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Original Research Article

Prevalence of Undernutrition and Morbidity in Children Aged 6-59 Months in Three Regions with High Security Challenges in Burkina Faso: The Case of the Centre-North, North and East Regions

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Abstract: Burkina Faso recorded 1.800.000 internally displaced persons (IDP) in February 2022 due to the security crisis. 56% of them are in the East, Centre-North and North regions, where the nutritional situation of children aged 6 to 59 months is poorly known, hence this study. The nutritional status of 537 IDP and host children aged 6-59 months was assessed using the SMART rapid methodology in the North Central, North, and East regions. Data were analyzed using ENA for SMART 2020 and IBM SPSS Statistics 20 software to generate prevalence by region based on household residence status. The prevalences of global acute malnutrition (GAM), chronic malnutrition (CM) and underweight (UW) were 16.4%, 21.7% and 16.9% respectively for the East region; 15.7%, 32.7% and 29.6% for the Centre-North region and 18.4%, 29.5% and 28.9% for the North region. GAM was more prevalent among IDP than among hosts in the Eastern and Northern regions (17.3% VS 15.7%) and (19.0% VS 18.0%). However, in the Centre-Nord region, it is higher among the host population (17.0% VS 13.2%). For chronic malnutrition, among IDPs and hosts respectively, the prevalences are 14.8% and 26.9% in the East, 37.7% and 30.2% in the Centre-North and 25.3% and 32.4% in the North. The weight insufficiency were 17.3% and 16.7% in the East, 35.8% and 26.4% in the Centre-North and 27.8% and 29.7% in the North. The nutritional situation of children aged 6 to 59 months in the three emergency regions is not satisfactory. The GAM exceeds the WHO's critical thresholds (15%).

Keywords: IDP, Host population, Acute malnutrition, Chronic malnutrition, Weight deficiency, Morbidity, Burkina Faso.

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INTRODUCTION

By the end of 2021, the number of people uprooted by war, violence, persecution and human rights violations had risen to 89.3 million, of whom 53.2 million were internally displaced [1]. In May 2022, more than 100 million people were uprooted worldwide due to persecution, conflict, violence, human rights violations or serious disruption of public order [1]. Conflict and violence caused 11.6 million internal displacements in sub-Saharan Africa in 2021[2]. In complex humanitarian crises, it is infants and young children under the age of five who are the most vulnerable and at risk of malnutrition [3]. Statistics also show that in severe emergencies, illness and mortality rates among these children are higher than for any other age group [4, 5]. The risk of death is particularly high because of the combined impact of communicable diseases and diarrhoea with possible increases in undernutrition rates of people fleeing their homes [6].

Burkina Faso has been facing a growing and unprecedented humanitarian crisis since December 2018. Violence and conflict have forced around two million people to leave their homes, leaving everything behind [7]. According to the Permanent Secretariat of

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the National Council for Emergency Relief and Rehabilitation (SP/CONASUR), the number of Internally Displaced Persons (IDPs) reached 1.8 million in February 2022. In this situation, at least 56% of IDPs are distributed in the Eastern, Central-Northern and Northern regions of the country [8, 9]. This situation increases the risk of malnutrition among vulnerable targets in general and among children under the age of 5 in particular. According to estimates made by the Nutrition Cluster as part of the analysis of humanitarian needs for 2020, the total number of children under the age of 5 suffering from acute malnutrition was estimated at 535,677, including 156,453 suffering from severe acute malnutrition, and cases in the six emergency regions represent almost 60% of all expected cases [10, 11]. According to the SMART (Standardised Monitoring and Assessment of Relief and Transitions) 2021 survey in Burkina Faso in the context of insecurity, the prevalence of undernutrition among children aged 6 to 59 months at the national level showed an unenviable situation, global acute malnutrition was 9.7%, of which 0.8% was severe, chronic malnutrition was 21.6%, of which 6% was severe, and underweight was 17.5%, of which 3.4% was severe [12]. At the national level, 15.6% and 26.5% of children suffered from diarrhoea and fever respectively in the two weeks preceding the survey [12].

The aim of this study was to assess the nutritional status of children aged 6-59 months among IDPs and non-displaced populations (hosts) in three regions of Burkina Faso with high security challenges. It will contribute to the literature on the subject, and provide guidance to help evidence-based decision-makers in the orientation of interventions according to the specificities and needs of each emergency region.

MATERIALS AND METHODS

Study area

The study was conducted in three regions (North, Centre-North, East) of the six (06) declared priorities by the State in the 2022 humanitarian response plan in Burkina Faso [11]. Accessibility of the state and its partners remains difficult in several localities in these regionsc [11, 13]. This situation leads, among other things, to poor national coverage of the public administration, limited provision of public services such as education, health, water, energy, civil status, security, justice [11]. According to the country's SMART 2021 nutrition survey, the acute malnutrition situation was 8.2%, 11.2% and 8.9% for the Centre-North, North and East regions respectively [12]. The chronic malnutrition situation was 32.2%, 21.3% and 29.3% respectively for the Centre-North, North and East regions [12]. Underweight was 22.6%, 19.1% and 21.7% respectively for the Centre-North, North and East regions [12].

The food security situation is as worrying as the nutrition situation. According to the first Harmonised Framework (HF) exercise carried out in March 2021, for the current period (March-April-May 2021), the population in need of immediate assistance (population in phase 3 to 5) was estimated at 2,076,319 people at national level. These populations were concentrated in the Centre-North (25%), North (18%) and East (12%) regions [12]. They were made up in part of displaced populations (more than one million people) because of insecurity that forced them to abandon their crops, livestock and other means of existence [12]. Most agricultural markets no longer function normally in these security-challenged areas [11]. The IDPs of these three regions represent 56% of the country's total IDPs as of 31 March 2022 [8, 14]. The study was carried out in three (3) communes of these four (3) regions. These were the communes of Kaya for the Centre-North region; the commune of Fada N'Gourma for the East region and the commune of Ouahigouya for the North region.

Type and population of the study

This was a descriptive cross-sectional study. The methodology used is exclusively based on the principles of the SMART surveys recommended for emergency situations (SMART Survey) [15]. The study population was composed of children aged 6 to 59 months from host and IDP households in the three (03) communes.

Sampling

The households to be surveyed were selected on the basis of a two-stage stratified survey. In the first stage, the primary units drawn were villages and commune sectors. In the second stage, the secondary units were the households. In the first stage, the primary units were selected in proportion to their size according to their place of residence (village or sector) and without discounting. In the second stage, households were selected by simple random draw without replacement. The 2019 General Census of Population and Housing (RGPH) was used for the selection of villages [16]. The number of children to be surveyed in each stratum was calculated using the 2020 version of the ENA for Smart software using the following information: (i) the GAM prevalence value per commune, (ii) the desired precision according to the prevalences (0.05), (iii) the 95% confidence level, (iv) the cluster effect (obtained from the 2020 smart nutrition survey: 1.5), (v) the percentage of children under 5 years of age (obtained from the results of the 2019 RGPH of Burkina Faso) [16]. Thus, the total sample size was estimated at 538 children aged 06 to 59 months distributed as follows: 159 children including 106 hosts and 53 IDPs in the North-Central Region, 190 including 111 hosts and 79 IDPs in the North Region and 189 including 108 hosts and 81 IDP children in the East Region. The total number of IDP children aged between 6 and 59 months surveyed in the three regions represents 40% of the total sample.

A questionnaire to collect anthropometric data (weight, age, sex, arm circumference, oedema) and morbidity in children was designed and implemented on Kobotoolbox. Thus, tablets and smartphones were used as collection media. (i) Age was collected in date of birth (day/month/year) from official documents (birth certificate, health record, vaccination card) if available. If documentation was not available, age was recorded by specifying the month and year according to the local calendar of events. (ii) weight (in kg) was measured with electronic scales of the SECA type (accuracy 100 g). When children could not stand on their own, the double weighing method was applied. (iii) Height (in cm) was measured using a wooden measuring rod with an accuracy of 0.1 cm. Children under two years of age were measured lying down (length) and those over two years of age standing. Brachial circumference (BP) was measured on the left arm in mm, equidistant from the elbow and shoulder, with the arm relaxed at the side of the body. (iv) Oedema was assessed by applying thumb pressure to the backs of both of the child's feet for 3 seconds to demonstrate the bucket sign. The following five characteristics: symmetrical, painless, soft, bilateral, ascending were considered to confirm the diagnosis of the presence of oedema. Morbidity data were collected by assessing diarrhoea and fever in children during the two weeks preceding the survey.

Data processing and statistical analysis

In order to facilitate the collection, the survey forms were designed and implemented in a mobile collection tool "KoboCollect". The collected data was sent to the research platform "Researchers, Aid Workers & Everyone Else" [17]. The database obtained was transferred to the ENA for SMART 2020 software to check the consistency of the data set through flat sorts, outliers or flags and then generate Z-scores (P/T, T/A and P/A) taking into account the WHO 2006 references. The results obtained were then transferred to the IBM SPSS Statistics 20 software for Windows [18] to calculate the prevalences. At the end of these different operations, the averages of the z-scores (± standard deviation) were calculated and the thresholds of -2 z-scores and -3 z scores were retained to identify the rate of moderate and severe malnutrition respectively according to each nutritional index by commune and by residence status.

RESULTS

Socio-demographic characteristics of children in the three emergency regions

The distribution of the sample by age and gender is presented in Table 1**.** Girls are as well represented as boys with a sex ratio of 0.9. This is "excellent" in terms of representativeness of the population as it ranges from 0.8-1.2 according to WHO 2006 standards. Children aged 6-17 months represented the highest proportion (35.9%) while the lowest proportion was for those aged 54-59 months with a proportion of 3.3%.

Table 1: Distribution of the sample by age and gender

Age	Boys		Girls		Total		Ratio
	N	%	N	%	N	%	Boys / Girls
6-17 months	98	50.8	95	49.2	193	35.9	1.0
18-29 months	70	50.4	69	49.6	139	25.8	1.0
30-41 months	51	45.9	60	54.1	111	20.6	0.9
42-53 months	29	37.7	48	62.3	77	14.3	0.6
54-59 months	7	38.9	11	61.1	18	3.3	0.6
Total	**255**	**47.4**	**283**	**52.6**	**538**	**100.0**	**0.9**

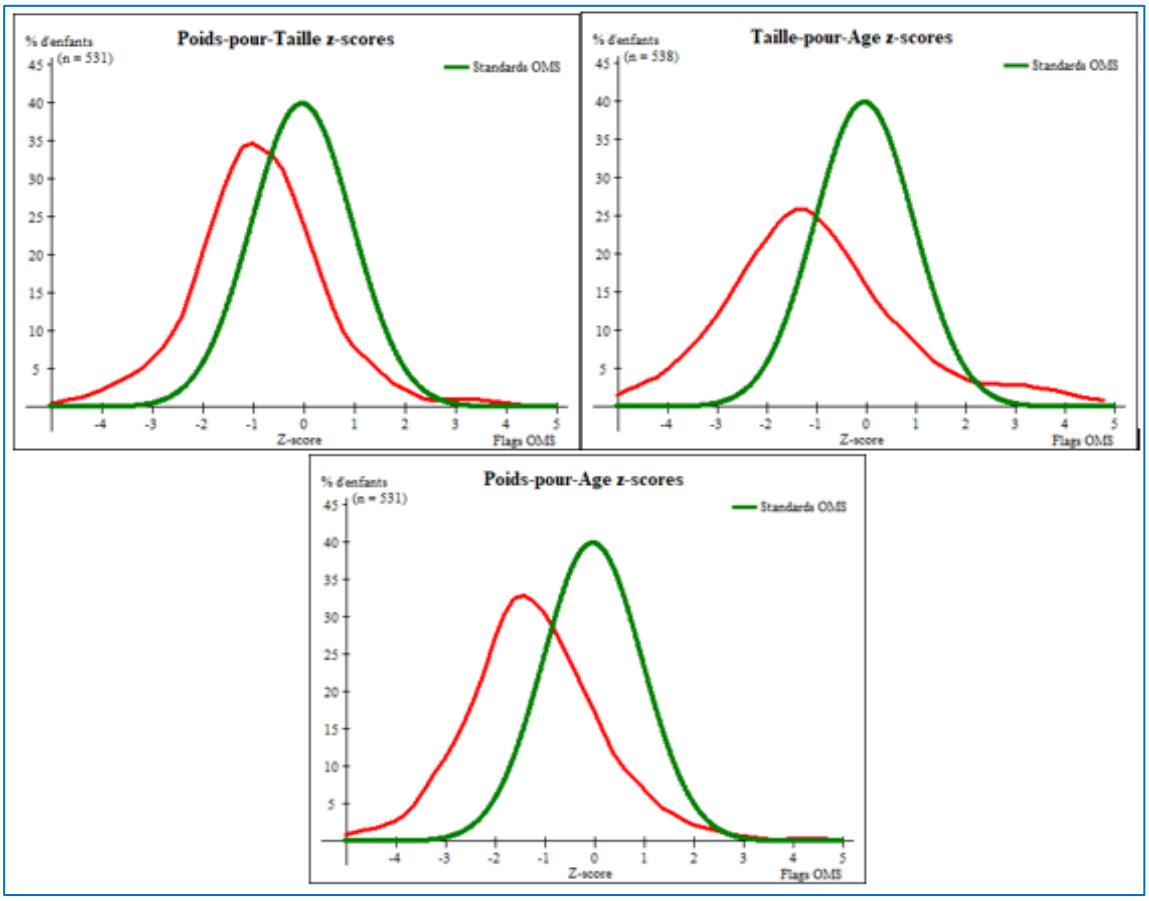
Distribution of anthropometric indices in the total population of children aged 06-59 months in the three emergency regions

The means (±SD) of Weight-for-Height Z-score (WHZ), Height-for-Age Z-score (HAZ) and Weight-for-Age Z-score (WAZ) of children aged 06-59 months were -0.85 (±1.31), -0.97 (±1.84) and -1.17 (±1.36) respectively. As shown in Fig. 1, the Z-score curves are shifted to the left of the WHO growth reference curve, demonstrating that malnutrition is prevalent among children aged 06-59 months (host and IDP) in all three emergency regions. The overall prevalences of acute malnutrition according to the weightfor-height z-score index (<-2 z-score and/or oedema), chronic malnutrition according to the height-for-age z-score index (<-2 z-score) and underweight according to the weight-for-age z-score index (<-2 z-score) were 16.9%, 27.7% and 25.0% respectively. Fig. 1 WHZ, HAZ and WAZ scores compared to WHO growth standards in 03 emergency regions, Burkina Faso, May 2021

Nutritional status of children aged 06-59 months according to the 03 emergency regions and household residence status

Analysis of the three anthropometric indices by emergency commune revealed that the prevalences of global acute malnutrition were 16.4%, 15.7% and 18.4%, respectively for the East, Centre-North and North regions. The prevalences of chronic malnutrition were 21.7%, 32.7% and 29.5% for the East, Centre-North and North regions respectively. The prevalence of underweight was 16.9%, 29.6% and 28.9% respectively for the East, Centre-North and North regions. In addition, the prevalence of severe acute malnutrition was 6.3%, 7.5% and 5.8% respectively for the East,

Centre-North and North regions (Table 2). According to household residence status, the analysis revealed that for global acute malnutrition, the prevalences were 17.3% among IDPs versus 15.7% among hosts in the East region, 13.2% among IDPs versus 17.0% among hosts in the Centre-North region, and 19.0% among IDPs versus 18.0% among hosts in the North region. For chronic malnutrition, the study revealed prevalences of 26.9% among hosts compared to 14.8% among IDPs in the Eastern region, 30.2% among hosts compared to 37.7% among hosts in the Centre-North region and 32.4% among hosts compared to 25.3% among IDPs in the Northern region. For weight insufficiency, the prevalences were 16.7% among hosts versus 17.3% among IDPs in the Eastern region, 26.4% among hosts versus 35.8% among IDPs in the Central-Northern region, and 29.7% among hosts versus 27.8% among IDPs in the Northern region (Table 2).



Nutritional status of children aged 06-59 months by gender, household residence status and age group

Across the three regions surveyed, the prevalence of malnutrition was higher among boys than among girls. In fact, in terms of global acute malnutrition, 20.4% of boys were affected compared to 13.8% of girls. In terms of chronic malnutrition, 33.7% of boys are underweight compared to 22.3% of girls, and underweight is also more prevalent among boys (29.4%) than among girls (21.2%). According to the household's residence status (IDP or host), the study also shows this gender segregation for the three types of undernutrition studied. Indeed, for global acute malnutrition, the prevalences are 19.8% and 20.8% among male hosts and IDPs against 13.5% and 14.3% among female hosts and IDPs. For chronic malnutrition, it is 39.0% and 25.7% among male hosts and IDPs, compared to 21.6% and 23.2% among female hosts and IDPs. The situation is almost identical for underweight, with 31.4% and 26.3% among male hosts and IDPs compared to 17.8% and 26.4% among female hosts and IDPs (Table 3).

Comparing age groups, the highest prevalence of wasting was observed among children aged 06-17 months, with a prevalence of 20.2%, and the lowest among children aged 30-41 months, with a prevalence of 9%. Similarly, the highest prevalence of chronic malnutrition, 36.7%, was observed among children aged 18-29 months and the lowest prevalence, 18.6%, among children aged 06-17 months. In addition, the highest prevalence of underweight (30.3%) was observed among children in the 18–29-month age group and the lowest (14.3%) in the 42–53-month age group. The age group most affected by the three forms of malnutrition is 18-29 months (Fig. 2).

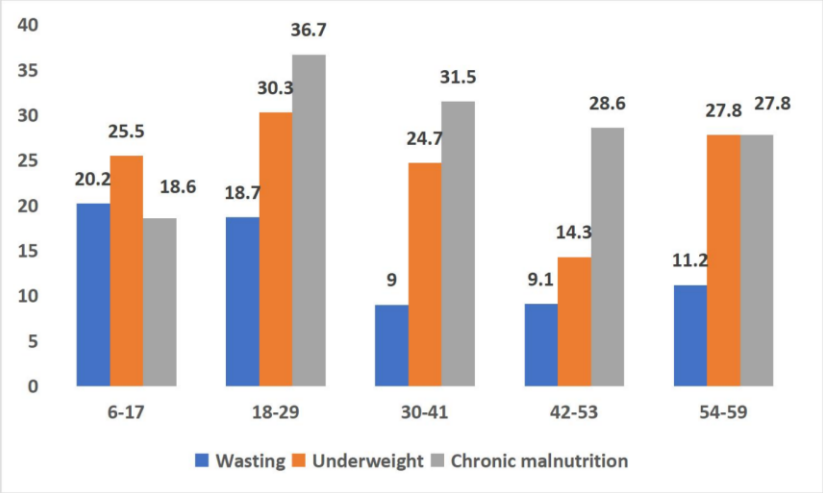


Figure 2: Distribution of prevalences (%) of wasting, underweight and chronic malnutrition according to age groups (in months)

Table 2: Prevalence of acute, chronic and underweight malnutrition among host and IDP children aged 6-59 months by region (WHO, 2006)

				Regions					
		East		**North Central**				**North**	
	Host (95% C.I.)	IDP (95% C.I.)	TOTAL (95% C.I.)	Host (95% C.I.)	IDP (95% C.I.)	TOTAL (95% C.I.)	Host (95% C.I.)	IDP (95% C.I.)	TOTAL (95% C.I.)
			Prevalence of acute malnutrition						
MAG	15.7 [10.1 - 23.8]	17.3 [10.6 - 26.9]	16.4 [11.8 - 22.3]	17.0 [11.0 - 25.3]	13.2 [6.5 - 24.8]	15.7 [10.9 - 22.2]	18.0 [12.0 - 26.2]	19.0 [11.9 - 29.0]	18.4 [13.6 - 24.5]
MAM	6.5 [3.2 - 12.8]	6.2 [2.7 - 13.6]	6.3 [3.7 - 10.8]	7.5 [3.9 - 14.2]	7.5 [3.0 - 17.9]	7.5 [4.4 - 12.7]	5.4 [2.5 - 11.3]	6.3 [2.7 - 14.0]	5.8 [3.3 - 10.1]
SAM	10.2 [5.1 - 16.2]	11.1 [6.0 - 19.8]	10.6 [6.5 - 15.2]	9.4 [5.2 - 16.5]	5.7 [1.9 - 15.4]	8.2 [4.8 - 13.5]	12.6[7.7 - 20.1]	12.7 [7.0 - 21.8]	12.6 [8.6 - 18.1]
			Prevalence of underweight						
GUW	16.7 [11.0 - 25.3]	17.3 [10.7 - 27.3]	16.9 [12.5 - 23.3]	26.4 [18.3 - 34.8]	35.8 [25.3 - 51.0]	29.6 [22.7 - 36.8]	29.7[22.0 -38.8]	27.8 [19.7 - 39.5]	28.9 [23.2 - 36.1]
MUW	4.6 [2.0 - 10.6]	4.9 [2.0 - 12.2]	4.8 [2.6 - 8.9]	6.6 [3.3 - 13.1]	11.3 [5.5 -23.4]	8.2 [4.9 - 13.7]	8.1 [4.3 - 14.7]	8.9 [4.5 - 17.6]	8.4 [5.3 - 13.4]
SUW	12.0 [7.3 - 19.9]	12.3 [6.9 - 21.5]	12.2 [8.4 - 17.9]	19.8 [12.7 - 27.6]	24.5 [15.5 - 38.9]	21.4 [15.4 - 28.0]	21.6 [15.0 - 30.2]	19.0 [12.2 - 29.7]	20.5 [15.6 - 27.1]
			Prevalence of chronic malnutrition						
GCM	26.9 [19.4 - 35.9]	14.8 [8.7 - 24.1]	21.7 [16.4 - 28.1]	30.2 [22.3 - 39.5]	37.7 [26.5 - 52.0]	32.7 [25.9 - 40.3]	32.4 [24.4 - 41.6]	25.3 [17.0 - 35.9]	29.5 [23.4 - 36.3]
MCM	10.2 [5.8 - 17.3]	4.9 [1.9 - 12.0]	7.9 [4.9 - 12.7]	17.9 [11.8 - 26.3]	13.2 [6.7 - 25.3]	16.4 [11.4 - 22.9]	14.4 [9.1 - 22.1]	6.3 [2.7 - 14.0]	11.1 [7.3 - 16.3]
SCM	16.7 [10.8 - 24.8]	9.9 [5.1 - 18.3]	13.8 [9.6 - 19.4]	12.3 [7.3 - 19.9]	24.5 [15.2 - 38.2]	16.4 [11.4 - 22.9]	18.0 [12.0 - 26.2]	19.0 [11.9 - 29.0]	18.4 [13.6 - 24.5]

GAM : Global Acute Malnutrition, **SAM:** Severe Acute Malnutrition; **MAM:** Moderate Acute Malnutrition; **GCM:** Global Chronic Malnutrition, **SMC**: Severe Chronic Malnutrition; **MCM:** Moderate Chronic Malnutrition; **GUW:** Global Underweight; **SUW:** Severe Underweight; **MUW:** Moderate Underweight.

Table 3: Prevalence of acute. chronic and underweight malnutrition among host and IDP children aged 6-59 months (WHO, 2006)

		Total (95% C.I.)		Boys (95% C.I.)			Girls (95% C.I.)		
	Host	IDP	Total	Host	IDP	Total	Host	IDP	Total
Prevalence of acute malnutrition									
GMA	16.9 [13.2 - 21.4]	16.9 [12.5 - 22.5]	16.9 [14.0 - 20.3]	20.8 [15.1 - 27.9]	19.8 [13.2- 28.6]	20.4 [15.9- 25.8]	13.5 [9.1 - 19.4]	14.3 [9.0 - 22.0]	13.8 [10.2 - 18.3]
MAM	10.5 [7.6 - 14.3]	10.3 [6.9 - 15.1]	10.4 [8.1 - 13.3]	12.3 [8.0 - 18.5]	9.9 [5.5 - 17.3]	11.4 [8.0 - 15.9]	8.8 [5.4 - 14.0]	10.7 [6.2 - 17.8]	9.5 [6.6 - 13.5]
SAM	6.5 [4.3 - 9.7]	6.6 [4.0 - 10.7]	6.5 [4.7 - 8.9]	8.4 [5.0 - 13.9]	9.9 [5.5 - 17.3]	9.0 [6.1 - 13.2]	4.7 [2.4 - 9.0]	3.6 [1.4 - 8.8]	4.2 [2.4 - 7.3]
Prevalence of underweight									
GUW	24.2 [19.9 - 29.2]	26.3 [20.8 - 32.7]	25.0 [21.5 - 28.9]	31.4 [24.6 - 39.1]	26.3 [18.6 - 35.7]	29.4 [24.1 - 35.3]	17.8 [12.7 24.2]	26.4 [19.0 - 35.3]	21.1 [16.8 - 26.3]
MUW	17.7 [13.9 - 22.2]	18.2 [13.5 - 24.0]	17.9 [14.9 - 21.4]	22.2 [16.4 - 29.4]	15.2 [9.4 - 23.5]	19.4 [15.0 - 24.8]	13.6 [9.2 - 19.6]	20.9 [14.4 - 29.4]	16.5 [12.6 - 21.3]
SUW	6.5 [4.3 - 9.8]	8.1 [5.1 - 12.6]	7.2 [5.3 - 9.7]	9.2 [5.5 - 14.8]	11.1 [6.3 - 18.8]	9.9 [6.8 - 14.2]	4.1 [2.0 - 8.3]	5.5 [2.5 - 11.4]	4.7 [2.7 - 7.8]
Prevalence of chronic malnutrition									
GCM	29.8 [25.1 - 35.0]	24.4 [19.1 - 30.6]	27.7 [24.1 - 31.6]	39.0 [31.6 - 46.8]	25.7 [18.2 - 35.0]	33.7 [28.2 - 39.7]	21.6 [6.1 - 28.4]	23.2 [16.4 - 31.8]	22.3 [17.8 - 27.5]
MCM	15.7 [12.1 - 20.0]	16.9 [12.5 - 22.5]	16.2 [13.3 - 19.5]	18.8 [13.4 - 25.7]	15.8 [10.0 - 24.2]	17.6 [13.5 - 22.8]	12.9 [8.7 - 18.7]	17.9 [11.9 - 26.0]	14.8 [11.2 - 19.5]
SCM	14.2 [10.818. 4]	7.5 [4.7 - 11.9]	11.5 [9.1 - 14.5]	20.1 [14.6 - 27.2]	9.9 [5.5 - 17.3]	16.1 [12.1 - 21.1]	8.8 [5.4 - 14.0]	5.4 [2.5 - 11.2]	7.4 [4.9 - 11.1]

GAM : Global Acute Malnutrition, **SAM:** Severe Acute Malnutrition; **MAM:** Moderate Acute Malnutrition; **GCM:** Global Chronic Malnutrition, **SMC**: Severe Chronic Malnutrition; **MCM:** Moderate Chronic Malnutrition; **GUW:** Global Underweight; **SUW:** Severe Underweight; **MUW:** Moderate Underweight.

Morbidity of children aged 06 to 59 months in the 03 emergency municipalities by residence status

The prevalence of diarrhoea and fever over the last two weeks is presented in Table 4. Across the three regions, 17% and 24% of children suffered from diarrhoea and fever respectively, and 7% from other diseases. These prevalences are disparate according to region and residence status. Depending on the region, diarrhoea was observed in 17%, 8% and 24% of children in the East, Centre-North and North regions respectively. Fever was observed in 26%, 12% and 32% respectively in the East, Centre-North and North regions. Other diseases such as malaria, ARI, dermatoses, eye and ear diseases were observed in 9%, 5% and 5% of children in the East, Centre-North and North respectively. According to residence status, the prevalence of diarrhoea is higher among displaced children (21% and 16%) than among nondisplaced children (14% and 4%) in the East and Centre-North regions respectively. On the other hand, in the North region, it is higher among the host population than among IDPs (26% versus 20%). Also, the prevalence of fever is higher among displaced children than non-displaced children in the East (26% and 11%) and Centre-North (27% and 13%) regions. In contrast, in the North region, the prevalence of fever is higher among hosts than IDPs (34% versus 28%). Other diseases are also more prevalent among the host population (9%) than among IDPs (3%). An analysis of other diseases present in the surveyed population shows that ARI, malaria, dermatoses, eye diseases and ear diseases are the most prevalent, respectively, in order of importance, and this independently of the regions surveyed and household status (Fig. 3).

Table 4: Comparison of morbidity in children aged 6-59 months according to emergency municipality and residence status

Residence status	Survey municipality	Diarrhoea		Fever		Other diseases	
		N	%	N	%	N	%
Host	Fada N'gourma	15	14%	28	26%	13	12%
	Kaya	4	4%	12	11%	7	7%
	Ouahigouya	29	26%	39	35%	8	7%
	Total	48	15%	79	24%	28	9%
IDP	Fada N'gourma	17	21%	22	27%	4	5%
	Kaya	9	17%	7	13%	1	2%
	Ouahigouya	16	20%	22	28%	2	3%
	Total	42	20%	51	24%	7	3%
Total	Fada N'gourma	32	17%	50	26%	17	9%
	Kaya	13	8%	19	12%	8	5%
	Ouahigouya	45	24%	61	32%	10	5%
	Total	90	17%	130	24%	35	7%
P-valu		0,066		0,677		0,813	

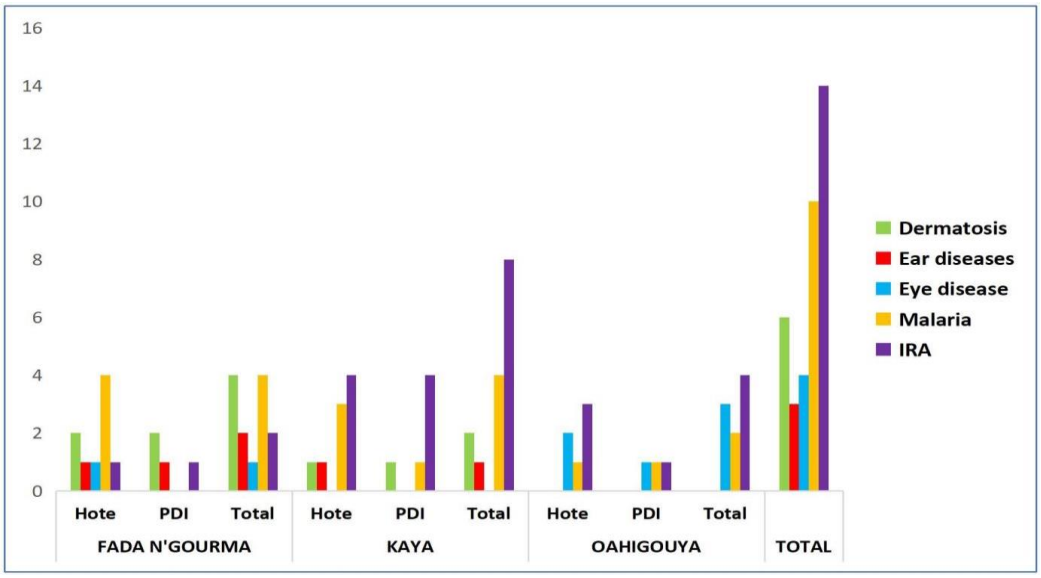


Figure 3: Other common diseases in the three emergency regions and according to residence status in the period March to May 2021

DISCUSSION

The study shows that the nutritional situation of children aged 6-59 months in the three regions with major security challenges is not very good. The prevalence of global acute malnutrition (16.9%) is said to be critical, that of chronic malnutrition (27.7%) is precarious and that of underweight (25.0%) is serious according to the WHO in 2006 [19]. These high prevalences of undernutrition among children under 5 years of age in areas affected by the security crisis have been reported in several studies in northern Ethiopia, eastern Chad and Burkina Faso [20–25]. Observation by region also shows a critical situation of global acute malnutrition (Eastern region 16.4%, Central-Northern region 15.7% and Northern region 18.4%). These prevalences exceed the critical thresholds (15%) set by the WHO in 2006 [19] and are comparable to those of the SMART Rapides surveys carried out by the Ministry of Health in the communes of Fada in the Eastern region (combined GAM is 16.9% including 3.9% of severe forms) and Ouahigouya in the Northern region in June 2022 where the acute malnutrition situation was critical in these two emergency localities [24, 25].

A study by Bougma et al in the Centre-North region of Burkina Faso in 2022 showed similar situations of acute malnutrition [26]. The situation of chronic malnutrition by region shows that those of the East and North regions remain precarious and that of the Centre-North is serious with regard to the WHO 2006 standards [12, 19, 27]. As for underweight, the East region is in a precarious situation and the Centre-North and North regions are both in a serious situation. These results corroborate those of the SMART rapid survey carried out in 2022 in Burkina Faso in the commune of Fada where the prevalences of chronic malnutrition and underweight were respectively 28.1% and 27.0% [19, 24]. Several factors could be at the

origin of the poor nutritional situation of children in regions with high security challenges in general and in particular in the three so-called emergency regions covered by this study. Indeed, the health system has become deficient due to the closure of certain health centres and the reduction of the minimum package of activities, notably vaccination and the promotion of optimal infant and young child feeding practices [11]. Furthermore, a major factor in this nutritional precariousness could be civil insecurity which leads to loss of livelihoods and reduced humanitarian access [7]. In view of the continuing deterioration of the security situation, the inadequacy of health care provision combined with the lean season, the risks of a deteriorating nutritional situation will persist. Other contributing factors such as the low production of the 2021 agricultural season, the increase in the price of basic foodstuffs due to the national and international context, the impact of the health crisis linked to COVID-19, the continued increase in the number of IDPs, the increase in diseases (water-borne, malaria, ARI, etc.), the minimal functioning or even the closure of certain health facilities, and food insecurity, all lead to the fear of a possible worsening of acute malnutrition in the regions with high security challenges [11, 14, 19].

The study revealed that the age groups of 6-17 months and 18-39 months of children are the most affected by acute malnutrition. These age groups have been reported by several studies to be the most privileged for the onset of acute malnutrition. Similar results were reported by the SMART survey in 2020 and 2021 in Burkina Faso where these age groups were the most affected by acute malnutrition [12, 19]. However, chronic malnutrition and underweight are higher in the age groups of 18-29 months and 30-41 months according to the present study. Similar results have been reported by several previous studies in Ethiopia, [20, 28–31]. Therefore, it is evident that the occurrence of some form of malnutrition in infants and young children is age dependent [32]. This situation could be explained by several factors, including poor ANCW practices, especially in emergency situations, and socio-cultural constraints. In addition, the study found that male gender was most implicated in all three types of malnutrition (wasting, chronic malnutrition and underweight). Male gender has been recognised by several authors as a risk factor for malnutrition [27, 33, 34] but other studies suggest that gender disparities in child undernutrition may be due to gender differences in body composition, mainly muscle mass and body fat distribution as measured by different anthropometric indicators [20, 26].

The present study also shows that the prevalence of acute malnutrition in children aged 6 to 59 months among IDPs was higher than that of the host population in all three regions covered by the present study. On the other hand, for chronic malnutrition and underweight, the prevalences are higher in the IDP population in the East and Centre-North regions. Bougma et al found similar prevalences in the Centre-Nord region in 2022 [26]. It is only in the commune of Ouahigouya that these two forms of malnutrition are more prevalent in the host population. These results are comparable to those of the Rapid SMART 2022 in the Ouahigouya commune in Burkina Faso [25]. Diarrhoea is more prevalent among IDPs than hosts (20% versus 15%) and fever remains the same (24%) in both groups in the two weeks prior to the survey. This clearly shows that IDPs are more exposed to diarrhoea than non-displaced people. Several authors in Burkina Faso and Ethiopia have also reported that diarrhoea is more prevalent in the IDP and refugee populations than in the non-displaced population [23, 26, 35]. Other diseases are more prevalent in non-displaced host populations than in IDPs. ARI, malaria, dermatoses, and eye and ear diseases were the most prevalent in all populations surveyed during the study period, in order of importance. According to the emergency region, the prevalence of diarrhoea and fever is higher in the North region (24% and 32%) than in the East (17% and 26%) and Centre-North (8% and 12%) regions. These results are comparable to those of the national level in 2021 where, 15.6% and 26.5% of children suffered from diarrhoea and fever respectively in the two weeks preceding the survey [12]. The same study found for the Eastern region prevalences of (9.3%) for diarrhoea and (12.2%) for fever [12]. These results from the Eastern region are slightly lower than those found in the present study. The prevalences of diarrhoea and fever in the present study at the Centre-North level also exceed the values of the SMART 2021 national nutrition survey [12]. This upward trend in these two regions could be explained by the fact that the humanitarian situation continues to deteriorate and that needs are becoming more numerous and very poorly met.

CONCLUSION

The nutritional situation of children under five in the three emergency regions covered by the study is unsatisfactory. The prevalence of acute malnutrition in each of these three regions remains high and reflects a critical situation as it exceeds the threshold set by the WHO in 2006, which is 15%. Also, the situation of chronic malnutrition in the East and North regions remains precarious and that of the Centre-North is serious in terms of the 2006 WHO standards. According to household residence status, the study showed that acute malnutrition is more prevalent among IDP children in the East and North regions. The male gender is the most affected by all forms of undernutrition studied and the 6-17 and 18-39 age groups of children are the most incriminated in the occurrence of acute malnutrition according to this study. The morbidity assessment showed that diarrhoea is more prevalent in IDP populations than hosts. In view of these results, the state and its partners involved in the humanitarian response should increase and orient their interventions according to the situations and specificities of each so-

called emergency region in the humanitarian response plan while ensuring better coordination. These interventions should also focus mainly on integrated interventions to prevent all forms of undernutrition among both IDPs and host populations.

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Ethical approval and consent to participate

The study was approved by the Burkina Faso Health Research Ethics Committee: DELIBERATION No. 2022-02-032. The objectives of the study were clearly explained to the participants, the selected household heads and the local authorities. Informed consent was obtained from parents and/or legal guardians of subjects under 6-59 months of age for voluntary participation in the survey. The identity of the participants was kept anonymous and the information collected was treated in strict confidence.

Consent to publication

All authors unanimously consent to the information contained in this manuscript being considered by your journal for publication and confirm that the results of this manuscript have not been published elsewhere and are not being considered by any other publisher.

Conflict of interest

All authors involved in this study and elsewhere declare no conflicts of interest.

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