abdominal surgery; junior surgeons being the least efficient [20].

Limits of the study

Three limitations were inherent in this study:

- The majority of practitioners involved in patient care were generalists;
- Failure to take into account the ASA score (American Society of Anesthesiologists) and the anesthetic protocols used;
- The systematic absence of necropsies for cultural reasons.

Conclusion

In view of the worsening of the thinness and the importance of mortality in this work, urgent measures in favor of the practice of physical exercise, early oral feeding in PO, parenteral feeding, control of Preoperative undernutrition and reduction of alcohol consumption are necessary especially in the elderly and in women. The medical schools and the Ministry of Public Health will have to design and plan the retraining of practitioners and junior surgeons.

Conflict of interest

The authors declare no conflict of interest

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Authors' contribution

DSK and BLM designed and wrote the work protocol; DVT and YVM supervised data collection, ANN analyzed the data; DSK and BLM wrote the initial version of the manuscript, DVT, CMT and RDK coordinated the study and interpreted the results. All authors approved the final version and revised the manuscript.

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