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Research Article

Evaluation of Nutritional Management among Patients with COVID-19 in Two Intensive Care Units of Abidjan

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ABSTRACT

Background: During the COVID-19 pandemic, specialized centers, including intensive care units, were established in Côte d'Ivoire for the management of patients with COVID-19. The objective of this study was to assess the nutritional prescriptions and management of these patients in two dedicated intensive care units.
Methods: A prospective study was conducted from December 2020 to January 2021. A dietary survey and calculations of energy intake from oral and blended enteral nutrition were performed.
Results: The nutritional value of the daily oral ration was 1490 kcal, representing 70% of the recommended energy intake, and did not meet patients' energy requirements in either center, which offered similar menus. The same applied to the nutritional value of the blended enteral feeds. That of center 1 provided 1537 kcal (carbohydrates 67.2%, proteins 16.3%, and fat 15.6%), while that of center 2 provided 2490 kcal (carbohydrates 60.5%, protein 15.8%, and fat 22%). These intakes were unbalanced and failed to meet patients' nutritional needs. Mortality was high, at 69.57% in center 1 and 47.4% in center 2.
Conclusion: Deficiencies were identified in both the assessment of patients' nutritional status and the evaluation of their dietary intake.

Introduction

The coronavirus disease 2019 (COVID-19) emerged in December 2019 and was declared a public health emergency of international concern by the World Health Organization (WHO) on January 30, 2020. In Côte d'Ivoire, as in many countries, emergency and intensive care services were heavily burdened. To strengthen patient care capacity, the Ivorian government and its partners established dedicated intensive care units for the management of patients with the disease. Severe clinical presentations were frequently associated with catabolism and systemic inflammation, leading to rapid nutritional deterioration and a worsening prognosis. The European Society for Clinical Nutrition and Metabolism (ESPEN) issued recommendations aimed at preventing and managing such nutritional deficiencies in these critically ill patients [1]. However, it remained unclear whether these recommendations were implemented locally. This study, therefore, aimed to evaluate the nutritional management of patients with the disease admitted to two dedicated intensive care units in Abidjan, Côte d'Ivoire.

Methods

This was a prospective descriptive study conducted in the two largest COVID-19 intensive care units in Abidjan, referred to as Center 1 and Center 2. The study

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period extended from December 2020 to January 2021. All patients aged 18 years and older admitted to intensive care for confirmed COVID-19 with or without acute respiratory distress syndrome (ARDS) were eligible for inclusion, regardless of their consciousness. Patients who died within the first 72 hours after admission or whose polymerase chain reaction (PCR) test for SARS-CoV-2 was negative were excluded. The variables collected included (1) sociodemographic characteristics (age, sex, and occupation); (2) nutritional parameters—type of nutrition (oral, enteral, or parenteral); (3) nutritional status: anthropometric data (weight, height), biochemical and biological parameters (urea, creatinine, blood glucose, sodium, potassium, etc.); and (4) clinical outcomes (length of stay and mortality). All data were recorded and analyzed using Microsoft Excel 2016. Energy values were calculated using the NutriSurvey software, which incorporates local and regional food composition databases to improve accuracy and contextual relevance.

Results

During the study period, 93 patients were admitted, of whom 40 met the inclusion criteria. Patients older than 55 years accounted for 65% of the study population, with a sex ratio (male: female) of 0.9. The most frequent comorbidities were hypertension (40%) and diabetes mellitus (20%). Seventeen patients required endotracheal intubation and mechanical ventilation. The mean length of stay was 7.7 ± 5.2 days in center 1 (range of 3-24 days) and 5.9 ± 2.4 days in center 2 (range of 2-10 days). Mortality rates were 69.57% in center 1 and 47.4% in center 2 (Table 1). The mode of nutrition depended on the patients' level of consciousness. Conscious patients received oral feeding (52.5%), while sedated or comatose patients were managed by enteral nutrition via nasogastric tube (47.5%). No patient received parenteral nutrition. The oral menus were similar in both centers for breakfast, lunch, and dinner. For enteral feeding, however, menus differed between the two centers: center 1 provided locally prepared blended, whereas center 2 used industrial nutritional solutions and supplements (Table 2). Oral nutrition was hypocaloric, providing an average of 1440.9 kcal/day, and hypoproteic, with 384 kcal from protein. The blended enteral formula used in center 1 supplied 15537.8 kcal/day (carbohydrates 67.2%, protein 16.3%, and fat 22.2%) (Table 3,4). These regimens failed to meet the recommended daily energy and protein requirements for critically ill patients.

Anthropometric measurements were limited because weighing beds were unavailable; consequently, patient weight was estimated and not monitored during hospitalization. Height was recorded, but other parameters were not measured. Laboratory tests included hepatic, renal, and metabolic panels performed as part of COVID-19 follow-up; specific nutritional markers, such as serum albumin and total protein, were requested in only 20% of cases.

Table 1- Sociodemographic, therapeutic, and clinical characteristics of patients hospitalized in the two centers

Parameters	**Variables**	**Center 1**	**Center 2**
		Number	**Number**
Age groups (years)	25-40	2	0
	40-55	6	6
	55-70	9	7
	> 70	6	4
Gender	Male	11	8
	Female	12	9
Treatment	Intubated and ventilated	8	11
	Enteral feeding	15	6
	Nasogastric tube	8	11
outcome	Death	16	9
	Transfers	7	10
	Hospital stay	7.66 ± 5.19 j [3; 24 j]	5.86 ± 2.35 [2; 10 j]

Table 2- Daily menu for the different centers

	Enteral nutrition			
	Center 1		**Center 2**	
Type of meal	Ingredients	Quantity	Ingredients	Quantity
Break fast	corn/millet/ ricePorridge	150 g	Food supplement	150 g
	Sugar	10 g	Industrial nutritional solution	100 ml
Lunch	corn/millet/ ricePorridge	150 g	Food supplement	150 g
	Sugar	10 g	Industrial nutritional solution	100 ml
Diner	Yaourt	250 g	Food supplement	150 g
			Industrial nutritional solution	100 ml

Table 3- Biochemical composition and energy values of oral nutrition

Biochemical composition	Breakfast	Lunch	Diner
Proteins: (g)	48.8	157.2	178
%	(12%)	(29%)	(37%)
Lipids: (g)	159.3	220.5	240.3
%	(39%)	(40%)	(48%)
Carbohydrates (g)	196.8	165.6	70.4
%	(49%)	(31%)	(15%)
Energetic value (Kcal)	407.4	543.0	490.5
Vit A (mcg)	159.6	46.6	73.3
Vit C (mg)	2.6	0.3	16.4
Fe	1.1	2.8	1.9
Zn (mg)	1.6	2.5	2.7
Mg (mg)	42.5	83.9	129

Table 4- Biochemical composition and energy values of the daily enteral nutrition menu at the two centers

Composition	Center 1	Center 2
Proteins (Kcal)	250.4 (16.3%)	408 (15.8%)
Lipids (Kcal)	239.8 (15.6%)	552 (22.2%)
Carbohydrates (Kcal)	1034.4 (67.2%)	1566 (60.5%)
Energy value (Kcal)	1537.8	2490
Vit A	0	351
Vit C	0	60
Vit D	0	51
Fe	5.4	5.1
Zn	1	7.5
Selenium	0	39
Mg	109	163.5

Discussion

In both intensive care units, most patients were over 50 years of age, consistent with previous reports showing higher disease severity in older populations [2]. Li et al. reported similar findings in a Chinese cohort, in which 28% of patients were at risk of undernutrition and 53% were classified as malnourished [3]. Aging, comorbidities, and reduced physiological reserves contribute to increased vulnerability and nutritional risk among critically ill COVID-19 patients. These factors are also associated with sarcopenia, which necessitates an adapted nutritional strategy.

Current international recommendations including those from French, American, and Australian expert groups, advocate for a progressive increase in caloric intake from 15-20 kcal/kg/day initially to 25-30 kcal/kg/day by day 4, and a protein target of 1.2-1.3 g/kg/day, increased up to 2 g/kg/day during rehabilitation [1,4]. These targets can be achieved using concentrated enteral solutions (1.5-2 kcal/ml). In our study, however, nutritional prescriptions were standardized regardless of body weight or duration of hospitalization. The average oral intake (1440.9 kcal/day and 384 kcal from protein) fell well below recommended targets, indicating insufficient coverage. In addition, reduced appetite further exacerbated this deficit.

Vitamin and trace element intake was also inadequate. In center 1, only vitamin C was routinely administered, although previous studies have not shown clear benefits from high-dose vitamin C supplementation in ARDS patients [5]. In center 2, patients received an additional high-calorie, high-protein milk-based supplement providing 600 kcal and 30 g of protein per 300 ml, yielding a total energy value of 2490 kcal/day, sufficient in calories but suboptimal in protein. Nutritional support did not adequately consider individual energy demands, which vary according to disease severity and metabolic stress [6]. This mismatch between energy expenditure and intake has been correlated with higher morbidity and mortality among critically ill patients [7-8].

Monitoring of nutritional status was limited in both centers. Weight was estimated due to the lack of weighing beds, and other anthropometric indices were not assessed. Laboratory monitoring focused mainly on liver, kidney, and metabolic function tests, while nutritional biomarkers such as albumin and total protein were measured in only 20% of cases. Simple bedside tools, such as a visual analog scale of food intake, could facilitate early identification of nutritional risk and timely referral to dietetic teams, as recommended by ESPEN guidelines [1].

Digestive intolerance remains another challenge in enteral nutrition. Upper gastrointestinal intolerance, resulting from delayed gastric emptying, prevents achievement of energy and protein targets and affects approximately 30% of critically ill patients [9-10]. This rate may be even higher among COVID-19 ICU patients, reaching 46% in one observational study [11].

Regular reassessment of tolerance, dietary intake, and body weight is therefore essential to ensure adequate coverage and improve outcomes.

Finally, evidence suggests that micronutrients such as vitamins A and D, selenium, and zinc play a supportive role in immune defense against viral infections [9,12]. Vitamin A has been shown to reduce the severity of viral infections [13-14], while vitamin D deficiency has been associated with increased susceptibility to infection and higher mortality in COVID-19 [10,14].

Selenium and zinc have recognized antioxidant and antiviral properties [15]. In our study, however, the contribution of these micronutrients was negligible, underscoring the need to integrate them into ICU nutrition protocols.

Conclusion

The study shows that the management of COVID does not include adequate nutritional support. Indeed, no nutritional assessment was performed on these patients upon admission to determine their nutritional status. They received an unbalanced diet that did not meet their energy needs. To address this problem, it is important to establish nutritional monitoring upon admission by systematically implementing nutritional assessment and monitoring scales for patients. Nutritional status assessment must be an integral part of overall care in intensive care.

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