Nutritional Status and Dietary Patterns of Children Aged Ten Years and Below In the Buea Municipality, South West Region Cameroon

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Abstract

Background: Nutrition plays a critical role in the growth and health of children and this has an impact on society, economic growth and development. Infant and young children's feeding practices directly influence their nutritional status and survival. Good nutrition as an essential factor in children's wellbeing is therefore closely linked to their dietary patterns. However, for decades, childhood malnutrition has remained a global health problem and is characterized by the 'double burden' of undernutrition and overnutrition. The aim of this study was to assess the relationship between dietary patterns and nutritional status among children aged ten years and below in the Buea Health District.

Materials and methods: A community-based cross-sectional study was carried out within the Buea Health District from February to May 2023 to assess the dietary patterns and nutritional status of children aged 10 years and below. Data was collected using a semi-structured self - self-administered questionnaire on the parents/caregivers with children aged 10 years and below. Dietary patterns were assessed using a 24-hour dietary recall and nutritional status was assessed using body-mass index, mid-upper arm circumference, weight and height to age ratio according to the WHO

standard. Data was analyzed using SPSS version 26.0 for Windows

Results: Overall malnutrition status showed that the prevalence of stunting, wasting, underweight, overweight and obesity were 137(38.7%), 34(9.6%), 50(23.6%), 49(35.4%) and 143(66.5%) respectively. For dietary diversity, 79 (22.4%) had a low score, indicating a poor dietary intake. Some factors affecting the nutritional status of children include vaccine noncompliance (AOR=1.909, p=0.029), mothers' who were housewives or privately employed had children were more likely to be stunted (AOR= 2.027, p=0.049) and (AOR=2.834, P=0.008) respectively, mother/caregivers residing in a rural area (AOR=0.348, P=0.013). Mothers/caregivers less than 30 years old had children who were likely to be wasted (AOR=5.14, p=0.037).

Conclusion: The prevalence of malnutrition among children under ten years in the BHD is high. About a quarter of children have a poor dietary intake. Factors such as vaccine noncompliance and some socioeconomic factors of mothers are associated with the nutritional status of children in the BHD.

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Background of the study

A nutritionally well-fed population is essential for economic growth and development[1]. Capanzana and collaborators, [2] posit that the nutritional status of children under 5 and under 10 years of age is the basic indicator of a community's nutritional status. Malnourished children are more likely to grow into adults who are vulnerable to diseases and death [3], thereby affecting the nation's population and productivity[4].

Globally, children under five years are more vulnerable and susceptible to undernutrition[5] which may partly be attributed to their feeding patterns and habits which largely depend on caregivers [6]. Studies have associated the distribution of protein energy malnutrition and micronutrient deficiencies among the population with socio-economic, education, sanitation, environment, season and climatic conditions[7]. According to the World Health Organization (WHO)[8], and

Yalew [9], about 35% of deaths in children under age five in the world are attributed to the double burden of undernutrition and overnutrition. With these statistics, a gloomy situation of poor nutrition is projected in the future and sub-Saharan Africa and many developing countries may continue to be the worst victims [10].

In parts of Africa such as Cameroon, Egypt, Ghana and Nigeria, the prevalence of malnutrition and other related illnesses among children still remains high. In their study of the nutritional status of under-five children of low-income earners in a South-Western Nigerian Community, Amosu and coworkers recorded a high prevalence of underweight (82.13%) and wasting (85.15%) while stunting represented 33.52%[11]. In Cameroon, the statistics are not different. The prevalence of stunting and underweight were found to be 42.22% and 6.67% respectively among children under age five in Bangang Rural Community in 2014 [12].

According to Capanzana and collaborators [2] and Smith & Haddad [4], infant and young children's feeding practice directly influences their nutritional status and survival. Therefore, improving nutrition, health and development of children, adolescents and women is critical to achieving goal two of the Sustainable Development Goals (SDG) which is aimed at ending hunger, achieving food security, improving nutrition, and promoting sustainable agriculture. According to the UNICEF conceptual framework [5], poverty is one of the underlying causes of malnutrition since poor people have low purchasing power and limited access to adequate food supply. Yet poverty is endemic in many developing countries and Cameroon is not an exception. The Sustainable Development Goals (SDGs) Report (2016) has indicated that about 5.9 million children under five years still die from preventable causes [13]. Many of these causes are aggravated by childhood poor nutrition which remains a global health problem orchestrated by lack of breastfeeding, poverty, and maternal illiteracy. The statistics above suggest that the battle against childhood malnutrition is challenging [14]. The fight to maintain good nutrition and a healthy life in the world is confronted with challenges of household access to food, poverty and hunger [15]. Studies have shown evidence of the positive effects of a balanced diet on nutritional well-being and the role dietary intake plays in an individual's health promotion and development [16][17]. Globally, interventions have been made to reduce poverty and hunger by ensuring an increase in food production, distribution, availability and access [18]. Promotion of good dietary practice may be seen as a mechanism through which malnutrition, morbidity and mortality can be reduced within a population [19], hence the study of the dietary pattern particularly in children in Cameroon is fundamentally important. Nutritional status is best determined from information obtained by physical, biochemical, and dietary studies [20]. Food intake directly influences an individual's nutritional status[21]. The state of not having adequate nutrition is termed malnutrition which is further divided into undernutrition and overnutrition. Nutritional status is based on two main domains; growth faltering and malnutrition. In the nutrition transition, children under five years are considered important and particularly vulnerable to malnutrition because there is an increased demand for nutrients for rapid growth during this life period of the individual [22]. With poverty always at the center in countries like Cameroon, with political and civil unrest, unfair weather and a host of other factors, sub-Saharan Africa remains at the heart of malnutrition. Many studies conducted in Cameroon and other sub-Saharan countries indicated that the determinants of micronutrient deficiencies and undernutrition among children under 5 years included the number of children in households with the same age group, birth order or residency, sources of improved drinking water, place of delivery, food insecurity and inappropriate feeding[23]. This study aimed to examine the relationship between dietary patterns and nutritional status

among children aged five years and below and six to ten years of age at the BHD.

Materials and Methods

Study Design: The study was a community-based cross-sectional investigation conducted in 4 health areas in the Buea Head District, from February to May 2023.

Study population: The study population consisted of children aged 10 years and below and their mothers/caregivers within the Buea Health District. Mothers/caregivers resident in the Buea Health District for at least six consecutive months with children aged 10 years and below who gave consent were included, children with certain factors that affect their nutritional status such as birth defect, physical disability sickle cell, HIV were excluded.

Sampling: The sample size was calculated using Cochran's formula{m/30/}**,** using an estimated prevalence of stunting (29%) as reported by Amungwa and collaborators in 2021 {m/31/}, a minimum sample size of 317 was calculated. Four health areas in Buea Health District were selected using the simple random sampling method. The selection of the community was done by a simple random sampling method and the selection of participants by snowball sampling technique.

Data collection: Data on demographic factors, socioeconomic factors, health-related factors, and household characteristics were collected for a period of three months from February to April 2023, using a structured, and pretested questionnaire. Recumbent length (for children less than 24 months of age) and height (for children more than 24 months of age) were measured with a United Nations Children Fund (UNICEF) standard wooden length board and recorded to the nearest 0.1cm in light clothing with shoes off. Weight was measured using a portable calibrated electronic scale (Seca Floor Scales - S761 (G50736)) with children without shoes on, in light clothing and with empty pockets. Each child stood in the centre of the scale with weight equally distributed over both feet, then the scale was read to the nearest 0.1 kg. The weight of each child was taken twice, and the mean weight was calculated and recorded. For infants and children who could not stand, the mother's weight was taken, the weight of the mother and the child measured, from which the child's weight was deducted. The process was repeated again, and the sum of the two weights recorded was divided by two to get the average weight of the child. Scales were always placed on a flat surface, re-zeroed and checked with known weights each time they were moved. The body mass index (BMI) was calculated from the ratio of weight to height square, where BMI = Weight (kg) /Height^2 (m). The mid-upper arm circumference (MUAC) was measured halfway between the acromian process of the scapula and the tip of the elbow using a MUAC 115mm Small Colored Insertion Tape (Maternova, USA) in which green, yellow and red colors corresponded to the child being normal, malnourished or severely malnourished respectively. The value indicated on the arrow on the MUAC tape was read and recorded in cm.

Anthropometric measurements were analyzed using WHO AnthroPlus software and the WHO z-score system was used to classify the nutritional status of children. Z-scores were calculated for height-to-age (HAZ, stunting), height-to-weight (HWZ, wasting) and weight-to-age (WAZ, underweight). Child Growth Standard, z-scores for HAZ, HWZ and WAZ were used as an evaluation standard of stunting, underweight and wasting as recommended by WHO, 2006. A food frequency

questionnaire (WHO) Standard) was used to assess the dietary intake pattern.

Data analysis: Data was analyzed using the Statistical Package for Social Sciences (SPSS) Version 26.0 for Windows. Descriptive statistics namely; frequencies and percentages for categorical data, mean and standard deviation and median were calculated as relevant. Bi-variate and stepwise logistic regression was used to investigate the factors associated with malnutrition. Simple logistic regression was used to screen predictors at p-value < 0.02, following the bivariate analysis. For Multivariate analysis, a multiple logistic regression was used to check factors associated with the nutritional status of children at a significant level of p-value <0.05.

Ethical Considerations: Ethical approval to conduct this study was obtained from the Institutional Review Board of the Faculty of Health Sciences (Reference Number, 1955), University of Buea. An administrative clearance was also obtained from the Regional Delegation of Public Health for the South West Region. The purpose of the study was explained to the caregivers and they completed and signed an informed consent form before their enrolment in the study. Caregivers had a choice to voluntarily participate in the study or not, they were free to withdraw from the study at any time without any intimidation or loss of benefits for which they would otherwise qualify. Confidentiality was maintained for both the child and the mother/caregiver, and their anonymity was guaranteed as codes were used on forms and in data analysis.

Results

Sociodemographic characteristics of study participants

A total of 354 participants were enrolled into the study. The mean age of the mothers/caregivers was 28.5 years, SD = 6.2 years. About half of the mothers 182 (51.1%) were between the ages of 26 and 35, and most of them 159 (44.9%) had attended secondary education. The majority of the mothers 218 (61.3%) had ≥2 children, and 206 (58.2%) of them resided in the urban area of the Buea Health Districts. More than half of the mothers 208 (58.8%) were unemployed, while 209 (59%) were married and 132 (37.3%) were small business owners. The majority of the mothers were Christians 342 (96.6%) and 151 (42.7%) had an income of less than 50000FCFA (Table 1).

Table 1. Demographic characteristics of mothers with children 0 to 120 months old.

Variable	Category	Frequency	Percent
Age group of mother (years)	15 - 25	126	35.6
	26 - 35	181	51.1
	36 - 45	40	11.3
	> 45	6	1.7
	Total	**354**	**100**
	No formal education	13	3.7
	Primary	45	12.7

Educational level	University	137	38.7
	Secondary	159	44.9
	Total	**354**	**100**
Number of children	>2 children	136	38.4
	<=2children	218	61.6
	Total	**354**	**100**
Place of Residence	Rural	148	41.8
	Urban	206	58.2
	Total	**354**	**100**
Employment status	Employed	146	41.2
	Unemployed	208	58.8
	Total	**354**	**100**
Marital status	Single/divorced/widow	145	41
	married	209	59
	Total	**354**	**100**
Occupation	Others	31	8.8
	Government	31	8.8
	Farmer	32	9
	Housewife	59	16.7
	Private sector	69	19.5
	Business	132	37.3
	Total	**354**	**100**
religion	Christians	342	96.6
	Muslims/Atheist	12	3.4
	Total	**354**	**100**
monthly income (FCFA)	< 50000	151	42.7
	>200000	26	7.3
	100000 - 150000	68	19.2
	150000 - 200000	27	7.6
	50000 - 100000	82	23.2
	Total	**354**	**100**

Of the total number of children studied, 189 (53.4%) of them were females, with a median age of 11 months, ranging from 6 to 120 months. A total of 302 were 60 months and below while 52 were 61 to 120 months old. More than half of the children 107 (30.2%) were of the age group of 12-59 months. The majority of children 277 (78.2%) had birth weights

greater than 2500g. Again, 246 (69.5%) children were the first of their parents. Also as regards their vaccine 72 (20.3%) were non-compliant (Table 2).

Table 2. Demographic characteristics of children 0 to 120 months old.

Variable	Category	Frequency	Percent
Sex of the child	Female	189	53.4
	Male	165	46.6
	Total	**354**	**100**
Age group (Months)	< 6	105	29.7
	>59	66	18.6
	12-59	107	30.2
	6-11	76	21.5
	Total	**354**	**100**
Birth weight of child (grams)		2	0.6
	< 2500	75	21.2
	>= 2500	277	78.2
	Total	**354**	**100**
Birth order	<= 2	246	69.5
	more than 2	108	30.5
	Total	**354**	**100**
Vaccine compliance	Complaints	282	79.7
	Non-complaints	72	20.3
	Total	**354**	**100**

Nutritional status of children aged 0 to 60 months and 61 to 120 months

For the nutritional status of children less than 60 months, 121(40.1%), 32(10.6%), 48(15.9%), 37(12.3%), and 131(43.4) were stunted, wasted, underweight, overweight and obese respectively. whereas, for children 61 to 120 months, children stunted, wasted, underweight, overweight and obese were 16(30.8%), 2 (3.8%), 4(7.7%), 12(23.1%) and 12(23.1%) respectively (Table 3)

Table 3. Stunting, wasting and BMI status of children aged 120 months

Nutritional status	Category	0 – 60 months		61 – 120 months	
		Frequency	Percent	Frequency	Percent
Wasting	Normal	270	89.4	50	96.2
	Wasted	32	10.6	2	3.8
	Total	**302**	**100.0**	**52**	**100.0**
Stunting	Normal	181	59.9	36	69.2
	Stunted	121	40.1	16	30.8
	Total	**302**	**100.0**	**52**	**100.0**
BMI	Normal	86	28.5	24	46.2
	Obese	131	43.4	12	23.1
	Overweight	37	12.3	12	23.1
	Underweight	48	15.9	4	7.7
	Total	**302**	**100.0**	**52**	**100.0**

Dietary Intake Patterns of children 10 years and below

An assessment of the source of drinking water revealed that, about one-quarter of the children, 65 (18.1%) had a poor source of drinking water and 20(5.6%) children were still on exclusive breastfeeding as they were not drinking water yet.

Frequency intake of food by the children 120 months and below

Figure 1, represents the different food types consumed by children and the colour represents the frequency of consumption. The blue bar indicates that the child consumed the food type less than once a week, the orange bar indicates that the food type was consumed at least once a week, the ash bar shows that the child consumed the food type 2-3 times a week, and the green bar shows that the child consumed the food every day. The frequency of intake of each food type can be determined by the height of the bars, with the highest bar indicating the most frequently consumed food type.

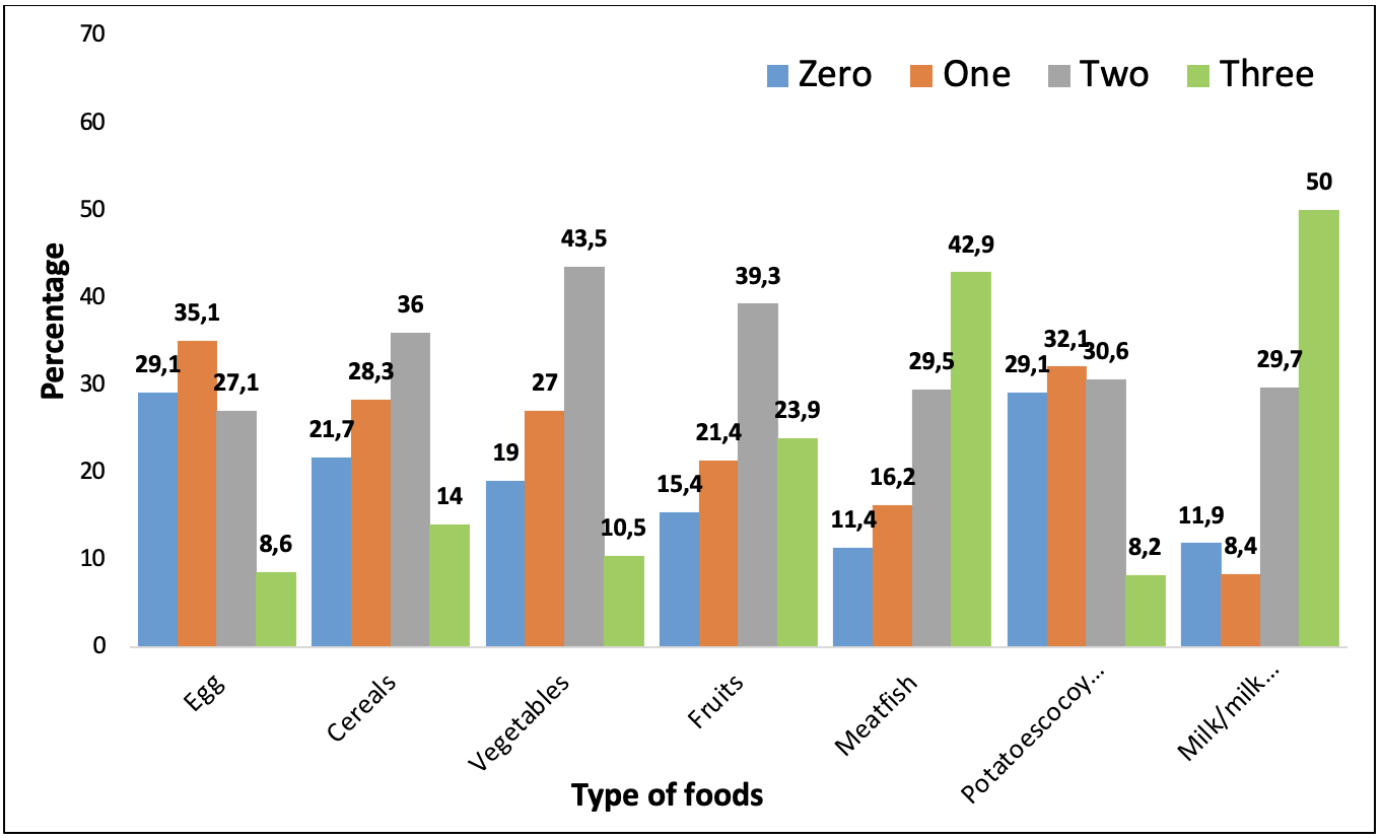

Figure 1. Different classes of food and frequency of consumption by the children.

In assessing the feeding type of the infant before 6 months, we found that 181 (51.1%) of the children were exclusively breastfed and 144 (40.7%) of infants were breastfed less than 10 times a day.

The Food Diversity Score of children 120 months and below

The scoring was based on the different classes of food nutrients (carbohydrate, protein, fat, vitamin, mineral, fiber) consumed by each child, taking into consideration their age group and nutrient requirements for healthy growth according to the WHO standard.

A total of 80(22.6%) had a low score indicating a poor dietary intake (Fig.2).

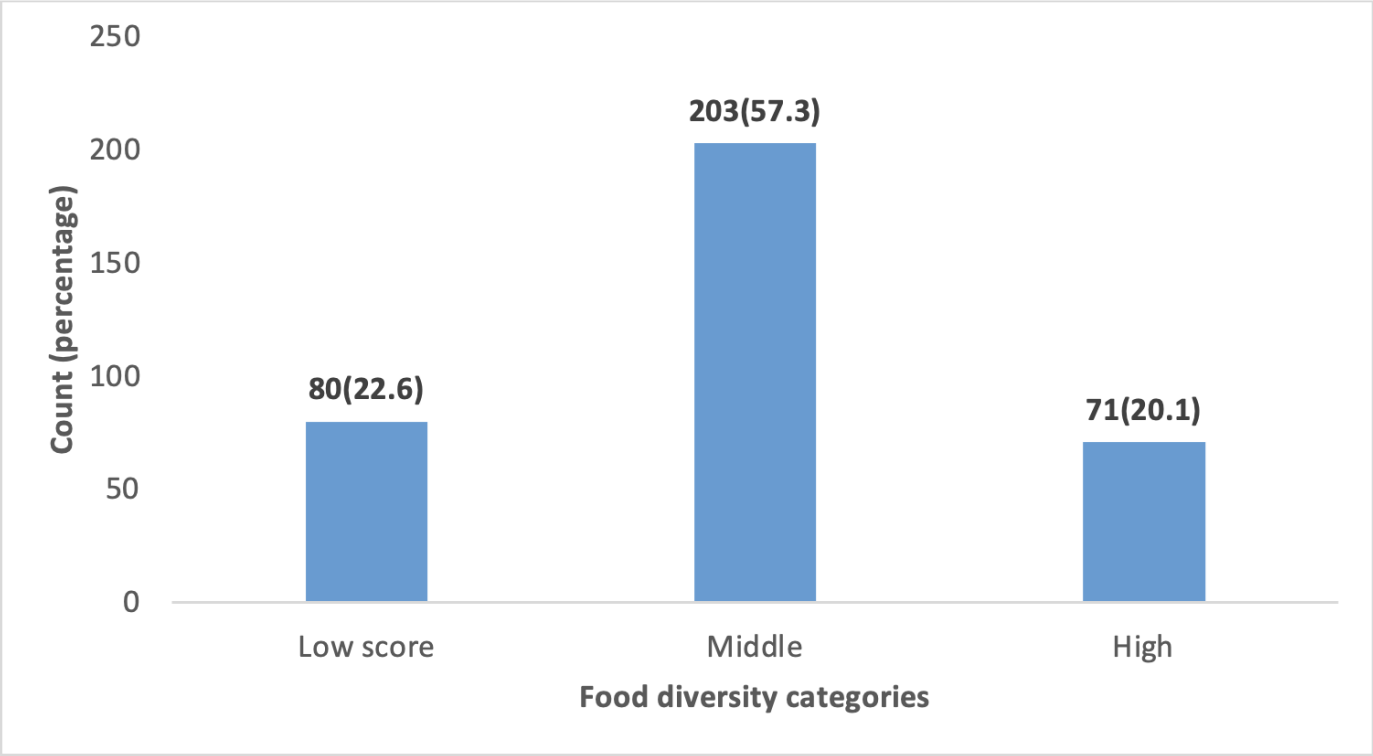

Figure 2. Food diversity score of participants

Factors associated with malnutrition of infants aged 0-60 months

Factors associated with stunting among children aged 0-60 months

The results of the multivariate binary logistic regression analysis revealed that vaccine completion and mothers' occupation were significantly associated with stunting. Children who had not completed their recommended vaccines for their ages were almost twice as likely to be stunted compared to those who had completed their recommended vaccine doses (AOR = 1.909, p = 0.029). In addition, regarding mothers' occupation, children 0-60 months of mothers who were housewives (AOR 2.027, p = 0.049) or worked in the private sector (AOR 2.843, p = 0.008) were more at risk of being stunted when compared to those whose mothers were small business owners. (Table 4)

Table 4. Factors independently associated with stunting among children aged 0-60 months (multivariate analysis)

Variable	Category	AOR	95% CI	p-value
Vaccine completion	Completed	1	-	-
	Not completed	1.909	1.070 – 3.406	**0.029**
Mother's occupation	Business	1	-	-
	Farmer	0.869	0.346 – 2.182	0.398
	Government employed	1.642	0.519 – 5.194	0.398
	Housewife	2.027	1.005 – 4.089	**0.049**
	Private sector	2.843	1.318 – 6.133	**0.008**
	Others	0.880	0.354 – 2.189	0.784

Factors associated with wasting among children aged 0-60 months

Children who lived in urban areas had a 65% lesser chance of being wasted compared to those in rural areas (AOR 0.348, p = 0.013) (Table 5).

Table 5. Factors independently associated with wasting among children aged 0-60 months (multivariate analysis)

Variable	Category	AOR	95% CI	p-value
Residence	Rural	1	-	**-**
	Urban	0.348	0.152-0.800	**0.013***

*AOR adjusted odds ratio; *p-value significant at the 5% significance level*

Factors associated with stunting among children aged 61-120 months

The multivariate analysis revealed that mother's age of less than 30 years was a significant predictor of stunting in children of age 61-12 months (Table 6). Mothers/caregivers of children below the age of 30 were about 5 times more likely to have children aged between 5 years and 10 years who are stunted compared to mothers aged 30 years or above (AOR 5.14, p=0.037).

Table 6: Factors independently associated with stunting among children aged 61-120 months (multivariate analysis)

Variable	Category	AOR	95% CI	p-value
Age group (years)	<30	5.140	1.101-24.002	**0.037***
	30+	1	-	-

Factors associated with underweight for age among children aged 61-120 months

Two factors (mother's occupation and income level) were found to be significantly ($p<0.05$) associated with underweight following bivariate analysis. The proportion of children who were malnourished was significantly higher among mothers who were business owners (28.6%) compared to housewives (25.0%), ($p = 0.042$). In addition, mothers who earned below 50,000 FCFA monthly were more likely to have malnourished children compared to those who earned higher incomes (39.3% vs. 17.9% or 7.1%, $p = 0.019$). None of the variables were found to be significant at the multivariate level (Table 7).

Table 7. Factors associated with underweight among children aged 61-120 months (bivariate analysis)

Variable	Category	Overall underweight		X^2	p-value
Mother's occupation	Unemployed	15(62.5)	12(42.9)	10.05	**0.042***
	Business	13(54.2)	8(28.6)		
	Farmer	3(12.5)	1(3.6)		
	Government employed	4(16.7)	5(17.9)		
	Housewife	0(0)	7(25.0)		
	Private sector	3(12.5)	6(21.4)		
	Others	1(4.2)	1(3.6)		
Monthly income (FCFA)	< 50000	1(4.2)	11(39.3)	11.02	**0.019***
	>200000	3(12.5)	5(17.9)		
	100000 - 150000	6(25.0)	5(17.9)		
	150000 - 200000	4(16.7)	2(7.1)		
	50000 - 100000	10(41.7)	5(17.9)		

**significant at 5% significance level*

Discussion

Sociodemographic characteristics: A total of 354 participants were recruited from four selected health areas in the Buea Health District. The lowest number of participants came from the Tole Health area (51). The reason for the minimum number of participants from this health area is that Tole is less developed, with fewer opportunities causing people to move out to seek better job opportunities, schools, and healthcare. The study focused on the sociodemographic characteristics of the mothers in the sample and their children's nutritional status and dietary patterns. It is interesting to

note that the majority of the mothers were between the age group of 26 and 35 years and had attended secondary education, which may be attributed to the educational setting of Buea. It is also notable that a significant proportion of the mothers were unemployed and involved in business, which may be indicative of the high standard of living in the area. However, this finding differs from the study carried out along the slope of Mount Cameroon where most of the mothers were farmers {m/26/}.

Nutritional status of children: In this study, the prevalence of stunting, wasting, underweight, overweight and obese were 38.7%, 9.6%, 23.6%, 35.4% and 66.5% respectively in the children. Malnutrition can predispose a child to a series of health complications such as anemia and other chronic diseases. The high prevalence of stunting and obesity is a call for concern, as these conditions can have significant implications for long-term health outcomes. Stunting is associated with a range of health problems, including impaired cognitive function, reduced work capacity, and increased risk of chronic diseases later in life. Meanwhile, obesity is a major risk factor for a range of chronic diseases, including diabetes, cardiovascular disease, and some forms of cancer.

The results suggest that a considerable proportion of the study participants had poor nutritional status. The prevalence was higher compared to the prevalence of stunting (16.4%), wasting (3.2%) and underweight (5.27) reported by Nzefa and collaborators in the Bandja Community of Cameroon {m/26/}. Compared to another study conducted in the southwest region, along the slope of Mount Cameroon {m/25/}, the results on wasting and underweight were 25.7% and 19.9% respectively, corroborating the findings of this study. The high prevalence of stunting, wasting and underweight could be because of the social context of the community such as the ongoing sociopolitical crisis in the South West Region of Cameroon.

Dietary intake of children: In the present study, 22.6% of children were considered as not having an acceptable dietary score. The dietary intake is different classes of food nutrients consumed by each child, taking into consideration their age group and nutrient requirements for healthy growth. The poor dietary patterns observed among the children, including inadequate intake of fruits, vegetables, and protein-rich foods, and excessive intake of carbohydrates and fats, may contribute to the high prevalence of malnutrition in the area. Poor dietary diversity score can lead to an increase in growth faltering such as stunting. A high diversity score indicates adequate nutritional intake which is essential for proper growth and healthy life. Promotion of good dietary practice may be seen as a mechanism through which malnutrition, morbidity and mortality can be reduced within a population [19].

These findings compared to the results of the study carried out by Arimond and Ruel {m/27/} are the same. This indicates that some women still do not have good knowledge of the importance of proper nutrition for their children within the BHD.

Factors associated with the Nutritional status of study participants: Inadequate source of drinking water has adverse effects on health and nutritional status. About 26.6% of children in this study drank from a poor source of drinking water which was associated with stunting. Poor sources of drinking water are linked to poor sanitation. An association between poor sources of drinking water and nutritional status has also been seen in another study [2]. Inadequate sources of drinking water can cause diseases such as diarrheal, typhoid, and other gastrointestinal problems which affect the child's nutritional status. This is seen as strengthened by the UNICEF conceptual framework {m/24/} as an underlying cause of

malnutrition.

Children with non-compliance to vaccine uptake were more likely to be stunted than children who had taken their vaccine. Vaccine compliance in children is important as it helps to boost the immune system of the child and prevent them from infection which could affect their nutritional status. Malnourished children are more likely to grow into adults who are vulnerable to diseases and death [3]. Vaccine non-compliance could be due to either dropout by mothers of the children or missed opportunities from the healthcare personnel.

Mothers or caregivers who have not attained a certain degree of education and mothers with low income had children who were more likely to be malnourished, either stunted or wasted. This finding is similar to that of a study {m/28/} that has found significant associations between child nutritional status and socio-economic factors such as maternal education, and maternal wealth status. Mothers who are more knowledgeable know the importance of good and adequate nutrition for their children. However, this finding differs from another study carried out by Ukwuani and Suchindran {m/29/}, who found negative effects of low maternal education on child nutritional status. They found that children whose mothers had higher education were more likely to be stunted compared to their counterparts whose mothers had no education. This may be due to the distinct setting in which the study was carried out as there are many adult schools in our own that many women could engage in to upgrade their knowledge on the nutrition of their children. We equally found the place of residence of the mothers to be significantly associated with the nutritional status of the child. Those resident in the rural areas had children who were more likely to be wasted than their counterparts in urban areas. This finding is similar to a study carried out by Ray and collaborators {m/28/} in their assessment of nutritional status and dietary patterns. They found that the magnitude of malnutrition was higher in the rural communities as compared to the urban areas. The place of residence influences dietary intake as well as physical activity which all have a significant impact on nutritional outcomes. Rural residents may engage in physical activities such as farming and other activities that require a lot of energy and burning fats.

Also, the nutritional status of children was found to be associated with the number of children the mother had. Children of mothers with more than two children were more likely to be malnourished (wasted) than those with less than two children. The higher the number of children in a household means increased competition for food which negatively affects nutritional status. These findings are similar to those of a study carried out by Capanzana and collaborators [2] that found an association between household size and the nutritional status of children aged ten years and below. This could be due to low purchasing power because of increased prices of goods within the BHD that limits some mothers leading to poor nutritional outcomes on their children.

Conclusions: The prevalence of malnutrition among children under ten years in the BHD is high. About a quarter of children have a poor dietary intake. Factors such as vaccine non-compliance and some socioeconomic factors of mothers are associated with the nutritional status of children in the BHD.

Recommendations: To the Delegation of Public Health to provide healthcare access to address underlying health conditions in the community that may contribute to the poor nutritional status of children. To the Quarter heads and other

authorities such as Non-Governmental Organizations to educate mothers on the importance of healthy eating habits by their children which take into consideration diverse nutritious foods. Further studies of other aspects of nutritional assessment in children such as dietary diversity, household food security and biochemical markers of nutritional status should be carried out in the Buea Health District.

References

1. ^*Heremebogori, T., Kimmel, K., Zhang, M., Kandiah, J., & Wang, Y. (2020). Nutrition transition and double burden of malnutrition in Africa: A case study of four selected countries with different social economic development. AIMS Public Health, 7(3), 425–439.*
2. a, b, c, d*Capanzana, M. V., Aguila, D. V., Gironella, G. M. P., & Montecillo, K. V. (2018). Nutritional status of children ages 0–5 and 5–10 years old in households headed by fisherfolks in the Philippines. Archives of Public Health, 76(1), 24.*
3. a, b*Galler, J. R., Bryce, C., Waber, D. P., Zichlin, M. L., Fitzmaurice, G. M., & Eaglesfield, D. (2012). Socioeconomic outcomes in adults malnourished in the first year of life: A 40-year study. Pediatrics, 130(1), e1–e7.*
4. a, b*Smith, L. C., & Haddad, L. J. (2000). Overcoming child malnutrition in developing countries: Past achievements and future choices. International Food Policy Research Institute.*
5. a, b*Aguayo, V. M., & Menon, P. (2016). Stop stunting: Improving child feeding, women's nutrition and household sanitation in South Asia. Maternal & Child Nutrition, 12(S1), 3–11.*
6. ^*Keats, E. C., Das, J. K., Salam, R. A., Lassi, Z. S., Imdad, A., Black, R. E., & Bhutta, Z. A. (2021). Effective interventions to address maternal and child malnutrition: An update of the evidence. The Lancet Child & Adolescent Health, 5(5), 367–384.*
7. ^*Yalew, B. (2013). Prevalence of Malnutrition and Associated Factors among Children Age 6-59 Months at Lalibela Town Administration, North Wollo Zone, Anrs, Northern Ethiopia. Journal of Nutritional Disorders & Therapy, 04.*
8. ^*Goswmai, S., & Das, K. K. (2015). Socio-economic and demographic determinants of childhood anemia. Jornal de Pediatria, 91(5), 471–477.*
9. ^*Gupta, S., Venkateswaran, R., Gorenflo, D. W., & Eyler, A. E. (1999). Childhood Iron Deficiency Anemia, Maternal Nutritional Knowledge, and Maternal Feeding Practices in a High-Risk Population. Preventive Medicine, 29(3), 152–156.*
10. ^*Onyeneho, N. G., Ozumba, B. C., & Subramanian, S. V. (2019). Determinants of Childhood Anemia in India. Scientific Reports, 9(1), 16540.*
11. ^*Amosu, A. M., Degun, A. M., Atulomah, N. O. S., & Olanrewju, M. F. (2011). A Study of the Nutritional Status of Under-5 Children of Low-Income Earners in a South-Western Nigerian Community. Current Research Journal of Biological Sciences, 3(6), 578–585.*
12. ^*Kasweka, I. W. (2021). To Assess The Knowledge And Feeding Practices Of Mothers On Nutritional Status Of Children Under The Age Of 5 Years: A Case Study Of Nakambala Clinic.*
13. ^*Yadav, K. K., & Awasthi, S. (2016). The current status of community-acquired pneumonia management and*

prevention in children under 5 years of age in India: A review. Therapeutic Advances in Infectious Disease, 3(3–4), 83–97.

14. ^*Bain, L. E., Awah, P. K., Geraldine, N., Kindong, N. P., Siga, Y., Bernard, N., & Tanjeko, A. T. (2013). Malnutrition in Sub–Saharan Africa: Burden, causes and prospects. Pan African Medical Journal, 15(1).*
15. ^*Lartey, A. (2008). Maternal and child nutrition in Sub-Saharan Africa: Challenges and interventions. Proceedings of the Nutrition Society, 67(1), 105–108.*
16. ^*Slawson, D. L., Fitzgerald, N., & Morgan, K. T. (2013). Position of the Academy of Nutrition and Dietetics: The Role of Nutrition in Health Promotion and Chronic Disease Prevention. Journal of the Academy of Nutrition and Dietetics, 113(7), 972–979.*
17. ^*Vaitkeviciute, R., Ball, L. E., & Harris, N. (2015). The relationship between food literacy and dietary intake in adolescents: A systematic review. Public Health Nutrition, 18(4), 649–658.*
18. ^*Fanzo, J. C., & Pronyk, P. M. (2011). A Review of Global Progress toward the Millennium Development Goal 1 Hunger Target. Food and Nutrition Bulletin, 32(2), 144–158.*
19. a, b*Mosley, W. H., & Chen, L. C. (1984). An Analytical Framework for the Study of Child Survival in Developing Countries. Population and Development Review, 10, 25–45.*
20. ^*Omage, K., & Omuemu, V. O. (2018). Assessment of dietary pattern and nutritional status of undergraduate students in a private university in southern Nigeria. Food Science & Nutrition, 6(7), 1890–1897.*
21. ^*Sims, L. S., Paolucci, B., & Morris, P. M. (1972). A theoretical model for the study of nutritional status: An ecosystem approach. Ecology of Food and Nutrition, 1(3), 197–205.*
22. ^*Rivera, J. A., Barquera, S., González-Cossío, T., Olaiz, G., & Sepúlveda, J. (2004). Nutrition Transition in Mexico and in Other Latin American Countries. Nutrition Reviews, 62(suppl_2), S149–S157.*
23. ^*Teh, R. N., Sumbele, I. U. N., Meduke, D. N., Ojong, S. T., & Kimbi, H. K. (2018). Malaria parasitaemia, anaemia and malnutrition in children less than 15 years residing in different altitudes along the slope of Mount Cameroon: Prevalence, intensity and risk factors. Malaria Journal, 17(1), 336.*