Open Access Library Journal
2025, Volume 12, e14253
ISSN Online: 2333-9721
ISSN Print: 2333-9705

Occurrence and Predictors of Undernutrition in Children Less Than Five Years Old: A Case Study of Old Town and Bamendakwe in the North West Region of Cameroon

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How to cite this paper: Veranso, L.J.T., Navti, L.K., Shalanyuy, L.H., Mengnjo, T.L., Leinyuy, D.M., Suiven, B.E. and Randze, L.N. (2025) Occurrence and Predictors of Undernutrition in Children Less Than Five Years Old: A Case Study of Old Town and Bamendakwe in the North West Region of Cameroon. *Open Access Library Journal*, **12**: e14253.
https://doi.org/10.4236/oalib.1114253

Received: September 8, 2025
Accepted: October 20, 2025
Published: October 23, 2025

Abstract

Undernutrition, caused by insufficient intake of energy and nutrients, impairs growth and reduces energy reserves in children. It is both a cause and consequence of poverty, affecting health, development, and societal economic progress. Africa bears a disproportionate burden, with millions of children affected by stunting and wasting, increasing susceptibility to infections and mortality. In Cameroon, undernutrition remains a significant public health concern, contributing to under-five deaths and highlighting the need for targeted interventions and research. This study was a community-based cross-sectional survey conducted in Old Town and Bamendankwe, Bamenda, to assess undernutrition among children under five and their parents. A total of 195 children were selected using multi-stage purposive and snowball sampling. Data collection involved anthropometric measurements (height/length, weight, mid-upper arm circumference) and sociodemographic information via a structured questionnaire. Nutritional status was classified using WHO 2007 growth standards as mild, moderate, or severe undernutrition. Data analysis included t-tests, chi-square tests, and logistic regression using SPSS version 21, with ethical approval and informed consent obtained. A total of 195 mothers participated, aged 17 - 38 years, with 52% Muslim and varying education levels. Most households had at least three members with diverse income levels. Children showed no significant gender differences in anthropometric measurements or z-scores

($p > 0.05$). Overall prevalence of undernutrition was: stunting (26% mild, 19.3% moderate, 8.9% severe), underweight (23.3% mild, 6.2% moderate, 4.1% severe), and wasting (12% mild, 2.6% moderate, 1% severe), with the 27 - 36 months age group most affected. No significant differences in stunting were observed by gender or residence, but underweight and wasting were higher in Old Town ($p = 0.007$). Religious differences were significant for underweight ($p < 0.001$) and wasting ($p = 0.001$), but not stunting ($p = 0.090$). Univariate analysis indicated that internally displaced person (IDP) status increased risks for underweight (OR = 2.9, $p = 0.001$) and wasting (OR = 1.3, $p = 0.043$), while larger household size increased stunting (OR = 4.0, $p = 0.007$) and underweight (OR = 27.4, $p = 0.02$). Low income and religion were also associated with undernutrition, with Christian children having a lower risk of underweight ($p < 0.001$). Multivariate analysis confirmed that household size ≥ 5 (OR = 19.2, $p = 0.005$) and being Muslim (OR = 0.3, $p = 0.005$) significantly affected underweight. The study recommends targeted nutritional interventions for high-risk children, especially those from large households, displaced families, and vulnerable religious or socioeconomic groups.

Subject Areas

Nutrition

Keywords

Occurrence, Predictors, Undernutrition, Children Less Than Five Years Old, Old Town, Bamendakwe, North West Region, Cameroon

1. Background

Undernutrition is defined as insufficient intake of energy and nutrients to meet an individual's health needs and can result from deficiencies in macronutrients (carbohydrates, proteins, fats) or micronutrients (vitamins and minerals) [1]. Macro nutrient deficiency leads to adaptations such as decreased growth and energy reserves, resulting in children who may be shorter or thinner than well-nourished peers [2]. Undernutrition is both a cause and consequence of poverty, significantly affecting health, development, and societal economic progress [3]. Globally, 19 million preschool children, mostly in Africa and Southeast Asia, suffer from severe wasting, contributing to high childhood morbidity and mortality [4] [5].

Africa carries a disproportionate burden of undernutrition, with one-third of the world's stunted children and 14.1 million wasted children living on the continent [6]. Severe wasting increases susceptibility to common infectious diseases and significantly elevates the risk of child mortality. Maternal, infant, and young child nutrition, particularly in the first 1000 days from conception to age two, is crucial for preventing long-term developmental deficits and promoting human

capital [6]. Acute undernutrition, including Severe Acute Malnutrition (SAM) and Moderate Acute Malnutrition (MAM), affects millions of children worldwide, emphasizing the need for early detection and intervention [3].

Undernutrition is both a medical and social disorder, influenced by family, socio-economic, and environmental factors [6]. Addressing only the medical aspect of undernutrition risks relapse, as underlying social determinants such as poverty, poor parental understanding, and inadequate care remain unaddressed. Growth monitoring and early nutritional interventions in primary health-care settings are critical for reducing morbidity and mortality, as low weight-for-height or mid-upper arm circumference strongly predicts increased risk of death [4].

In Cameroon, undernutrition remains a significant public health challenge. Although some progress has been made toward exclusive breastfeeding and reducing stunting and wasting, prevalence remains high, with 28.9% of children under five stunted and 4.3% wasted [7]. Undernutrition is responsible for 38% of deaths among children under five in the country, with limited awareness and implementation of effective nutritional strategies [8]-[13]. Gaps in population-level data, particularly in regions like Bamenda, highlight the need for research to inform policies and interventions targeting child growth and nutritional status [14] [15].

2. Methodology

The study was a community-based cross-sectional survey conducted in Old Town and Bamendankwe, Bamenda, targeting children under five years and their parents/guardians to assess the prevalence and predictors of undernutrition. A sample size of 195 was determined using a single proportion formula, and a multistage purposive and snowball sampling method was used to select households with children under five. Purposive sampling was applied to intentionally identify households with eligible children, while snowballing was used to reach additional participants in hard-to-identify households, thereby improving coverage and efficiency. To avoid clustering bias, each household was treated as one sampling unit, and while all eligible children were assessed, analyses accounted for multiple children within the same household to prevent overestimation. Data collection involved anthropometric measurements, including height/length, weight, and mid-upper arm circumference, using calibrated instruments, while sociodemographic and risk factor information was obtained via a structured, pretested questionnaire. Children's nutritional status was assessed using WHO 2007 growth standards, with z-scores calculated for height-for-age, weight-for-age, and weight-for-height; undernutrition was classified into mild, moderate, and severe categories. Statistical analysis was done using SPSS version 21 and included independent t-tests, chi-square tests, and univariate and multivariate logistic regression to identify significant predictors of undernutrition ($p < 0.05$). Ethical approval was secured from the University of Bamenda, and informed consent was obtained from parents, with verbal assent from children.

3. Results

3.1. Sociodemographic Characteristics of Parents

As shown in Table 1 below, a total of 195 mothers were enrolled in this study. 92 (47.2%), 88 (45.1%) and 15 (7.7%) were within the age group 17 - 27, 28 - 38 and 39 - 55 respectively. 102 of the parents were from the Muslim background. 7 (3.6%) of the mothers did not attend primary school, 85 (43.6%) attended primary school, 88 (45.1%) attended secondary school and 15 (7.7%) of them graduated.

Table 1. Sociodemographic characteristics of parents.

	Variable	Frequency	Percentage
Age (years)	17 - 27	92	47.2
	28 - 38	88	45.1
	39 - 55	15	7.7
IDP status	IDP	62	31.8
	Not IDP	130	66.7
Marital status	Single	38	19.5
	Married	148	75.9
	Widow	4	2.1
	Divorced	5	2.6
Level of education	No formal education	7	3.6
	Primary	85	43.6
	Secondary	88	45.1
	Tertiary	15	7.7
Religion	Christian	93	47.7
	Muslim	102	52.3
Area of residence	Bamendankwe	67	34.4
	Old town	128	65.6

3.2. Socioeconomic Characteristics of Parents

Table 2 below shows that 141 (72.3%) participants were from a home with at least three members. 14 homes had five or more persons. It was also found out that 12 (6.4%), 74 (33.6%) 48 (25.7%) and 53 (28.3%). Participants had <15,000 (6.4%), 15,000 - 30,000 (33.6%), 30,000 - 50,000 (25.7%) and >50,000 (28.3%) monthly incomes respectively.

3.3. Anthropometric Characteristics of Children

Table 3 below shows the comparison of means of age (months), height (cm) weight (kg), BMI (kg/m^2), MUAC (cm), height z-score, weight z-score, weight/height, z-score and MUAC z-score between males and females. There were no significant differences in the means of age ($p = 0.728$), height ($p = 0.265$), weight ($p = 0.342$), z-score ($p = 0.089$) and MUAC ($p = 0.694$) between boys and girls.

Table 2. Socioeconomic characteristics of parents.

	Variable	Frequency	Percentage
Ownership of house	Own	44	22.6
	Rent	155	59.0
	free	36	18.5
Building material use	Paved	18	9.3
	Semi paved	31	16.0
	Not paved	145	74.7
Number of people per household	Three	141	72.3
	Four	40	20.5
	Five	14	7.2
Type of fuel use	Fire wood	109	55.9
	Kerosene	1	0.5
	Gas	7	3.6
	Firewood and Kerosene	59	30.3
	Firewood and gas	19	9.7
Household income	<15,000	12	6.4
	15,000 - 30,000	74	39.6
	30,000 - 50,000	48	25.7
	>50,000	53	28.3
Farmland cultivation	Yes	71	36.4
	No	124	63.6
Farmland cultivation	Civil servant	1	0.5
	Employee	13	6.7
	Self employed	68	35'2
	Not working	111	57.5

Table 3. Anthropometric characteristics of children.

Variable	Boys' mean (SD)	Girls mean (SD)	p-value
Age (months)	26.47 (16.1)	27.29 (16.2)	0.728
Height (cm)	80.93 (14.84)	83.45 (15.91)	0.265
Weight (kg)	12.11 (7.22)	11.35 (3.93)	0.342
BMI (kg/m^2)	22.38 (39.34)	15.99 (1.93)	0.089
MUAC (cm)	15.10 (1.37)	15.01 (1.61)	0.694
Height z-score	−1.32 (1.64)	1.89 (28.79)	0.312
Weight z-score	−0.47 (1.30)	−0.36 (1.35)	0.597
BMI z-score	0.52 (1.37)	0.16 (1.39)	0.080
Weight-to-height z-score	0.33 (1.29)	0.12 (1.27)	0.261
MUAC z-score	−0.21 (1.13)	−0.25 (1.10)	0.801

3.4. Prevalence of Different Types of Undernutrition in Children

Prevalence of stunting

The prevalence of stunting in the study population based on WHO classification was 26% for mild stunting, 19.3% for moderate stunting and 8.9% for severe stunting as shown in the Figure 1 below **[Normal range for Stunting: Mild (−1 to <−2 SD), Moderate (−2 to <−3 SD), Severe (<−3 SD)]**

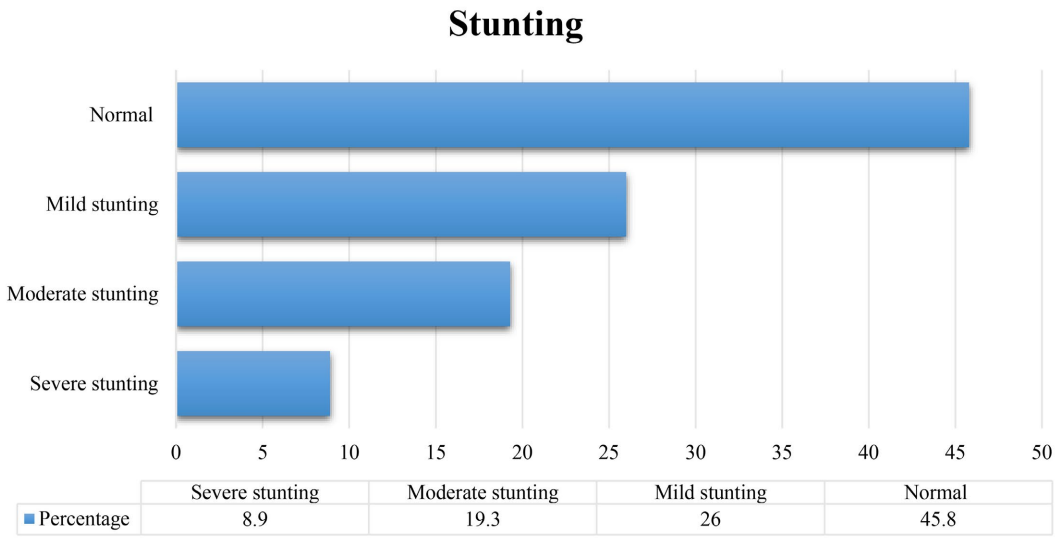

Figure 1. Prevalence of stunting.

Prevalence of underweight

Figure 2 below shows that the proportion of underweight children based on WHO classification were 23.3%, 6.2% and 4.1% for mild underweight, moderate underweight and severe underweight respectively **[Normal ranges for Underweight: Mild (−1 to <−2 SD), Moderate (−2 to <−3 SD), Severe (<−3 SD)].**

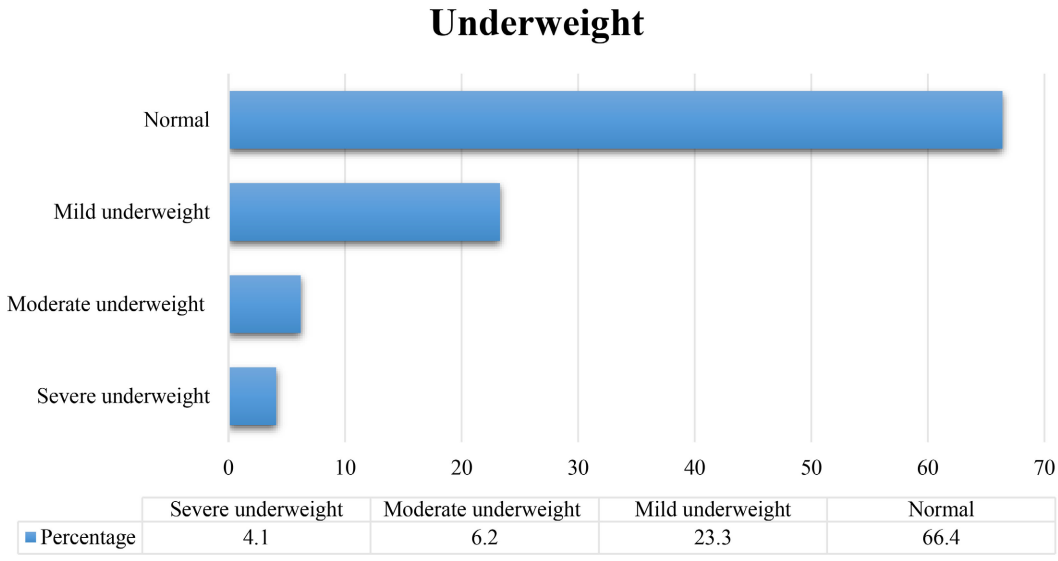

Figure 2. Prevalence of underweight.

Prevalence of wasting

For wasting, the proportion of wasting in children was found to be 12% for mild wasting, 2.6 % for moderate wasting and 1% for severe wasting, as shown in Figure 3 below. **[Normal range for Wasting: Mild (−1 to <−2 SD), Moderate (−2 to <−3 SD), Severe (<−3 SD)].**

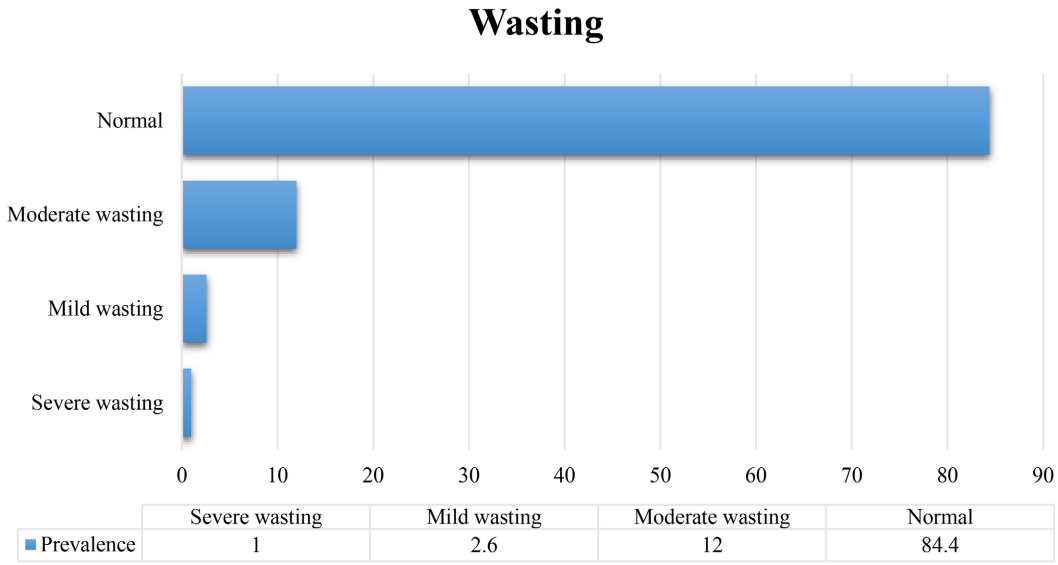

Figure 3. Prevalence of wasting.

3.5. The Prevalence of Undernutrition with Respect to Age Group

Prevalence of stunting with respect to age group

Table 4 below shows that stunting occurs at ages from 0 to 5 years with 27 to 36 months being the most affected with 25 (13.0%) mild cases, 13 (6.8%) moderate cases and 6 (3.1%) severe cases.

Table 4. Stunting with respect to age group.

		Age group (months)				
		0 to 6	7 to 16	17 to 26	27 to 36	37 to 46
Stunting	Mild	2 1.0%	7 3.6%	11 5.7%	25 13.0%	5 2.6%
	Moderate	1 0.5%	7 3.6%	12 6.3%	13 6.8%	4 2.1%
	Severe	2 1.0%	3 1.6%	2 1.0%	6 3.1%	4 2.1%

Prevalence of underweight with respect to age group

Table 5 below shows that underweight children were registered throughout the ages from 0 to 46 months of age with the highest record in the age group 27 to 36 which recorded 21 (10.8%) mild cases, 6 (3.1%) moderate cases and 2 (1.0%) severe cases.

Table 5. Underweight with respect to age group.

		Age group (months)				
		0 to 6	7 to 16	17 to 26	27 to 36	37 to 46
Underweight	Mild	2 1.0%	6 3.1%	11 5.6%	21 10.8%	6 3.1%
	Moderate	0 0%	3 1.5%	1 0.5%	6 3.1%	2 1.0%
	Severe	1 0.5%	2 1.0%	1 0.5%	2 1.0%	2 1.0%

Prevalence of wasting with respect to age group

Table 6 below indicates that the age group that was most affected by wasting was the 27 to 36 age group which registered 10 (5.2%) mild cases, 1 (0.5%) moderate case and 1 (0.5%) severe case.

Table 6. Wasting with respect to age group.

		Age group (months)				
		0 to 6	**7 to 16**	**17 to 26**	**27 to 36**	**37 to 46**
Wasting	Mild	2 1.0%	3 1.6%	4 2.1%	10 5.2%	4 2.1%
	Moderate	0 0%	2 1.0%	1 0.5%	1 0.5%	1 0.5%
	Severe	0 0%	0 0%	1 0.5%	1 0.5%	0 0%

3.6. Proportion of Undernourished Children with Respect to Gender, Area of Residence and Religion

Proportion of undernourished children with respect to gender.

A total of 195 children participated in this study. 112 of the children were females and 83 of them were males. There was no significant difference in the proportion of stunted ($p = 0.106$), underweight ($p = 0.139$) and wasted ($p = 0.510$) with respect to gender as shown in Table 7 below.

Proportion of undernourished children with respect to area of residence

Table 8 below shows that there was no statistically significant difference in the proportion of stunted children with respect to area of residence ($p = 0.633$). There was a statistically significant difference in the proportion of underweight ($p = 0.007$) and wasting ($p = 0.007$) with respect to area of residence with the highest proportion residing in Old Town.

Proportion of undernourished children with respect to religious beliefs

Table 9 below shows that there was no statistically significant difference in the proportion of stunted ($p = 0.090$) children between Muslims and Christians but there was a statistically significant difference in wasting ($p = 0.001$) and underweight ($p \leq 0.001$) between Muslims and Christians.

Table 7. Proportion of undernourished children with respect to gender.

		Male	Female	Total	p-value	Chi-square
Stunting	**Mild**	24 (12.5%)	26 (13.5%)	50 (26.0%)		
	Moderate	20 (10.4%)	17 (8.9%)	37 (19.3%)	0.106	6.111
	Severe	8 (4.2%)	9 (4.7%)	17 (8.9%)		
Underweight	**Mild**	26 (13.3%)	20 (10.3%)	46 (23.6%)		
	Moderate	6 (3.1%)	6 (3.1%)	12 (6.2%)	0.139	5.498
	Severe	3 (1.5%)	5 (2.6%)	8 (4.1%)		
Wasting	**Mild**	9 (4.7%)	14 (7.3%)	23 (12.0%)		
	Moderate	2 (1.0%)	3 (1.6%)	5 (2.6%)	0.510	2.313
	Severe	0 (0%)	2 (1.0%)	2 (1.0%)		

Table 8. Proportion of undernourished children with respect to area of residence.

		Bamendankwe	Old town	Total	p-value	X^2 value
Stunting	Mild	16 (8.3%)	34 (17.7%)	50 (26.0%)		
	Moderate	11 (5.7%)	26 (13.5%)	37 (19.3%)	0.633	1.716
	severe	4 (2.1%)	13 (6.8%)	17 (8.9%)		
Underweight	Mild	11 (5.6%)	35 (17.6%)	46 (23.6%)		
	Moderate	3 (1,5)	9 (4.6%)	12 (6.2%)	0.007	12.109
	Severe	0 (0.0%)	8 (4.1%)	8 (4.1%)		
Wasting	Mild	3 (1.6%)	20 (10.5%)	23 (12.0%)		
	Moderate	0 (0.0%)	5 (2.6%)	5 (2.6%)	0.007	12.145
	Severe	0 (0.0%)	2 (1.0%)	2 (1.0%)		

Table 9. Proportion of undernourished children with respect to religious beliefs.

		Religion		Total	p-value	X^2
		Christian	Muslim			
Stunting	Mild	25 (13%)	25 (13%)	50 (23%)		
	Moderate	13 (6.8%)	24 (12%%)	37 (19.3 %)	0.090	6.497
	Severe	5 (2,6%)	12 (6.3%)	17 (8.9%)		
Wasting	Mild	4 (2.1%)	19 (9.9%)	23 (12.0%)		
	Moderate	1 (0.5%)	4 (2.1%)	5 (2.6.%)	0.001	15.659
	Severe	0 (0.0%)	2 (1.0%)	2 (1.0%)		
Underweight	Mild	16 (8.2%)	30 (15.4%)	46 (23.6%)		
	Moderate	2 (1.0%)	10 (5.1%)	12 (6.1%)	<0.001	24.260
	severe	0 (0.0%)	8 (4.1%)	8 (4.1%)		

3.7. Risk Factors Associated with Undernutrition

A univariate analysis was carried out to establish the risk factors of undernutrition in the study participants (Table 10 below). With respect to IDP status, being an IDP increases the chances of stunting, underweight and wasting by 1.7 ($p = 0.114$), 2.9 ($p = 0.001$) and 1.3 ($p = 0.043$) times, respectively, as compared to not being an

IDP. The influence of IDP status on underweight and wasting was statistically significant. Low-income earners (<15,000 francs CFA) had a 3.4 (p = 0.09) chance of being stunted and a 1.3 (p = 0.576) chance of being underweight as compared to high-income earners (>50,000 francs CFA). Children belonging to a family size of 5 and above had 4.0 (p = 0.007) risk of stunting, 27.4 (p = 0.02) risk of underweight and 3.3 (p = 0.132) risk of wasting as compared to a family size of just 2.

Table 10. Univariate analysis.

		Stunting		Underweight		Wasting	
	Predictors	**0R (95% CI)**	**p-value**	**OR (95% CI)**	**p-value**	**OR (95% CI)**	**p-value**
IDP Status	Yes	1.7 (0.9 - 3.1)	0.114	2.9 (1.6 - 5.5)	0.001	1.3 (0.6 - 2.9)	0.043
	No	ref		ref		ref	
Religion	Christian	0.6 (0.3 - 1.0)	0.069	0.3 (0.1 - 0.5)	<0.001	0.2 (0.1 - 0.5)	0.001
	Muslim	ref		ref			
L.E	Tertiary Secondary	0.2 (0.02 - 2.0)	0.178	0.08 (0.01 - 0.9)	0.040	0.5 (0.05 - 4.2)	0.488
	Primary	0.2 (0.02 - 1.5)	0.108	0.08 (0.01 - 0.7)	0.023	0.5 (0.08 - 2.7)	0.407
	N.F. E	0.1 (0.01 - 1.1)	0.064	0.07 (0.01 - 0.6)	0.018	0.4 (0.1 - 2.4)	0.327
		ref					
Income	<15,000	3.4 (0.8 - 13.9)	0.093	1.3 (0.6 - 2.9)	0.576	0.8 (0.3 - 1.9)	0.585
	15 - 30,000	1.4 (0.7 - 2.8)	0.397	1.4 (0.7 - 3.0)	0.373	0.2 (0.6 - 0.8)	0.025
	30 - 50 (100)	1.4 (0.7 - 3.2)	0.361	0.8 (0.2 - 3.2)	0.722	0.00	0.999
	>50,000	ref					
Householdsize	≥5	4.0 (1.5 - 11.0)	0.007	27.4 (3.5 - 212.2)	0.02	3.3 (0.7 - 15.6)	0.132
	4	2.6 (1.1 - 6.4)	0.037	15.3 (1.9 - 121.2)	0.010	3.2 (0.7 - 16.0)	0.146
	3	2.4 (0.96.10)	0.064	12.9 (1.6 - 105.9)	0.017	1.6 (0.39.4)	0.602
	2	ref					

Table 11. Multivariate analysis.

	Predictors	**Underweight**	**p-value**
		OR (95% CI)	
IDP Status	Yes	1.4 (0.7 - 3.0)	0.391
	No	ref	
Religion	Christian	0.3 (0.1 - 0.7)	0.005
	Muslim	Ref	
Educational level	Tertiary	0.1 (0.02 - 1.3)	0.089
	Secondary	0.2 (0.02 - 1.9)	0.156
	Primary	0.3 (0.03 - 4.1)	0.382
	No education	Ref	
Household size	≥5	19.2 (2.4 - 153.3)	0.005
	4	11.8 (1.4 - 96.8)	0.022
	3	0.7 (1.2 - 91.4)	0.031
	2	Ref	

Following a univariate analysis. IDP status, religion (Christians), educational level (tertiary, secondary and primary education) and household size (3 and above) were seen to significantly have an effect on underweight. A multivariate analysis was then carried out and the results are as in Table 11.

4. Discussion

In order to effectively address undernutrition, especially in resource-scarce communities, knowing the prevalence, causes, and risk factors is essential. This study aimed to determine patterns and factors related to undernutrition to guide nutrition program planning. The prevalence of undernutrition among children in Old Town and Bamendankwe in Bamenda was 54.2%, 33.8%, and 15.7% for stunting, underweight, and wasting, respectively. There was no significant difference in stunting ($p = 0.106$), underweight ($p = 0.139$), or wasting ($p = 0.510$) between male and female children. With respect to area of residence, wasted and underweight children were significantly different ($p = 0.007$). Statistically significant differences in wasting ($p = 0.001$) and underweight ($p < 0.001$) were also observed between children from Muslim and Christian backgrounds. Household size, monthly income, IDP status, and religion were identified as risk factors associated with undernutrition in Old Town and Bamendankwe. The prevalence of underweight, stunting, and wasting in these communities exceeded the national average of 27.2% for stunting and 4.3% for wasting [8] [16]. This could be linked to low parental income, rising food prices, and higher household populations due to internal displacement. The high prevalence aligns with Florence T. *et al.* [17] and Dynes Kejo *et al.* [18] in Cameroon.

Assessing risk factors for undernutrition among children under five in migrant-populated areas revealed a high prevalence. WHO, UNICEF, and World Bank reported 27.2% stunting and 4.3% wasting in Cameroon [7], while Nagahori C. *et al.* [19] reported 45.8%, 30.2%, and 11.3% prevalence for stunting, underweight, and wasting in Batouri. Maleta K. [20] reported 49%, 30%, and 7% for Malawi, and Agbor Evon *et al.* [21] reported 20.9%, 8.6%, and 7% for Cameroon. The current study's prevalence exceeded these figures, likely due to the smaller sample and localized study area. Undernutrition was most frequent among children aged 27-36 months, highlighting the need for age-targeted interventions. Differences in age-related prevalence were observed compared to Florence T. *et al.* [17] and Agbor Evon *et al.* [21].

The proportion of stunted males and females was equal (27.1%). For underweight, 17.9% of males and 16% of females were affected; for wasting, 4.7% of males and 9.9% of females were affected. These differences were not significant, consistent with Dabar D. *et al.* [22], but contrast with Susan *et al.* [23] and Samuel *et al.* [24]. Religion also influenced nutritional status: no significant difference in stunting was observed between Muslims and Christians, but wasting ($p = 0.001$) and underweight ($p < 0.001$) were higher among Muslim children, aligning with Nidhi [25]. Family size ≥ 4 was associated with a higher risk of stunting (OR = 2.4, p =

0.04) and underweight (OR = 12.9, p = 0.02), similar to findings by Ayana A. B. *et al.* [26] and Mohammad M. Islam *et al.* [27].

Wealth status significantly affected nutritional outcomes. Children from low-income households had 3.4 times higher risk of stunting (OR = 3.4, p = 0.09), consistent with Yalew B. M. *et al.* [28], Kanjilal *et al.* [29], and Philips Edomwonyi *et al.* [30]. Maternal education was not associated with undernutrition in this study, contrary to Iftikhar *et al.* [31]. Limitations include purposive sampling, small sample size, cross-sectional design, and potential information bias. Strengths include being among the few community-based studies assessing undernutrition in North West Region.

5. Conclusion

The prevalence of undernutrition (stunting, underweight, and wasting) among children under five in Bamendankwe and Old Town, Bamenda, was high. No significant differences were observed between male and female children for any undernutrition indicator. Differences in underweight and wasting were significant between the two communities and between Muslim and Christian children. Identified risk factors included family size, IDP status, religion, and income. Religion was significantly associated with stunting, family size with wasting, and all four factors with underweight.

6. Study Limitations

Limitations include purposive sampling, small sample size, cross-sectional design, and potential information bias. Because a non-probability approach (purposive and snowball sampling) was used, the findings may not fully represent the wider population of Bamenda, limiting generalizability and external validity. The absence of randomization also increases the risk of selection bias, which could have influenced the estimated prevalence. Residual confounding cannot be ruled out, as unmeasured factors such as recent illness episodes, child feeding practices, and parental health behaviours may have influenced the observed associations. Therefore, while significant predictors were identified, causal inferences should be made with caution.

Conflicts of Interest

The authors declare no conflicts of interest.

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