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ASSESSMENT OF DIETARY PRACTICES AMONG SEVERELY BURNED PATIENTS ADMITTED TO THE INTENSIVE CARE UNIT OF THE ABIDJAN BURN CENTRE (CÔTE D'IVOIRE)

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ABSTRACT

Severe burn injuries represent a major public health concern because of their high morbidity and the profound metabolic disturbances they induce. Nutritional management plays a critical role in the prognosis of severely burned patients. This study aimed to assess the dietary practices of severely burned patients admitted to the Intensive Care Unit (ICU) of the Abidjan Burn Center. A prospective cross-sectional descriptive study was conducted at the Abidjan Burn Center from January 1, 2023, to December 31, 2024. The study included 230 patients aged between 6 months and 86 years. Dietary habits were assessed using a food frequency questionnaire and a qualitative 24-hour dietary recall. Dietary diversity scores were determined according to age-specific international recommendations. Children under five years of age accounted for 37.4% of the study population. Burn injuries were predominantly thermal in origin (94.8%). Patients' diets were mainly based on traditional meals, and exclusive oral feeding was observed in 80% of cases. Low dietary diversity was identified in more than two-thirds of patients across all age groups. Biologically, hypoalbuminemia and decreased hemoglobin levels were observed during hospitalization, particularly among patients who died. Severely burned patients admitted to the Intensive Care Unit of the Abidjan Burn Center exhibited low dietary diversity and received nutritional care that was insufficiently adapted to their increased nutritional requirements. Strengthening nutritional support and implementing standardized nutritional protocols could contribute to improving patient outcomes.

KEYWORDS: Severe burns; Nutrition; Dietary diversity; Intensive care unit.

INTRODUCTION

Severe burn injuries represent a major public health challenge worldwide. According to the World Health Organization (WHO), burns are responsible for approximately 180,000 deaths annually, the majority of which occur in low- and middle-income countries.[1] In sub-Saharan Africa, burn injuries disproportionately affect children and socioeconomically disadvantaged populations, resulting in high morbidity, long-term functional disabilities, and a substantial socioeconomic burden.[2]

Beyond skin damage, severe burns trigger a complex pathophysiological response characterized by hypermetabolism, increased protein catabolism, prolonged systemic inflammation, and impaired immune function.[3] This metabolic response considerably increases patients' energy and nutritional requirements, thereby exposing them to a high risk of malnutrition, infections, delayed wound healing, and increased mortality.[4]

Nutritional management is therefore a fundamental component of the treatment of severely burned patients. Several international guidelines, particularly those issued by the European Society for Clinical Nutrition and Metabolism (ESPEN), recommend early, individualized, and appropriate nutritional support to reduce metabolic

complications and improve clinical outcomes.[5,6] Adequate nutritional intake, rich in protein and energy, contributes to the preservation of lean body mass, supports immune function, and promotes wound healing.[7]

However, in many resource-limited settings, the implementation of these recommendations remains challenging. Economic constraints, limited access to specialized nutritional products, the absence of standardized nutritional protocols, and local dietary habits may compromise the adequacy of nutritional intake among burn patients.[8]

In Côte d'Ivoire, the Abidjan Burn Centre serves as the country's main referral facility for the management of severe burn injuries. Despite the recognized importance of nutrition in the clinical course of severely burned patients, data on dietary practices and nutritional adequacy among hospitalized burn patients remain scarce in West Africa, particularly in Côte d'Ivoire.

In this context, the present study aimed to assess the dietary practices of severely burned patients admitted to the Intensive Care Unit (ICU) of the Abidjan Burn Centre in order to contribute to the improvement of their nutritional management.

MATERIALS AND METHODS

Study Population

The study included 230 severely burned patients admitted to the Intensive Care Unit (ICU) of the Abidjan Burn Centre, ranging in age from 6 months to 86 years. The sample consisted of 116 males and 114 females who were consecutively recruited. Patients originated from Abidjan and other regions of Côte d'Ivoire.

Study Design, Period, and Setting

This was a prospective cross-sectional descriptive study conducted over a two-year period, from January 1, 2023, to December 31, 2024, at the Abidjan Burn Centre (ABC), a component of the Emergency Medical Assistance Service (SAMU) located within the Cocody University Hospital (CHU de Cocody) in Abidjan, Côte d'Ivoire.

Data Collection

Sociodemographic data (sex, age, occupation, place of residence, and socioeconomic characteristics) and clinical information were collected using a standardized survey form. The form was completed daily by the data manager of the Abidjan Burn Centre.

To be eligible for inclusion, burn patients had to be admitted to the ICU with a total body surface area (TBSA) burn exceeding 10% in children and at least 20% in adults. Patients admitted for electrical burns were included regardless of the percentage of burned body surface area. All participants, or their legal representatives, were informed about the objectives of the study and provided written informed consent prior to enrollment.

The exclusion criteria were as follows: patients who died within the first 72 hours after injury; pediatric patients with burns involving less than 10% of TBSA; adult patients with burns involving less than 20% of TBSA; and patients discharged against medical advice.

For adult participants, occupation referred to the profession practiced at the time of admission. For pediatric patients, the occupation recorded was that of the parent or legal guardian to better characterize the family's socioeconomic background.

Burn Severity Assessment and Length of Hospital Stay

The percentage of total body surface area burned (TBSA) was assessed using Wallace's Rule of Nines.[9] Burn depth (superficial, intermediate, or deep burns) was evaluated according to standard clinical criteria. The Baux score (age + TBSA burned)[10] was calculated only for adult patients older than 18 years.

Length of hospital stay was determined as the number of days between ICU admission and discharge from the ICU.

All clinical and demographic data were collected at the time of admission.

Nutritional Assessment

Dietary quality was assessed using a food frequency questionnaire (FFQ), recording the frequency of food consumption per day and per week over a one-week period, according to the methodology described by Cade et al. (2002).[11] In addition, a qualitative 24-hour dietary recall was conducted following the approaches proposed by Wark et al. (2018)[12] and Osadchiy et al. (2019).[13]

Dietary Diversity Scores (DDS) were determined according to three age categories.

For children aged 6–23 months, the Dietary Diversity Score (DDS 6–23 months) included seven food groups, in accordance with international recommendations.[14] For children aged 24–59 months, the score included nine food groups. Dietary diversity was classified as low (1–4), moderate (5), or high (6–9).

For participants aged 5 years and older, dietary diversity was assessed using a structured questionnaire covering 12 food groups, based on the methodology developed by the Food and Nutrition Technical Assistance Project (FANTA).[15] The Individual Dietary Diversity Score (IDDS) was classified as low (1–4), moderate (5–8), or high (9–12).

Ethical Considerations

The study protocol was approved by the administration of the Abidjan Burn Centre and by the management of Cocody University Hospital. All participants were informed about the purpose of the study and provided informed consent before participation. For minors, consent was obtained from parents or legal guardians.

Participant anonymity was maintained throughout data collection, and all information was treated confidentially.

Statistical Analysis

Data were entered and analyzed using IBM SPSS Statistics (version 27), XLSTAT (version 2016), and Microsoft Excel (version 2016).

Comparisons between groups were performed using Student's t-test for quantitative variables and the chi-square (χ^2) test of independence for qualitative variables.

The Shapiro–Wilk test was first used to assess the normality of quantitative variables. When assumptions of normality and homogeneity of variances were met, the independent-samples Student's t-test was applied. In cases of unequal variances, as determined by Levene's test, Welch's correction was used.

For variables that did not follow a normal distribution, the non-parametric Mann–Whitney U test was employed for group comparisons.

A p-value < 0.05 was considered statistically significant for all analyses.

RESULTS

Sociodemographic Characteristics of the Patients

Table 1 summarizes the sociodemographic characteristics of the 230 burn patients admitted to the Intensive Care Unit (ICU).

The sex distribution was balanced, with a slight male predominance (50.43% versus 49.56% for females), although the difference was not statistically significant (p = 0.610).

Children under five years of age represented the most affected age group, accounting for 37.39% of all cases, followed by patients aged 25–44 years (27.83%). Individuals aged 65 years and older were underrepresented, accounting for only 1.30% of the study population. The distribution across age groups was statistically significant ($p = 1.13 \times 10^{-25}$).

Regarding occupation, self-employed workers constituted the largest group (54.35%), followed by unemployed individuals (40.87%), whereas salaried employees represented only 4.78% of the study population. The differences among occupational categories were statistically significant ($p = 2.08 \times 10^{-20}$).

Most patients originated from the municipality of Abobo (26.95%), followed by other municipalities of Abidjan (21.74%) and other cities across Côte d'Ivoire (20.00%). The municipalities of Adjamé and Yopougon accounted for 15.22% and 16.09% of cases, respectively. The geographical distribution was statistically significant ($p = 1.03 \times 10^{-14}$).

Table 1: Sociodemographic Characteristics of the Patients.

Characteristics	N (%)	P-value
Sex		
- Male	116(50.43)	0.610
- Female	114 (49.56)	
Age groups		
- 0-4 years	86 (37.39)	
- 5-14 years	18 (7.83)	
- 15-24 years	37 (16.09)	1.13×10^{-25}
- 25-44 years	64 (27.83)	
- 45-64 years	22 (9.56)	
- ≥65 years	3 (1.30)	
Professions		
-Salaried employees	11 (4.78)	2.08×10^{-20}
-Self-employed workers	125 (54.35)	
Unemployed	94 (40.87)	
Place of residence		
- Abobo	62 (26.95)	
- Adjamé	35 (15.22)	
- Yopougon	37 (16.09)	1.03×10^{-14}
- Other municipalities of Abidjan	50 (21.74)	
- Other cities in Côte d'Ivoire	46 (20)	

Clinical Characteristics of the Patients

Table 2 presents the clinical characteristics of the study participants.

Analysis of burn etiology according to age showed that all burns among children under five years of age were thermal in origin (100%). In contrast, among patients aged 5 years and older, thermal burns accounted for 91.67% of cases, whereas electrical burns represented 8.33%. The distribution of burn causes differed significantly between age groups (p = 0.0042).

The median total body surface area burned (TBSA) was lower among children under five years of age, at 20.38% (14–25.5), compared with patients aged 5 years and older, for whom the median TBSA reached 34.5% (23–48.25).

Regarding burn depth, mixed superficial and deep second-degree burns were the most common lesions (71.74%), followed by isolated superficial second-degree burns (20.43%). Deep second-degree burns and third-degree burns were less frequent, accounting for 6.96% and 0.87% of cases, respectively.

The median Baux score was 74.25 (59.75–88.38), indicating a high level of burn severity among the study population. The median length of stay in the intensive care unit was 15 days (10.5–23).

Table 2: Clinical Characteristics of the Patients.

Characteristics	Value	p-value
Cause of Burn Injury, n (%)		
Thermal burns: Patients < 5 years	86 (100)	
Thermal burns: Patients ≥ 5 years	132 (91.67)	
Electrical burns: Patients < 5 years	0	
Electrical burns: Patients ≥ 5 years	12 (8.33)	**0.0042**
Total Body Surface Area Burned (TBSA), Median (P25–P75)		
Patients < 5 years	20.38 (14–25.5)	
Patients ≥ 5 years	34.5 (23–48.25)	**< 0.001**
Burn Depth, n (%)		
Superficial second-degree burns	47 (20.43)	
Mixed superficial and deep second-degree burns	165 (71.74)	
Deep second-degree burns	16 (6.96)	
Third-degree burns	2 (0.87)	**< 0.001**
Baux Score, Median (P25–P75)	74.25 (59.75–88.38)	
Length of ICU Stay (days), Median (P25–P75)	15 (10.5–23)	

Assessment of Patients' Dietary Practices

Food Consumption Patterns

Table 3 presents the dietary habits observed among the patients and compares them with nutritional recommendations derived from French clinical guidelines for the management of severely burned patients.

A discrepancy was observed between patients' dietary practices and the nutritional requirements recommended for burn care. The findings indicate that patients' diets were primarily based on traditional meals centered on cereal products, animal protein sources, and local preparations such as millet porridge.

Table 3: Dietary Habits of Patients and Recommended Foods According to French Nutritional Guidelines for Severely Burned Patients.

Meal Time	Observed Dietary Habits	Foods Recommended by French Nutritional Guidelines for Severely Burned Patients
Breakfast	Bread, omelet, coffee, butter, millet porridge, milk or yogurt	Full-fat dairy products, eggs (high-protein source), whole-grain bread, butter, and fresh fruit juice
Morning Snack	Yogurt, eggs, or leftovers from lunch	Oral Nutritional Supplements (ONS), such as milk-based drinks or fortified dairy desserts
Lunch	Meat, fish, or chicken (standard portion), starchy foods (rice, attiéké), sauce, potatoes, eggs, or millet porridge with milk	Lean meat or fish (double portion), starchy foods (pasta, rice), and cooked vegetables enriched with fats (oil, cream)
Afternoon Snack	Yogurt, eggs, or leftovers from lunch	Cottage cheese enriched with milk powder or hard cheese
Dinner	Meat, fish, or chicken (standard portion), starchy foods (rice, attiéké), sauce, potatoes, eggs, or millet porridge with milk	Enriched soup (protein and cheese), eggs or ham, and a dairy dessert
Evening	None	Nocturnal enteral nutrition may be provided when oral intake is insufficient to meet nutritional requirements

Feeding Modalities and Nutritional Supplementation

Patients received either exclusive oral feeding or mixed nutritional support. Exclusive oral feeding was the predominant feeding modality, accounting for 80% of cases, followed by combined oral and parenteral nutrition (19.57%).

Only one patient received combined enteral and oral nutrition before transitioning to exclusive oral feeding.

In addition to locally consumed foods, several nutritional supplements were prescribed. Oral supplementation included spirulina (50.43%), Astymin® (89.13%), and Renutryl® (59.13%). Supplemental parenteral nutrition was administered using Perikabiven® in 19.57% of patients (Table 4).

Table 4: Feeding Modalities and Nutritional Supplements Administered to Patients.

Variable	Frequency (%)
Feeding Modality	
Exclusive oral feeding	184 (80.00)
Exclusive enteral nutrition	0 (0.00)
Exclusive parenteral nutrition	0 (0.00)
Combined enteral and oral feeding	1 (0.43)
Combined parenteral and oral feeding	45 (19.57)
Nutritional Supplements	
Oral supplementation	
Spirulina	116 (50.43)
Astymin	205 (89.13)
Renutryl	136 (59.13)
Parenteral supplementation	
Perikabiven	45 (19.56)

Dietary Diversity Score Assessment

Figures 1, 2, and 3 illustrate the distribution of patients admitted to the Intensive Care Unit (ICU) of the Abidjan Burn Centre according to their Individual Dietary Diversity Score (IDDS) across different age groups.

The Individual Dietary Diversity Score (IDDS) ranged from 2 to 5, with an overall mean score of approximately 4. Among patients aged 6–23 months, 66.67% exhibited low dietary diversity (IDDS ranging from 2 to 4), whereas 30.0% demonstrated moderate dietary diversity (IDDS = 5).

Similarly, among patients aged 24–59 months and those aged 5 years and older, low dietary diversity was observed in 74.3% and 66.67% of the study population, respectively. In contrast, 25.7% and 30.0% of these age groups exhibited moderate dietary diversity.

No patients in any age category achieved a high dietary diversity score.

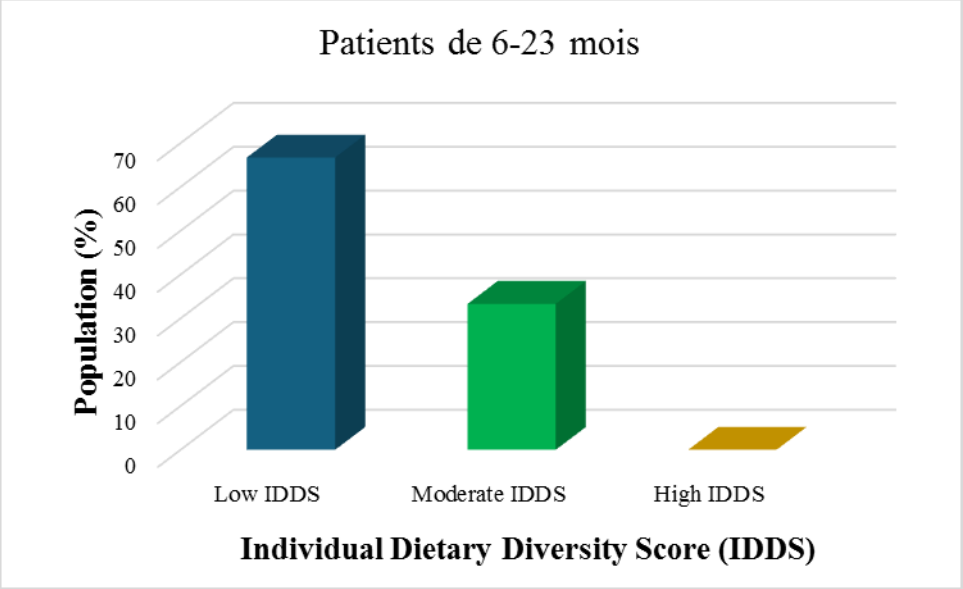

Figure 1: Distribution of patients aged 6–23 months according to Individual Dietary Diversity Score (IDDS).

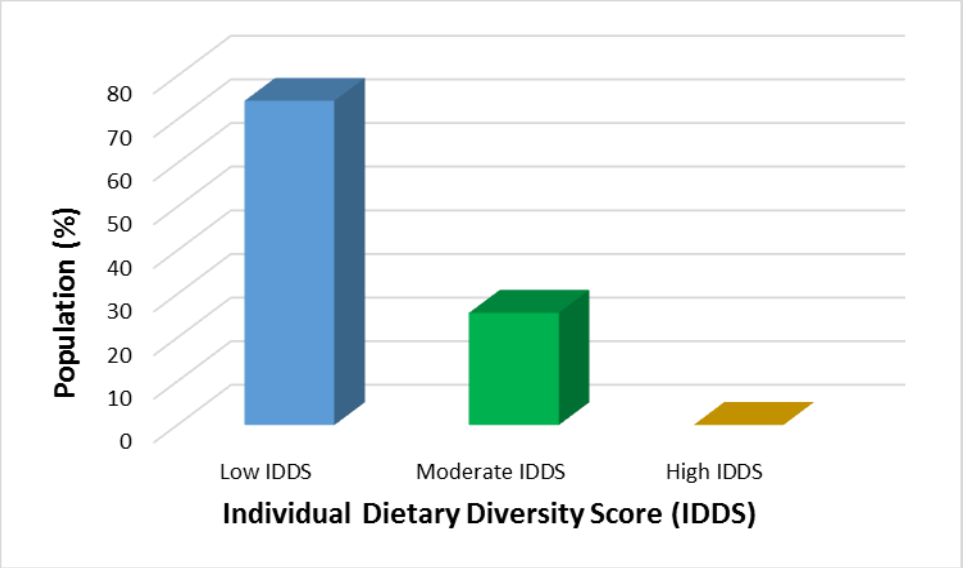

Figure 2: Distribution of patients aged 24–59 months according to Individual Dietary Diversity Score (IDDS).

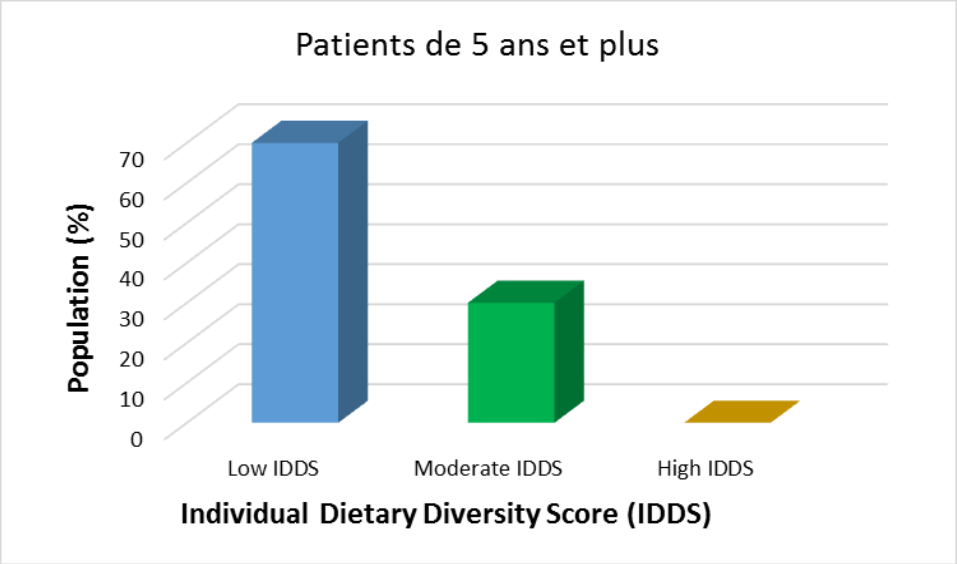

Figure 3: Distribution of patients aged 5 years and older according to Individual Dietary Diversity Score (IDDS).

Biological Assessment of Patients

Table 5 presents the mean values of the patients' biological parameters at three assessment points: upon admission, during treatment, and at discharge or before death.

At admission, the mean serum albumin, total protein, and hemoglobin levels were 27.63 ± 5.78 g/L, 54.42 ± 8.95 g/L, and 12.71 ± 3.96 g/dL, respectively. During treatment, the corresponding mean values were 24.95 ± 4.71 g/L, 53.43 ± 9.54 g/L, and 9.30 ± 1.93 g/dL. At discharge, the mean values were 28.65 ± 5.12 g/L, 60.42 ± 8.40 g/L, and 10.05 ± 2.09 g/dL, respectively, whereas among patients who died, the corresponding values were 19.38 ± 7.64 g/L, 45.08 ± 9.70 g/L, and 7.83 ± 1.88 g/dL.

Table 5: Biological Parameters of the Patients.

Biological Parameter	At Admission	During Treatment (Day 3–Day 8)	At Discharge	Before Death
Serum Albumin (g/L)	27.63 ± 5.78	24.95 ± 4.71	28.65 ± 5.12	19.38 ± 7.64
Total Protein (g/L)	54.42 ± 8.95	53.43 ± 9.54	60.42 ± 8.40	45.08 ± 9.70
Hemoglobin (g/dL)	12.71 ± 3.96	9.30 ± 1.93	10.05 ± 2.09	7.83 ± 1.88

Figure 4 illustrates the evolution of the mean biological parameters from admission to discharge among patients who survived their stay in the intensive care unit.

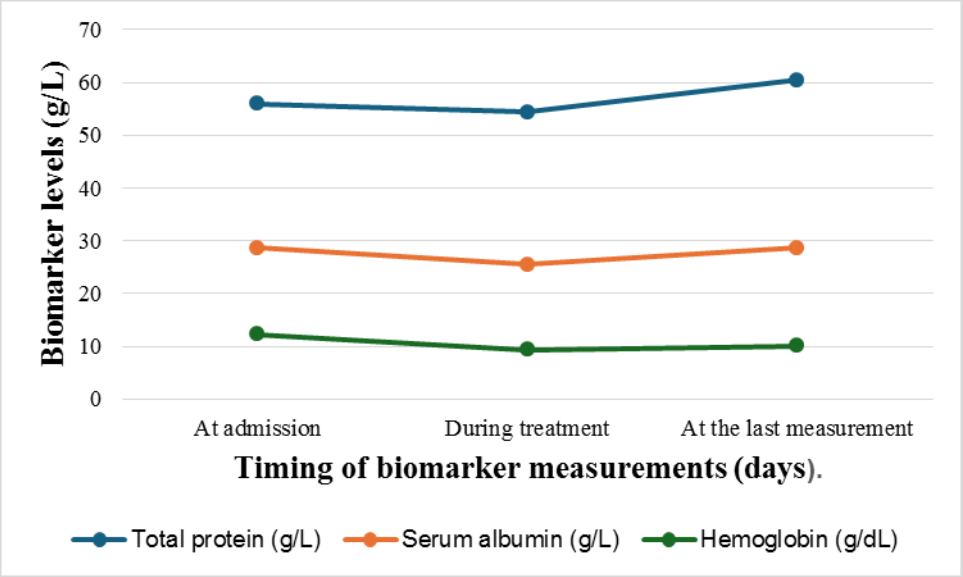

Figure 4. Changes in Mean Biological Parameters among Patients Discharged Alive

Figure 5 illustrates the changes in serum albumin levels among patients who died during hospitalization. The figure presents serum albumin concentrations measured at admission (Day 0), during hospitalization between Days 4 and 8, and immediately before death.

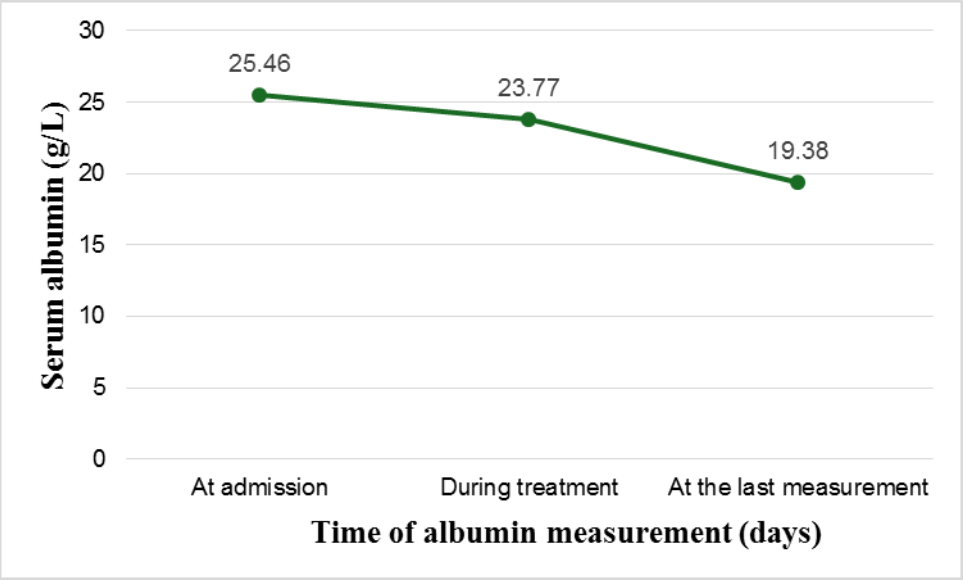

Figure 5: Changes in Serum Albumin Levels among Patients Who Died During Hospitalization.

DISCUSSION

Sociodemographic and Clinical Characteristics

This study highlights the epidemiological, clinical, nutritional, and biological characteristics of patients with severe burn injuries admitted to the Intensive Care Unit of the Abidjan Burn Centre.

In our series, children under five years of age represented the most affected age group, accounting for 37.39% of all burn cases. This high frequency of pediatric burns has been widely reported in both African and international literature. Peck (2011) emphasized that children constitute the most vulnerable population to burn injuries in low- and middle-income countries due to their increased exposure to domestic accidents and poor housing conditions.[2] Similarly, Forjuoh (2006) reported that burn injuries among young children occur predominantly in the home environment, particularly through contact with hot liquids and cooking fuels.[16] In our setting, this situation may be explained by household overcrowding, inadequate domestic safety measures, and limited supervision of young children.

The sex distribution was relatively balanced, with a slight male predominance that did not reach statistical significance. These findings are consistent with those reported by Ahuja and Bhattacharya (2004), who observed a slight predominance of males among patients

with severe burn injuries, likely due to greater exposure to occupational and domestic risk factors.[17] However, the absence of a significant difference in our study suggests that burn injuries constitute an important health risk for both sexes in our environment.

Thermal burns accounted for nearly all cases (94.78%). This predominance is consistent with data reported by the World Health Organization and several African studies.[1] Among children younger than five years, burns were exclusively thermal and were mainly caused by hot liquids, whereas flame burns were more common among patients aged five years and older. Brusselaers et al. (2010) similarly demonstrated that scald burns predominated among children, while flame burns were more frequently observed in adults.[18] This difference can be explained by the nature of exposure: domestic accidents among children and occupational or hydrocarbon-related accidents among adults.

The severity of burn injuries observed in this study was considerable. The median total body surface area burned (TBSA) reached 34.5% among patients aged five years and older, compared with 20.38% among children under five years of age, with a statistically significant difference ($p < 0.001$). Several studies have demonstrated that increasing TBSA is strongly associated with a higher risk of infection, hypermetabolic syndrome, and mortality.[3,4] Furthermore, the median Baux score of 74.25 observed in our study indicates substantial injury severity. Osler et al. (2010) demonstrated that a high Baux score is an excellent predictor of mortality among patients with severe burn injuries.[19]

Mixed burns involving both superficial and deep second-degree lesions accounted for the majority of cases (71.74%). This predominance of intermediate and deep burns has also been reported by Dissanaike and Rahimi (2009), who emphasized that such lesions are frequently encountered among patients requiring intensive care hospitalization.[20] These deeper burns increase the risk of infection, delay wound healing, and substantially elevate nutritional and metabolic requirements.

The median length of hospitalization was 15 days, reflecting the complexity of managing severe burn injuries. Prolonged hospital stays were frequently observed among patients with extensive burns because of infectious complications and the substantial need for local wound care and nutritional support.[3]

Nutritional Assessment

The nutritional assessment revealed a substantial discrepancy between patients' dietary habits and international recommendations for the nutritional management of severely burned patients. Meals were primarily composed of cereal-based foods and relatively limited portions of protein-rich foods. However, severe burn injuries induce a profound hypermetabolic state that can increase energy requirements to as much as twice the normal levels.[20] According to Jeschke et al. (2008), severe burns trigger a prolonged hypercatabolic response characterized by increased energy expenditure, accelerated protein breakdown, and immunosuppression.[4] Consequently, diets that are insufficiently enriched in protein and calories may expose patients to delayed wound healing, significant muscle wasting, and an increased risk of mortality.

In the present study, exclusive oral feeding was the predominant nutritional modality, accounting for 80% of cases, whereas early enteral nutrition was almost absent. These findings differ from ESPEN recommendations, which advocate the initiation of enteral nutrition within the first 24 hours after burn injury in order to preserve intestinal mucosal integrity, attenuate hypermetabolism, and improve clinical outcomes.[5,6] The limited use of enteral nutrition observed in our setting may be explained by economic constraints, lack of specialized equipment, and the absence of standardized nutritional protocols, all of which are common challenges in resource-limited environments.

Nevertheless, the frequent use of nutritional supplements such as Astymin®, Renutryl®, and spirulina reflects efforts to improve patients' nutritional intake. Spirulina, in particular, is recognized for its high content of protein, iron, and antioxidant micronutrients, which may contribute to improving nutritional status.[21] However, the actual effectiveness of these supplements in severely burned patients warrants further investigation through dedicated clinical studies.

The Individual Dietary Diversity Score (IDDS) was low across all age groups, with more than two-thirds of patients exhibiting low dietary diversity. According to Swindale and Bilinsky (2006), dietary diversity is an indirect indicator of dietary quality and micronutrient adequacy.[15] In burn patients, poor dietary diversity may limit the intake of vitamins and trace elements that are essential for wound healing and immune function.

The biological assessment revealed marked hypoalbuminemia from the time of admission, which worsened among patients who subsequently died. Mean serum albumin levels decreased from 27.63 ± 5.78 g/L at admission to 19.38 ± 7.64 g/L before death. These findings confirm the presence of a severe hypercatabolic state among patients with major burn injuries. According to Dickerson and Gervasio (2018), hypoalbuminemia is a common marker of disease severity in burn patients and is associated with an increased risk of infection and mortality.[22] Similarly, the substantial decline in hemoglobin levels observed during hospitalization may be explained by blood losses related to wound care procedures, hemodilution, and systemic inflammation.

This study has several limitations. First, it was conducted in a single referral center, which may limit the

generalizability of the findings to the entire country. Second, dietary data were partially based on information provided by patients or caregivers, making them susceptible to recall bias. Finally, the absence of additional nutritional biomarkers prevented a more comprehensive assessment of nutritional status.

Despite these limitations, this study provides original data on the epidemiological, clinical, nutritional, and biological characteristics of patients with severe burn injuries in Côte d'Ivoire. The findings underscore the need to strengthen burn prevention strategies, particularly those targeting domestic accidents among young children, and to integrate standardized nutritional protocols into the management of severely burned patients in order to improve clinical outcomes.

CONCLUSION

Severe burn injuries primarily affected children under five years of age (37.4%) and were predominantly of thermal origin (94.8%). The patients exhibited severe burn lesions, inadequate dietary diversity, and biological evidence of significant nutritional impairment. The findings also revealed a substantial gap between current dietary practices and international recommendations for the nutritional management of severely burned patients.

These results highlight the urgent need to strengthen burn prevention strategies, particularly those targeting domestic accidents involving young children. They also underscore the importance of improving nutritional care through the implementation of standardized nutritional protocols, early nutritional support, and enhanced access to appropriate nutritional interventions. Such measures could contribute to reducing complications and improving clinical outcomes among severely burned patients.

Conflict of Interest

The authors declare no conflict of interest.

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