PriMera Scientific
Medicine and Public Health
Volume 9 Issue 1 July 2026
DOI: 10.56831/PSMPH-09-298
ISSN: 2833-5627

PriMera Scientific Publications

Prevalence of Infant and Child Malnutrition and Associated Factors in the Bengamisa Health Zone, Tshopo Province, DRC

Type: Research Study
Received: June 05, 2026
Published: July 08, 2026

Citation:
Louis Ndjondo Longanga., et al. "Prevalence of Infant and Child Malnutrition and Associated Factors in the Bengamisa Health Zone, Tshopo Province, DRC". PriMera Scientific Medicine and Public Health 9.1 (2026): 04-12.

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Abstract

Introduction: The objective of This study aimed to determine the prevalence of infant and child malnutrition and associated factors.

Materials and methods: An analytical cross-sectional study was conducted in the Bengamisa Health Zone with 167 households during the period from April 12 to June 25, 2025. Logistic regression was used to search for factors associated with child malnutrition.

Results: The overall prevalence of malnutrition was 15%, while the prevalence of moderate acute malnutrition was 8.3% and 7.1%, respectively, for severe acute malnutrition. Complete childhood vaccination (aOR=0.28; 95% CI: 0.13-0.41) and a "Good" overall maternal knowledge level (aOR=0.42; 95% CI: 0.28-0.56) reduced the risk of childhood malnutrition.

Conclusion: The overall prevalence of malnutrition remains high in all its forms. Complete childhood vaccination and maternal overall knowledge were associated factors. Mothers should be encouraged to continue CPS (Community-Based Post-Prevention) after their children have completed their vaccination schedule.

Keywords: Prevalence; malnutrition; associated factors; Tshopo

Introduction

It is estimated that in 2012-2014, 805 million people worldwide, or more than one in eight, suffered from chronic hunger, meaning they did not receive enough food on a regular basis to lead an active life [1]. Despite numerous efforts and the commitment made by the international community in the Millennium Declaration to halve the number of people suffering from hunger by 2015, persistent hunger and malnutrition continue to affect millions of people [2].

Global malnutrition is an irreversible scourge [3], persisting in all its forms, with children paying a heavy price. It is estimated that in 2020, more than 149 million children under the age of 5 were stunted; more than 45 million suffered from wasting and nearly 39 million were overweight [4].

In resource-limited countries, malnutrition is common in all its forms and is multifactorial. In Benin, the prevalence of malnutrition in all its forms was 32.0%, with female sex, anemia, low birth weight, reduced household food consumption and non-consumption of dairy products being associated factors [5].

In Burkina Faso, malnutrition prevalence rates were high, at 15% for acute malnutrition, 13% for chronic malnutrition, and 7% for underweight. Age ≥ 12 months increased the risk of acute malnutrition (aOR = 2.3, 95% CI: 1.1-4.7), while knowledge of early childhood nutrition (ECN) reduced the risk of acute malnutrition (aOR = 0.4, 95% CI: 0.2-0.9). Furthermore, age ≥ 12 months (aOR = 0.08, 95% CI: 0.03-0.22), female sex (aOR = 0.31, 95% CI: 0.12-0.77), and the absence of dietary restrictions (aOR = 0.13, 95% CI: 0.05-0.3) reduced the risk of chronic malnutrition in infants [6].

In Cameroon, the prevalence of global acute malnutrition (GAM) was 4.5%, moderate acute malnutrition (MAM) was 7.8%, and severe acute malnutrition (SAM) was 1.6%. The age group most affected by GAM was children aged 48 to 59 months, and with regard to MAM, children aged 36 to 47 months were the most affected (11%), while children aged 48 to 59 months had the highest prevalence of SAM [7].

In the DRC, the recent Demographic and Health Survey, based on three nutritional indices (height for age, weight for height, and weight for age) and overweight, revealed that 45% of children suffered from stunting and 23% had severe stunting; 7% were wasted or thin and 2% had severe stunting; and 25% were underweight and 9% had severe stunting [8]. A study conducted in the VAKU health zone in the DRC found a prevalence of severe acute malnutrition of 3.8%; male sex and age between 12 and 24 months were associated with this high frequency (4.7%). Potential determinants of the occurrence of severe acute malnutrition in this health zone were non-compliance with the recommended daily intake (RDI), inadequate supplemental feeding, a monthly income of household heads ≤ USD 30, and non-attendance at the primary healthcare center (PHC) [9].

In July 2015, in Tshopo province, the management of acute malnutrition (AMPM) was introduced in the health facilities of the Bengamisa health zone. This was accompanied by a community garden initiative, established in some health districts, as an approach aimed at encouraging households with malnourished children to cultivate vegetables, Moringa, and Chaya on their plots to improve food availability and access within the framework of food security.

This study is conducted within the overall context of insufficient child and infant nutrition in the DRC in general, and the "community garden" initiative associated with the promotion of key community practices in certain health zones of the Tshopo province on the other hand, with the aim of determining the prevalence of infant and child malnutrition and associated factors.

Materials and Methods

Study site

The study was conducted in the rural health zone of Bengamisa, Tshopo Province in the DRC.

Study population

All children aged 6 to 59 months living in the Bengamisa health zone.

Type and period of study

An analytical cross-sectional study was conducted in the Bengamisa Health Zone, Tshopo province, during the period from April 12 to June 25, 2025.

Sampling

Our sample size was calculated using the SCHWARTZ formula as follows: $n=Z*p*q/d^2$.

Considering p as the expected proportion of malnutrition among children under 5 years of age, estimated in this study at 10% (the WHO accepts a prevalence estimate between 5 and 20% based on the results of previous studies in the DRC) [11]; with a Z-coefficient of 1.96 and a margin of error of 5%, and an anticipated non-response rate of 10%, the minimum size of our sample was 167 households. Thus, to increase the sample size and improve precision, we took the same sample from villages that had integrated the community garden and from villages without a community garden [10].

We combined stratified and random sampling techniques

The systematic approach was carried out as follows:

- Stratification of the ZS into four axes of supervision (grouping of AS based on criteria of geographical, economic and cultural proximity).
- Simple random selection two AS in each stratum (total 8 AS);
- Selection of two villages at the level of each drawn AS, one village with a plot garden and one village without a plot garden (total 16 villages).
- At the level of each village, we selected households using the systematic sampling technique operated as follows: counting all households (N), calculating sampling steps (k), randomly selecting the first household to be surveyed, then adding sampling steps until the required number of households for each village was reached.

The households surveyed were evenly distributed among the 16 villages, with 21 households per village. Within each household, only one target child was selected. In households with more than one target child, a child was chosen at random.

Data collection techniques

Data was collected from mothers/caregivers using a guided interview technique with a pre-tested questionnaire, and entered into smartphones via the Kobo Collect platform, where they were responsible for providing child data. Anthropometric measurements of the children were taken using MUAC, a height gauge, and scales.

Data analysis techniques

The collected data were entered into Excel and imported into STATA 13 for analysis. Categorical variables were described as proportions and quantitative variables as mean ± SD. The analysis of factors associated with malnutrition was performed using Pearson's chi-squared test for non-binary categorical variables and an odds ratio (OR) at the 5% significance level for binary variables.

To control for potential confounding factors, a multiple logistic regression model was constructed using a stepwise forward approach. Explanatory variables that showed a statistically significant association in bivariate analysis (p-value < 0.05) were included in the initial model. The results were presented as adjusted odds ratios (ORa) with their 95% confidence intervals and the Wald p-value. The overall goodness of fit of the final model was verified using the Hosmer-Lemeshow test. A p-value > 0.05 was considered an indicator of good fit, confirming that there was no significant difference between the observed and predicted frequencies.

Classification of forms of malnutrition
According to the branchial perimeter (BP)

- If the PB is less than 115 mm = Severe Acute Malnutrition;
- If the PB is between 115 and 125mm = Moderate Acute Malnutrition
- If the PB is greater than 125 mm = Good nutritional status.

Based on the Weight-to-Height Ratio Standard Deviation or Z-score (W/H)

- P/T <−3 ET = Severe acute malnutrition;
- P/T <−2 ET = Moderate acute malnutrition;
- P/T <−1 ET = GOOD nutritional status.

Categorization of the overall level of knowledge

"GOOD" level: when the mother cited at least two causes of malnutrition, two types of malnutrition and at least three preventive measures.

Administrative and ethical considerations

The study protocol had received approval from the ethics committee of the University of Kisangani and field authorizations were obtained from the DPS and the BCZS.

Participation in the study was voluntary and required the signing of an informed consent form. The anonymity of the information collected was guaranteed at all stages of the study, from collection to dissemination.

Results

Variables N=384	***Terms and conditions***	***Frequency***	***Percentage***
Age (Mean ±SD) Months	28.8 ±13.1		
	6 to 11	48	12.5
	12 to 23	87	22.6
	24 to 35	112	29.2
	36 to 59	137	35.7
Sex	Male	191	49.7
	Female	193	50.3
Vaccination status	Never vaccinated	22	5.7
	Partially vaccinated	185	48.2
	Fully vaccinated	177	46.1
Parasite control	Yes	46	12.0
	No	338	88.0
Vitamin A supplementation	Yes	114	29.7
	No	270	70.3
Anthropometric data			
Mid-upper arm circumference	≤115 mm	35	9.1
	115 - 125 mm	25	6.5
	>125 mm	324	84.4
Average weight (Average ±SD) kg	12.4 ± 6.2		
Average size (Average ±SD) cm	89.1 ± 44.8		

Table 1: Characteristics of the children surveyed, coverage of public health interventions and anthropometric data.

This table shows that the average age of the children was 28.8 ± 13.1 years, with nearly one-third aged between 36 and 59 months. The sexes were evenly distributed; less than half of the children were fully vaccinated, and very few were dewormed or receiving Vita-

min A supplementation. The vast majority of children had a mid-upper arm circumference > 125 mm; the average weight and average height were 12.4 ± 6.2 kg and 89.1 ± 44.8 cm, respectively.

Variables N=384	*Terms and conditions*	*Frequency*	*Percentage*
Nutritional status N=384	Good	325	84.6
	MAM	32	8.3
	MAS	27	7.1
Z score	< - 3	0	0.0
	< - 3 < - 2	17	4.4
	≥ - 2	367	95.6
Presence of edema	Yes	18	4.7
	No	366	95.3
Malnourished children	Yes	59	15.4
	No	325	84.6

Table 2: Nutritional status of children.

The prevalence of malnutrition was 15%, MAM was 8.3% and SAM was 7.1%.

Variables	*Terms and conditions*	*Malnourished Children*		*OR*	*P value*
Characteristics of the child		Yes, n=59	No, n=326		
Child sex	Male	32 (16.8)	159 (83.2)	1.24	0.45
	Female	27 (14.0)	166 (86.0)		
Complete vaccination	Yes	11 (6,2)	166 (93.8)	0.22	0.0001
	No	48 (23.2)	159 (76.8)		
Plot garden	Yes	24 (12.5)	168 (87.5)	0.64	0.12
	No	35 (18.2)	157 (81.8)		
Parasite control	Yes	4 (8.7)	42 (91.3)		0.18
	No	55 (16.3)	283 (83.7)	0.49	
Supplementation	Yes	22 (19.3)	92 (80.7)	1.51	0.165
	No	37 (13.7)	233 (86.3)		
Child's age	6 to 11 months	4 (8.3)	44 (91.7)	-	0.0002*
	12 to 23 months	21 (24.1)	66 (75.9)		
	24 to 35 months	25 (22.3)	87 (77.7)		
	36 to 59 months	9 (6.5)	128 (93.5)		
Mother's characteristics					
Age	< 18 years old	2 (16.7)	10 (83.3)		0.927
	18-24 years old	24 (16.2)	124 (83.8)		
	25 years and older	33 (14.7)	191 (85.3)		
Education level	Weak	36 (14.9)	206 (85.1)	0.9	0.729
	AVERAGE	23 (16.2)	119 (83.8)		

occupation of mothers	Shopkeeper	0 (0)	12 (100)	-	0.212*
	Official	1 (7.7)	13 (92.3)		
	housewife	58 (16.2)	300 (83.8)		
Awareness	Yes	14 (12.5)	98 (87.5)	0.71	0.318
	No	45 (16.5)	227 (83.5)		
General knowledge	Good	6 (6.5)	86 (93.5)	0.31	0.007
	Weak	53 (18.2)	239 (81.8)		
Pearson's squared chi-square.					

Table 3: Analysis of factors associated with children's nutritional status.

This study revealed that the community garden did not reduce the prevalence of malnutrition in the Bengamisa health zone. The risk factor associated with malnutrition was children aged between 12 and 23 months and between 24 and 35 months, while the protective factors were complete child vaccination and good general knowledge about malnutrition among mothers/caregivers.

Variables	***f(%)***	***aOR***	***IC95%***	***p-value***
Complete vaccination of the child				
Yes	11 (6.2)	0.28	0.13 - 0.41	0.001
No	48 (23.2)			
Overall level of mothers' knowledge				
Good	6 (6.5)	0.42	0.28 - 0.56	0.001
Weak	53 (18.2)			

Table 4: Multivariate analysis of factors associated with children's nutritional status.

Analysis of factors associated with children's nutritional status shows, in a multivariate analysis, that complete vaccination of the child (aOR=0.28; 95% CI: 0.13 - 0.41) and the overall level of knowledge "Good" of the mother (aOR=0.42 95% CI: 0.28 - 0.56) were protective factors.

Discussion

Prevalence of malnutrition

The overall prevalence of malnutrition in this study is 15.4%, including 8.3% moderate acute malnutrition (MAM) and 7.1% severe acute malnutrition (SAM).

According to the World Health Organization's thresholds, a prevalence between 10% and 14% is considered serious, and ≥15% critical. Thus, the situation observed in Bengamisa can be described as worrying [11].

Comparatively, the prevalence of acute malnutrition observed in this study appears to be higher than those reported in the literature, with UNICEF estimating a prevalence of around 10% in sub-Saharan Africa, while EDS -DRC placed this rate at 8% in the Democratic Republic of Congo; nevertheless, these results remain within the range of 5 to 20% reported by Masibo and Makoka depending on the context [8].

The high prevalence observed in this study could be explained by rural vulnerability, chronic food insecurity, limited access to health services, and poor hygiene or adverse socio-economic conditions. These factors are recognized as structural determinants of malnutrition [8].

Factors associated with malnutrition

The risk factor associated with malnutrition was the child's age (12-23 months and 24-35 months), and the protective factors were complete child vaccination and mothers'/caregivers' general knowledge of malnutrition. Multivariate analysis of factors associated with children's nutritional status showed that complete child vaccination (aOR=0.28; 95% CI: 0.13-0.41) and a mother's overall "Good" level of knowledge (aOR=0.42; 95% CI: 0.28-0.56) were protective factors.

The results of this study show that the child's age, complete vaccination, and the mother's level of knowledge were factors significantly associated with malnutrition.

These results corroborate those of a study which had identified as factors associated with childhood malnutrition the age of the child, repeated infections, inadequate feeding practices, low level of education or knowledge of mothers [8].

Child's age of 12 to 35 months as a risk factor

The significant association between malnutrition and child age, particularly in the 12-23 month and 24-35 month age groups, is consistent with data from the literature. This period corresponds to a critical phase of nutritional transition characterized by the introduction of complementary feeding.

According to Dewey KG, this phase is often marked by a qualitative and quantitative inadequacy of food intake, including: the introduction of complementary feeding, often inadequate in quality and quantity, a progressive decrease in breastfeeding and increased exposure to pathogens, thus exposing the child to an increased risk of nutritional deficiencies [12].

Furthermore, Smith et al. point out that this age group is also associated with increased exposure to infections, due to immaturity of the immune system, gradual weaning, poor hygiene practices, non-diversified diet and often unfavorable environmental conditions [13]. The interaction between inadequate nutrition and increased morbidity helps to explain the particular vulnerability of children during this period.

The high prevalence of malnutrition in this age group is explained by a combination of nutritional and infectious factors, thus reinforcing the critical nature of the period of dietary diversification.

Complete vaccination as a protective factor

Complete vaccination has emerged as a significant protective factor against malnutrition. This result is consistent with the recommendations of the World Health Organization, which emphasizes the essential role of vaccination in reducing infant morbidity and mortality [8].

Indeed, infectious diseases such as measles, acute respiratory infections, and diarrhea, as demonstrated by the WHO in 2022, are major causes of malnutrition. The work of Caulfield et al. shows that these conditions lead to decreased appetite, impaired nutrient absorption, and increased energy requirements, thus contributing to the development of malnutrition [14]. Consequently, vaccination indirectly affects nutritional status by interrupting the vicious cycle of infection and malnutrition and reducing the frequency of infectious diseases that can cause malnutrition or nutrient loss.

Good knowledge of mothers as a protective factor

Mothers'/caregivers' good knowledge of nutrition is also a significant protective factor that leads to a reduction in malnutrition. This finding is consistent with the work of Smith and Haddad [15], who demonstrated that maternal education plays a crucial role in improving children's nutritional status.

Improved nutritional knowledge positively promotes the adoption of appropriate practices, particularly regarding breastfeeding, complementary feeding, hygiene, and access to healthcare services. According to UNICEF, behavior change interventions are essential

for sustainably improving nutritional indicators; an informed mother is more likely to practice exclusive breastfeeding, ensure adequate complementary feeding, and seek early medical attention in case of illness.

Knowledge acts as a key behavioral lever to improve a child's nutritional status.

Limitations of the Study

This study has some limitations, notably, the cross-sectional nature of the study does not allow the temporal sequence between effect and exposure to be established, and the data collected are based on mothers' declarations with the possibility of memory bias.

Conclusion

The overall prevalence of malnutrition remains high in all its forms. Complete childhood vaccination and maternal overall knowledge have shown a significant association with children's nutritional status. This underscores the need for an integrated approach combining nutritional, health, and educational interventions for effective and sustainable malnutrition prevention.

Auditor contributions

Louis Ndjondo: study design, data collection, analysis and manuscript writing.

Eugene Basandja: reader and co-supervisor.

John Panda & Joris Losimba: last readers.

Conflict of interest:

None.

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