



Determinants of Malnutrition Among Children Aged 0 to 59 months: A Study at the Bonassama District Hospital, Douala, Cameroon

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Abstract

Malnutrition is a major cause of childhood morbidity and mortality, affecting children's growth and development. This study aimed to identify the factors associated with malnutrition among children aged 0 to 59 months at Bonassama District Hospital in Douala. A descriptive and analytical cross-sectional study was conducted from July 2025 to April 2026 among children aged 0 to 59 months seen in the pediatrics and immunization units. Data were collected using a questionnaire administered to parents. Nutritional status was assessed according to WHO standards, and associated factors were identified through multivariate analysis. Among the children studied, 82.2% had normal nutritional status and 17.8% were malnourished. After adjustment, the factors significantly associated with malnutrition were type of housing (modern house: AOR = 2.10; 95% CI: 1.03–4.01; $p = 0.044$), tenant status (AOR = 3.01; 95% CI: 1.53–6.78; $p < 0.001$), history of respiratory infection (AOR = 2.12; 95% CI: 1.20–5.35; $p = 0.019$), and occasional use of health services (AOR = 2.23; 95% CI: 1.05–5.21; $p = 0.030$). Mothers' knowledge of essential food groups was not significantly associated with malnutrition. Malnutrition remains a significant problem among children under five years of age in Bonassama. Prevention strategies should incorporate health, socioeconomic, and environmental factors to improve screening and management of at-risk children.

Keywords: Determinants; Prevalence; Malnutrition; Children; Bonassama-Cameroon

Introduction

Child malnutrition remains one of the leading public health problems worldwide due to its impact on the growth, cognitive development, immunity, and survival of children under five years of age.¹ It is defined as an imbalance between nutritional intake and the body's physiological needs, which can result from

either insufficient or excessive dietary intake.² In children, it manifests primarily as stunting, wasting, underweight, or even overweight and obesity. The causes of malnutrition are multifactorial and include inadequate diet, recurrent infectious diseases (diarrhea, respiratory infections, malaria), poor infant and young child feeding practices, poor hygiene conditions, household food insecurity, poverty, low parental education levels, and limited access to health services.^{3–4} These various factors often act synergistically and perpetuate a vicious cycle between malnutrition and infectious diseases, contributing to nearly half of all deaths among children under five in low- and middle-income countries.^{5–6}

Globally, progress in combating malnutrition remains insufficient to meet the goals set by the United Nations. In 2022, approximately 148 to 149 million children under the age of five suffered from stunting, 45 million were wasted, and nearly 37 million were overweight.⁷ Africa bears a significant share of this burden, with nearly 30% of children under five suffering from stunting and a prevalence of wasting estimated at between 6% and 7%.^{8–9} In Cameroon, despite the many nutritional interventions implemented, the situation remains a cause for concern. According to the most recent national data, approximately 29% of children under five suffer from stunting, 11% are underweight, nearly 4–5% are wasted, and about 11% are overweight.^{10–11} These indicators reflect the coexistence of persistent undernutrition and a gradual increase in overnutrition, illustrating the dual nutritional burden facing the country.

Despite the efforts made by the Cameroonian government, UNICEF, and several technical and financial partners through the promotion of exclusive



breastfeeding, nutritional supplementation, community-based management of acute malnutrition, and nutrition education campaigns, malnutrition remains a major challenge.¹² This situation jeopardizes the achievement of Sustainable Development Goal 2, which aims to eliminate all forms of malnutrition by 2030, as well as the objectives of the 2020–2030 National Development Strategy.¹³ Studies conducted in Cameroon show that several individual, family, and environmental factors influence children's nutritional status, including low socioeconomic status, recurrent infections, poor dietary practices, and difficulties accessing healthcare.¹⁴⁻¹⁵

Furthermore, the determinants of malnutrition are also rooted in a socio-economic, cultural, and anthropological context specific to Cameroon. Persistent poverty limits households' access to a diverse and high-quality diet, while rapid urbanization contributes to the emergence of significant disparities between neighborhoods.¹⁶ In many families, traditional infant feeding practices, cultural beliefs regarding certain foods, early weaning, women limited economic empowerment, and low levels of maternal education negatively impact children's nutritional status.¹⁷ Added to this are food insecurity, difficulties in accessing safe drinking water, poor sanitation conditions, and the high prevalence of infectious diseases, which perpetuate an environment conducive to the onset of malnutrition.¹⁸⁻¹⁹ Understanding these interactions between biological, social, economic, and cultural factors is essential for developing interventions tailored to the Cameroonian context.

With this in mind, the objective of this study is to identify the determinants of malnutrition among children aged 0 to 59 months treated at the Bonassama District Hospital in Douala. The results will help improve understanding of the factors associated with malnutrition in this urban setting, guide policymakers and health professionals in implementing targeted prevention and management strategies, and contribute to the development of more effective nutrition policies to promote the health and development of Cameroonian children.

Materials and methods

Study Setting and Timeframe

This study took place over a period of nine (09) months, from July 2025 to April 2026, with data collection conducted between February and March 2026. It was conducted at the Bonassama District Hospital (HDB), located in the Douala IV arrondissement, Wouri Department, Littoral Region, in Cameroon. The Bonassama District Hospital is a second-level public facility within the Cameroonian healthcare system. Established as a district hospital by Ministerial Decree No. 122/A/MSP/DSG of August 7, 1995, it serves as the primary healthcare referral center for the Bonassama health district. It offers several healthcare services, including pediatrics,

immunization, obstetrics and gynecology, surgery, medical imaging, laboratory services, general medicine, and emergency care. The hospital serves a large urban and periurban population characterized by significant socioeconomic and cultural diversity.

This study site was selected because of the high number of children under five who visit it, both for pediatric consultations and for immunization activities. Furthermore, despite the scale of the problem of child malnutrition in Cameroon, few studies have explored the factors associated with it at this health facility. This study thus aims to address this gap by generating data that can guide strategies for the prevention and management of child malnutrition.

Study Design and Population

This was a quantitative, cross-sectional, descriptive, and analytical study conducted among children aged 0 to 59 months attending the Bonassama District Hospital during the data collection period. The source population consisted of all children under five years of age seen in the hospital's pediatric and immunization departments. The target population included children aged 0 to 59 months accompanied by their parents or legal guardians who agreed to participate in the study.

Children aged 0 to 59 months present in the selected departments during the data collection period, accompanied by a parent or legal guardian who had signed an informed consent form, were included in the study. Excluded were children with incomplete questionnaires, those with acute or chronic illnesses likely to influence their nutritional status (such as malaria or sickle cell disease), and children older than five years.

Sample Size and Sampling Procedure

The minimum sample size was calculated using the Cochran formula:

$$n = \frac{Z^2 \times p(1 - p)}{d^2}$$

Where n represents the minimum sample size, Z is the value corresponding to a 95% confidence level (1.96), P is the national prevalence of acute global malnutrition among children under five in Cameroon (8.6%) as reported by the 2022 SMART survey,²⁰ and d is the precision set at 5%. The minimum sample size obtained was 121 participants. To improve the study's statistical power and the precision of the estimates, a total of 236 children accompanied by their parents were ultimately included.

Sampling was non-probability convenience sampling. Participants were recruited consecutively from pediatric and immunization clinics as they arrived during the data collection period.

Parents who met the inclusion criteria were informed of the study's objectives and invited to participate voluntarily after providing informed consent.

Data Collection Techniques and Tools

Data were collected using a structured questionnaire administered in face-to-face interviews with the children's parents or guardians. The questionnaire was developed based on the scientific literature and adapted to the local context. A pre-test was conducted with ten parents of children under five years of age to assess the comprehensibility of the questions, their relevance, and the duration of the interview. The necessary adjustments were then made. The questionnaire collected information on the sociodemographic characteristics of the children and their parents, the household's socioeconomic conditions, dietary practices, the child's medical history, hygiene and sanitation conditions, use of health services, and the mothers' nutritional knowledge.

Anthropometric measurements were taken in accordance with World Health Organization (WHO) recommendations. Weight was measured to the nearest 0.1 kg using a pre-calibrated electronic scale. Infants were weighed on a baby scale, while older children were weighed barefoot and wearing light clothing. Height (or length for infants) was measured to the nearest 0.1 cm using a ShorrBoard® measuring board for children under two years of age and a stadiometer for older children. Each measurement was taken twice to minimize measurement errors. Upper Arm Circumference (UAC) was measured on the left arm using a non-stretchable tape measure, midway between the acromion and the olecranon, and recorded to the nearest 0.1 cm.

To ensure data quality, interviewers received prior training, equipment was regularly calibrated, questionnaires were checked daily, and data were entered twice.

Operational Definition of Variables

The dependent variable in this study was the nutritional status of children aged 0 to 59 months. Nutritional status was assessed in accordance with WHO recommendations based on upper arm circumference (UAC). Children with an upper arm circumference (UAC) of less than 11.5 cm were classified as suffering from severe acute malnutrition; those with a UAC between 11.5 and 12.5 cm were classified as having moderate acute malnutrition or being at risk of malnutrition; and those with a UAC of 12.5 cm or greater were considered to have a normal nutritional status.

The independent variables included child

Description of Respondent Characteristics

Table 1 presents the distribution of respondents according to sociodemographic and economic characteristics. The most represented age group of children in this study was 1 to 15 months (74.68%). Boys were slightly more numerous than girls (57.63% vs. 42.37%). Most respondents were in pediatric care (87.3%); were Catholic (63.29%); and

characteristics (age, sex, birth weight, history of illness, vaccination status), maternal characteristics (age, educational level, occupation, nutritional knowledge), household socioeconomic characteristics (type of housing, tenure status, occupation of the head of household), environmental and hygiene factors (water source, type of latrines, waste management), feeding practices (breastfeeding, complementary feeding, dietary diversity), and use of health services.

Data Processing and Analysis

The data collected using KoboCollect were exported, cleaned, and then analyzed using RStudio version 4.2.4. Tables were created in Microsoft Excel 2013. Descriptive statistics were calculated for all study variables. Qualitative variables were presented as counts and percentages. The prevalence of malnutrition was estimated among children under five years of age. Associations between malnutrition and explanatory variables were first assessed using bivariate logistic regression. Variables showing a statistically significant association were then included in a multivariate logistic regression model to identify factors independently associated with malnutrition. The results were expressed as odds ratios (OR) with their 95% confidence intervals (95% CI). The threshold for statistical significance was set at $p < 0.05$.

Ethical Considerations

This study was approved by the Institutional Ethics Committee for Human Health Research (CEIRSH) of the School of Health Sciences at the Catholic University of Central Africa, under number 2023/0220573/CEIRSH/ESS/LSP.

Administrative authorization was also obtained from the Administration of the Bonassama District Hospital. Written informed consent was obtained from parents or legal guardians prior to participation. The anonymity and confidentiality of the data were ensured throughout the study. All procedures were conducted in accordance with the principles of the Declaration of Helsinki (7th revision, 2013) regarding research involving human participants.

Results

Data collection took place from February to March 2026, during which 300 participants were recruited. Of the 300 participants recruited, 236 agreed to participate in the study, representing a participation rate of 79%, with 64 refusals recorded.

lived with married parents (38.82%) or parents living together without being married (38.82%). The vast majority of the children's mothers were unemployed (35.44%) and lived in modern homes (68.35%), where they were renters (54.01%). The most represented age group among mothers was 19 to 29 years old (83.54%), with a high school education (51.48%).

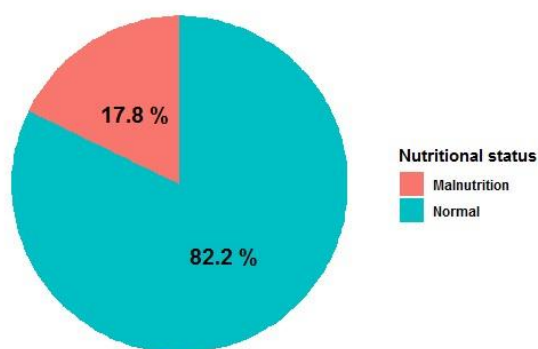
Table 1: Distribution of Participants by Sociodemographic Characteristics

Variable	Frequency	Percentage (%)
Services		
Pediatrics [distinct service category — label to be confirmed by authors]	4	1.69
Pediatrics	202	85.23
Vaccination	30	12.66
Child's gender		
Female	100	42.37
Male	136	57.63
Mother's educational level		
Elementary	2	0.84
Secondary	122	51.48
Higher education	112	47.26
Mother's age		
(19–29)	198	83.54
(30–39)	30	12.66
(40 and older)	8	3.38
Religion		
Catholic	150	63.29
Protestants	70	29.54
Jehovah's Witnesses	16	6.75
Marital status		
Single	50	21.10
Living with a partner	92	38.82
Married	92	38.82
Mother's occupation		
Other	12	5.06
Retailer	76	32.07
Civil servant	16	6.75
Housewife	48	20.25
Unemployed	84	35.44
Type of housing		
Other	4	1.69
Modern house	162	68.35
Traditional house	70	29.54
Household occupancy status		
Homeowner	98	41.35
Renter	128	54.01
Company housing	2	0.84
Free housing	8	3.38
Age group (months)		
(1–15)	177	74.68
(16–30)	25	10.55
(31–59)	34	14.35

Prevalence of Malnutrition Among Children Aged 0 to 59 months at the Bonassama District Hospital

Figure 1 presents the results on the prevalence of malnutrition among children aged 0 to 59 months at Bonassama District Hospital in the city of Douala. This

figure shows that 82.2% of the participants had a normal nutritional status and 17.8% were malnourished.

**Figure 1:** Prevalence of malnutrition among children aged 0 to 59 months at the Bonassama District Hospital in the

Determinants of malnutrition among children aged 0 to 59 months at the Bonassama District Hospital in the city of Douala.

Table 2: Sociodemographic determinants of malnutrition—bivariate analysis

Variables	Malnutrition (n=42)	Normal (n=194)	OR [95% CI]	P-value
Child's gender				
Female	18 (42.86)	82 (42.27)	1	
Male	24 (57.14)	112 (57.73)	0.97 [0.49–1.93]	0.944
Age group (months)				
(1–15)	38 (90.48)	139 (71.65)	3.14 [0.87–20.13]	0.131
(16–30)	2 (4.76)	23 (11.86)	1	
(31–59)	2 (4.76)	32 (16.49)	0.13 [0.08–6.34]	0.750
Mothers' age group				
(19–29)	38 (90.48)	160 (82.47)	1.54 [0.55–5.46]	0.443
(30–39)	4 (9.52)	26 (13.40)	1	
(40 and over)	0 (0.00)	8 (4.12)		
Religion				
Catholic	28 (66.67)	122 (62.89)	1.60 [0.41–10.59]	0.546
Protestants	12 (28.57)	58 (29.90)	1.44 [0.34–9.98]	0.785
Jehovah's Witnesses	2 (4.76)	14 (7.22)	1	
Level of education				
Elementary	0 (0.00)	2 (1.03)		
Secondary	24 (57.14)	98 (50.52)	1.27 [0.65–2.53]	0.474
Higher education	18 (42.86)	94 (48.45)	1	
Marital status				
Single	6 (14.29)	44 (22.68)	1	
Living with a partner	20 (47.62)	72 (37.11)	2.03 [0.79–5.92]	0.157
Married	14 (33.33)	78 (40.21)	1.31 [0.48–3.93]	0.599
Mother's occupation				
Other	0 (0.00)	12 (6.19)		
Retailer	14 (33.33)	62 (31.96)		
Civil servant	6 (14.29)	10 (5.15)	4.2 [0.79–8.46]	0.101
Homemaker	6 (14.29)	42 (21.65)	1	
Unemployed	16 (38.10)	68 (35.05)	1.65 [0.46–2.33]	0.919
Type of housing				
Other	0 (0.00)	4 (2.06)		
Modern house	24 (57.14)	138 (71.13)	2.50 [1.25–5.01]	0.040 *
Traditional house	18 (42.86)	52 (26.80)	1	
Household occupancy status				
Homeowner	8 (19.05)	90 (46.39)	1	
Renter	34 (80.95)	94 (48.45)	4.06 [1.86–9.88]	<0.001 ***
Company housing	0 (0.00)	2 (1.03)		
Free housing	0 (0.00)	8 (4.12)		

Table 2 presents the results of bivariate analyses using a simple regression model to examine the determinants of malnutrition among children aged 0–59 months at Bonassama District Hospital. This table

shows that living in a modern house [OR = 2.50 (95% CI: 1.25–5.01); p-value = 0.040] and being a renter [OR = 4.06 (95% CI: 1.86–9.88); p-value < 0.001] significantly increased the likelihood of children being malnourished.

Table 3: Bivariate analysis of determinants related to children's dietary practices and medical history associated with malnutrition.

Variables	Malnutrition (n=42)	Normal (n=194)	OR [95% CI]	P-value
History of diarrhea				
No	30 (71.43)	156 (80.41)	1	
Yes	12 (28.57)	38 (19.59)	1.64 [0.74–3.44]	0.199
History of malaria				

Variables	Malnutrition (n=42)	Normal (n=194)	OR [95% CI]	P-value
No	34 (80.95)	172 (88.66)	1	
Yes	8 (19.05)	22 (11.34)	1.83 [0.71–4.34]	0.179
History of respiratory infection				
No	36 (85.71)	122 (62.89)	1	
Yes	6 (14.29)	72 (37.11)	0.28 [1.10–6.65]	0.006 **
Vaccination status				
Up to date	38 (90.48)	186 (95.88)	0.30 [0.08–1.24]	0.077
Incomplete	4 (9.52)	6 (3.09)	1	
Unvaccinated	0 (0.00)	2 (1.03)		
Use of healthcare services				
As soon as they get sick	30 (71.43)	142 (73.20)	0.54 [0.24–1.30]	0.156
Never	0 (0.00)	4 (2.06)		
Occasionally	2 (4.76)	22 (11.34)	0.24 [1.03–4.01]	0.041 *
Rarely	10 (23.81)	26 (13.40)	1	
Types of breastfeeding practiced				
Exclusive breastfeeding	0 (0.00)	2 (1.03)		
AME	20 (47.62)	86 (44.33)	1	
AMM	22 (52.38)	104 (53.61)	0.90 [0.46–1.78]	0.782
Age at the start of complementary feeding				
At 6 months	8 (19.05)	80 (41.24)	1	
After 6 months	0 (0.00)	6 (3.09)		
Before 6 months	18 (42.86)	96 (49.48)	1.87 [0.79–4.77]	0.163

Table 3 presents the results of bivariate analyses conducted using a simple regression model to examine factors associated with malnutrition among children aged 0 to 59 months at the Bonassama District Hospital. A history of respiratory infection was significantly associated with reduced odds of

malnutrition [OR = 0.28; (95% CI: 1.10–6.65); p = 0.006], while occasional use of health services was also associated with reduced odds of malnutrition [OR = 0.24; (95% CI: 1.03–4.01); p = 0.041], compared with rare use of health services. These two factors were thus identified as statistically significant protective factors in the bivariate analysis.

Table 4. Determinants related to hygiene and sanitation conditions associated with malnutrition: bivariate analysis.

Variables	Malnutrition (n=42)	Normal (n=194)	OR [95% CI]	P-value
Drinking water supply				
Home tap	26 (61.26)	146 (75.26)	0.53 [0.26–1.09]	0.080
Public water faucet	16 (38.10)	48 (24.74)	1	
Family latrine				
Modern latrine	26 (61.90)	138 (71.13)	0.65 [0.33–1.34]	0.241
Traditional latrine	16 (38.10)	56 (28.87)	1	
Handwashing by the mother				
Only after using the toilet	10 (23.81)	30 (15.46)	2.66 [0.60–18.74]	0.239
Before each meal	20 (47.62)	118 (60.82)	1.35 [0.34–8.98]	0.699
I don't know	10 (23.81)	26 (13.40)	3.07 [0.69–21.71]	0.179
Rarely	2 (4.76)	16 (8.25)	1	
Child under 5 in the household				
1	16 (38.10)	96 (49.48)	0.33 [0.09–1.36]	0.101
2	22 (52.38)	84 (43.30)	0.52 [0.14–2.10]	0.325
3	4 (9.52)	8 (4.12)	1	
Mothers' knowledge of AME				
No	14 (33.33)	58 (29.90)	1	
Yes	28 (66.67)	136 (70.10)	0.85 [0.42–1.77]	0.661
Knowledge of the age for introducing				

solid foods				
No	14 (33.33)	52 (26.80)	1	
Yes	28 (66.67)	142 (73.20)	0.73 [0.36–1.53]	0.394
Knowledge of essential food groups				
No	24 (57.14)	68 (35.05)	2.5 [1.36–4.43]	0.034 *
Yes	18 (42.86)	126 (64.95)	1	
Mothers' knowledge score				
Good	22 (52.38)	98 (50.52)	1.23 [0.52–3.15]	0.640
Low	12 (28.57)	52 (26.80)	1.26 [0.48–3.50]	0.634
Medium	8 (19.05)	44 (22.68)	1	

OR: Odds Ratio; CI: Confidence Interval; p-value: Significance level; $p < 0.001$ ****; $p < 0.01$ ***; $p < 0.05$ **Factors Independently Associated with Malnutrition in Children Aged 0 to 59 months: Multivariate Analysis

Table 4 presents the results of the bivariate analysis of determinants related to hygiene and sanitation conditions and maternal nutritional knowledge associated with malnutrition among children aged 0 to 59 months at the Bonassama District

Hospital. The results show that only knowledge of essential food groups was significantly associated with malnutrition (OR = 2.50; 95% CI: 1.36–4.43; $p = 0.034$). Children whose mothers were unaware of the essential food.

Table 5. Multivariate analysis of factors associated with malnutrition among children aged 0–59 months at Bonassama District Hospital.

Variables	Malnutrition (n=42)	Normal (n=194)	AOR [95% CI]	P-value
Type of housing				
Other	0 (0.00)	4 (2.06)		
Modern house	24 (57.14)	138 (71.13)	2.10 [1.03–4.01]	0.044 *
Traditional house	18 (42.86)	52 (26.80)	1	
Household occupancy status				
Homeowner	8 (19.05)	90 (46.39)	1	
Renter	34 (80.95)	94 (48.45)	3.01 [1.53–6.78]	<0.001 ***
Company housing	0 (0.00)	2 (1.03)		
Free housing	0 (0.00)	8 (4.12)		
History of respiratory infection				
No	36 (85.71)	122 (62.89)	1	
Yes	6 (14.29)	72 (37.11)	2.12 [1.20–5.35]	0.019 *
Use of health care services				
As soon as they get sick	30 (71.43)	142 (73.20)	0.54 [0.24–1.30]	0.156
Never	0 (0.00)	4 (2.06)		
Occasionally	2 (4.76)	22 (11.34)	2.23 [1.05–5.21]	0.030 *
Rarely	10 (23.81)	26 (13.40)	1	
Knowledge of essential food groups				
No	24 (57.14)	68 (35.05)	1.65 [0.96–2.43]	0.074
Yes	18 (42.86)	126 (64.95)	1	

AOR: Adjusted Odds Ratio; CI: Confidence interval; p-value: Significance level; $p < 0.001$ ****; $p < 0.01$ ***; $p < 0.05$ *

Table 5 presents the results of the multivariate analysis of factors associated with malnutrition among children aged 0 to 59 months at the Bonassama District Hospital. After adjusting for the other variables in the model, housing type, household occupancy status, history of respiratory infection, and occasional use of health services remained significantly associated with malnutrition. Children living in a modern house had a higher risk of being malnourished than those living in a traditional house (AOR = 2.10; 95% CI: 1.03–4.01; $p = 0.044$). Similarly, children from renter households were approximately three times more likely to be malnourished than those living in owner-occupied housing (AOR = 3.01; 95% CI: 1.53–6.78; $p < 0.001$). A history of respiratory infection also increased the risk

of malnutrition (AOR = 2.12; 95% CI: 1.20–5.35; $p = 0.019$). Finally, children who occasionally visited health care facilities were 2.23 times more likely to be malnourished than those who rarely visited them (AOR = 2.23; 95% CI: 1.05–5.21; $p = 0.030$). In contrast, the mother's knowledge of essential food groups was no longer significantly associated with malnutrition after adjustment (AOR = 1.65; 95% CI: 0.96–2.43; $p = 0.074$).

Discussion

The main objective of this study was to determine the factors associated with malnutrition among children aged 0 to 59 months at the Bonassama

District Hospital in the city of Douala. To do so, we started with the hypothesis that the prevalence of malnutrition at the Bonassama District Hospital would be nonzero and could be associated with several factors. The results suggest interpretations that will be discussed below in light of other studies and the scientific evidence available to us.

In this study, the prevalence of malnutrition among children aged 0 to 59 months was 17.8%, according to the World Health Organization (WHO) reference thresholds. This prevalence is higher than that reported by Nagahori et al.²¹ in Batouri, Cameroon, who observed prevalences of 6% for wasting, 14% for underweight, and 31% for stunting, based on various anthropometric indicators. It is also higher than the 2.72% prevalence of severe acute malnutrition reported in a hospital-based study conducted in Yaoundé by Chiabi et al.,²² as well as the wasting rates of 4–6% reported in the northern regions of Cameroon by the World Food Programme.²³ In contrast, our result is lower than the overall prevalence of 32.6% observed in the Mount Cameroon region by Asoba et al.,¹⁷ as well as the 36.5% prevalence reported in the Tole health zone by Njigang et al.²⁴ The differences observed between these studies could be explained by variations in the anthropometric indicators used to define malnutrition, the characteristics of the populations studied, geographical and socioeconomic contexts, as well as differences in sampling methods. Furthermore, communitybased studies generally report higher prevalence rates than hospital-based studies, as they account for all forms of malnutrition in the population.

Regarding the determinants of malnutrition among children aged 0 to 59 months at the Bonassama District Hospital, this study showed that children living in modern homes had a significantly higher risk of being malnourished than those living in traditional homes. This finding is consistent with that reported by Al-Zangabila et al.²⁵ in Yemen, who showed that a high socioeconomic status of households was associated with an increased risk of malnutrition among children. In contrast, it differs from the findings of Pongou et al.¹⁴ and Nagahori et al.²¹ in Cameroon, who reported that better housing conditions and a more favorable socioeconomic environment were associated with better nutritional status among children. This discrepancy could be explained by the fact that modern housing does not necessarily reflect adequate nutrition or good nutritional practices. Indeed, in some urban households, the adoption of a modern lifestyle may be accompanied by early weaning, frequent consumption of nutrientpoor processed foods, a diet lacking in variety, or the delegation of child care to third parties. These practices can contribute to the development of nutritional deficiencies despite seemingly favorable material conditions.

The results of this study also showed that children from renter households had a significantly higher risk of being malnourished than those living in

homes owned by their parents (AOR = 3.01; 95% CI: 1.53–6.78; $p < 0.001$). This finding is consistent with the work of Al-Zangabila et al.,²⁵ who showed that housing-related constraints and economic insecurity were associated with a deterioration in children's nutritional status. Similarly, Shi et al.²⁶ reported that children living in vulnerable family contexts had an increased risk of malnutrition.

In addition, Santos et al.²⁷ observed a high prevalence of malnutrition among children living in substandard housing in Brazil. This association could be explained by the fact that renter households often face greater economic insecurity, as a significant portion of their income is spent on rent. This situation reduces the resources available for purchasing quality food, accessing health care, and improving living conditions, thereby increasing the risk of malnutrition among young children.

Furthermore, this study showed that children with a history of respiratory infection had a significantly higher risk of being malnourished than those without such a history. This finding is consistent with that of Jonong et al.,²⁸ conducted in the Mada health district in Cameroon, which reported a high prevalence of cough and fever among malnourished children, suggesting a close relationship between respiratory infections and malnutrition. This association can be explained by the fact that respiratory infections increase the body's energy requirements while reducing appetite and food intake. They also promote a state of inflammation that impairs the absorption and utilization of nutrients, which can lead to a progressive deterioration in nutritional status. Moreover, malnutrition weakens the immune system, making children more vulnerable to respiratory infections and thus creating a vicious cycle between infection and malnutrition.

Similarly, children whose parents occasionally used health services were at a higher risk of malnutrition compared to those whose parents regularly used health facilities. Similar findings have been reported in Yemen, where a 2021 study showed that low utilization of nutritional programs was associated with persistent acute malnutrition among children.²⁹ Similarly, a study conducted in a resource-limited setting showed that insufficient access to health services and low utilization of community-based nutritional interventions contributed to an increased risk of child malnutrition.³⁰ This association could be explained by the fact that irregular visits to health services reduce opportunities for anthropometric screening, limit nutritional education for parents, and delay the treatment of childhood illnesses (diarrhea, respiratory infections, parasitic infections) that can compromise a child's nutritional status. Thus, improving the use of health services and strengthening nutritional monitoring programs are essential strategies for reducing malnutrition among children under five.

Study Limitations

The main limitation of our study is information bias, stemming from the fact that some participants may have lied or may not have accurately recalled the information requested of them. Furthermore, because this was a cross-sectional study, it was unable to establish temporal relationships between childhood malnutrition and the independent variables. Additionally, we encountered some difficulties during the course of this study, notably the refusal of some parents to participate.

Conclusion

This cross-sectional study conducted at the Bonassama District Hospital aimed to identify the determinants of malnutrition among children aged 0 to 59 months. The results show a prevalence of malnutrition of 17.8%, according to WHO reference thresholds based on upper arm circumference a significant proportion in this urban hospital setting. The multivariate analysis identified four determinants independently associated with malnutrition: living in a modern house, the household's tenant status, a history of respiratory infection, and occasional use of health services. These results confirm the multifactorial nature of childhood malnutrition, which depends as much on underlying economic hardship as on the child's susceptibility to infection and the family's healthcare-seeking behavior.

These findings call for strengthening systematic screening for malnutrition during all pediatric visits, raising parents' awareness of the importance of regular health checkups, and developing an integrated care approach that combines the prevention of respiratory infections with nutritional monitoring, with particular attention to tenant households. Larger-scale longitudinal studies would provide a better understanding of the mechanisms linking housing conditions, infectious morbidity, and the nutritional status of Cameroonian children.

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Consent for publication

All participants, as well as their parents or legal guardians, have given their consent for the publication of the results of this study. They were informed that the data would be presented in aggregate form only, and that no individually identifiable information would be

disclosed. Participants' anonymity and confidentiality were strictly respected throughout the study and when the results were published.

Consent to Participate

Participation in this study was entirely voluntary. Before data collection began, the objectives, methodology, potential benefits, and minimal risks of the study were explained in detail to parents, legal guardians, and students. An information and informed consent form was distributed to parents or guardians for signature, authorizing their children's participation. Participants' confidentiality and anonymity were strictly respected throughout the research process.

Data Availability

Data generated and analyzed during this study are available upon request from the authors. We encourage transparency and are willing to share data to support future research. Data will be provided subject to requests that comply with the ethical and confidentiality conditions established during the study.

Conflicts of Interest

The authors declare that they have no personal or financial interests to disclose in connection with this research. None of the authors has any financial or personal relationships with other individuals or organizations that could inappropriately influence or bias their work.

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Authors' contributions

Godfroy Rostant Pokam Djoko designed and conducted the study, developed the methodology, collected and analyzed the data, interpreted the results, and drafted the first version of the manuscript. Murielle Tsobgny Nguéack contributed to the study's methodology, participated in data collection, contributed to data validation and interpretation, and critically reviewed the manuscript. Devis Sobnang supervised the research, contributed to the study design and the validation of the results, provided essential intellectual input throughout the study, and reviewed and approved the final version of the manuscript. All authors have read and approved the final version of the manuscript and agree to be accountable for the work as a whole.

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