Research Article ISSN 2689-1093

Surgical Research

Impact of Preoperative Hypoalbuminemia and Malnutrition on Postoperative Outcomes in Patients Undergoing Surgery for Gastrointestinal Cancer at Yaoundé Central Hospital

Bwelle Motto Georges[1,3], Chopkeng Ngoumfe Cyrille[3]*, Ekani Boukar Yanick[4], Ngono Chantale[3], Onana Menguele Yvan[3], Bang Guy Aristide[1,2] and Biwole Sida Magloire[1]

[1]*Faculty of Medicine and Biomedical Sciences, University of Yaoundé I, Yaoundé, Cameroon.*

[2]*Surgical unit, Yaoundé University Teaching Hospital, Yaoundé, Cameroon.*

[3]*Digestive surgical unit, Yaoundé Central hospital, Cameroon.*

[4]*Faculty of Health Sciences, University of Buea, Cameroon.*

***Correspondence:**

Chopkeng Ngoumfe Joseph Cyrille, Digestive Surgical Unit, Yaoundé Central Hospital, Cameroon, Yaoundé, Cameroon, Tel: +237 699 04 79 15.

Received: 17 Jun 2026; **Accepted:** 24 Jul 2026; **Published:** 05 Aug 2026

Citation: Bwelle Motto Georges, Chopkeng Ngoumfe Cyrille, Ekani Boukar Yanick, et al. Impact of Preoperative Hypoalbuminemia and Malnutrition on Postoperative Outcomes in Patients Undergoing Surgery for Gastrointestinal Cancer at Yaoundé Central Hospital. Surg Res. 2026; 8(5): 1-7.

ABSTRACT

Background: *Malnutrition is frequent among patients with digestive cancer and may adversely affect postoperative outcomes. However, data from sub-Saharan African surgical settings remain limited. This study aimed to assess preoperative nutritional impairment and its association with postoperative outcomes among patients undergoing surgery for digestive cancer at Yaoundé Central Hospital.*

Methods: *We conducted a retrospective analytical observational study at Yaoundé Central Hospital, Cameroon, from January 2023 to December 2024. Adult patients who underwent surgery for histologically confirmed digestive cancer and had available preoperative anthropometric and serum albumin data were included. Nutritional impairment was assessed using available phenotypic criteria, including body mass index and weight loss. Serum albumin was analyzed as a biological marker of severity and perioperative risk. Postoperative outcomes included morbidity, surgical site infection, length of hospital stay and in-hospital mortality.*

Results: *A total of 64 patients were included. The mean age was 56.4 ± 12.3 years, and 38 patients (59.4%) were female. The most common tumor locations were the colon (34.4%), pancreas (29.7%) and rectum (15.6%). Mean preoperative body mass index was 20.38 ± 3.03 kg/m², and 62 patients (96.9%) had weight loss of at least 10%. Preoperative hypoalbuminemia was found in 34 patients (53.1%). Postoperative morbidity occurred in 28 patients (43.7%) and was more frequent among patients with malnutrition/hypoalbuminemia than among those without: 58.8% versus 26.6% (odds ratio: 3.93; 95% confidence interval: 1.36–11.33; p=0.01). These patients also had longer hospital stay and higher in-hospital mortality.*

Conclusion: *Preoperative nutritional impairment and hypoalbuminemia were frequent and associated with poorer postoperative outcomes. Systematic nutritional assessment and perioperative nutritional support should be integrated into digestive cancer surgery in this setting.*

Keywords

Digestive System Neoplasms, Malnutrition, Hypoalbuminemia, Postoperative Complications, Cameroon.

Background

Digestive cancers are frequently associated with nutritional deterioration due to reduced oral intake, tumor-related inflammation, digestive obstruction, malabsorption and cancer cachexia. This impairment may be present at diagnosis and may

worsen during treatment, especially in patients requiring major abdominal surgery.

Malnutrition has a major impact on surgical outcomes. In digestive cancer surgery, poor nutritional status is associated with impaired immune response, delayed wound healing, surgical site infection, anastomotic complications, prolonged hospital stay and increased postoperative mortality. In a large international cohort, the GlobalSurg Collaborative reported that severe malnutrition was associated with increased early mortality after surgery for colorectal and gastric cancer, with a particularly important burden in low- and middle-income countries [1].

The definition of malnutrition has evolved. Current Global Leadership Initiative on Malnutrition criteria require the association of at least one phenotypic criterion, such as weight loss, low body mass index or reduced muscle mass, and at least one etiologic criterion, such as reduced intake, impaired assimilation, inflammation or disease burden [2,3]. In patients with active digestive cancer, the etiologic criterion is usually present. Serum albumin should not be used as a standalone diagnostic criterion for malnutrition, but hypoalbuminemia remains a useful marker of severity and perioperative risk in surgical oncology [4-7].

International guidelines recommend nutritional screening and perioperative nutritional support for patients at nutritional risk, particularly those undergoing major abdominal surgery or cancer surgery [8,9]. However, in many sub-Saharan African settings, nutritional assessment is not systematically integrated into surgical pathways. In Cameroon, digestive cancers are often diagnosed at advanced stages, and access to surgery may be limited by clinical, financial and organizational factors [10,11].

Few local studies have assessed the relationship between preoperative nutritional impairment, hypoalbuminemia and postoperative outcomes in digestive cancer surgery. This study aimed to assess preoperative nutritional impairment and hypoalbuminemia among patients undergoing surgery for digestive cancer at Yaoundé Central Hospital, and to evaluate their association with postoperative morbidity, length of hospital stay and in-hospital mortality.

Methods

Study design and setting

We conducted a retrospective analytical observational study at Yaoundé Central Hospital, Cameroon. Yaoundé Central Hospital is a referral hospital located in the Messa district of Yaoundé and receives patients from Yaoundé and surrounding health facilities. The study focused on adult patients managed surgically for digestive cancer.

The study covered a two-year period from January 2023 to December 2024. Data collection was performed retrospectively from medical records, operative reports, anesthesia records, laboratory results and hospitalization files.

Study population

The source population consisted of all patients managed for digestive cancer at Yaoundé Central Hospital during the study period. The study population included adult patients who underwent surgery for histologically confirmed digestive cancer during the same period.

Patients were eligible if they met the following criteria: age 18 years or older, histologically confirmed digestive cancer, surgical management during the study period, and availability of essential preoperative nutritional data, including weight, height and serum albumin level.

Patients were excluded if the medical file was unavailable or incomplete for the main variables of interest. According to the original study protocol, patients with comorbid conditions likely to significantly alter nutritional or inflammatory status, such as human immunodeficiency virus infection, diabetes mellitus or uncontrolled hypertension, were not included.

Sampling

A consecutive exhaustive sampling method was used. All eligible patients managed during the study period and fulfilling the inclusion criteria were included.

Variables and data collection

Data were collected using a standardized data extraction form. The following variables were recorded: sociodemographic characteristics, lifestyle factors, clinical characteristics, including tumor location, histological diagnosis; anthropometric parameters, biological parameters, including preoperative serum albumin, therapeutic variables, including type of surgical procedure and perioperative resuscitation measures; and outcome variables, including postoperative complications, surgical site infection, length of hospital stay and in-hospital mortality.

Nutritional assessment

Nutritional status was assessed using the available anthropometric and biological data. In accordance with current recommendations, malnutrition was not defined by serum albumin alone. A diagnosis of malnutrition was considered when at least one phenotypic criterion was associated with at least one etiologic criterion.

Serum albumin was analyzed separately as a biological marker of nutritional severity and perioperative risk, rather than as a standalone diagnostic criterion for malnutrition. Hypoalbuminemia was defined as serum albumin <35 g/L. It was classified as moderate when serum albumin was between 30 and 35 g/L and severe when serum albumin was <30 g/L.

Statistical analysis

Data were entered and analyzed using SPSS version 26.0 and R software version 4.2.3 with the R Commander interface. Quantitative variables were described using means and standard deviations when normally distributed, or medians and interquartile

ranges when distribution was non-normal. Qualitative variables were described using frequencies and percentages.

Comparisons between groups were performed according to nutritional status and preoperative hypoalbuminemia status. The Chi-square test or Fisher's exact test was used for categorical variables, as appropriate. Student's t-test was used for normally distributed continuous variables, and the Mann–Whitney U test was used for non-normally distributed continuous variables.

A p-value <0.05 was considered statistically significant.

Ethical considerations

The study was conducted in accordance with the principles of medical research ethics and confidentiality. Ethical clearance was obtained from the Institutional Ethics Committee for Research on Human Health of the University of Douala (approval number: 5206 CEI-UDo/07/2025/T; approval date: 21 July 2025).

Results

Baseline characteristics of the study population

A total of 64 patients undergoing surgery for digestive cancer were included in the study. The baseline characteristics of the study population are summarized in Table 1. The mean age was 56.4 ± 12.3 years, with a range from 30 to 76 years. Patients aged 40 years or younger represented the largest age group. There were 38 women (59.4%) and 26 men (40.6%). Most patients were married (65.6%), and the most frequent occupation was housewife (42.0%). Tobacco and alcohol exposure were reported in 20.3% and 29.7% of patients, respectively.

The most common tumor locations were the colon in 22 patients (34.4%), pancreas in 19 patients (29.7%) and rectum in 10 patients (15.6%). Other tumor sites included the stomach in 7 patients (10.9%), small bowel in 2 patients (3.1%), mesentery in 2 patients (3.1%), esophagus in 1 patient (1.6%) and liver in 1 patient (1.6%). Most patients had poor preoperative physical status, with ASA III and ASA IV classifications representing the majority of cases.

Preoperative nutritional and biological status

Preoperative nutritional and biological parameters are presented in Table 2. The mean preoperative weight was 61.48 ± 8.54 kg, with a range from 37 to 80 kg. The mean height was 174 ± 8.39 cm, with a range from 158 to 191 cm. The mean preoperative body mass index was 20.38 ± 3.03 kg/m², compared with a mean body mass index of 27.5 kg/m² before disease onset.

Based on body mass index alone, 22 patients (34.4%) had a body mass index below 18.5 kg/m², including 3 patients (4.7%) with severe thinness or cachexia. Estimated weight loss over six months was at least 10% in 62 patients (96.9%), including 25 patients (39.1%) with weight loss greater than 30%.

Preoperative hypoalbuminemia, defined as serum albumin <35 g/L, was found in 34 patients (53.1%). Among these patients, 6 (9.4%) had moderate hypoalbuminemia and 28 (43.8%) had severe hypoalbuminemia. Agreement between low body mass index and hypoalbuminemia was weak, with a Cohen's kappa coefficient of 0.20.

Table 1: Baseline characteristics of patients undergoing surgery for digestive cancer at Yaoundé Central Hospital (N=64).

Characteristics	n (%) or mean ± SD
Age, years	56.4 ± 12.3
Age range, years	30–76
Age group, years	
≤40	23 (35.9)
41–50	8 (12.5)
51–60	10 (15.6)
61–70	19 (29.7)
≥71	4 (6.3)
Sex	
Female	38 (59.4)
Male	26 (40.6)
Lifestyle factors	
Tobacco exposure	13 (20.3)
Alcohol exposure	19 (29.7)
Tumor location	
Esophagus	1 (1.6)
Stomach	7 (10.9)
Small bowel	2 (3.1)
Colon	22 (34.4)
Mesentery	2 (3.1)
Rectum	10 (15.6)
Pancreas	19 (29.7)
Liver	1 (1.6)
American Society of Anesthesiologists physical status	
ASA II	7 (10.9)
ASA III	23 (35.9)
ASA IV	31 (48.4)
ASA V	3 (4.7)

Table 2: Preoperative nutritional and biological status of patients undergoing surgery for digestive cancer at Yaoundé Central Hospital, January 2023 to December 2024 (N=64).

Variables	n (%) or mean ± SD
Anthropometric parameters	
Preoperative weight, kg	61.48 ± 8.54
Weight range, kg	37–80
Height, cm	174 ± 8.39
Height range, cm	158–191
Preoperative body mass index, kg/m²	20.38 ± 3.03
Body mass index range, kg/m²	12–25
Mean body mass index before disease onset, kg/m²	27.5
Body mass index categories	
Low body mass index <18.5 kg/m²	22 (34.4)
Severe thinness/cachexia <16 kg/m²*	3 (4.7)
Normal body mass index, 18.5–25 kg/m²	40 (62.5)
Overweight >25 kg/m²	2 (3.1)

Variables	n (%) or mean ± SD
Estimated weight loss over 6 months	
<10%	2 (3.1)
10–30%	37 (57.8)
>30%	25 (39.1)
Weight loss ≥10%	62 (96.9)
Nutritional status according to available phenotypic criteria	
Malnutrition based on low body mass index and/or ≥10% weight loss†	62 (96.9)
Low body mass index alone	22 (34.4)
Serum albumin status	
Hypoalbuminemia <35 g/L	34 (53.1)
Moderate hypoalbuminemia, 30–35 g/L	6 (9.4)
Severe hypoalbuminemia <30 g/L	28 (43.8)
Normal serum albumin ≥35 g/L	30 (46.9)
Agreement between low body mass index and hypoalbuminemia	
Low body mass index and hypoalbuminemia	22 (34.4)
Normal body mass index with hypoalbuminemia	12 (18.8)
Normal body mass index with normal albumin	30 (46.9)
Cohen's kappa for body mass index/albumin agreement	0.20

* Severe thinness/cachexia is a subset of the low body mass index (<18.5 kg/m²) category.

† Composite phenotypic criterion combining low body mass index and/or significant weight loss.

Postoperative morbidity and complication events

Postoperative outcomes according to preoperative hypoalbuminemia status are shown in Table 3. Overall postoperative morbidity occurred in 28 patients (43.7%). Morbidity was more frequent among patients with hypoalbuminemia than among those without hypoalbuminemia: 20 of 34 patients (58.8%) versus 8 of 30 patients (26.6%), respectively. Hypoalbuminemia was associated with higher odds of postoperative morbidity (OR: 3.93; 95% CI: 1.36–11.33; p=0.01).

A total of 32 postoperative complication events were recorded. The most frequent complication event was surgical site infection, observed in 11 patients (17.2%). Surgical site infection occurred in 8 patients with hypoalbuminemia and 3 patients without hypoalbuminemia. Enterocutaneous fistula was observed in 7 patients (10.9%), including 5 patients with hypoalbuminemia and 2 patients without hypoalbuminemia.

Gastrointestinal bleeding occurred in 3 patients (4.7%), including 2 patients with hypoalbuminemia and 1 patient without hypoalbuminemia. Pneumonia occurred in 3 patients (4.7%), all of whom had hypoalbuminemia. Wound dehiscence/evisceration occurred in 2 patients (3.1%), both in the hypoalbuminemia group. Intestinal obstruction occurred in 2 patients (3.1%), with one case in each group. Acute kidney injury, septic shock and pressure ulcer each occurred in one patient, all in the hypoalbuminemia group.

Length of hospital stay and in-hospital mortality

Length of hospital stay and in-hospital mortality according to hypoalbuminemia status are also presented in Table 3. The mean length of hospital stay was 16.7 ± 12.4 days, with a range from 3 to 51 days. Patients with hypoalbuminemia had a longer mean hospital stay than those without hypoalbuminemia: 22.3 ± 13.7 days versus 10.1 ± 6.1 days, respectively. Hospital stay longer than 28 days occurred in 11 patients (17.2%), all of whom belonged to the hypoalbuminemia group.

Overall in-hospital mortality was 23.4% (15/64). Mortality was

Table 3: Association between nutritional status and postoperative outcomes among patients undergoing surgery for digestive cancer (N=64).

Postoperative outcomes	Malnutrition/ hypoalbuminemia n=34	No malnutrition/ hypoalbuminemia n=30	Total N=64	p-value
Overall postoperative morbidity				
At least one complication	20 (58.8)	8 (26.6)	28 (43.7)	0.01
No complication	14 (41.2)	22 (73.4)	36 (56.3)	
Postoperative complication events				
Surgical site infection	8 (23.5)	3 (10.0)	11 (17.2)	—
Enterocutaneous fistula	5 (14.7)	2 (6.7)	7 (10.9)	—
Gastrointestinal bleeding	2 (5.9)	1 (3.3)	3 (4.7)	—
Pneumonia	3 (8.8)	0 (0.0)	3 (4.7)	—
Wound dehiscence/evisceration	2 (5.9)	0 (0.0)	2 (3.1)	—
Intestinal obstruction	1 (2.9)	1 (3.3)	2 (3.1)	—
Acute kidney injury	1 (2.9)	0 (0.0)	1 (1.6)	—
Septic shock	1 (2.9)	0 (0.0)	1 (1.6)	—
Pressure ulcer	1 (2.9)	0 (0.0)	1 (1.6)	—
Length of hospital stay				
Mean length of stay, days	22.3 ± 13.7	10.1 ± 6.1	16.7 ± 12.4	—
Hospital stay >28 days	11 (32.4)	0 (0.0)	11 (17.2)	<0.001†
In-hospital mortality				
Death	12 (35.3)	3 (10.0)	15 (23.4)	—
Survival to discharge	22 (64.7)	27 (90.0)	49 (76.6)	

† Fisher's exact test / statistically significant comparison.

higher among patients with hypoalbuminemia than among those without hypoalbuminemia: 12 of 34 patients (35.3%) versus 3 of 30 patients (10.0%), respectively. Hypoalbuminemia was associated with higher odds of in-hospital mortality (OR: 4.91; 95% CI: 1.23–19.61).

Discussion

This study showed a high burden of preoperative nutritional impairment among patients undergoing surgery for digestive cancer at Yaoundé Central Hospital. More than half of the patients had preoperative hypoalbuminemia, and almost all patients had significant weight loss compared with their pre-illness status. Patients with hypoalbuminemia had poorer postoperative outcomes, including higher postoperative morbidity, longer hospital stay and higher in-hospital mortality.

Overall postoperative morbidity occurred in 43.7% of patients and was significantly more frequent among patients with hypoalbuminemia than among those without hypoalbuminemia. Surgical site infection and enterocutaneous fistula were the most common postoperative events. These findings support the hypothesis that impaired preoperative nutritional and biological status is associated with adverse short-term outcomes after digestive cancer surgery.

Serum albumin was analyzed as a biological marker of severity and perioperative risk, rather than as a standalone diagnostic criterion for malnutrition. This distinction is important because hypoalbuminemia may reflect nutritional depletion, systemic inflammation, tumor burden, liver dysfunction, renal losses or digestive losses. Nevertheless, hypoalbuminemia remains clinically relevant in surgical oncology because it reflects a biological vulnerability associated with postoperative complications and mortality [4-7]. The weak agreement between low body mass index and hypoalbuminemia in our study supports the need for multidimensional nutritional assessment rather than reliance on a single marker [12].

Our findings are consistent with international data showing that malnutrition is associated with adverse postoperative outcomes after gastrointestinal cancer surgery. In a large international prospective cohort study, severe malnutrition was common among patients undergoing surgery for colorectal or gastric cancer and was associated with increased 30-day mortality after elective surgery [1].

Several recent studies in colorectal cancer surgery have also reported that hypoalbuminemia is associated with increased postoperative complications, major morbidity and mortality [4-7]. Studies applying GLIM criteria have similarly shown that GLIM-defined malnutrition is associated with postoperative complications and worse long-term prognosis in colorectal cancer surgery [13,14]. These findings are consistent with our results, in which patients with hypoalbuminemia had nearly four-fold higher odds of postoperative morbidity and almost five-fold higher odds of in-hospital mortality.

The predominance of infectious complications in our series is consistent with the pathophysiological effects of malnutrition, including impaired immune function, reduced collagen synthesis, delayed wound healing and decreased tolerance to surgical stress. The occurrence of fistula and wound dehiscence among patients with hypoalbuminemia further supports the role of nutritional impairment and low albumin status in tissue repair failure.
In patients with significant weight loss, low body mass index or hypoalbuminemia, surgery should ideally be preceded by nutritional optimization when oncologically feasible. ESPEN guidelines recommend perioperative nutritional support for patients at nutritional risk, particularly those undergoing major abdominal surgery or cancer surgery [8,9]. Recent evidence also suggests that preoperative oral nutritional supplementation may reduce infectious complications and improve postoperative outcomes in gastrointestinal cancer surgery [15,16].

African data on perioperative nutritional status remain limited. In a sub-Saharan African surgical setting, Mambou Tebou et al. reported that malnutrition was frequent among patients undergoing abdominal surgery and that poor albumin status was associated with unfavorable postoperative outcomes [17].

Our results also fit within the broader context of digestive cancer surgery in Cameroon. Bang, Bwelle Moto and colleagues reported that colorectal, pancreatic and gastric cancers were among the most frequent digestive cancers operated in Cameroon, and that diagnosis was rarely made through systematic screening [10]. This pattern is consistent with our series, in which colon, pancreas and rectum were the most frequent tumor locations. Bang, Chopkeng and colleagues also reported the burden of acute presentations in digestive oncological surgery in Yaoundé [18]. These local data support the need to integrate nutritional screening and optimization into digestive cancer surgery pathways in Cameroon.

Strengths and limitations in relation to other studies

The main strength of this study is that it provides local data on an important and underreported issue in digestive cancer surgery in Cameroon. It combines anthropometric data, weight loss, serum albumin and clinically relevant surgical outcomes.

However, its retrospective and single-center design limits causal inference and generalizability. The sample size was relatively small, which restricted robust multivariable adjustment. Muscle mass, inflammatory markers, standardized nutritional screening scores, detailed tumor staging and neoadjuvant treatment data were not systematically available. Serum albumin may also be influenced by non-nutritional factors. Therefore, the findings should be interpreted as showing an association between nutritional impairment/hypoalbuminemia and poor postoperative outcomes, rather than proving a direct causal relationship.

Meaning of the study and future research

This study highlights the need to move from passive recognition of nutritional impairment to systematic perioperative nutritional care in digestive cancer surgery. Future studies should prospectively apply GLIM criteria, include inflammatory markers and muscle mass assessment, stratify patients by tumor stage and type of surgery, and evaluate the impact of structured nutritional support on postoperative morbidity, length of hospital stay and mortality.

Conclusion

Preoperative nutritional impairment was frequent among patients undergoing surgery for digestive cancer at Yaoundé Central Hospital. Patients with malnutrition/hypoalbuminemia had higher postoperative morbidity, longer hospital stay and higher in-hospital mortality than those without nutritional impairment. Although serum albumin should not be considered a standalone diagnostic criterion for malnutrition, it remains a useful marker of severity and perioperative risk.

These findings support the need for systematic preoperative nutritional assessment in patients with digestive cancer. A practical strategy combining weight loss history, body mass index, dietary intake, functional status and serum albumin could help identify high-risk patients. When oncologically feasible, nutritional optimization before surgery and early postoperative nutritional support should be integrated into the perioperative management of digestive cancer patients in Cameroon and similar resource-limited settings.

Limitations

This study its retrospective design exposed it to missing data and information bias, particularly for variables such as dietary intake, exact timing of weight loss, inflammatory markers and detailed perioperative nutritional support.

The study was conducted in a single referral hospital with a relatively small sample size, which may limit the generalizability of the findings and restricted the ability to perform robust multivariable adjustment.

Finally, tumor stage, neoadjuvant treatment, surgical urgency and procedure complexity were not fully controlled for, although they may also influence postoperative outcomes.

Despite these limitations, the study provides useful local data on the relationship between preoperative nutritional impairment, hypoalbuminemia and short-term outcomes after digestive cancer surgery in a resource-limited setting.

Acknowledgments

The authors thank the nursing and administrative staff of the Visceral Surgery Department at Yaoundé Central Hospital for their support in patient management and data collection.

References

1. GlobalSurg Collaborative and NIHR Global Health Research Unit on Global Surgery. Impact of malnutrition on early outcomes after cancer surgery: an international, multicentre, prospective cohort study. Lancet Glob Health. 2023; 11: e341-e349.
2. Cederholm T, Jensen GL, Correia MITD, et al. GLIM criteria for the diagnosis of malnutrition: a consensus report from the global clinical nutrition community. Clin Nutr. 2019; 38: 1-9.
3. Cederholm T, Jensen GL, Correia MITD, et al. The GLIM consensus approach to diagnosis of malnutrition: a 5-year update. Clin Nutr. 2025; 49: 11-20.
4. Hu WH, Eisenstein S, Parry L, et al. Preoperative malnutrition with mild hypoalbuminemia associated with postoperative mortality and morbidity of colorectal cancer: a propensity score matching study. Nutr J. 2019; 18: 33.
5. Christina NM, Tjahyanto T, Lie JG, et al. Hypoalbuminemia and colorectal cancer patients: any correlation? A systematic review and meta-analysis. Medicine (Baltimore). 2023; 102: e32938.
6. Kang B, Zhao ZQ, Liu XY, et al. Effect of hypoalbuminemia on short-term outcomes after colorectal cancer surgery: a propensity score matching analysis. Front Nutr. 2022; 9: 925086.
7. Alajmi A, Almehari A, Alzahrani AR, et al. Impact of preoperative serum albumin level on the outcome of colorectal cancer surgery. Cureus. 2024; 16: e57655.
8. Weimann A, Braga M, Carli F, et al. ESPEN practical guideline: clinical nutrition in surgery. Clin Nutr. 2021; 40: 4745-4761.
9. Muscaritoli M, Arends J, Bachmann P, et al. ESPEN practical guideline: clinical nutrition in cancer. Clin Nutr. 2021; 40: 2898-2913.
10. Bang GA, Djopseu LK, Beugheum Chasim C, et al. Cancers digestifs opérés au Cameroun: typologie et stadification au moment du diagnostic. Health Sci Dis. 2021; 22: 11-15.
11. Bang GA, Moto GB, Ngoumfe JCT, et al. What is the place of surgery in the management of digestive cancers in Cameroon (Central Africa)? A study of a national cohort of 582 patients. Jpn J Gastroenterol Res. 2022; 2: 1060.
12. Poulter S, Steer B, Baguley B, et al. Comparison of the GLIM, ESPEN and ICD-10 criteria to diagnose malnutrition and predict 30-day outcomes: an observational study in an oncology population. Nutrients. 2021; 13: 2602.
13. Song HN, Wang WB, Luo X, et al. Effect of GLIM-defined malnutrition on postoperative clinical outcomes in patients with colorectal cancer. Jpn J Clin Oncol. 2022; 52: 466-474.
14. Shen N, Wen J, Chen C, et al. The relationship between GLIM-malnutrition, post-operative complications and long-term prognosis in elderly patients undergoing colorectal cancer surgery. J Gastrointest Oncol. 2023; 14: 2134-2145.
15. Zou QH, Yin ZC, Ding LL, et al. Effect of preoperative oral

nutritional supplements on clinical outcomes in patients undergoing surgery for gastrointestinal cancer: a systematic review and meta-analysis. Medicine (Baltimore). 2024; 103: e39844.

16. Knight SR, Qureshi AU, Drake TM, et al. The impact of preoperative oral nutrition supplementation on outcomes in patients undergoing gastrointestinal surgery for cancer in low- and middle-income countries: a systematic review and meta-analysis. Sci Rep. 2022; 12: 12456.
17. Mambou Tebou CG, Temgoua MN, Esiene A, et al. Impact of perioperative nutritional status on the outcome of abdominal surgery in a sub-Saharan Africa setting. BMC Res Notes. 2017; 10: 484.
18. Bang G, Goura G, Chopkeng J, et al. Emergency digestive oncological surgery in Yaounde (Cameroon): indications and short-term results. Surg Sci. 2022; 13: 198-206.