Determinants of Acute Malnutrition Among Children Aged 6–59 Months in Cibitoke Health District, Burundi

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Abstract
Acute malnutrition among children under five remains a major public health concern in low-income countries, particularly in Burundi. This study aimed to identify determinants of acute malnutrition among children aged 6–59 months in Cibitoke Health District to inform prevention strategies. A cross-sectional analytical study was conducted from January 12–25, 2026, among 379 mothers or caregivers of children recruited from six randomly selected health centers. Sample size was calculated using Cochran's formula and proportionally allocated through stratified sampling. Data collection combined an electronic questionnaire (KoboCollect) with anthropometric measurements (weight, height, mid-upper arm circumference). Indices were processed using ENA for SMART, and analyses performed with STATA 15. Variables with $p < 0.20$ in bivariate analysis were entered into multivariate logistic regression, with significance set at $p < 0.05$. Model performance was assessed using the ROC curve. The prevalence of acute malnutrition was 15.3%. Significant risk factors included young maternal age at first pregnancy (aOR = 5.55), birth interval <24 months (aOR = 1.90), low birth weight (aOR = 48.78), recent illness (aOR = 2.79), drought (aOR = 2.61), and distance >1 km to drinking water (aOR = 11.33). Protective factors were being in a union (aOR = 0.41), household size <5 (aOR = 0.32), sufficient income (aOR = 0.20), presence of a latrine (aOR = 0.05), knowledge of food groups (aOR = 0.32), and correct knowledge of complementary feeding age (aOR = 0.18). The final model showed excellent discrimination (AUC = 0.9734). Acute malnutrition in Cibitoke is shaped by sociodemographic, socioeconomic, health, nutritional, and environmental factors. Strengthening maternal nutrition education, improving household living conditions, expanding access to safe water and sanitation, and promoting appropriate feeding practices are essential to prevention.

Keywords *: Determinants; acute malnutrition; children aged 6–59 months; Cibitoke Health District; Burundi.*

I. Introduction

Malnutrition is a major public health and development problem, particularly among children under five years of age, whose health status is closely linked to household social conditions (1). The period from 6 to 59 months represents a critical phase of vulnerability due to the introduction of complementary feeding, increased exposure to pathogens, and the child's dependence on household care (2). Optimal nutritional status therefore depends on adequate

food intake, appropriate caregiving practices, access to health services, and a healthy environment (3). Acute malnutrition, or wasting, is a form of undernutrition that develops rapidly, most often following a sudden reduction in food intake or recurrent infections ; it is characterized by low weight-for-height (4). Globally, undernutrition remains an important cause of childhood morbidity and mortality: it is implicated in approximately 45% of deaths among children under five years of age (2,5) and constitutes a major obstacle to human development (6). In low-income countries, it is closely associated with poverty, food insecurity, and limited access to essential services (7). In Burundi, chronic food insecurity affects more than one person in two, and its level is almost twice as high as the average observed in sub-Saharan Africa (8). This situation, exacerbated by recurrent climate shocks, compromises children's health and development (9). According to the 2024 National Nutrition and Mortality Survey based on the SMART methodology, the prevalence of global acute malnutrition among children aged 6–59 months was above the 5% alert threshold established by the World Health Organization, with children under 24 months being the most affected due to their nutritional vulnerability and inadequate feeding practices (10).

Cibitoke Province is among the most affected areas in the country : the prevalence of global acute malnutrition increased from 2.4% in 2018 to 10% in 2024 (10). Recurrent floods and episodes of drought further increase household vulnerability to food insecurity (11). This unfavorable trend justifies an in-depth analysis, at the health district level, of the factors contributing to this situation. The UNICEF conceptual framework on the determinants of maternal and child nutrition, updated in the 2020–2030 Nutrition Strategy, explains that malnutrition results from a complex interaction between immediate, underlying, and structural causes (12). It is within this perspective that the present study was conducted.

The general objective of this study was to identify the determinants of acute malnutrition among children aged 6–59 months in Cibitoke Health District. Specifically, the study aimed to (i) determine the prevalence of acute malnutrition in this population and (ii) examine the relationship between acute malnutrition and sociodemographic and socioeconomic determinants, factors related to the medical history of mothers and children, mothers' practices and knowledge, and climate change. The hypothesis was that these different groups of determinants are significantly associated with the occurrence of acute malnutrition among children aged 6–59 months in this district.

II. Materials And Methods

II.1. Study Setting, Location, and Study Design

Cibitoke Health District is one of the three health districts in Cibitoke Health Province, in northwestern Burundi. It has a population of 249,393 inhabitants and eleven health centers (HCs) distributed across the communes of Buganda and Rugombo. This was a cross-sectional analytical study conducted in six health centers in the district: three in Buganda Commune (Buganda, Kaburantwa, and Nyamitanga) and three in Rugombo Commune (Rugombo, Cibitoke, and Rukana). The study was conducted from September 2025 to March 2026, with data collection carried out from January 12 to 25, 2026.

II.2. Study Population and Selection Criteria

The study population consisted of mothers or caregivers of children aged 6–59 months residing in Cibitoke Health District. Mothers or caregivers were included if they resided in the district and attended the selected health centers, were present and available at the time of the survey, had provided informed consent, and had a child who was clinically stable and eligible for accurate anthropometric measurements. Exclusion criteria included mothers or caregivers of children younger than 6 months or older than 59 months, those who did not reside in the district or did not attend the selected health centers, those who were absent or unavailable or refused

to participate, as well as children with a pathological or physical condition preventing accurate anthropometric measurements.

II.3. Sample Size and Sampling Technique

The sample size was determined using Cochran's formula (13):

$n = N \times Z^2 \times p\,(1 - p) / [N \times E^2 + Z^2 \times p\,(1 - p)]$

where N represents the total population, n the sample size, Z the z-score corresponding to a 95% confidence level (1.96), p the expected proportion (0.5), and E the margin of error (5%). For a population of 26,123 children aged 6–59 months attending the selected health centers, the minimum sample size obtained was 378.5, which was rounded up to 379 participants.

Stratified sampling with proportional allocation was used, with the six health centers constituting the strata. These centers were selected by simple random sampling using the Randomizer.org tool from the eleven health centers in the district, representing 50% of the health facilities. The sample size for each stratum was calculated using the formula ni = (Ni × n) / N, where ni is the sample size for the stratum, Ni is the population size of the stratum, N is the total population, and n is the overall sample size (Table 1). Within each health center, participants were recruited consecutively during curative consultations and vaccination sessions until the allocated sample size was reached.

Table 1: Distribution of the Sample Among the Surveyed Health Centers

Health Center	Population (Ni)	Sample (ni)
Buganda	1,605	23
Cibitoke	5,107	74
Kaburantwa	3,393	49
Nyamitanga	5,760	84
Rugombo	8,468	123
Rukana	1,790	26
Total	26,123	379

Source: Cibitoke Health District.

II.4. Data Collection Tools and Techniques

Data were collected using an electronic questionnaire developed specifically for this study based on the study objectives, research questions, and variables identified in the conceptual framework. The questionnaire was not directly adopted from a previously published or validated interview instrument. It was developed by the research team and reviewed to ensure that the questions were relevant to the study objectives and understandable to the target population. The English version of the questionnaire is provided as a supplementary file (Supplementary File 1). The questionnaire was designed in KoboCollect and administered using a smartphone or tablet, then synchronized with KoboToolbox for daily monitoring and data quality control. The questionnaire, written in French, was orally translated into Kirundi by the interviewers to facilitate participants' understanding. It was coded to ensure anonymity. Anthropometric measurements were taken using a weighing scale for weight, a stadiometer for height, and a MUAC tape for mid-upper arm circumference. A pre-test was conducted in Mabayi Health District at Buseruko Health Center among 38 mothers or caregivers, representing 10% of the sample, to assess the comprehension, clarity, and relevance of the questions. Six interviewers, organized into three teams, received three days of training. Daily field visits were conducted to ensure data quality control.

II.5. Study Variables

The dependent variable was the occurrence of acute malnutrition among children aged 6–59 months, defined as a weight-for-height below –3 z-scores, a mid-upper arm circumference below 115 mm, or the presence of bilateral nutritional edema. It was dichotomized as "yes" or "no." The independent variables were grouped into six categories: (i) sociodemographic determinants of the mother and child (maternal age at first pregnancy, marital status, religion, household size, number of children under five years of age, child's age and sex, birth order, and birth interval); (ii) socioeconomic determinants (main household occupation, monthly income, educational level of the mother and household head, and availability of arable land); (iii) determinants related to the medical history of the mother and child (anemia and dietary intake during pregnancy, birth weight, recent morbidity, utilization of and accessibility to health services); (iv) determinants related to mothers' practices (initiation of breastfeeding, exclusive breastfeeding, number of meals, weaning, vaccination, antenatal care attendance, participation in nutrition education sessions, and handwashing); (v) determinants related to mothers' knowledge (signs of malnutrition, nutritional requirements, food groups, and the appropriate age for introducing complementary foods); and (vi) determinants related to climate change and the environment (drought, flooding, source of drinking water, distance traveled to fetch water, and availability of latrines).

II.6. Data Processing and Analysis

Anthropometric data were interpreted using ENA for SMART software. All data were subsequently imported into Microsoft Excel 2016 for preliminary cleaning and then analyzed using STATA 15. Descriptive analysis was used to describe the characteristics of the sample, presented as frequencies and proportions. Bivariate analysis examined the association between each independent variable and the occurrence of acute malnutrition by calculating crude odds ratios and their 95% confidence intervals. All variables with a p-value below 0.20 in the bivariate analysis were entered into a multivariate logistic regression model to control for confounding factors. Results were expressed as adjusted odds ratios (aORs) with their 95% confidence intervals. Statistical significance was set at $p < 0.05$. The discriminative performance of the final model was assessed by constructing a Receiver Operating Characteristic (ROC) curve.

II.7. Ethical Considerations

Ethical approval for this study was obtained from the Ethics Committee of the East African Nutritional Sciences Institute (Ethical Approval No. 27/2026) before the commencement of data collection. The study procedures, objectives, and data collection methods were explained to the mothers or caregivers of children aged 6–59 months who were invited to participate in the study. Participants were informed about the purpose of the study, the procedures involved, the voluntary nature of their participation, and their right to decline participation or withdraw from the study at any time without any consequences.

Written informed consent was obtained from each mother or caregiver before participation in the study. No participant was compelled to take part in the study, and no financial or other form of compensation was provided for participation. The information collected from participants was treated confidentially and used solely for research purposes. Personal identifiers were not included in the analysis, and the questionnaire was coded to ensure participants' anonymity. The data were securely managed throughout the research process and were accessible only to the research team. The study involved anthropometric measurements of children, including weight, height, and mid-upper arm circumference (MUAC). These measurements were conducted by trained interviewers using appropriate measurement procedures while respecting

the dignity and privacy of the children and their caregivers. The study did not involve any invasive procedures or interventions.

All procedures involving human participants were conducted in accordance with the ethical principles of the Declaration of Helsinki and with applicable ethical standards for research involving human participants. The study was conducted with due consideration for the rights, safety, dignity, privacy, and confidentiality of all participants.

III. Presentation Of Results

III.1. Prevalence of Acute Malnutrition

Among the 379 children aged 6–59 months surveyed, 58 were affected by acute malnutrition, corresponding to a prevalence of 15.30% (Table 2). Rugombo Health Center, which included the largest number of surveyed children (n = 123), recorded the highest proportion of cases.

Table 2: Prevalence of Acute Malnutrition among Children Aged 6–59 Months in Cibitoke Health District, Burundi, 2026 (n = 379)

Acute malnutrition	Frequency (n)	Percentage (%)
Yes	58	15.30
No	321	84.70

III.2. Univariate Analysis

III.2.1. Sociodemographic and Socioeconomic Determinants

The majority of mothers had their first pregnancy at the age of 20 years or older (81.00%), were living in a union (81.80%), and were Protestant (50.10%). More than half of the households consisted of at least five people (51.72%), and 58.32% had more than two children under five years of age. Among the children, those aged 12–23 months were the most represented age group (43.30%), with a slight predominance of females (51.70%); 75.20% were ranked beyond the third position among their siblings, and 35.88% were born after a birth interval of less than 24 months. Agriculture was the main occupation of the households (86.50%), and 70.97% reported having insufficient monthly income (Table 3).

Table 3: Distribution of the Sample According to Sociodemographic and Socioeconomic Determinants, Cibitoke Health District, 2026 (n = 379)

Characteristics	Frequency (n)	Percentage (%)
Sociodemographic characteristics of the mother		
Age at first pregnancy: < 20 years	72	19.00
Age at first pregnancy: ≥ 20 years	307	81.00
Marital status: married	310	81.80
Marital status: divorced	25	6.60
Marital status: separated	27	7.10
Marital status: teenage mother	17	4.50
Religion: Catholic	103	27.20
Religion: Protestant	190	50.10
Religion: Adventist	75	19.80
Religion: Muslim	11	2.90
Household size: < 5 people	183	48.28
Household size: ≥ 5 people	196	51.72
Children under 5 years: ≤ 2	158	41.68
Children under 5 years: > 2	221	58.32
Sociodemographic characteristics of the child		

Age: 6–11 months	112	29.60
Age: 12–23 months	164	43.30
Age: 24–59 months	103	27.20
Sex: male	183	48.30
Sex: female	196	51.70
Birth order: 1–3	94	24.80
Birth order: > 3	285	75.20
Birth interval: < 24 months	136	35.88
Birth interval: ≥ 24 months	243	64.12
Household socioeconomic characteristics		
Main occupation: agriculture	328	86.50
Main occupation: trade	27	7.10
Main occupation: civil servant	24	6.30
Monthly income: sufficient	110	29.03
Monthly income: insufficient	269	70.97
Mother's education: primary	135	35.63
Mother's education: secondary	208	54.88
Mother's education: university	36	9.49
Household head's education: primary	120	31.67
Household head's education: secondary	172	45.38
Household head's education: university	87	22.95
Arable land: sufficient	82	21.64
Arable land: insufficient	297	78.36

III.2.2. Health, Behavioral, Cognitive, and Environmental Determinants

From a health perspective, 19.00% of mothers had experienced anemia during pregnancy, and 71.80% reported not having had a balanced diet during this period; 29.02% of children had a birth weight below 2.5 kg, and 41.68% had experienced an illness during the two weeks preceding the survey. Regarding practices, 82.10% of mothers had initiated breastfeeding immediately after delivery, 47.49% had not practiced exclusive breastfeeding, 36.67% gave their children fewer than three meals per day, and 72.30% had never participated in a nutrition education session. In terms of knowledge, the majority of mothers were unaware of their children's nutritional requirements (63.10%) and food groups (72.56%). Finally, 70.44% of households reported experiencing episodes of drought, 29.82% traveled more than one kilometer to fetch water, and 27.45% did not have access to latrines (Table 4).

Table 4: Distribution of the Sample According to Health, Behavioral, Cognitive, and Environmental Determinants, Cibitoke Health District, 2026 (n = 379)

Characteristics	Frequency (n)	Percentage (%)
Medical history of the mother and child		
Anemia during pregnancy: yes	72	19.00
Anemia during pregnancy: no	307	81.00
Balanced diet during pregnancy: yes	107	28.20
Balanced diet during pregnancy: no	272	71.80
Birth weight: < 2.5 kg	110	29.02
Birth weight: ≥ 2.5 kg	269	70.98
Illness during the preceding two weeks: yes	158	41.68
Illness during the preceding two weeks: no	221	58.32

Health center attendance in case of illness: yes	305	80.47
Health center attendance in case of illness: no	74	19.53
Accessibility of health services: yes	302	79.68
Accessibility of health services: no	77	20.32
Mothers' practices		
Breastfeeding initiation: immediate	311	82.10
Breastfeeding initiation: delayed	68	17.90
Exclusive breastfeeding: yes	199	52.51
Exclusive breastfeeding: no	180	47.49
Balanced diet given to the child: yes	156	41.17
Balanced diet given to the child: no	223	58.83
Number of meals per day: < 3	139	36.67
Number of meals per day: ≥ 3	240	63.33
Child weaned: yes	156	41.16
Age at weaning: < 24 months	64	41.02
Age at weaning: ≥ 24 months	92	58.98
Nutrition education sessions: yes	105	27.70
Nutrition education sessions: no	274	72.30
Regular antenatal care: yes	351	92.60
Regular antenatal care: no	28	7.40
Handwashing before feeding the child: yes	320	84.43
Handwashing before feeding the child: no	59	15.57
Mothers' knowledge		
Knowledge of signs of malnutrition: yes	221	58.31
Knowledge of signs of malnutrition: no	158	41.69
Knowledge of nutritional requirements: yes	140	36.90
Knowledge of nutritional requirements: no	239	63.10
Knowledge of food groups: yes	104	27.44
Knowledge of food groups: no	275	72.56
Knowledge of the role of fruits and vegetables: yes	341	90.00
Knowledge of the role of fruits and vegetables: no	38	10.00
Knowledge of appropriate age for introducing complementary foods: yes	277	73.08
Knowledge of appropriate age for introducing complementary foods: no	102	26.92
Environment and climate change		
Drought episodes: yes	267	70.44
Drought episodes: no	112	29.56
Flooding: yes	30	7.90
Flooding: no	349	92.10
Water source: *rusengo*	196	51.70
Water source: tap	134	35.40
Water source: borehole	20	5.30
Water source: river	29	7.70
Distance to fetch water: ≤ 1 km	266	70.18
Distance to fetch water: > 1 km	113	29.82
Latrine availability: yes	275	72.55
Latrine availability: no		

III.3. Bivariate Analysis

III.3.1. Sociodemographic and Socioeconomic Determinants

Six of the nine sociodemographic determinants studied were significantly associated with acute malnutrition: maternal age at first pregnancy, marital status, religious affiliation, household size, number of children under five years of age, and birth interval. Children whose mothers had their first pregnancy before the age of 20 had nearly five times higher odds of acute malnutrition (OR = 4.85; 95% CI [2.65–8.88]). Among the socioeconomic determinants, only monthly household income was significantly associated with acute malnutrition : children from households with sufficient income were less frequently affected (OR = 0.40; 95% CI [0.18–0.84]) (Table 5).

Table 5: Association Between Sociodemographic and Socioeconomic Determinants and Acute Malnutrition among Children Aged 6–59 Months, Cibitoke Health District, 2026 (n = 379)

Variables	Yes n (%)	No n (%)	Crude OR [95% CI]	p
Maternal age at first pregnancy				
< 20 years (n = 72)	26 (37.11)	46 (62.89)	4.85 [2.65–8.88]	< 0.001*
≥ 20 years (n = 307)	32 (10.43)	275 (89.57)	1	
Marital status				
In union (n = 284)	18 (6.33)	266 (93.67)	0.09 [0.05–0.17]	< 0.001*
Not in union (n = 95)	40 (42.11)	55 (57.89)	1	
Religious affiliation				
Christian (n = 291)	22 (7.57)	269 (92.43)	0.11 [0.05–0.47]	< 0.001*
Non-Christian (n = 88)	36 (40.90)	52 (59.10)	1	
Household size				
< 5 people (n = 183)	18 (9.84)	165 (90.16)	0.42 [0.23–0.77]	< 0.001*
≥ 5 people (n = 196)	40 (20.40)	156 (79.60)	1	
Number of children under 5 years				
≤ 2 children (n = 158)	17 (10.76)	141 (89.24)	0.52 [0.28–0.97]	0.03*
> 2 children (n = 221)	41 (18.56)	180 (81.44)	1	
Child’s age				
6–11 months (n = 112)	13 (11.60)	99 (88.40)	1	
12–23 months (n = 164)	29 (17.69)	135 (82.31)	–	0.30
24–59 months (n = 103)	16 (15.54)	87 (84.46)	–	
Child’s sex				

Male (n = 183)	31 (16.93)	152 (83.07)	1.27 [0.72–2.23]	0.39
Female (n = 196)	27 (13.78)	169 (86.22)	1	
Birth order				
1–3 (n = 94)	14 (14.89)	80 (85.11)	0.95 [0.49–1.84]	0.89
> 3 (n = 285)	44 (15.44)	241 (84.56)	1	
Birth interval				
< 24 months (n = 136)	28 (20.58)	108 (79.42)	1.84 [1.04–3.23]	0.03*
≥ 24 months (n = 243)	30 (12.34)	213 (87.66)	1	
Main household occupation				
Agriculture (n = 328)	50 (15.24)	278 (84.76)	–	0.38
Trade (n = 27)	6 (22.22)	21 (77.78)	–	
Civil servant (n = 24)	2 (8.33)	22 (91.67)	–	
Monthly household income				
Sufficient (n = 110)	9 (8.19)	101 (91.81)	0.40 [0.18–0.84]	< 0.001*
Insufficient (n = 269)	49 (18.21)	220 (81.79)	1	
Mother's educational level				
No formal education (n = 135)	24 (17.78)	111 (82.22)	1.33 [0.67–2.58]	0.19
Educated (n = 244)	34 (13.94)	210 (86.06)	1	
Household head's educational level				
No formal education (n = 120)	19 (15.84)	101 (84.16)	1.06 [0.17–3.16]	0.93
Educated (n = 259)	39 (15.06)	220 (84.94)	1	
Arable land				
Sufficient (n = 82)	12 (14.64)	70 (85.36)	0.93 [0.47–1.86]	0.84
Insufficient (n = 297)	46 (15.49)	251 (84.51)	1	

** $p < 0.05$: variable significantly associated with acute malnutrition.*

III.3.2. Medical History and Mothers' Practices

The analysis of medical history showed that anemia during pregnancy (OR = 4.41; 95% CI [2.41–8.08]), the presence of edema (OR = 8.25; 95% CI [4.50–15.15]), birth weight below 2.5 kg (OR = 23.20; 95% CI [10.81–49.79]), and illness during the two weeks preceding the survey (OR = 2.45; 95% CI [1.38–4.34]) were significantly associated with acute malnutrition. In contrast, diet during pregnancy, attendance at a health center, and accessibility of health services were not significantly associated with acute malnutrition. Among maternal practices,

exclusive breastfeeding was associated with a 62% lower odds of acute malnutrition (OR = 0.38; 95% CI [0.21–0.68]), while handwashing before feeding the child was associated with a 55% lower odds (OR = 0.45; 95% CI [0.23–0.88]). Conversely, providing fewer than three meals per day (OR = 4.53; 95% CI [2.49–8.24]) and weaning before 24 months (OR = 4.39; 95% CI [1.69–11.35]) were significantly associated with higher odds of acute malnutrition (Table 6).

Table 6: Association Between Medical History, Mothers' Practices, and Acute Malnutrition among Children Aged 6–59 Months, Cibitoke Health District, 2026 (n = 379)

Variables	Yes n (%)	No n (%)	Crude OR [95% CI]	p
Anemia during pregnancy				
Yes (n = 72)	25 (34.72)	47 (65.28)	4.41 [2.41–8.08]	< 0.001*
No (n = 307)	33 (10.75)	274 (89.25)	1	
Balanced diet during pregnancy				
Yes (n = 107)	16 (14.96)	91 (85.04)	0.96 [0.51–1.79]	0.90
No (n = 272)	42 (15.45)	230 (84.55)	1	
Presence of edema				
Yes (n = 81)	34 (41.97)	47 (58.03)	8.25 [4.50–15.15]	< 0.001*
No (n = 298)	24 (8.06)	274 (91.94)	1	
Child's birth weight				
< 2.5 kg (n = 110)	49 (44.55)	61 (55.45)	23.20 [10.81–49.79]	< 0.001*
≥ 2.5 kg (n = 269)	9 (3.35)	260 (96.65)	1	
Illness during the preceding two weeks				
Yes (n = 158)	35 (22.16)	123 (77.84)	2.45 [1.38–4.34]	< 0.001*
No (n = 221)	23 (10.41)	198 (89.59)	1	
Health center attendance in case of illness				
Yes (n = 305)	48 (15.73)	257 (84.27)	1.19 [0.57–2.49]	0.63
No (n = 74)	10 (13.52)	64 (86.48)	1	
Accessibility of health services				
Yes (n = 302)	49 (16.22)	253 (83.78)	1.63 [0.68–3.13]	0.32
No (n = 77)	9 (11.69)	68 (88.31)	1	
Timing of breastfeeding initiation				
Immediate (n = 265)	49 (18.50)	216 (81.50)	2.64 [1.25–5.59]	< 0.001*
Delayed (n = 114)	9 (7.90)	105 (92.10)	1	

Exclusive breastfeeding				
Yes (n = 199)	19 (9.54)	180 (90.46)	0.38 [0.21–0.68]	< 0.001*
No (n = 180)	39 (21.67)	141 (78.33)	1	
Balanced diet given to the child				
Yes (n = 134)	15 (11.20)	119 (88.80)	0.59 [0.31–1.11]	0.10
No (n = 245)	43 (17.56)	202 (82.44)	1	
Number of meals given to the child per day				
< 3 meals (n = 139)	39 (28.05)	100 (71.95)	4.53 [2.49–8.24]	< 0.001*
≥ 3 meals (n = 240)	19 (7.92)	221 (92.08)	1	
Complete vaccination				
Yes (n = 174)	25 (14.37)	149 (85.63)	0.47 [0.15–1.41]	0.17
No (n = 19)	5 (26.32)	14 (73.68)	1	
Age at weaning				
< 24 months (n = 64)	17 (26.57)	47 (73.43)	4.39 [1.69–11.35]	< 0.001*
≥ 24 months (n = 92)	7 (7.61)	85 (92.39)	1	
Participation in nutrition education sessions				
Yes (n = 105)	16 (15.24)	89 (84.76)	0.99 [0.53–1.85]	0.98
No (n = 274)	42 (15.33)	232 (84.67)	1	
Antenatal follow-up for this child				
Yes (n = 137)	16 (11.67)	121 (88.33)	0.63 [0.24–1.64]	0.14
No (n = 242)	42 (17.36)	200 (82.64)	1	
Handwashing before feeding the child				
Yes (n = 320)	43 (13.44)	277 (86.56)	0.45 [0.23–0.88]	0.01*
No (n = 59)	15 (25.43)	44 (74.57)	1	

** p < 0.05: variable significantly associated with acute malnutrition.*

III.3.3. Mothers' Knowledge and Environmental Factors

Knowledge of the signs of malnutrition (OR = 0.41; 95% CI [0.23–0.72]), knowledge of food groups (OR = 0.26; 95% CI [0.10–0.63]), and knowledge of the appropriate age for introducing complementary foods (OR = 0.15; 95% CI [0.08–0.28]) were significantly associated with lower odds of acute malnutrition. In contrast, knowledge of nutritional requirements and knowledge of the role of fruits and vegetables in the child's diet were not statistically associated with acute malnutrition. Among environmental factors, only the availability of latrines was significantly associated with acute malnutrition; households with latrines had 84% lower odds of having a malnourished child (OR = 0.16; 95% CI [0.09–0.29]) (Table 7).

Table 7: Association Between Mothers' Knowledge, Environmental Factors, and Acute Malnutrition among Children Aged 6–59 Months, Cibitoke Health District, 2026 (n = 379)

Variables	Yes n (%)	No n (%)	Crude OR [95% CI]	p
Knowledge of signs of malnutrition				
Yes (n = 221)	23 (10.40)	198 (89.60)	0.41 [0.23–0.72]	< 0.001*
No (n = 158)	35 (22.15)	123 (77.85)	1	
Knowledge of nutritional requirements				
Yes (n = 140)	16 (11.43)	124 (88.57)	0.60 [0.32–1.12]	0.10
No (n = 239)	42 (17.58)	197 (82.42)	1	
Knowledge of food groups				
Yes (n = 104)	6 (5.76)	98 (94.24)	0.26 [0.10–0.63]	< 0.001*
No (n = 275)	52 (18.91)	223 (81.09)	1	
Knowledge of the role of fruits and vegetables				
Yes (n = 341)	52 (15.25)	289 (84.75)	0.96 [0.38–2.40]	0.93
No (n = 38)	6 (15.79)	32 (84.21)	1	
Knowledge of the appropriate age for introducing complementary foods				
Yes (n = 277)	22 (7.95)	255 (92.05)	0.15 [0.08–0.28]	< 0.001*
No (n = 102)	36 (35.30)	66 (64.70)	1	
Drought episodes during the year				
Yes (n = 267)	49 (18.36)	218 (81.64)	0.66 [0.36–1.22]	0.19
No (n = 112)	9 (8.04)	103 (91.96)	1	
Flooding during the year				
Yes (n = 30)	6 (20.00)	24 (80.00)	1.42 [0.55–3.66]	0.45
No (n = 349)	52 (14.90)	297 (85.10)	1	
Distance traveled to fetch drinking water				
≤ 1 km (n = 266)	48 (18.04)	218 (81.96)	0.59 [0.31–1.09]	0.09
> 1 km (n = 113)	10 (8.85)	103 (91.15)	1	
Availability of latrines				

Yes (n = 275)	22 (8.00)	253 (92.00)	0.16 [0.09–0.29]	< 0.001*
No (n = 104)	36 (34.62)	68 (65.38)	1	

** p < 0.05: variable significantly associated with acute malnutrition.*

III.4. Multivariate Analysis

All variables with a p-value below 0.20 in the bivariate analysis were entered into the multivariate logistic regression model. After adjustment, twelve variables remained independently associated with acute malnutrition among children aged 6–59 months (Table 8).

Table 8: Multivariate Analysis of Determinants of Acute Malnutrition among Children Aged 6–59 Months, Cibitoke Health District, 2026 (n = 379)

Variables and categories	n	aOR [95% CI]	p
Maternal age at first pregnancy			
< 20 years	72	5.55 [2.74–11.19]	< 0.001*
≥ 20 years	307	1	
Marital status			
In union	302	0.41 [0.20–0.83]	< 0.001*
Not in union	77	1	
Household size			
< 5 people	183	0.32 [0.16–0.63]	< 0.001*
≥ 5 people	196	1	
Birth interval			
< 24 months	136	1.90 [1.02–3.54]	0.04*
≥ 24 months	243	1	
Household income			
Sufficient	110	0.20 [0.19–0.41]	< 0.001*
Insufficient	269	1	
Child's birth weight			
< 2.5 kg	110	48.78 [15.88–149.85]	0.02*
≥ 2.5 kg	269	1	
Illness during the preceding two weeks			
Yes	158	2.79 [1.16–6.75]	< 0.001*
No	221	1	
Knowledge of food groups			
Yes	104	0.32 [0.11–0.95]	< 0.001*
No	275	1	
Knowledge of the appropriate age for introducing complementary foods			
Yes	277	0.18 [0.10–0.34]	< 0.001*

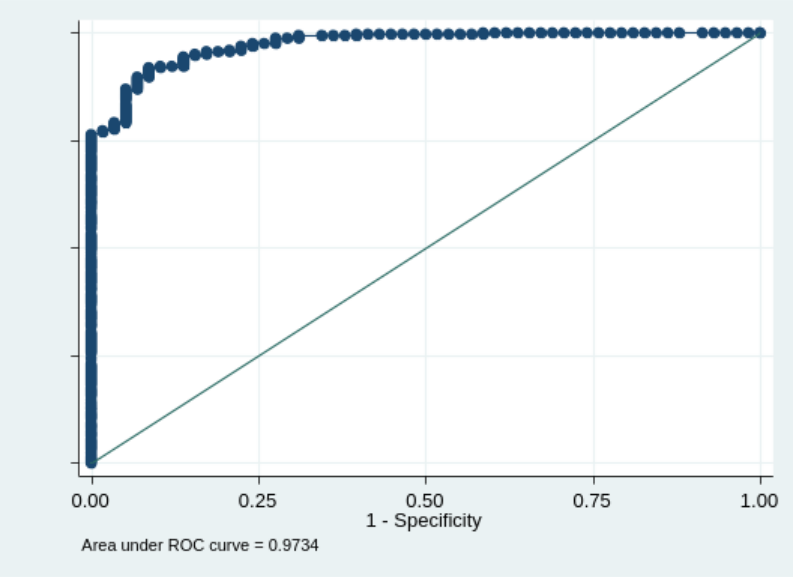
No	102	1	
Drought episodes			
Yes	267	2.61 [1.09–6.26]	0.03*
No	112	1	
Distance traveled to fetch drinking water			
> 1 km	113	11.33 [4.55–28.21]	< 0.001*
≤ 1 km	266	1	
Availability of latrines			
Yes	275	0.05 [0.02–0.11]	< 0.001*
No	104	1	

*aOR: adjusted odds ratio; 1: reference category; * p < 0.05.*

Thus, children of mothers who had their first pregnancy before the age of 20 had 5.55 times higher odds of acute malnutrition than children whose mothers were aged 20 years or older at first pregnancy. A birth interval of less than 24 months was associated with 1.90 times higher odds, birth weight below 2.5 kg with 48.78 times higher odds, recent illness with 2.79 times higher odds, drought episodes with 2.61 times higher odds, and traveling more than one kilometer to fetch drinking water with 11.33 times higher odds.
Conversely, living in a union was associated with 59% lower odds of acute malnutrition, a household size of fewer than five people with 68% lower odds, sufficient household income with 80% lower odds, knowledge of food groups with 68% lower odds, knowledge of the appropriate age for introducing complementary foods with 82% lower odds, and the availability of latrines with 95% lower odds.

III.5. Discriminatory Ability of the Model

Figure 1: ROC Curve of the Final Model



The area under the ROC curve of the final model was 0.9734, indicating that the model had excellent ability to distinguish children with acute malnutrition from those without acute malnutrition.

IV. Discussion Of Results

IV.1. Prevalence of Acute Malnutrition

The prevalence of acute malnutrition observed in this study was 15.30%. This proportion was higher than that reported by the 2024 SMART survey in Cibitoke Province, which found a prevalence of 10% (10). This difference could be related to seasonal variations, the socioeconomic conditions of households, or the specific characteristics of the study population, which was recruited in healthcare settings. Our findings, however, were close to those of ISTEEBU in 2023, which reported a prevalence of 12.6% in Cibitoke Province (11), as well as to those of a study conducted in Bamako District in 2012, where the prevalence of acute malnutrition was 13.72% (14). This high prevalence could be explained by persistent socioeconomic difficulties, the effects of climate change, and inadequate feeding practices observed among the households studied.

IV.2. Factors Associated with Acute Malnutrition

IV.2.1. Maternal Age at First Pregnancy

Children born to mothers who had their first pregnancy before the age of 20 had 5.55 times higher odds of developing acute malnutrition. These findings were similar to those reported by Mukuku et al. in 2018, who found that young maternal age significantly increased the risk of severe acute malnutrition among children under five years of age (15). Similarly, Ayaya et al., in Kenya, identified maternal age below 25 years as a risk factor for severe malnutrition (16). This situation could be explained by young mothers' lack of experience in infant feeding, limited financial autonomy, and insufficient nutritional knowledge.

IV.2.2. Marital Status and Household Size

Children living in households where the parents were in union had lower odds of acute malnutrition than those whose mothers lived alone (aOR = 0.41). This finding was consistent with that of Tshibanda et al. in 2023, who reported a significant association between parents' marital status and acute malnutrition (17). This could be explained by mutual support between spouses in meeting the child's food and healthcare needs, as well as greater economic stability in these households.

Similarly, children living in households with fewer than five people had lower odds of acute malnutrition (aOR = 0.32). These findings were consistent with those of Ndayikeje in 2025 in Kabezi Health District (18) and those of Matanda et al. in 2023 (19). Insufficient food resources in large households can lead to inadequate allocation of food and care to children.

IV.2.3. Interpregnancy Interval

An interpregnancy interval of less than 24 months was associated with increased odds of acute malnutrition (aOR = 1.90). These findings were consistent with those of Traoré et al. in 2020, who showed that a short interpregnancy interval significantly increased the risk of acute malnutrition (20), but differed from those of Aminata in 2021, who found no significant association (21). Insufficient maternal recovery between pregnancies and a reduction in the optimal duration of breastfeeding could explain this association.

IV.2.4. Household Income

Children from households with sufficient income had lower odds of suffering from acute malnutrition (aOR = 0.20). These findings were consistent with those of Ndayikeje in 2025 (18) and Gakou in 2014 (22), which highlighted the importance of socioeconomic conditions in the occurrence of malnutrition. Households with sufficient income have greater capacity to access a diversified diet, healthcare, and other essential needs of the child.

IV.2.5. Birth Weight

Children with a birth weight below 2.5 kg had very high odds of acute malnutrition (aOR = 48.78). These findings were similar to those of Mukuku et al. in 2018, who also found a strong association between low birth weight and severe acute malnutrition (15). Low birth weight may reflect intrauterine growth restriction or inadequate maternal nutrition during pregnancy, thereby increasing the child's vulnerability to infections and nutritional disorders. However, the wide confidence interval associated with this estimate calls for cautious interpretation of the magnitude of this association.

IV.2.6. Recent Morbidity in the Child

Children who had experienced an illness during the two weeks preceding the survey had higher odds of acute malnutrition (aOR = 2.79). These findings were similar to those reported by Niyongabo in 2024 in the Gisagara displacement camp (23); Camara et al. in 2021 also showed that infections were frequently associated with acute malnutrition (24). Illnesses increase nutritional requirements while reducing appetite and nutrient absorption, thereby accelerating deterioration in nutritional status.

IV.2.7. Mothers' Nutritional Knowledge

Knowledge of food groups (aOR = 0.32) and knowledge of the appropriate age for introducing complementary foods (aOR = 0.18) were protective factors against acute malnutrition. These findings were comparable to those of Niyongabo in 2024 (23), as well as to studies conducted in Nepal (25) and India (26). According to the recommendations of the World Health Organization and UNICEF, exclusive breastfeeding should be practiced until the age of six months before the introduction of appropriate complementary foods (27). Good nutritional knowledge enables mothers to adopt better feeding practices, particularly dietary diversification and the timely introduction of complementary foods. The specific contribution of this study was to highlight, in the context of Cibitoke Health District, the central role of maternal nutritional knowledge in the prevention of acute malnutrition.

IV.2.8. Drought and Access to Drinking Water

The occurrence of drought episodes significantly increased the odds of acute malnutrition (aOR = 2.61), consistent with the findings of ISTEEBU in 2023 regarding the negative impact of climate change on food security in Burundi (11). Drought reduces agricultural production and limits food availability, thereby exacerbating household food insecurity.

Furthermore, children from households that travelled more than one kilometre to obtain drinking water had higher odds of acute malnutrition (aOR = 11.33), a finding similar to that reported by Butoyi in 2025 (28). Difficult access to safe drinking water promotes waterborne diseases and reduces the time mothers can devote to childcare.

IV.2.9. Presence of Latrines

Households with latrines had lower odds of having a child suffering from acute malnutrition (aOR = 0.05). This finding differed from that of Butoyi in 2025, who found no statistically significant association (28), but was consistent with the work of Diouf et al. in Senegal on the relationship between sanitation, diarrhoea, and undernutrition (29). The availability of latrines contributes to improved hygiene conditions and reduces diarrhoeal infections, which are frequently involved in the occurrence of malnutrition among children.

IV.3. Limitations of the Study

This study has several limitations. As it was restricted to Cibitoke Health District and conducted among children attending health centres, its findings cannot be generalized to the

entire country or to the general population of the district. Some potential determinants of acute malnutrition were not investigated. The cross-sectional nature of the study does not allow causal relationships to be established between the factors studied and acute malnutrition. Finally, the wide confidence intervals of some estimates, related to the small size of certain subgroups, call for cautious interpretation of the magnitude of these associations. Despite these limitations, the findings remain relevant for guiding prevention interventions in the district.

Conclusion

This study, conducted among 379 mothers or caregivers of children aged 6 to 59 months in six health centres in Cibitoke Health District, found a prevalence of acute malnutrition of 15.30%, indicating that this remains an important public health concern in the district.

Multivariable analysis showed that young maternal age at first pregnancy, a short interpregnancy interval, low birth weight, recent illness in the child, drought, and difficult access to drinking water increased the odds of acute malnutrition. Conversely, being in union, having a small household size, having sufficient income, the presence of latrines, and mothers' nutritional knowledge were protective factors. The research hypothesis was therefore confirmed: sociodemographic, socioeconomic, health-related, nutritional, and environmental determinants were significantly associated with acute malnutrition among children aged 6 to 59 months in Cibitoke Health District. These findings support strengthening nutrition education for mothers, promoting antenatal care and the prevention of low birth weight, intensifying early detection of acute malnutrition in communities, expanding access to safe drinking water points, supporting vulnerable households in coping with the effects of drought, and promoting the use of latrines as well as birth spacing. Longitudinal studies conducted in other health districts across the country would help to better establish causal relationships between these determinants and acute malnutrition.

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