

# Undernutrition among children under five in the Bandja village of Cameroon, Africa

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**Background:** Sub-Saharan Africa has a long history of struggling with child undernutrition. The prevalence of undernutrition is still high and knowledge about this public health problem and the underlying causes is essential for children's health.

**Aim:** To evaluate the anthropometric status of children under five in the Bandja village of Cameroon.

**Methods:** A cross-sectional study was undertaken that included 388 children. Undernutrition was evaluated in terms of wasting, stunting and underweight. Information on sex, age, birth order, birth interval, duration of breastfeeding, and mother's age at birth, occupation and educational level were collected.

**Results:** The prevalence of wasting, stunting and underweight was 3.2%, 16.4% and 5.2%, respectively. Boys were more stunted than girls (OR 2.24; 95% CI 1.16–4.34). Children less than 30 months were more often wasted than older children (OR 17.70; 95% CI 1.82–172.40). The first and second born in order were more stunted than the third or later born in order (OR 2.06; 95% CI 1.02–4.18). Children of farming mothers were more often stunted (OR 2.87; 95% CI 1.35–6.13) and underweight (OR 3.47; 95% CI 1.09–11.09) than others. Children still being breastfed were more underweight (OR 6.52; 95% CI 1.31–32.43) than those whose mothers had finished breastfeeding.

**Conclusion:** Undernutrition is highly prevalent in Bandja, and is more common among boys, younger children, first born in order, children still being breastfed and children of farming mothers. This study underlines the importance of intervention to prevent and reduce undernutrition among children.

**Keywords:** Cameroon, children under five, stunting, underweight, wasting

## Introduction

### Background

Globally 6.3 million children under five years of age die every year. Nearly half of these deaths are attributable to undernutrition.<sup>1</sup> The consequences of undernutrition among children are delay in physical growth, lower intellectual quotient, greater behavioural problems, and deficiency in social skills and susceptibility to contracting diseases.<sup>2,3</sup> These negative outcomes are attributable to moderate rather than to severe undernutrition.<sup>4</sup>

Undernutrition is still a major health problem in developing countries and particularly in sub-Saharan Africa. The consequences of chronic undernutrition include stunting, wasting and underweight.<sup>5</sup> An estimated 160 million children are affected by stunting in Africa, particularly in West, Central and Eastern Africa.<sup>6,7</sup> Severe acute malnutrition with oedema (*kwashiorkor*) has the highest prevalence followed by severe acute malnutrition without oedema (*marasmus*) and *marasmic-kwashiorkor*.<sup>8</sup>

Undernutrition is most often measured by anthropometry and evaluated in terms of stunting, wasting and underweight. These conditions are based on World Health Organization (WHO) classification using child growth standards medians in terms of standard deviations (SD). Stunting is defined as a height-for-age z-score (HAZ) below -2 SD, wasting defined as a weight-for-height z-score (WHZ) below -2 SD, and underweight as a weight-for-age z-score (WAZ) below -2 SD.<sup>9,10</sup> Undernutrition can also be

evaluated using mid upper arm circumference (MUAC-for-age z-score below -2SD), which provides more accurate results in dehydrated children.<sup>11</sup> Undernutrition is related to several infectious diseases such as malaria, diarrhoeal diseases and pneumonia. Undernourished children have weakened immune systems, rendering them less able to fight these diseases, whilst children who are sick are more likely to become undernourished.<sup>4</sup> In 2015, Cameroon had an estimated under-five mortality rate of 88 per 1 000 live births.<sup>12</sup>

Malaria is still a deadly disease in Cameroon that in 2015 caused an estimated 3.4 to 7.5 million cases and 5 200 to 14 000 deaths.<sup>13</sup> In 2013, the overall attributable proportion of morbidity associated with wasting for malaria was 8% among children under five.<sup>4</sup> Undernutrition has no great impact on malaria prevalence, but has a negative impact on the morbidity and mortality of malaria-infected children.<sup>14</sup>

Diarrhoea is the leading cause of undernutrition in children under five years old and is the second leading cause of death in children in Cameroon. Annually it causes 760 000 deaths among children under five.<sup>15</sup> The co-morbidity for wasting in comparison with diarrhoea was estimated to be 5% in 2013.<sup>4</sup> Undernutrition increases both the frequency and duration of diarrhoea.<sup>15</sup>

### Objective

This study aimed to evaluate undernutrition and its underlying factors among children under five in the Bandja village of Cameroon.

## Method

### Study design and setting

This was a cross-sectional study. Data were collected in Bandja village, located in the West region of Cameroon. Bandja has 7 305 inhabitants of whom 1 315 (18%) are under five years of age.<sup>16</sup> Bandja village consists of a land area of 62 km<sup>2</sup>. The primary occupation in the village is farming. There is a district hospital in Bandja and another hospital administered by the Protestant church.

### Participants and data collection

Data were collected in March and April 2016 from children under five years of age in nursery schools, hospitals and some households in Bandja village. A questionnaire was designed, following the UNICEF guidelines for children under five years, which was tested and adapted to the Cameroonian context prior to the study.<sup>17</sup> Information was collected concerning the child's age, sex, birth order and birth interval; also collected were the mother's age at birth, education level, occupation, marital status, duration of breastfeeding, type of toilet at home (modern toilet or pic latrine) and water sources.

The children's weights were measured with a precision of 0.1 kg using a digital scale model Coline® BG-1003 (Clas Ohlson, Insjön, Sweden). The scale was validated against a Salter Brecknell 235–6S Hanging Scales 25 kg x 100 g/56 lb x 4 oz (Salter Brecknell, Smethwick, England). The children's lengths were measured supine using a measuring board. This was validated against a SECA 416 Infantometer (SECA, Hamburg, Germany). Length, height and MUAC were measured with half-centimetre precision.

### Sample size

Sample size was estimated using the Lorenz formula:  $n = C^2P(1-P)/d^2$ . The z-value (c) was set to 1.96 for a 95% confidence level. The prevalence (P) of underweight was 0.32 from a previous study in Cameroon.<sup>18</sup> The confidence interval (d) was set to 0.05. The sample size adjusted for dropout was calculated to be 388.

### Data analysis

SPSS® version 23 (IBM Corp, Armonk, NY, USA) and WHO Anthro (<http://www.who.int/childgrowth/software/en/>) were used. Sex was normally distributed, whilst all other variables were not. Because of this, Mann–Whitney U-tests were done to evaluate the level of statistical significance for the distribution of wasting, stunting and underweight in each category. Cross-tabulations presenting correlations between all variables were generated. Multivariate logistic regression was performed to evaluate the relationship between dependent variables: wasting (WHZ < -2 SD), stunting (HAZ < -2 SD), and underweight (WAZ < -2 SD), and independent variables: sex, age, birth order, birth interval, and the mother's age at birth, occupation, education level, duration of breastfeeding, water source and sanitation. The regression analysis resulted in odds ratios (OR), generated with 95% confidence intervals (CI).

## Results

Most of the mothers were married (65.9%) and had been to secondary school (65.4%). Marital status and educational level were not significantly associated with undernutrition. Some 41.2% of the mothers were housewives, 20.5% were farmers, and 10.1% were students, tailors, teachers and vendors. In total, 70.3% of the mothers were drawing water from springs or fountains. The most common category of birth interval between the children and their older siblings was 2–4 years. Among the

mothers who had completed breastfeeding 37.7% breastfed their children for less than 14 months and 44.8% for more than 14 months.

This study included 49.5% boys and 50.5% girls. The children > 30 months represented 58.8% and those < 30 months made up 41.2%. The majority of mothers reported using a latrine (96.3%). A latrine is a hole in the ground and a toilet is a modern toilet that uses a pour-flush system. In this study, 17.5% of the children were still breastfeeding (Table 1).

The prevalence of stunting was 16.4%, wasting 3.2% and underweight 5.2% (Table 2). The prevalence of stunting was 22.2% and 10.7% for boys and girls, respectively ( $p = 0.003$ ). The prevalence of wasting was 7.2% in children below 30 months of age and 0.4% in children over 30 months ( $p < 0.001$ ). The prevalence of wasting was 9.7% for those children who were still breastfed and 2.0% for those whose mothers had weaned them ( $p = 0.002$ ). The prevalence of wasting was 1.7% in those who drank water from the spring, 8.8% in those who drank from the public tap, 9.5% in those who drank from a well and 5.3% in those who drank from tap water at home ( $p = 0.021$ ). The prevalence of underweight was 15.6% for the children still being breastfed during the study and 3.2% for the others ( $p < 0.001$ ). The prevalence of underweight was 4.3% if their mother collected water from the spring, 12.5% if water was from a public tap, 9.5% from a well and 5.3% if from the tap at home ( $p = 0.029$ ) (Table 2).

Boys had a higher risk of being stunted than girls (OR = 2.24) (Table 3). Children < 30 months old were more at risk of being wasted compared with those > 30 months (OR = 17.70). Children born as first or second in order were more likely to be stunted compared with those born third in line or later (OR = 2.06). Children whose mothers were farmers were more likely to be stunted and underweight compared with the others (OR = 2.87 and 3.47, respectively). Children who were still breastfed had a higher risk of being underweight than those who had been weaned (OR = 6.52) (Table 3). Since only six children were below

**Table 1:** Demographic and characteristics of children under five in Bandja village ( $n = 388$ )

Factor	Percentage (%)	
Sex	Boys	49.5
	Girls	50.5
Age	< 30 months	41.2
	> 30 months	58.8
Birth order	1st–2nd	46.1
	3rd or later	53.9
Birth interval	< 2 years	33.7
	2–4 years	45.7
	> 4 years	20.5
Mothers age at birth	< 20 years	20.4
	20–30 years	47.5
	> 30 years	32.1
Breastfeeding	Ongoing	17.5
	Weaned	82.5
Sanitation	Latrine	96.3
	Modern WC	3.7

**Table 2:** Wasting, stunting and underweight in relation to sex, age, breastfeeding duration and water source ( $n = 388$ )

Factor	Wasting		Stunting		Underweight		
	%	p-value	%	p-value	%	p-value	
Total	3.2		16.4		5.2		
Sex	Boys	2.6	0.570	22.2	0.003*	5.8	0.629
	Girls	3.7		10.7		4.7	
Age	< 30 months	7.2	< 0.001*	12.9	0.144	7.1	0.179
	> 30 months	0.4		18.7		3.9	
Breast-feeding	Ongoing	9.7	0.002*	11.5	0.237	15.6	< 0.001*
	Weaned	2.0		17.7		3.2	
Water source	Public tap	8.8	0.021*	18.2	0.289	12.5	0.029*
	Well	9.5		5.3		9.5	
	Spring	1.7		17.2		4.3	
	Tap at home	5.3		33.3		5.3	

MUACZ -2SD (the cut-off value for undernutrition), no significant associations were found. The large confidence interval in Table 3 is explained by the fact that the sample size was calculated using the prevalence of undernutrition in Cameroon, which was high compared with the prevalence of undernutrition in Bandja.

## Discussion

The prevalence of stunting in the present study was 16.4%, which means that one in six children in Bandja village was stunted due to chronic undernutrition. This prevalence falls into the national rate of 10–45%.<sup>18</sup> In the current study, the prevalence of undernutrition was lower than estimated, which could explain the wide confidence intervals.

Boys showed more than twice the risk of being stunted compared with girls. This is in accordance with a meta-analysis of the

nutritional status of children under five in Africa, which concluded that boys are significantly more sensitive than girls to undernutrition and suggests that this is because of a biological predisposition.<sup>19</sup> A likely reason for this inequality could be that there is better care and feeding for infant girls than boys in Bandja village.

The findings of the current study showed that children younger than 30 months are more wasted than those older than 30 months. A similar result was found in a recent study conducted in Ghana.<sup>20</sup> An explanation could be that younger children are more vulnerable to undernutrition than older children. Moreover, younger children are more vulnerable to infectious diseases and thus prone to become undernourished than older children, because of their weak immune system.<sup>20</sup>

The birth order of the children showed a higher risk of being wasted for those born as a first or second child compared with those born as the third or later, probably because the mothers have had more experience and practice in how to feed and take care of their children.

Interestingly, this study showed that having a farmer mother predisposed to both stunting and underweight. In contrast, a study conducted in Ethiopia found that farmer mothers have good access to food, and therefore have well-nourished children.<sup>21</sup> Children of farming mothers from our study have access to food such as cassava, potatoes, plantain, maize, beans and groundnuts or carbohydrate food from farms, but did not have access to protein animal food, i.e. meat and fish, since these are expensive and not always available in Bandja village.<sup>22</sup> Another explanation is that there are many people in the household sharing the same food, resulting in food insecurity meaning that not everyone will get enough food to eat, especially children. Also, farmer mothers used to sell some of the food in order to afford other needs of the household, rather than using it for the family nutrition. Lack of knowledge regarding adequate food for children can also explain why children of farmer mothers were more stunted than others. When food is available, it might be the father who gets the largest portion in accordance with

**Table 3:** Multivariate regression analysis of wasting, stunting and underweight among under-five children in Bandja, in relation to sex, age, birth order, mother's occupation and breastfeeding ( $n = 388$ )

Factor	Wasting		Stunting		Underweight	
	OR (95% CI)	p-value	OR (95% CI)	p-value	OR (95% CI)	p-value
Sex	Girls					
	Boys	0.60 (0.16–2.25)	0.450	2.24 (1.16–4.34)	0.017*	1.14 (0.40–3.23)
Age	> 30 months					
	< 30 months	17.70 (1.82–172)	0.013*	0.69 (0.31–1.57)	0.379	0.61 (0.13–2.79)
Birth order	3rd or later					
	1st to 2nd	0.28 (0.05–1.66)	0.162	2.06 (1.02–4.18)	0.044*	0.39 (0.11–1.39)
Mother occupation	Others <sup>1</sup>					
	Farmer	0.44 (0.08–2.55)	0.363	2.87 (1.35–6.13)	0.006*	3.47 (1.09–11.1)
Breastfeeding	Weaned					
	Ongoing	1.70 (0.44–6.52)	0.439	0.72 (0.22–2.37)	0.592	6.52 (1.31–32.4)

Notes: <sup>1</sup>Others include: housewives, students, tailors, teachers and vendors.

\*Statistically significant ( $p$ -value < 0.05) multivariate logistic regression.

Cameroonian culture and thus children might lack adequate food intake, resulting in stunting.

Children who were still breastfed during our study were at a higher risk of being underweight compared with those who had been weaned. Children are generally, in spite of WHO recommendations, rarely exclusively breastfed in Cameroon even though breast milk offers the best source of nutrients.<sup>6,18</sup> Consequently, inadequate breastfeeding practice could explain this higher prevalence of underweight among children who were still breastfed, as described in other studies.<sup>20,21,23,24</sup> In 2012, the World Breastfeeding Trends initiative reported low rates (20%) of exclusive breastfeeding in children up to six months old in Cameroon and that complementary foods were introduced early as is the tradition in that country.<sup>25,26</sup>

Although our study included only children under five years of age, our findings can be considered to reflect the anthropometric status for the population in Bandja village in general since the status of children under five can be considered a good gauge for population-based malnutrition. We suggest that our results can be applied to other settings with similar characteristics in Cameroon or other low-income countries.

### Conclusion and recommendations

Undernutrition is still prevalent in Bandja, and is common among boys, younger children, the first born in order, children still being breastfed and children of farming mothers. The present study shows a need for improved infant nutritional status in Bandja. Practical education is needed for both parents on the implementation of adequate infant feeding practices. Education and information regarding the amount and the quality of food given to infants, potable water and appropriate hygiene should be given to both parents whilst considering their economic and employment status.

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**Ethical considerations** – Ethical approval was obtained from the ethical committee of Cameroon, reference number N°2016/10/799/L/CNERSH//SP. Written informed consent was obtained from all mothers before the study. Confidentiality was ensured for all mothers. During data entry, names were excluded to ensure anonymity and the data were also password-protected. All information collected from participants was kept confidential and no trace of identification details existed in the final report.

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