Available online at *www.ujpronline.com*
Universal Journal of Pharmaceutical Research
An International Peer Reviewed Journal
ISSN: 2831-5235 (Print); 2456-8058 (Electronic)

RESEARCH ARTICLE

EVALUATION OF CALORIC INTAKE, KNOWLEDGE, AND PRACTICES ON POSTOPERATIVE REFEEDING IN DIGESTIVE SURGERY IN NGAOUNDERE HOSPITALS, ADAMAWA REGION, CAMEROON

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Article Info:

Article History:
Received: 7 June 2023
Reviewed: 11 July 2023
Accepted: 25 August 2023
Published: 15 September 2023

Cite this article:
Tsague MV, Nguimbou RM, Ngaha Damndja W, Sineche Ngunte R, Modjo GA, Ngadjui Ngodjoum DR, Ze Minkande J. Evaluation of caloric intake, knowledge, and practices on postoperative refeeding in digestive surgery in Ngaoundere Hospitals, Adamawa Region, Cameroon. Universal Journal of Pharmaceutical Research 2023; 8(4):31-38.
https://doi.org/10.22270/ujpr.v8i4.973

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Abstract

Background and objective: Insufficient caloric intake among postoperative digestive surgery patients, linked to a lack of knowledge and practices regarding their re-feeding, is a frequent health problem in developing countries. The aim of this study was to assess the caloric intake of postoperative digestive surgery patients, as well as the knowledge and practices related to their refeeding in two hospitals in the city of Ngaoundere.
Methods: This was an observational, analytical, cross-sectional, prospective cohort study over a 5 months period from June to November 2022, focusing on the patients, the diets of post-digestive surgery patients, their nurses, and the operating theatre nursing staff. Caloric targets were defined as those with mean intakes above 15 kcal/kg/day at day 3 and 25 kcal/kg/day at discharge.
Results: A total of 134 patients, 240 caretakers, 20 nursing staff, and 614 dieters (meals) were included in the study. Males were more represented, with rates of 82.1%, 56.7%, and 75% for patients, nurses, and staff respectively. 25.4% of day-3 caloric targets and 24.6% of discharge caloric targets were met. The Kruskal-Wallis test was used to investigate daily variations in means for each macronutrient, the difference being significant at $p<0.05$. Lack of information and practice on the composition of a porridge, food frequency score, feeding chronology, and lack of nursing practice on the part of operating room nursing staff, were the main reasons observed.
Conclusion: The dietary balance in postoperative digestive surgery patients and the practices of re-feeding are deficient in the 2 hospitals in the town of Ngaoundere, suggesting an in-depth study of the dietary consequences they may have, such as undernutrition.
Keywords: Digestive surgery, knowledge and practices, Ngaoundere hospitals, postoperative, refeeding, undernutrition.

INTRODUCTION

Insufficient caloric and/or protein intake in relation to the body's needs is a heavy burden in developing countries[1]. It is all the more marked in healthcare settings, with 15% to 60% of hospitalized patients suffering from it depending on the type of admission[2]. In surgical wards, the figures are even higher, with 40-50% of patients affected, due to increased caloric requirements caused by increased catabolism and anorexia, the intensity and duration of which are proportional to the severity of the surgical procedure[3,4].

In Cameroon, very few or no studies have addressed the problem of calculating caloric intake in surgical inpatients. The persistence of this deficiency in caloric intake is associated with other exogenous factors responsible for undernutrition, some of which are linked to the patient's comorbidities, such as extreme age, cancers, sepsis, chronic digestive pathologies, HIV and factors linked to carcinological treatments, corticosteroid therapy exceeding one month and the polymedication[5] in postoperative patients: hence the need to carry out an assessment of caloric intake in the latter. The poor exploration of the dietary sector among

postoperative digestive surgery patients in the Cameroonian context is the reason that prompted us to conduct the present study with the aim of assessing the caloric intakes of postoperative, refeeding digestive surgery patients in two hospitals in the city of Ngaoundere.

MATERIALS AND METHODS

Total 134 patients, were collected 100 from Ngaoundere Patience Clinic and 34 from Ngaoundere Regional Hospital; 255 patients' attendants, 15 of whom were lost to follow-up. Of the remaining 240 attendants, 174 were from Ngaoundere Patience Clinic and 66 from Ngaoundere Regional Hospital of 20 post-operative attendants (none lost to follow-up), including 6 from Ngaoundere Patience Clinic and 14 from Ngaoundere Regional Hospital; 650 meals, of which 36 could not be characterized. Of the 614 meals, 454 came from Ngaoundere Patience Clinic and 160 from Ngaoundere Regional Hospital. Four representative soups were analyzed.

Type, period, and setting of study

A cross-sectional, observational, analytical, and prospective cohort study was carried out. It was carried out in the "Ngaoundere Patience Clinic" and Ngaoundere Regional Hospital in from June to November 2022.

Study population

The study population consisted of postoperative patients in the post-surgical care departments of the selected hospitals, their meals, patient caretakers, and the nursing staff working in the surgical department.

Selection Criteria

Included in our study were all patients who had undergone emergency or scheduled digestive surgery during the study period, and who had given their consent, all the patient caretakers who spent less than 24 hours at the patient's bedside, who had spent at least 24 hours at the bedside and who had given their consent, all nursing staff in the surgical department had given their consent, and all enteral and parenteral meals were included. Not included in our study were patients who had undergone digestive surgery but died, patients who were malnourished prior to surgery, nursing staff who were lost to follow-up, and enteral and parenteral meals consumed by patients but which could not be characterized during their stay, and all liquid meals that were not representative of the dosing phase.

Data Collection

The sampling of patients, patient caretakers, nursing staff, and meals was based on exhaustive, non-probabilistic, and consecutive recruitment. The data were selected among patients who had undergone emergency or scheduled digestive surgery, all the patient caretakers who spent less than 24 hours at the patient's bedside, and all nursing staff in the surgical department. Signed informed consent was obtained from each participant. Before the data collected were anonymized to protect patient privacy. A structured interview was set up to collect the following information:

- Sociodemographic characteristics like age, sex, profession, education level, matrimonial status, religion, patient caretakers;
- Assessment of nutritional intake goals and debts of enteral and parenteral patients.

The methodological approach used to assess the nutritional intake targets and debts of enteral and parenteral patients was divided into 4 phases: the characterization phase, the sampling and preservation phase, the dosing phase, and the macronutrient and calorie calculation phase.

1. **Meal characterization phase:** Total 7 elements are used to characterize a meal: The Food Diversity Score (FDS) per day is low when consumption is ≤ 2 food groups, medium when consumption is between 3 and 4 food groups, and high when consumption is ≥ 5 food groups. According to the 7 major food families[6]: Meat, fish, and eggs family; Dairy products family; Starchy foods and cereals family; Fruit and vegetable family; Fats family; Sugars and sweetened products family; Beverages family. Record the meal code: structure-patient-day-meal. Food Frequency Score (FFS) per day: Low (1 time - 3 times), normal (4-6 times), high (more than 6 times/day)[7,8]. Food typology from the first day consumed, to identify the types of food consumed: water diet, soup, compote, solid, and solute. Consistency of meal if liquid: liquid, fluid, and thick. Routes of administration per day until discharge: oral, enteral, parenteral. Amount of food consumed per meal, per day.
2. **The sampling and preservation phase:** Liquid foods were sampled; mainly 4 soups (corn porridge, soy, apple poisons, and apple meat). Solid foods, solutes, and labeled liquids were not sampled, as the macronutrient and calorie contents laid down by the FAO were already known from the labels. Samples were kept in the freezer for future analysis, and labeled with the meal code.
3. **The dosing phase:** The water content is determined by obtaining a constant weight after heating to 130°C[9,10]. The hexane extraction technique for lipids uses the Soxhlet[11,12]. The Kjeldah method is used to determine total protein concentration[13,14]. Incineration in a muffle furnace (Nabertherm®) at 550°C for 4h[15,16] measures ash content. Total carbohydrate content was calculated[17,18] using the following formula.

   Total Carbohydrate=100-[Water content (%) + Protein content (%) + Lipid content (%) + Ash content (%)
4. The macronutrient and calorie calculation phase. Following the determination of macronutrient contents, the energy value of the dishes was calculated using the coefficients of Atwater and Benedict[19,20] according to formula.

   Energy value (Kcal/100g) = Carbohydrate content (%) × 4 (Kcal) + Protein content (%) × 4 (Kcal) + Fat content (%) × 9 (Kcal)

- Caloric content and macronutrients of operated patients' mean calorie and macronutrient levels at

day-3 and discharge. First, the contents of daily meals were added. Second, we'll take the average on Day-3 and at discharge for each patient. Third, we'll compare with the energy-carbohydrate-lipid-protein targets on Day-3 at 15 kcal/kg/day-2.25 g/kg/day- 0.5 g/kg/day- 0.5 g/kg/day and at discharge at 25 kcal/kg/day- 3.75 g/kg/day-0.8 g/kg /day-1.2 g/kg/day (for those who did more than a week) if ≥ then achieved. And finally, for debts or boluses, make the difference between the average on Day-3 or at discharge with the target limits established[21].

- Nutritional goals, caloric and macronutrient balance. The energy intake considered was that of the average of three successive days. Normal energy and protein requirements were 35 kcal/kg/day and 20% of energy intake, respectively. Patients with an energy intake below the requirement of more than 200 kcal had a low energy intake. Those whose energy intake was above the requirement of more than 200 kcal had a high energy intake. Patients with a protein intake below the requirement of more than 10 g had a low protein intake. Those whose protein intake exceeded the requirement by more than 10 g had a high protein intake. Water intake was calculated as the sum of drinking water, water in liquid food, and infused fluids. Water requirements were 1 mL for 1 kcal or as many kilocalories as mL of water. Patients with a fluid intake below the requirement of more than 500 mL had a low fluid intake. Those whose fluid intake exceeded the requirement by more than 500 mL had a high fluid intake. Outside the defined limits, energy, protein, or water intake was considered normal[4].
- Knowledge and practices of health care staff and patient caretakers on post-digestive surgery refeeding. Total 4 questionnaires were used based on Virginia Henderson's 14 needs and dietary recommendations after digestive surgery[7,22]. Questionnaire 1 concerns the reception of information by the patient attendant from the nurse on the refeeding of a postoperative patient; Questionnaire 2 looks at the nurse's practice in relation to the information received; Questionnaire 3 looks at the nursing staff's knowledge of post-op nutrition in digestive–surgery; Questionnaire 4 looks at nursing practices with regard to feeding and hydration needs.

Ethical considerations

All the procedures of the study were approved by authorization of the Department of Biomedical Sciences of the Faculty of Sciences of the University of Ngaoundere 022/1002/UN/R/DFS/CD-SBM from May 19, 2022. Ngaoundere Regional Hospital and "The Patience Clinic", and authorization was obtained from the Regional Delegation of the Ministry of Health N° 598 AR/RA/DSP/BEP/NGE from July 15, 2022 to recruit participants for this study.

Statistical analysis

The Sphinx Plus.V5 software allowed us to establish the survey questionnaire forms; Microsoft Excel 2016 to collect answers, calculate caloric and macronutrient contents, and establish graphs; finally, the XLSAT 2016 software allowed us to make statistical analyses such as statistical description (by numbers and frequencies for qualitative variables, means, standard deviations and extremes for quantitative ones); Kruskal Wallis test to compare the means Values of $p<0.05$ were considered statistically significant.

Limitations of the study

Due to the short survey period, we were unable to visit all hospitals in Ngaoundere. Additional analyses such as albumin levels at hospital discharge remain an indicator of undernutrition. Finally, the energy value of all meals consumed during the hospitalization of postoperative patients should be estimated in order to correct the caloric debts of each patient.

RESULTS AND DISCUSSION

Sociodemographic characteristics

Our study was carried out on 134 patients, 240 nurses, and 20 patient caretakers. The predominant sex was male, or 82.09%, 56.71%, and 75% for patient caretakers, and nursing staff respectively. This may be explained by the fact that, during our study period, the majority (for patients) of pathologies encountered were strangulated and non-strangulated hernias (29.85%), the latter affecting men more than women. Our results are superior to the study conducted by Adébayo et al.[4] in Benin, who found 57.78% male predominance. Among patients, the most represented age bracket was [18-70] years, either 73.35% (105); the majorities 62.68% (84) were married and 65.67% (88) were Muslims. Among patient's caretakers, the majority were [18-28] years old, or 30.83% (74). The majority were farmers (34.17%, 82), undereducated (34.17%, 82), married (60%, 144), and Muslim (60.42%, 145). Among operating theater staff, the majority were aged [28-38], either 35% (7) or 50% (10) were nurses (Table 1).

Assessment of nutritional intake goals and debts of enteral and parenteral patients

Nutritional characterization and diet dosage

Figure 1A showed that the most consumed food group was soup at 52.28% (apple, fish, meat, soy porridge, and corn porridge) with 25.26%, which is normal since this is the recommended food form for postoperative patients. Figure 1B showed that the majority of patients had a low Food Diversity Score because they consumed less than 2 food groups (78.37%). This is due to the fact that the most consumed soup was corn porridge (46.15%). Of the 4 soups measured, maize porridge had a high carbohydrate content (82.07 g/100 g DM), but the lowest energy content (395.91 kcal/100 g DM), with low protein (5.75 g/100g DM) and lipid (4.96 g/100 g DM) contents.

Table 1: Demographic characteristics of postoperative patients, operating room staff, and patient caretakers.

Variables	Effective (N)	Frequency (%)	Variables	Effective (N)	Frequency (%)
Patients (N=134)			**Patients (N=240)**		
Structure			**Education level**		
CPN	100	74.63	Undereducated	82	34.17
HRN	34	25.37	Primary	43	17.92
Gender			Secondary	60	25.00
Male	110	82.09	Upper	55	22.92
Female	24	17.91	**Matrimonial status**		
Age range (year)			Single	46	19.17
<18	19	14.18	Divorced	38	15.83
[18-70]	105	78.36	Married	144	60.00
>70	10	7.46	Widower	12	5.00
Age (year)			**Religion**		
Mean, SD	36 ± 17.78		Christian	95	39.58
Religion			Muslim	145	60.42
Animist	5	3.731	**Staff working in the operating room (N=20)**		
Christian	41	30.59	**Structure**		
Muslim	88	65.67	PCN	6	30
Matrimonial status			RHN	14	70
Single	50	37.31	**Profession**		
Married	84	62.68	Farmer	82	34.17
Patient caretakers (N=240)			Frame	16	6.67
Structure			Retailer	72	30.00
PCN	153	63.75	Teacher	10	4.17
RHN	87	36.25	Student	8	3.33
Gender			Housewife	44	18.33
Male	139	57.92	Retired	8	3.33
Female	101	42.08	**Gender**		
Sex ratio			Female	5	25
M /F	1.3		Male	15	75
Age range (year)			**Age range (year)**		
<18	4	1.67	[18-28[	6	30
[18-28[	74	30.83	[28-38[	7	35
[28-38[	50	20.83	[38-48[	5	25
[38-48[	57	23.75	≥48	2	10
≥48	55	22.92	**Age (year)**		
Age (year)			Mean, SD		33 ±10.89
Mean, SD	40 ±13.73		**Grade of the staff**		
			Nursing Assistant	4	20
			Nurses	10	50
			Trainee	6	30

This is due to the fact that no other protein or lipid elements were added to its composition (Figure 1C). Patients consumed an average of 7.089 kcal/kg/day of calories containing 1.26 g/kg/day of mostly carbohydrates; 0.21 g/kg/day of protein and 0.13 g/kg/day of fat. This was far from the study done by Preiser[21] which found an average calorie intake of 18.5±9.6 kcal/kg/day. This is explained by the fact that the most consumed soup which was corn porridge, has a low energy intake (395.91 kcal) and a low Food Diversity Score.

Table 2: Summary of average calorie and macronutrient contents on day-3 and at discharge.

	Minimum	Maximum	Mean	SD
Mean Carbohydrate on day-3 (g/kg/day)	0	8.04	1.50	1.93
Mean Fat on Day-3 (g/kg/day)	0	0.99	0.14	0.24
MeanProtein on Day-3 (g/kg/day)	0	1.23	0.23	0.35
Mean Energy Values on day-3 (kcal/kg/day)	0	41.92	8.22	10.76
Mean Carbohydrate at discharge (g/kg/day)	0.17	8.04	1.91	1.91
MeanLipids at discharge (g/kg/day)	0.008	1.87	0.21	0.29
MeanProtein at discharge (g/kg/day)	0.01	4.07	0.32	0.49
Mean Energy Values at discharge (kcal/kg/day)	0.81	56.26	10.90	11.41

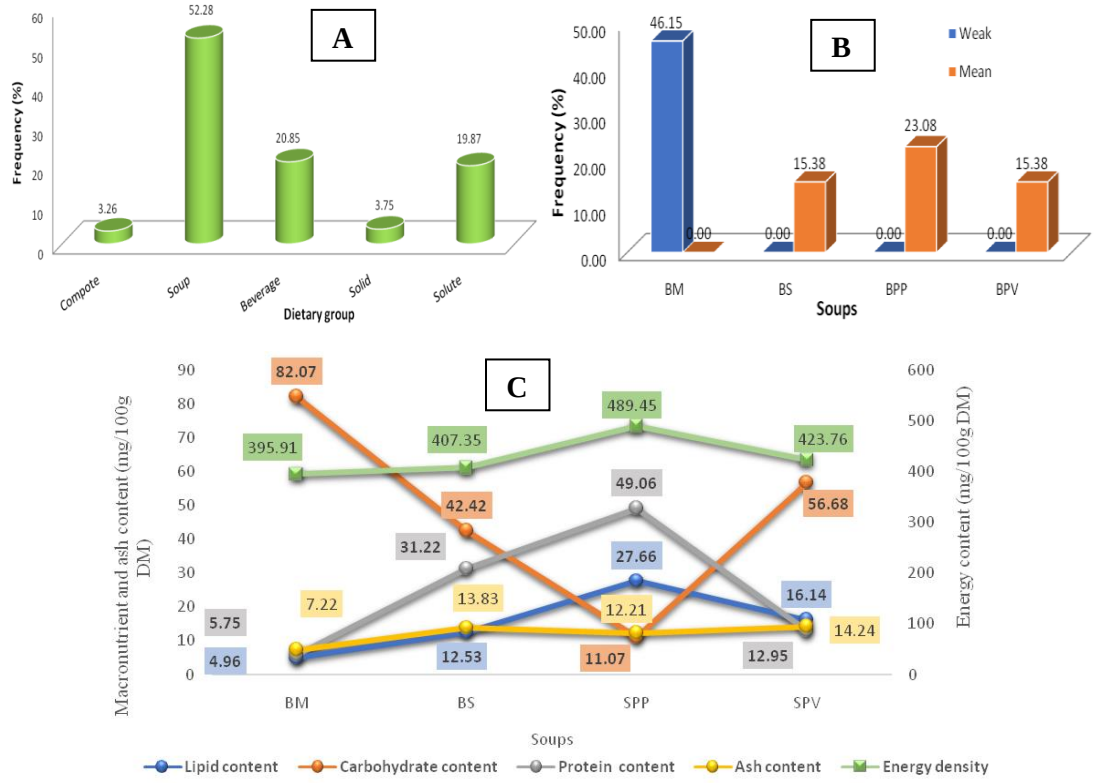

Figure 1: Distribution of diet groups consumed by patients (A), SDA of most consumed diet (B) Average energy content of soups (C).

BM: corn porridge; BS: soy porridge; BPP or SPP: porridge fish soup; BPV or SPV: porridge meat soup; FDS: Food Diversity Score; DM: dry matter.

Caloric content and macronutrients of operated patients

Of 134 patients surveyed, carbohydrates were the most consumed macronutrient with a peak on day 12 of 3.17 g/kg/day followed by day 3 of 2.55 g/kg/day for 59 and 132 patients with 12 and 3 days of hospitalization respectively (Figure 2A). The caloric peak was 19.45 g/kg/day on day 12 followed by 15.37 g/kg/day on day 3 for 59 and 132 patients with 12 and 3 days of hospitalization, respectively (Figure 2B). The Kruskal-Wallis test shows us that the means for each macronutrient varied very significantly by day $p<0.0001$.

Table 3: Mean caloric and macronutrient debts and boluses on day-3 and at discharge.

	Mean [min ; max]			
	Day-3		output	
	Debts	Bolus	Debts	Bolus
Carbohydrate (g/kg/day)	-1.84 [-2.25 ; -0.01]	1.91 [0.06; 5.7]	-2.65 [-3.37 ; -0.05]	1.82 [0.06; 5.79]
Lipid (g/kg/day)	-0.43 [-0.50 ; -0.11]	0.21 [0.01; 0.49]	-0.58 [-0.79 ; -0.07]	0.33 [0.02; 1.38]
Protein (g/kg/day)	-0.40 [-0.50 ; -0.01]	0.46 [0.09; 0,74]	-0.85 [-1.19 ; -0.08]	0.57 [0.10; 3.57]
Caloric (kcal/kg/day)	-12.36 [-15 ; -1.12]	9.66 [2.65; 26.93]	-17.61 [-24.19; -0.95]	11.52 [1.32 ; 41,27]

Of 134 patients surveyed, carbohydrates were the most consumed macronutrient, with a peak on day-12 of 3.17 g/kg/day followed by day 3 of 2.55 g/kg/day for 59 and 132 patients respectively, who had been hospitalized for 12 and 3 days (Figure 2A). Peak caloric intake was 19.45 g/kg/day on day 12, followed by 15.37 g/kg/day on day 3, for 59 and 132 patients respectively with 12 and 3 days of hospitalization (Figure 2B). The Kruskal-Wallis test showed us that the means for each macronutrient varied very significantly by day $p<0.0001$. Patients consumed an average of 7.089 kcal/kg/day of calories, containing 1.26 g/kg/day of main carbohydrates, 0.21g/kg/day of protein, and 0.13g/kg/day of fat. This was a far cry from Clara's 2014 study, which found an average calorie intake of 18.5±9.6 kcal/kg/day. This can be explained by the fact that the most widely consumed soup was Corn Porridge, which has a low energy intake (395.91 kcal) and a low Food Diversity Score.

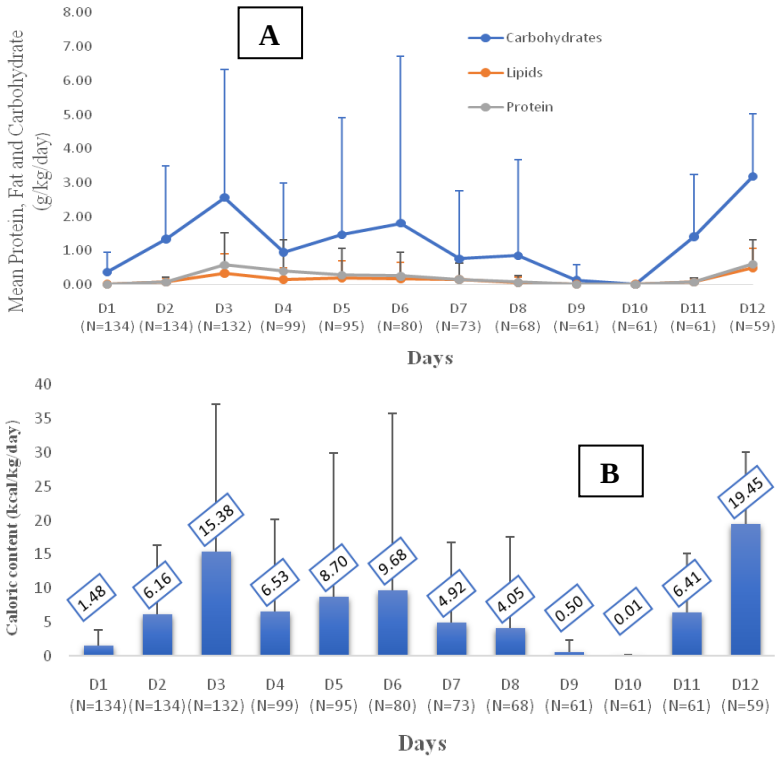

Figure 2: Average daily macronutrient (A), and caloric (B) content of dishes per kg according to hospitalization days and number of patients remaining per day.

The majority of patients had not reached their caloric-carbohydrate-lipid-protein goal at day-3, which was 15 kcal/kg/day- 2.25 g/kg/day- 0.5 g/kg/day-0.5 g/kg/ day. Thus, only 24.63%; 30.60%; 11.94%; 14.93% respectively for caloric, carbohydrate, lipid, and protein objectives were reached. Also, the majority of patients had not reached their caloric-carbohydrate-lipid-protein objective at discharge, which was set at 25 kcal/kg/day-3.75 g/kg/day- 0.8 g/kg/day- 1.2 g/kg/day. Thus, only 25.37%; 29.10%; 11.19%; 14.96% for caloric, carbohydrate, lipid, and protein targets respectively were achieved. This would be a departure from the 2020 Preiser[21] study in France which found 53% at day-3 and 54.5% at discharge of patients who achieved their caloric goal. This is because the patients had a very low average caloric intake. Thus, patients who did not reach their caloric goals on day-3 or at discharge had an average of 12.36 kcal/kg/day as a caloric debt on day-3 and were discharged with an average caloric debt of 17.61 kcal/kg/day which is very high.

Mean calorie and macronutrient levels on day-3 and discharge

On average 8.22 [0-41.92] Kcal/kg/day were consumed on day-3 and 10.9 [0.81-56.26] Kcal/kg/day at discharge. All post-op patients were grade I and II patients, as daily intake over 7 days was < 60% (Table 2).

Table 4: Knowledge and practices of staff and patient caretakers.

Variables	Patient care (N=240)		Staff (N=20)	
	Information	Practices	Knowledges	Practices
On re-feeding				
Start feeding (after gas emission)	240	235	20	20
Type of food and consistency (soup, compote... liquid/semi-liquid)	230	220	20	20
Composition of a soup mix (corn, sugar, peanuts, soya...)	10	5	10	10
Feeding chronology (water diet, real 1, real 2, normo caloric without residues)	45	19	12	6
FFS (at least 4 times per day)	20	9	6	3
Hygiene rules (wash hands, utensils, use bottled water)	59	240	20	10
On the need for nutrition and hydration				
Care plan with regard to feeding and hydration needs	/	/	20	2
Evaluation of ingesta and excreta (diuresis, stools, quantity of food ingested)	/	/	15	11
BMI Assessment	/	/	20	2
Energy requirements	/	/	16	0
Counseling on re-feeding	/	/	20	20

BMI: Body Mass Index; FFS: Food Frequency Score; *p*-value <0.05 chi² test

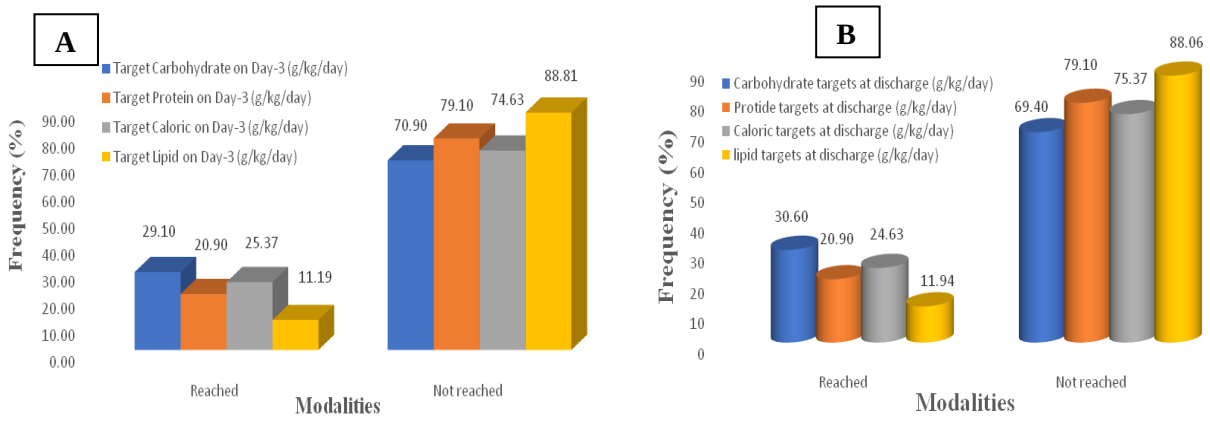

Figure 3: Distribution of patients according to the achievement of caloric and macronutrient targets on D-3 (A) and at discharge (B).

Nutritional goals

The majority of patients had not reached their caloric-carbohydrate-lipid-protein goals set at 15 kcal/kg/day- 2.25 g/kg/day- 0.5 g/kg/day- 0.5 g/kg/day for day-3 respectively and at 25 kcal/kg/day- 3.75 g/kg/day- 0.8 g/kg/day-1.2 g/kg/day respectively for discharge. Thus only 25.37%; 29.10%; 11.19%; 20.90% respectively for caloric, carbohydrate, lipid, and protein goals at day-3 (Figure 3A) and 24.63%; 30.60%; 11.94%; 20.90% respectively for caloric, carbohydrate, lipid, and protein goals at discharge (Figure 3B) were achieved. These results are in line with those of Preiser, who worked on the evaluation of nutritional management in the surgical intensive care units at the Nancy University Hospital Center in 2014 in Benin.

Caloric and macronutrient balance

Patients who did not reach their caloric goals on day-3 or at discharge had an average caloric debt of 12.36 kcal/kg/day on day-3 and were discharged with an average caloric debt of 17.61 kcal/kg/day (Table 3).

Knowledge and practices of health care staff and patient caretakers on post-digestive surgery refeeding

The nurses were more informed about the beginning of the feeding (100%), the type of food (95.83%), and had good practices (97.91% of the nurses waited for the gas to be released and 91.66% gave the best type of food to the patients). On the other hand, regarding the other parameters such as the composition of slurry, the Food Frequency Score, and the chronology of feeding, the caretaker was not sufficiently informed about it and therefore had non-conforming practices. These data correlated very well with staff knowledge and practice, as the higher the rate of staff knowledge and practice, the higher the rate of staff information and practice. For the aspect of knowledge and practices of the personnel with regard to the needs of feeding and hydration expressed by the patient, the majority of the personnel had knowledge of it, or 15/20 for the most minimal knowledge or the evaluation of the ingesta, but on the other hand, the practices left something to be desired, or 0/20 of the person who always calculated the BMI and the caloric needs of the patients, and 2/20 of the person who drew up the nursing care plans (Table 4).

Lack of information and practices of the nurses on the composition of porridge, the Food Frequency Score, the chronology of feeding, and the lack of practices of the operating room staff on the nursing care plans, the evaluation of the BMI, and the calculation of the caloric intake of the patients were mostly observed. This can be explained by the fact that the majority of under-educated people at the bedside are not able to remember the instructions given by the staff. For the staff, the presence of non-nursing staff within the operating team is not equipped with knowledge of the nursing care plan but is considered as such. And also the laziness developed by some nursing staff in the past years.

CONCLUSIONS

The patients were predominantly male, aged between [18-70] years, married, and of the Muslim religion. The majority of dishes consumed by patients were from the soup group, in this case, corn porridge, which is not very diversified in terms of Food Diversity Score and has a low energy and protein content, unlike fish soup or other diets. This is the reason why the majority of patients did not reach their carbohydrate, lipid, and protein caloric objectives on day-3 and at discharge and left the ward with more caloric debts than boluses. Also, there was a lack of information and practices of the nurses on the constitution of porridge, the Food Frequency Score, the chronology of feeding, and the lack of practices of the personnel in function in the operating room on the nursing care plan, the evaluation of body mass index and the calculation of the caloric intake of the patients.

ACKNOWLEDGEMENTS

The authors would like to thank the Professor Nguimbou Richard Marcel, for his commitment to this study.

AUTHOR'S CONTRIBUTION

Tsague MV: writing, review, editing, methodology. **Nguimbou RM:** formal analysis, data curation, conceptualization. **Ngaha Damndja W:** writing, data curation. **Sineche Ngunte R:** supervision, review. **Modjo GA:** writing, review and editing, data curation. **Ngadjui Ngodjoum DR:** formal analysis, writing,

review, and editing. **Ze Minkande J:** supervision. All authors revised the article and approved the final version.

DATA AVAILABILITY

The data supporting the findings of this study are not currently available in a public repository but can be made available upon request to the corresponding author.

CONFLICT OF INTEREST

The authors have no conflict of interest.

REFERENCES

1. Wu Y, Wang X, Gao F, Liao J, Zeng J, Fan L. Mobile nutrition and health management platform for perioperative recovery: an interdisciplinary research achievement using WeChat Applet. Frontiers Med (Lausanne) 2023. *https://doi.org/10.3389/fmed.2023.1201866*
2. Purnamasari D, Bunawan NC, Suseno D, Rinaldi I, Dillon, DH.. In-hospital malnutrition among adult patients in a national referral hospital in Indonesia. Nutrition Res Pract 2023; 17(2):218-227. *https://doi.org/10.4162/nrp.2023.17.2.218*
3. Mareschal J, Hemmer A, Douissard J, *et al.* Surgical prehabilitation in patients with gastrointestinal cancers: Impact of unimodal and multimodal programs on postoperative outcomes and prospects for new therapeutic strategies-A systematic review. Cancers (Basel) 2023; 15(6):1881. *https://doi.org/10.3390/cancers15061881*
4. Adebayo C, Adrien M, Albert C, *et al.* Frequency and determinants of postoperative undernutrition in visceral surgery at the Centre National Hospitalier et Universitaire Koutoucou Hubert Maga, Cotonou. Pan African Med J 2018; 29(1): 1-10. *https://doi.org/10.11604/pamj.2018.29.19.10805*
5. A'zim AZA, Zaid ZA, Yusof BNM, Jabar MF, Shahar, ASM. Effectiveness of intensive perioperative nutrition therapy among adults undergoing gastrointestinal and oncological surgery in a public hospital: study protocol for a pragmatic randomized control trial. Trials 2022; 26; 23(1):961. *https://doi.org/10.1186/s13063-022-06898-2*
6. Nguimbou RM. Chemistry of food and the environment. Department of Biomedical Sciences, University of Ngaoundere, Cameroon 2009.
7. Mathieu J. Nutrition and digestive surgery. Med Nutri 2007; 43(3):128-131.*https://doi.org/10.1051/mnut/2007433128*
8. Adakal O, Rouga MM, Abdoulaye MB, *et al.* Indications, complications and socio-economic weights of digestive stomas at regional hospital center of Maradi. African J Digest Surg 2021; 21(1):3269 – 3274.
9. French Association for Standardization (AFNOR) 2000. Determination of moisture content, practical method. Cereals, Pulses, Derived Products NF V 03-707.
10. Rakiswende OE, Conate K, Dakuyo R, *et al*. Optimization of soybean pre-treatment processes for the improvement of their nutritional, biochemical and bioactive characteristics. World J Adv Res Rev 2022; 15(02): 129–138. *https://doi.org/10.30574/wjarr.2022.15.2.0700*
11. Hama-Ba F, Siedogo M, Ouedraogo DA, Dicko HM, Diawara B. Consumption patterns and nutritional value of food legumes in Burkina Faso. African J Food Agri Nutri Dev 2017; 17(4): 12871-12888. *http://dx.doi.org/10.11648/j.ijnfs.20170606.14*
12. Semporé NJ, Songré-Ouattara TL, Tarpaga VW, Bationo F, Dicko Mamoudou H. Comparison of proximate composition and nutritional qualities of fifty-three cashew accessions from Burkina Faso. Food Nutri Sci 2021; 12(12). *http://dx.doi.org/10.4236/fns.2021.1212087*
13. Sousa DO, Fernandes AG, Alves DC, De Freitas AM, Naves MM.V. Nutritional Quality and Protein Value of Exotic Almonds and Nut from the Brazilian Savanna Ompared to Peanut. Food Res Int 2011; 44:2319-2325. *https://doi.org/10.1016/j.foodres.2011.02.013*
14. Kumar S, Sigh S. Variability assessment of seed traits in *Jatropha curcas* L. for Improvement of oil yield. Int J Genetics Mol Biol 2014; 6: 8-15. *https://doi.org/10.5897/IJGMB2013.0079*
15. ISO (International Standardization Organization). 2007. Determination of ash content by incineration at 550°C. Cereals, pulses and derived products, ISO 2171.
16. Mensah P, Tunkins A. Household level technologies to improve the availability and preparation of adequate protein and safe complementary foods. Food Nutri Bullet 2003; 24:104-125. *http://dx.doi.org/10.1177/156482650302400106*
17. Egan H, Kirk RS, Sawyer PR. Chemical Analyses of Food 1981; (8th edition). Churchill. Livingstone: London-UK, 591.ISBN 10: 044302149X / ISBN 13: 9780443021497
18. Mu J, Zhao H, Yang G. A critical discourse analysis of reports about China on the COVID-19 Pandemic in the New York Times. Library J 2021; 8 (8). *https://doi.org/10.4236/oalib.1107746*
19. Atwater WO, Benedict FG. Experiments on the metabolism of matter and energy in the human body. US Department of Agriculture. Washington, DC, Bulletin 1899; 69: 112.
20. Babaa S, Rawahi A, Subramanian A, *et al*. Smart building design to improve the energy consumption at an office room. Smart Grid Renew Energy 2022; 13, 209-221. *https://doi.org/10.4236/sgre.2022.139013*
21. Preiser JC, Devroey M, Lheureux O. Nutritional management of the patient hospitalised in the department of intensive care of the Erasme University hospital in Brussels. Anesth Resuscit 2020;6(1):54-58. *https://doi.org/10.1016/j.anrea.2019.10.006*
22. Paget S, Adam F, Courtois-Dubresson C, Bon C. The Virginia Henderson Model 2018. *https://www.ifsidijon.info/v2/wp-content/uploads/2015/09/2016*