

Nutritional Status and Eating Habits of Children in Orphanages in Bamenda (North West Cameroon)

Adeline Ambe Singwa¹, Agatha Nguti Tanya^{1,2,*}, Thierry Noumo Ngangmou¹,
Lifoter Kenneth Navti³, Primus Azinwi Tamfuh^{4,5}, Richard Aba Ejoh¹

¹Department of Nutrition, Food and Bioresource Technology, College of Technology, University of Bamenda, Bambili, Cameroon

²Department of Public Health, Faculty of Medicine and Biomedical Sciences, University of Yaoundé 1, Yaoundé, Cameroon

³Department of Biochemistry, Faculty of Science, University of Bamenda, Bambili, Cameroon

⁴Department of Soil Science, Faculty of Agronomy and Agricultural Sciences, University of Dschang, Dschang, Cameroon

⁵Department of Mining and Mineral Engineering, National Higher Polytechnic Institute, University of Bamenda, Bambili, Cameroon

Email address:

ambesingwa@gmail.com (A. A. Singwa), tanyaagatha@yahoo.fr (A. N. Tanya), thierrynoumo@gmail.com (T. N. Ngangmou),
knnavti@gmail.com (L. K. Navti), apimus20@yahoo.co.uk (P. A. Tamfuh), ejohrab62@gmail.com (R. A. Ejoh)

*Corresponding author

To cite this article:

Adeline Ambe Singwa, Agatha Nguti Tanya, Thierry Noumo Ngangmou, Lifoter Kenneth Navti, Primus Azinwi Tamfuh, Richard Aba Ejoh. Nutritional Status and Eating Habits of Children in Orphanages in Bamenda (North West Cameroon). *International Journal of Nutrition and Food Sciences*. Vol. 11, No. 2, 2022, pp. 30-37. doi: 10.11648/j.ijnfs.20221102.13

Received: March 8, 2022; **Accepted:** March 28, 2022; **Published:** April 8, 2022

Abstract: Regular growth assessment of children helps maintain adequate dietary intake and physical growth. However, very little or no information is available on the nutritional status of children in orphanages in Cameroon making control of deficiency diseases in children very difficult in these institutions. The main aim of this study was to determine the nutritional status and eating habits of children in some orphanages in Bamenda (North West Cameroon). The height and weight of 205 children (97 boys and 108 girls) ages 1-18 years were measured and their BMI (Body Mass Index) was calculated. A structured questionnaire was used for eating habits and dietary data collection. A usual intake of nutrients was collected and some food samples from the orphanages were collected for three days and analyzed in the laboratory to determine children's usual intakes of nutrients. The data were analyzed by descriptive statistics. The results revealed that 15.7% of girls and 18.6% of boys were underweight, 3.7% of girls and 4.1% of boys were stunted and 16.5% of boys and 23.1% of girls were overweight/obese. The most eaten foods were cereals and the least were dairy products. Vegetables, fruits and milk consumption rates were low. The average intake of energy, protein and total fats was inadequate for orphanage children aged 14 to 18 years. The average intake of vitamin A, calcium and iron was inadequate in all orphanages compared to the RDA (Recommended Dietary Intake) values. Efforts should be directed towards educating the orphanage caregivers on meal planning and preparation to increase micronutrient intake in the orphanages' diets and improve the health of the children. Food or financial aid should also be granted to these institutional care homes to enable them to improve on the overall nutritional content of foods.

Keywords: Nutritional Status, Children, Orphanage, Eating Habits, Bamenda, Cameroon

1. Introduction

Adequate nutrition is a basic human right that is embedded in the constitution of most developing countries [1]. However, malnutrition has been and remains a persistent problem for children [2]. Poor nutritional intake has negative implications on children's growth and immune status leading to recurrent and increasing severe infectious diseases and may ultimately

threaten child survival [3]. Malnutrition occurs most commonly in sub-Saharan Africa with high rates of the stunted growth pattern in many countries. About 140 million orphans are reported worldwide in 2015 with 52 million in Africa [6]. It has been reported that about 171 million pre-school children were stunted in 2010, with 95% (167 million) living in developing countries [7]. About 45% of deaths among children under 5 years of age are caused by malnutrition and most especially in

low and middle-income countries [8]. In Cameroon, malnutrition afflicts 3 out of 10 children with an increase in the number of stunted and acutely malnourished children. Cameroon has been on the red list of highly malnourished countries for a long time [9]. Underprivileged children such as orphans and children who lack a stable family are at particularly high risk of undernutrition [10, 11]. Orphanage children are vulnerable and disadvantaged members of the community, especially if measures to provide adequate dietary intakes in terms of macro-and micronutrients are not put in place [12]. An orphan is a child of age less than 18 years old who is bereaved of one or both of his or her parents to any cause of death. In Cameroon in 2012, the rate of moderate chronic malnutrition among children under 5 years of age was estimated at 33%; this rate varied according to the Region and is higher in the North and Far North Cameroon. A study in Douala (Littoral Cameroon), revealed that the rate of malnutrition in orphanage children is high, that is, 5.7% of children are underweight [13]. However, little or no information is available on the nutritional status of orphan children in Bamenda (North West Cameroon), a town with a probable increase in orphan children due to the socio-political crisis and which is experiencing food insecurity [14, 15]. With all these malnutrition problems and challenges faced by children in complete homes around the world and Cameroon in particular, there is an added need to understand the nutritional status of the vulnerable group of children deprived of one or both of their primary caregivers who stay in orphanages. Studies have indicated that the nutritional needs of orphans should be solved by providing the adequate nutrients needed by the children, if not there will be long-term consequences to the health and development of the children [10]. Thus, combating malnutrition in all its forms is a global health challenge [8]. Promoting children's health and nutrition in orphanages is therefore, a priority and requires the attention of all to ensure the children's safety and develop their personalities.

Therefore, the objective of this study was to determine the nutritional status and eating habits of children living in orphanages in Bamenda, ascertain the iron and vitamin A deficiency among orphans in orphanages, assess the food consumption patterns and dietary habits of the children in orphanages and to compare nutrient intake in the different orphanages.

2. Material and Methods

2.1. Methodology

The study was a cross-sectional survey and an experimental design carried out among 205 (97 boys and 108 girls) orphanage children living in four orphanages in Bamenda ages 1 to 18 years. The anthropometric assessments were carried out using standard techniques [16]. For children of age below 5 years old, the care-givers provided information for them. A usual intake was obtained per week.

A standard questionnaire was used for data collection which consisted of socio-demographic factors, child health and behavioral factors, child anthropometric measurements, dietary assessments and eating practices.

The demographic questionnaire permitted personal data collected on the age, gender, health status, educational background, and activities performed by the children, as well as other health, demographic and socioeconomic characteristics.

The anthropometric data were collected based on standard methods [16]. The age of the children under study was gotten from their birth certificate. Body weight was measured using a digital scale (Omron BF 511 Japan) to the nearest 0.1 kg with participants wearing light clothing. Standing height was also measured using a portable stadiometer (Seca 213 Germany) to the nearest 0.1 cm. All anthropometric measures were carried out in duplicates and the average values were recorded. The BMI was calculated by dividing body weight (kg) by the square of the height (m^2) [17]

$$BMI = \frac{\text{body weight (kg)}}{\text{height (m)}^2} \quad (1)$$

The dietary assessment was done using a 24-hour dietary recall and a food frequency questionnaire.

The 24-hour dietary recall was carried out on orphans for 3 different days to measure their average dietary intakes. For the 24 hours dietary recall, interviewees were asked to recall all items of food and drinks consumed in the last 24 hours, from waking up until going to bed the previous day. The average portion size of each type of food was determined for each age group and sex using commonly used household utensils and the weights of each portion measured (using an electronic kitchen scale SF-400). Weighed samples of the foods were taken for laboratory analysis (Laboratory of animal nutrition of The University of Dschang, Cameroon) including energy, fats, protein, iron, vitamin A and calcium contents for the different orphanages' food. The results were compared with the RDA [18].

The development and description of the food frequency questionnaire have been previously presented in detail [19].

2.2. Statistical Analysis

Z-score of height, weight and BMI were calculated using growth monitoring software (WHO Anthro and WHO Anthro Plus), which makes use of the WHO (2007) growth reference data for children. Children were then classified as underweight, stunted and overweight/obese using the respective WHO cut-off point [17]. The continuous variables were compared between boys and girls using an independent samples *t*-test. A One-Way ANOVA with a posthoc Bonferroni test was used to compare nutrient intake across the different orphanages. A *p*-value of 0.05 was considered statistical significance.

3. Results

Malnutrition among children has been a severe public health problem internationally, in developing countries like Cameroon and particularly in Bamenda where there has been a socio-political crisis. All the children of ages 1 to 18 years present in the orphanages in Bamenda at the period of sampling participated. Some were displaced from nearby towns to Bamenda which is free from the socio-political

crisis where they could attend school.

The descriptive characteristics of the study population from the four orphanages are presented in Table 1. A total number of 205 children, males (n =97) and females (n = 108), were sampled. There was no statistically significant difference in age, height, weight, and BMI between boys and girls ($P < 0.05$). The respective proportions have been presented for categorical variables. A majority of the children (66.0% of the boys and 60.2% of the girls) were of primary school level and 6.2% of the boys and 4.6% of the girls were not educated (still too young to start school). Most of the respondents were from orphanages 2 and 3 with 39.2% and 40.2%, respectively of the total boys, and 38.9% and 35.2% respectively for total girls. Ninety-one children (44%) have been living in the orphanages for 3-6 years. Most of the children living in the orphanages 148 (72%) were orphans, only one was abandoned and 18 (9%) live in the orphanages in order to have access to education since most schools are now shut down in many villages due to the socio-political crisis.

The analysis of the weight status indicated that the majority of the children (boys: 82.5%) (girls: 74.1%) had a healthy weight. Also, 1.0% of boys and 2.8% of girls were underweight, meanwhile 16.5% of boys and 23.1% of girls were overweight/obese (Table 1). The prevalence of malnutrition showed more females (23.1%) with overnutrition meanwhile a majority of the males (18.6%) showed undernutrition (Figure 1).

From the population sampled, the highest rate of undernutrition was observed in orphanages 2 and 3 (8.8% and 6.3%, respectively) and overnutrition is highest in the same orphanages (8.8% and 7.3%, respectively). In orphanage 4, there were no undernourished children but the rate of overnutrition in this orphanage was 0.5% of the total population (16 children). In orphanage 1, 9.1% of the children were stunted and 24.2% were underweight. There were low rates of overweight and the highest rate of normal children in orphanage 3 (figures 2 and 3).

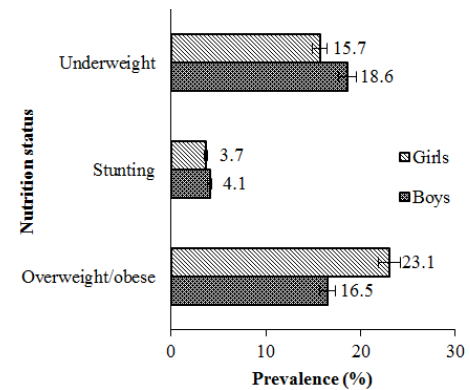


Figure 1. Nutrition status of children showing the distribution of undernutrition (< -2 z-score of height-for-age and weight-for-age for stunting and underweight respectively) and overnutrition ($> +1$ z-score of BMI-for-age).

Table 1. Descriptive characteristics of the children in Bamenda Orphanages.

Variables	Gender		p-value
	Boys (n= 97)	Girls (n= 108)	
Age (years)	10.4 (4.8)	10.5 (4.6)	0.875
Weight (kg)	35.1 (17.4)	35.5 (16.2)	0.820
Weight z-score	-0.83 (1.78)	-0.83 (3.24)	0.999
Height (cm)	134.5 (29.1)	132.6 (29.3)	0.644
Height z-score	-0.32 (.91)	-0.20 (0.97)	0.361
BMI (kg/m ²)	18.2 (2.8)	38.1 (188.0)	0.274
BMI z-score	0.21 (1.97)	0.18 (1.78)	0.893
Weight status			
Thinness	1 (1.0)	3 (2.8)	
Healthy weight	80 (82.5)	80 (74.1)	
Overweight/obese	16 (16.5)	25 (23.1)	
Education			
No education	6 (6.2)	5 (4.6)	
Primary	64 (66.0)	65 (60.2)	
Secondary	27 (27.8)	38 (35.2)	
Orphanage			
Orphanage 1	14 (14.4)	19 (17.6)	
Orphanage 2	38 (39.2)	42 (38.9)	
Orphanage 3	39 (40.2)	38 (35.2)	
Orphanage 4	6 (6.2)	9 (8.3)	
Duration at the orphanage			
<6 months	7 (7.2)	11 (10.2)	
6 months to 2 years	14 (14.2)	19 (17.6)	
3-6 years	51 (52.6)	40 (37.0)	
>6 years	25 (25.8)	38 (35.2)	
Reason for placement at an orphanage			
Parents not alive	72 (74.2)	76 (70.4)	
Poverty	9 (9.3)	11 (10.2)	
Abandoned	0 (0.0)	1 (0.9)	
School	9 (9.3)	9 (8.3)	
Others	7 (7.2)	11 (10.2)	

For continuous variables, values = mean (standard deviation) and for categorical variables, values = n (%).

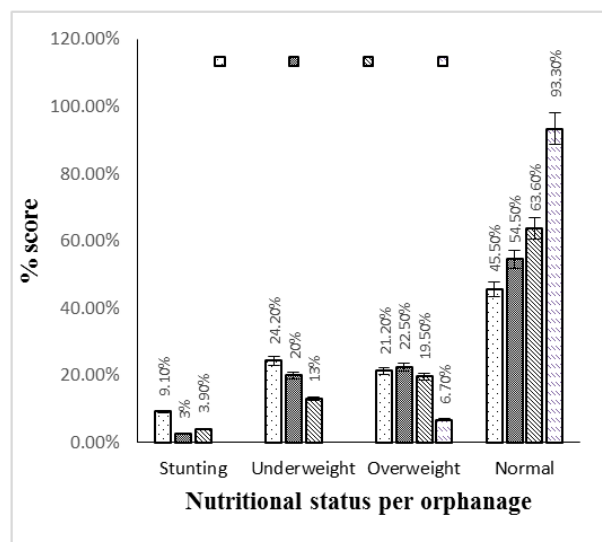


Figure 2. Distribution (\pm standard deviation) of the nutritional status with orphanages in Bamenda.

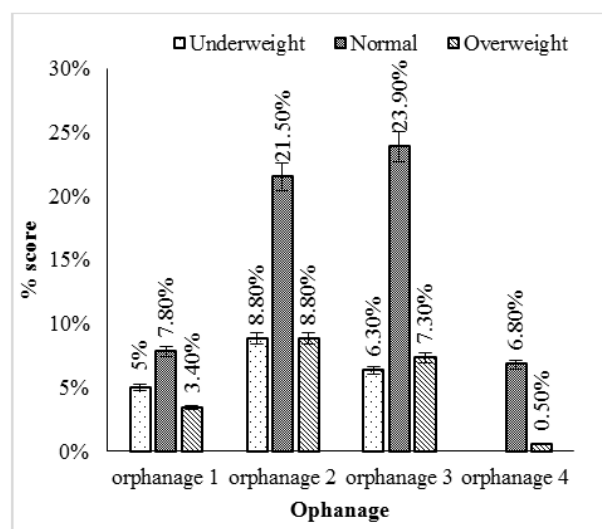


Figure 3. Distribution (\pm standard deviation) of the nutritional status per orphanage.

Table 2. Dietary habits of the orphanage children.

Variables	N	% of Total
Number of Meals	2 meals	4
	3 meals	185
	More than 3 meals	16
Skip meals	Yes	31
	No	174
	Skip/rarely skip	10
Skip breakfast	1-2 times a week	8
	3-4 times a week	2
	Not skip	185
Skip lunch	Skip/rarely skip	4
	1-2 times a week	9
	3-4 times a week	4
Skip dinner	Not skip	188
	Skip/rarely skip	5
	1-2 times a week	11
	3-4 times a week	3
	Not skip	186

Variables	N	% of Total
Snacks	None	34
	1 /day	72
	2-3/day	65
	Greater than 3	34

In all the orphanages, the children were given an average of 3 meals a day. Only 15% of the children skipped meals. The meals skipped were variable between the children and depended on the reason for skipping the meal. Most of the orphanage children (35%) had one snack a day during the period of the study, 3.2% had snacks 2-3 times a day and 17% of them did not take snack while 17% of them take snacks more than 3 times a day (table 2). The overall good dietary habits in these orphanages could be because to the fact that donors (like NGO) and some well-wishers gave food items amongst which were snacks to the internally displaced persons and orphanages during this crisis period.

Table 3. Physical activities.

	N	% of Total
Exercise	Yes	196
	No	9
Exercise type	Walking	24
	Running	71
	Jumping	13
	Football	36
	None	2
	Others	6
	Walking, running, jumping	31
	Running, football	22
Exercise days	Everyday	127
	1-2 days	30
	3-5 days	34
	6-7 days	9
	None	5
Exercise duration	< 15 minutes	47
	15-30 minutes	47
	31-60 minutes	44
	>60 minutes	61
	None	6
Activities performed	Playing	104
	Farming	19
	Cooking	25
	Others	16
	Playing, farming	27
Health problem	Playing, farming, cooking	14
	Yes	29
	No	176

From this study, 96% of the children did physical exercise and exercise activities. The remaining 4% of the children who did not do exercise had either a health problem or were physically disabled or were too young to do exercise. Among the children, 30% did exercise for more than one hour per day, 23%, 23% and 21% of the children, did exercise for less than 15 minutes, 15-30 minutes and 31-60 minutes respectively per day. About 26% of the orphan children practiced two or more types of physical activities. The orphanage children also had other healthy activities which they performed like playing, farming and cooking. During the period of the study, 86% of the children were healthy without any health (Table 3).

Table 4. Comparison of nutrient intakes between orphanages.

parameter	RDA (18)	Age Range (years)	Orphanage 1	Orphanage 2	Orphanage 3	Orphanage 4
Energy (Kcal)	1000	'1-3	1504.82±98.48	1151.58±0.00 ^d	1110.28±44.87 ^d	-
	1600	'4-8	1985.57±510.14 ^c	1698.82±263.13 ^c	1327.75±145.80 ^c	1482.58±0.00 ^c
	1800	'9-13	2231.54±227.18 ^b	2307.58±246.19 ^b	2056.63±206.94 ^b	2062.68±0.00 ^b
	2800	'14-18	2649.29±223.45 ^a	2660.56±72.02 ^a	2456.47±446.52 ^a	2825.56±32.35 ^a
Protein (g)	13	'1-3	64.14±2.04 ^c	33.93±0.00 ^c	24.34±0.75	-
	19	'4-8	77.05±7.91 ^c	39.00±2.03 ^c	29.80±4.82 ^c	37.75±0.00 ^c
	34	'9-13	81.50±5.68 ^b	43.17±5.98 ^b	45.48±5.73 ^b	46.00±0.00 ^b
	52	'14-18	92.75±7.71 ^a	50.35±2.83 ^a	50.66±11.37 ^a	50.26±0.40 ^a
Fats (g)	39	'1-3	55.40±2.12	72.95±0.00 ^d	61.49±3.62 ^d	-
	62	'4-8	60.56±15.90	109.66±17.61 ^c	81.98±14.46 ^c	61.15±0.00 ^c
	69	'9-13	74.33±13.12	144.11±11.85 ^b	131.29±17.77 ^b	105.43±0.00 ^b
	108	'14-18	78.64±11.94 ^a	162.44±4.07 ^a	156.40±32.68 ^a	131.03±1.66 ^a
Vitamin A (ug)	300	'1-3	202.82±9.19 ^c	64.45±0.00 ^c	129.36±6.69	-
	400	'4-8	274.56±62.87 ^{bc}	110.31±21.88 ^b	146.52±17.19 ^c	244.18±0.00 ^c
	600	'9-13	294.01±32.38 ^b	182.88±24.00	209.51±17.95 ^b	307.33±0.00 ^b
	900	'14-18	345.55±32.83 ^a	189.17±11.07 ^a	235.52±36.93 ^a	536.39±15.72 ^a
Calcium (mg)	700	'1-3	218.81±3.71	111.60±0.00	144.68±18.15	-
	1000	'4-8	245.22±81.84	133.19±19.54	225.72±64.01 ^c	101.80±0.00 ^c
	1300	'9-13	243.54±44.94 ^a	162.35±23.99 ^a	325.83±75.68 ^b	136.78±0.00 ^b
	1300	'14-18	240.80±43.76 ^a	175.58±11.43 ^a	464.96±140.55 ^a	175.29±1.23 ^a
Iron (mg)	7	'1-3	12.62±0.47 ^c	6.25±0.00 ^c	7.44±0.37	-
	10	'4-8	17.30±4.02 ^c	9.55±4.08 ^c	13.69±5.52 ^c	7.98±0.00 ^c
	8	'9-13	19.75±2.11 ^b	12.14±4.25 ^b	24.43±4.24 ^b	10.85±0.00 ^b
	15	'14-18	21.46±2.00 ^a	12.81±0.76 ^a	30.15±8.39 ^a	14.66±0.06 ^a

The energy intake of the orphanage children in the age group of 14-18 was less than the RDA requirement for this age group in orphanages 1, 2 and 3. The energy intake was also low for the age group of 4-8 in orphanage 3. The protein intake was low in orphanages 2, 3 and 4 in the 14-18 age group. The protein intake was of plant origin with very little or no protein of animal origin since protein from animal sources is expensive (table 5). As for the total fats intake, lower values were observed in orphanage 1 in the 14-18 age group and orphanage 4 in the 4-8 age group. As for the micronutrient intakes, the average vitamin A (207 mcg) and calcium (213 mg) intakes were less than the RDA values. The average iron intakes for orphanages 2 and 4 were less than the required values (< 13 mg). For orphanages 4 the iron intakes were low for the age groups of 4-8 and 14-18 and in orphanage 2, the average iron intakes were less than the RDA values except for the age group of 9-13 years old. In orphanage 4, there were no

children of age between 1-3 years old.

The most consumed foods and their frequencies of consumption from the orphanages as obtained from their menu and food frequency questionnaire are present in Table 5. This indicates a low diversity in the diet from all the orphanages with low frequencies of occurrences per week. This makes the diet qualitatively and quantitatively deficient as compared with standard recommendations, such that the children were affected by hidden hunger resulting from micronutrients deficiency. Milk and milk products were the least consumed food group in the orphanages when compared to a food pyramid. In orphanage 3, the milk and eggs were consumed by the younger children of age 1-4 years old. The most eaten foods are cereals (100%). The rate of consumption of fruits and milk was very low and their portion sizes were also small for the needs of the orphanage children.

Table 5. Food consumption pattern in the orphanages and the frequencies of consumption.

Food groups	Frequency n=21 (%)			
	Orphanage 1	Orphanage 2	Orphanage 3	Orphanage 4
Starchy roots/tubers, and cereals (eg rice, yam, maize, plantain, etc)	21 (100)	21 (100)	21 (100)	21 (100)
Vegetable group (eg bitterleaf, huckleberry, eru, green okro, tomatoes, carrots, green beans, parsley, leaks, etc)	10 (47.6)	7 (33)	8 (38.1)	12 (57.1)
Fruits group (eg plum, mango, watermelon, pear, paw paw etc)	7 (33)	3 (14)	4 (19)	3 (14)
Milk group (milk and milk product)	5 (23.8)	1 (4.8)	3 (14)	2 (9.5)
Meat and meat product (meat, fish, legumes, egg, nuts, seeds, etc)	13 (62)	12 (57)	17 (81)	10 (47.6)

4. Discussion

The objective of this study carried out in orphanages in Bamenda in the North West Region of Cameroon was to determine the nutritional status and eating habits of children

in orphanages in Bamenda.

The majority of the orphanage children who participated were females, preadolescents, and were all educated. The results of this study are similar to findings in Nepal where more than half the respondents in an orphanage are females [20]. The orphanages cultivate some of the food they

consume and also rear animals for both consumptions and to raise income since they complained of reduced subvention due to the socio-political crisis in the Region and the Covid-19 pandemic. About 10% of the children live in orphanages because of poverty and 9% due to educational needs since schools in the rural areas are locked down and families are displaced from their homes. These findings confirm with a study carried out by Huq and that of Reddy [21, 22], who documented for some orphanages in Bangladesh that, the placement of children in orphanages is not only because they are orphans but also for other reasons like educational purposes and poverty.

This study recorded small proportions of underweight and stunting based on WHO reference standards [17] relative to a national survey on orphans and vulnerable children among the under-fives in Nigeria which recorded that 45.5% and 63.5% of the orphans are underweight and stunted, respectively [23]. This lower rate of stunting might affect the educational performance of the orphanage children as confirmed by Prendergast and Kamath [24, 25] that children in orphanages with high rates of malnutrition have cognitive delay compared to the non-orphans. The rate of stunting, although with 3 meals per day, is probably due to the micronutrient intake deficiency. Also because the macronutrient intake was not variable enough to provide the required nutrients and amino acids respectively for growth. Indeed, the protein-rich foods mostly consumed in the orphanages are of plant origin with low biological value protein. High biological value proteins from animal sources that provide a balanced and adequate amount of proteins for growth were rarely consumed thus justifying the high malnutrition rates. This can be confirmed by the fact that the orphanages have low income due to the present socio-political crisis in this region that has increased the prices of commodities and the present Covid 19 pandemic in the world that has led to both decreased in donations to the orphanages. These results are similar with those of Aggarwal [26], whereby a majority of the children that had nutritional problems are from low-income orphanages. The findings are similar to a demographic and health survey by Arimond [27] whereby there is an association between dietary diversity and the nutritional status of a child especially height-for-age Z-scores. Prevalence of stunting was also found to be higher in boys compared to girls. Also, stunting was higher in boys (21.8%) than in girls (9.6%) because the foods were shared equally amongst the orphans of the same age group irrespective of sex and the fact that the RDA for boys is higher than for girls. In addition to this, the high exercise carried out by the orphans was not compensated for by the amount of food consumed leading to a deficiency in nutrients. Besides, the presence of children with health problems like sickle cell anemia, heart problems, especially in orphanage 1 also accounts for the high rates of stunting in this orphanage. More girls (22.5%) were overweight/obese compared to the boys (16.4%) because of the association with the intense physical exercises performed by the boys compared to girls. These results agree with [20] who observed that in orphanages of Bhubaneswar, boys are also underweight compared to girls.

There was a vitamin A and calcium deficiency among the children in all the orphanages. This deficiency is because of the fact that the orphanages rarely or almost do not consume foods rich in these nutrients like milk, fruits and fish. Although they eat provitamin A-rich vegetables, the quantities and frequencies of intake are very low compared to their nutrient needs. This concurs with the findings of [28] but in his study, the rate of undernutrition was comparatively higher than that gotten in the present study. A low intake of iron below the RDA in orphanages 2 and 4, was not good especially for the children in the age group of 14-18 since it is an age with a growth spurt and most girls experience menarche, as such, the rate of iron-deficiency can lead to iron deficiency anemia. There is then an increased need to meet up with the iron needs of the children in these orphanages and even provide iron supplements to them.

The orphans consumed 3 square meals per day with only 15% who had the habit of skipping some meals. Regular consumption of meals among children and adolescents brought up in Krakow's orphanages was also declared [29]. Some of the elderly children skipped meals especially lunch because they were fasting for prayers, and breakfast was also skipped at times if the breakfast was from left-over of the previous day's food and the quantity not sufficient for all the children. From this result, it seems the children are well fed but there are some cases of undernutrition. This is expected because the food consumed in the orphanages is largely starchy food made of food found in the cereal food group, then fats, vegetables and sometimes meat products. They rarely consume milk or milk products and vitamin A-rich fruits, meanwhile organ meat and fish are rare and thus might justify the undernutrition rate. Also, starchy foods are the cheapest foods to get and are the main food crops cultivated in the area [30]. Besides, the proteins rich foods consumed are mostly beans without supplementary protein added to them and not animal-rich protein sources thus making the protein quality low. Similar results were reported in orphanages in Ghana where orphans eat mostly beans and anchovies as their only source of protein [12]; Also in Kenya where fruits are consumed in relatively low quantities and cereals are the most consumed for energy provision [31], while dairy products are consumed only as a special menu feast and occasionally taken with some fruits [19]. Childhood is a period of rapid growth alteration accompanied by an increase in nutritional needs. This increases their demand for nutrients related to an increase in physical growth and development, the changes in their lifestyle and food habits affect their nutrient intake [32]. Thus, there is a high need to supplement the Bamenda orphanage foods mainly with micronutrients.

5. Conclusion

Adequate nutrition in childhood is a basic requirement for the development and promotion of optimum, health and good behavior of the child. Children get their macro-and micronutrients from various sources. Identifying these sources and comparing them to age groups helps to understand the nutrient intake in humans. Children require very high energy

and nutrients for adequate growth and development as well as for their activities [33, 34]. The macronutrient intake of the orphanages in Bamenda was variable between the orphanages and the different age groups. The orphanage foods were of low quality and not diverse thus making the nutrient needs of the orphans inadequate. The low micronutrient intake was then explained by poor planning of the menus and purchasing procedures of the orphanages as well as high prices of commodities and less income available for them coupled with the fact that the number of children per orphanage is often high and they receive fewer aids now compared to periods without crisis [35]. The dietary patterns of the total orphans indicated almost no consumption of milk, milk products and fruit. There is thus a high need to increase the funding to orphanages to improve their feeding. Efforts should also be directed towards increasing foods with high biological value proteins, milk, and fruits intake in the Bamenda orphanages' diet.

Conflict of Interest

The authors declare that there was no conflict of interest regarding this paper.

Acknowledgements

This research did not receive any grant from funding agencies in the public, commercial, or not-for-profit sector. The authors thank the Authorities of the orphanages in Bamenda Town for permitting to include orphans in their orphanages in this study. Special thanks also go to the mothers in households and caregivers at the orphanages who spent their time answering the interview questions.

References

- [1] De Onis, M, Monteiro C, Akre J, and Clugston G. The worldwide magnitude of protein-energy malnutrition: an overview from the WHO global data base on child growth. *Bull. World Health Organisation*, 2002; 71: 703-712.
- [2] FAO. Soaring Food Prices: Facts, Perspectives, Impacts and Actions Required," background paper prepared for the High-Level Conference on World Food Security: The Challenges of Climate Change and Bioenergy. 2008. Available at www.fao.org/foodclimate/conference/en/.
- [3] Nelson M. Childhood nutrition and poverty. *Proceedings of the nutrition society*. Cambridge University press, 2000: 59: 307-315.
- [4] Dakota Karratti. How poor nutrition affects child development. 2018.
- [5] UNICEF. The State of the World's Children 2019. Children, Food and Nutrition: Growing well in a changing world. UNICEF, New York. United Nations Children's Fund (UNICEF). 2019.
- [6] UNICEF. Orphans. press center. <https://www.unicef.org>. 2017.
- [7] De Onis M, Bloßner M and Borghi E. Prevalence and trends of stunting among pre-school children, 1990–2020. *Public Health Nutrition*, 2011; 15 (1): 142–148.
- [8] WHO. Fact sheet. Malnutrition. <https://www.who.int>, 2020.
- [9] Ntaryike DJ. Child malnutrition spreading in Cameroon. <http://www.voanews.com>, 2013.
- [10] Joint Council on International Children's Services. Addressing Nutrition with Orphans and Adopted Children. 2020 Alliance to End Hunger, 2015.
- [11] Ali Z, Abu N, Ankamah A, Abena EG, Alimatu SS. and Abdula-Razak A. Nutritional status and dietary diversity of orphan and non – orphan children under five years: a comparative study in the Brong Ahafo region of Ghana. *BioMedical Central Nutrition*, 2018; 4, 32.
- [12] Sadik A. Orphanage children in Ghana: Are their dietary needs met? *Pakistan Journal of Nutrition*, 2010; 9 (9): 844-852.
- [13] Okalla EC, Kedy DK, Calixte IP, Jean-Pierre NM, Fanta W, Servais AE, Elvis T. and Henry NL. Assessment of the Nutritional Status of Children Living in Orphanages in the City of Douala, Cameroon. *International Journal of Child Health and Nutrition*, 2019; 8: 1-9.
- [14] World food program. World food program Cameroon country brief November 2019. Saving lives changing lives, 2019.
- [15] USAID (U.S. Agency for International Development). Food assistance fact sheet-Cameroon. <https://usaid.gov>, 2020.
- [16] Martin R, Saller K. *Lehrbuch der Anthropologie*. Stuttgart: G. Fisher; 1956 (3).
- [17] De Onis M, Onyango WA, Borghi E, Siyam A, Nishida C, Siekmann J. Development of a WHO growth reference for school-age children and adolescents. *Bulletin of the World Health Organization*, 2007; 85 (9): 660 – 667.
- [18] Table of content. Dietary guidelines / health.gov. Appendix 7. nutritional goals for age sex group based on <https://health.gov/our-work/food-nutrient/2015-2020-dietary-guidelines/guidelines/table-of-contents/#subnav-4,2015-2020>.
- [19] Sharma S, Jackson M, Mbanya JC, Cade J, Forrester T, Wilks R, Balkau B, Cruickshank JK. Development of food frequency questionnaires in three population samples of African origin from Cameroon, Jamaica and Caribbean migrants to the UK. *European Journal of Clinical Nutrition*, 1996; 50: 479-486.
- [20] Suraksha S., Kushalata B., Maginsh D., Rama K. and Meena K. (2020). Nutritional status of children living in orphanage home of Kathmandu district, Nepal. *International Journal of Research in Medical Science*, 2020: 11-15.
- [21] Huq AKO, Tanni C, Provat R, Haque KMF and Bellal MH. Health Care Facilities and Nutritional Status of Orphans Residing in Selected Orphanage in Capital City of Bangladesh. *International Journal of Current Microbiology and Applied Science*, 2013; 2 (10): 118-125.
- [22] Reddy S. B., Naresh J., Indhira K. and Ganapathy S. C. (2019). Nutritional status and personal hygiene of children living in the orphanages of Bhubaneswar: Capital city of Odisha. *International Journal of Community Medicine Public Health*, 2019; 6 (1): 379-385.
- [23] Steve-Edemba CL. Assessment of the feeding practices, vitamin a, Iron, zinc and anthropometrics status of under-five Children in orphanages of federal capital Territory Abuja, Nigeria, 2012.

- [24] Prendergast AJ, and Humphrey JH. "The stunting syndrome in developing countries," *Paediatrics and International Child Health*, 2014: 34 (4): 250–265.
- [25] Kamath SK, Kavana GV, and Ergod MS. Impact of nutritional status on the cognition in institutionalized orphans: A pilot study. *Journal of clinical and diagnostic research*, 2017: 11 (3): CC01-CC04.
- [26] Aggarwal V, Anju S, Satinder A, Bhawna S, Pitamber S, Satveer S, and Raman KM. Role of Calcium Deficiency in Development of Nutritional Rickets in Indian Children: A Case-Control Study. *Journal of Clinical Endocrinology and Metabolism*, 2012: 97: 3461–3466.
- [27] Arimond M. and Ruel M. Dietary diversity is associated with child nutrition status: Evidence from 11 demographic and health surveys. *The journal of nutrition*, 2004: 134: 2579-2585.
- [28] Mwaniki EW, and Makokha AN. Nutrition Status of Children in Orphanages in Selected Primary Schools within Dagoretti Division Nairobi, Kenya. *Journal of Nutrition and Food Science*, 2013: 4: 248.
- [29] Pysz K, Teresa L and Aneta K. Assessment of nutritional habits and preferences of children and adolescents brought up in Krakow's orphanages. *Rocz Panstw Zakl Hig*, 2015: 66 (3): 253-260.
- [30] Agriculture in Cameroon. [En.m.wikipedia.org/wik](http://en.m.wikipedia.org/wiki/Agriculture_in_Cameroon). 2018.
- [31] Ministry of Health (MoH) / United Nations International Children's Education Fund (UNICEF). Anemia and status of iron, vitamin A and Zinc in Kenya. Inc. The 1999 National micronutrient survey report, 2001. In Mwaniki E. W and Makokha AN. Nutrition Status of Children in Orphanages in Selected Primary Schools within Dagoretti Division Nairobi, Kenya. *Journal of Nutrition and Food Science*, 2013: 4: 248.
- [32] Spear BA. Nutrition in adolescents, 2000. In: Sadik A. orphanage children in Ghana: are their dietary needs met? *Pakistan Journal of Nutrition*, 2010: 9 (9): 844-852.
- [33] Lucas B. Nutrition in children, 2000. In: Sadik A. orphanage children in Ghana: are their dietary needs met? *Pakistan Journal of Nutrition*, 2010: 9 (9): 844-852.
- [34] Trahms, CM. Nutrition in infancy, 2000. In: Sadik A. Orphanage children in Ghana: are their dietary needs met? *Pakistan Journal of Nutrition*, 2010: 9 (9): 844-852.
- [35] Lone MA. and Ganesan P. Health and Nutritional Status of Orphan Children's Living in Orphanages with Special Reference to District Anantnag of Jammu and Kashmir. *The International Journal of Indian Psychology*, 2016: 3: 164-169.