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Child malnutrition in North East Region of Ghana: Magnitude, Determinants and Socioeconomic Complexities

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Abstract

Child malnutrition is a complex disorder with long-term effects that can be traced to health outcomes, academic performance, and economic productivity. Although the problem is recognized globally, the burden of child malnutrition remains disproportionately high in Ghana. This study examined the magnitude, determinants, and socioeconomic complexities of child malnutrition in the North East Region of Ghana. Using a cross-sectional design with a quantitative approach, the study employed structured questionnaires to collect data from 1,347 mothers. The prevalence of malnutrition among under-five children in the North East Region was 14.3%. Among these, 65.6%, 13.0%, and 21.4% were underweight, stunted, and wasted, respectively. The respondents' age ($\chi^2 = 58.227$, $p < 0.001$), marital status ($\chi^2 = 29.600$, $p < 0.001$), number of children ($\chi^2 = 34.620$, $p < 0.001$), educational level ($\chi^2 = 53.165$, $p < 0.001$), and occupation ($\chi^2 = 40.953$, $p < 0.001$) were socio-demographic characteristics that showed significant associations with the prevalence of malnutrition. Monthly income (Fisher's exact test = 13.203, $p < 0.001$), frequency of financial difficulties (Fisher's exact test = 127.503, $p < 0.001$), and type of financial support received (Fisher's exact test = 13.119, $p = 0.002$) were economic factors significantly associated with the prevalence of malnutrition. The study also found significant associations between the prevalence of malnutrition and respondents' ability to provide nutritious foods (Fisher's exact test = 122.514, $p < 0.001$), frequency of purchasing or receiving protein-rich foods (Fisher's exact test = 47.276, $p < 0.001$), percentage of household income spent on food ($\chi^2 = 22.828$, $p < 0.001$), age at which children were introduced to solid foods ($\chi^2 = 108.727$, $p < 0.001$), respondents' knowledge of nutrition ($\chi^2 = 5.718$, $p = 0.020$), family traditions related to nutrition ($\chi^2 = 100.978$, $p < 0.001$), availability of food ($\chi^2 = 34.810$, $p < 0.001$), and adherence to health professionals' advice on child feeding and nutrition ($\chi^2 = 76.023$, $p < 0.001$). These results highlight that both structural socioeconomic constraints and behavioural practices contribute substantially to the burden of malnutrition in the region. A comprehensive, multisectoral approach should be implemented that integrates nutrition education, economic empowerment, and improved access to diverse and nutritious foods, while strengthening health system support for optimal child feeding practices, particularly among socioeconomically vulnerable households.

Keywords: Child malnutrition; Determinants; Feeding practices; Food security; Nutritional status; Prevalence; Socioeconomic factors; Under-five children; North East; Ghana

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1. Introduction

Child malnutrition is one of the most significant universal civil health issues that impact millions of children and undermine their survival, development, and growth (1). According to the latest estimates of the global population, in 2022, around 149 million children below the age of five were stunted, 45 million were wasted, and 37 million were overweight or obese (2). This is especially heavy in low- and middle-income countries (LMICs), where vulnerability is further increased by structural inequalities, poor dietary intake, and the lack of access to healthcare services (2). In sub-Saharan Africa, the malnourished children have grown significantly over the last decade, which has led to over 3.5 million child deaths a year with severe acute malnutrition putting the children at a high risk of death up to nine times higher than other well-nourished children (3).

Malnutrition is a complex disorder, which involves undernutrition, micronutrient disorders, and overnutrition (4). There has been a growing global interest in the health discourse of the triple burden of malnutrition, which is described as the presence of all three types of malnutrition together among individuals, households, and populations (5). This trend is symptomatic of the systemic compromise of food systems, socioeconomic inequalities, and swift changes in nutritional patterns, especially in LMIC (6). The world prevalence of the triple burden of malnutrition is imprecise, but it is estimated that 12 percent of the population of the LMICs as well as 25 percent in selected sub-Saharan Africa countries are affected by it (4). Such trends are a great problem to the realisation of the Sustainable Development Goal (SDG), 2.2, which is to eradicate all types of malnutrition by the year 2030.

Child malnutrition has long term effects that can be traced into the health outcomes, academic performance and economic efficiency (7). Early childhood undernutrition is linked to poor cognitive abilities and prone to infectious diseases whereas childhood overweight and obesity are linked to higher risks of non-communicable diseases in adulthood (8). Moreover, the nutritional status of the mother, both in deficiency of micronutrients and obesity, is also a defining factor of child health, which triggers an intergenerational cycle of malnutrition (9).

Although the problem can be observed worldwide, the burden of child malnutrition is still disproportionately distributed in sub-Saharan Africa and Asia that comprise almost 95 percent of the world cases of stunting (3). In sub-Saharan Africa, the structural factors like poverty, rural dwellings, low maternal education and poor access to health services have continued to be among the most significant contributors to poor nutritional performance (10). The empirical data also reveal that the children in low-income families and rural areas, as well as in areas with lower level of educational attainment of the mothers, have a much higher risk of being stunted, wasted, and underweight (11).

Ghana presents a complex and evolving context in the fight against child malnutrition. Even though significant improvements have been made over the years, with the prevalence of underweight and wasting among children reduced by half by 1993 and 2014 according to the Millennium Development Goals, the country still faces some challenges (12). According to national statistics, stunting has decreased to 18 percent after 33 percent, whereas wasting has gone up by a small margin, and children under the age of five years continue to face underweight (13).

The available literature in Ghana has revealed a number of factors that are determinants of child malnutrition including child factors (age, sex, and peri-natal size), maternal factors (education and use of antenatal care), and household factors (wealth status, food security, and access to healthcare) (14–17). Nevertheless, most studies have been too narrow in that they mostly concentrate on one facet of inequality or they do not explore the interaction of socioeconomic, cultural, and environmental factors fully (9,17,18). Moreover, the lack of region-specific evidence that encapsulates the contextual forces of malnutrition that are distinctive to underserved regions like North East region of Ghana is still evident.

Considering such gaps there is a pressing demand of context-specific, multidimensional studies that measure the magnitude and factors of child malnutrition as well as taking into consideration the underlying socioeconomic complexities. This information will be critical in informing the design of specific interventions, optimal resource distribution, and promotion of equity-based approaches to curb malnutrition. This research is therefore designed to determine the extent, causes and socioeconomic complexities of child malnutrition in North East region of Ghana. The study aims to produce evidence that may inform policy development and add to the existing work toward reaching SDGs 2 and 3 in Ghana by offering an in-depth analysis of the feeding behaviour, household socioeconomic status, and access to resources.

1.1. Study area and methodology

The research was carried out in North East region of Ghana. The area is mostly agricultural and most of the livelihoods are based in subsistence farming and seasonal rainfall. District hospitals, health centres and Community-based Health Planning and Services (CHPS) compounds are used to provide health services though the accessibility is still in imbalance among the communities. This hospital-based study was conducted specifically at Baptist Medical Centre (Nalerigu), Walewale Municipal Hospital (West Mamprusi Municipal), Chereponi District Hospital (Chereponi District), Bunkpurugu District Hospital (Bunkpurugu-Nakpanduri District), and Yagaba-Kubori District Hospital (Mamprugu Moagduri District). The region is an appropriate environment to study the scale, determinants, and socioeconomic complications of child malnutrition due to the socio-cultural environment, such as the household feeding habits, the level of maternal education and poverty.

2. Study design and methods

The research used a cross-sectional design with a quantitative approach to collect and analyse data. Mothers with children below the age of five years, who were receiving postnatal care services in the selected districts formed the target population. Informed consent was obtained from the facility managers and verbal consent obtained from the mothers. The study used Rose, Spinks, and Cahoto formula to estimate the sample size. The formula is expressed as: $n = \frac{Z^2 pq}{d^2}$, where: **Z** = z-value (1.96 for a 95% confidence level), **p** = proportion of the population that possesses the desired characteristics (malnutrition among children under five years), expressed as a decimal, and **C** = Confidence interval stated in decimal notation (0.028 = ±2.8 percentage points).

The sample size was calculated using the above parameters: $\mathbf{n}=\frac{1.96^2 0.5(1-0.5)}{(0.028)^2}=\frac{0.9604}{0.000784}=1{,}225$

The study had 1,225 at a 95% confidence level with an extra 122 respondents (10%) were added to the sample to address non-response and related issues, making a total sample size of 1,347.

A structured questionnaire was used to gather data following a comprehensive investigation based on the study's objectives. The data was analysed using Statistical Package for Social Sciences (SPSS) version 27. In this study, a child is termed undernourished if they are stunted (height-for-age z-score< -2 SD), wasted (weight-for-age z-score < -2 SD) or underweight (weight-for-height z-score< -2 SD) and overweight if (weight-for-height z-score > +3SD). The malnutrition status of children was confirmed from their weighing book during postnatal care services.

The analysis involved univariate analysis to explore the connection between independent variables (socio-demographics, economic factors, and feeding practices) and dependent variable (prevalence of malnutrition). Initially, bivariate relationships were tested using Pearson's chi-square test for categorical variables, however, Fisher's exact test was used where cell counts were less than five. A p-value of 0.05 was considered statistically significant, and the prevalence of malnutrition among under-five children was compared across various respondent characteristics.

3. Results

3.1. Socio-demographic characteristics of mothers

Table 1 presents detailed information on the socio-demographic characteristics of the mothers. A total of 1347 mothers responded to the survey, yielding a 100% response rate. The result revealed that 60.4% of the mothers were aged 26 to 35 years old. The mean age of the mothers was 28.85 years with a standard deviation of 4.98 years. Most (72.9%) of the mothers were married. It was also found that 62.3% of the mothers had between one and three children. Almost half (49.5%) of the mothers had no formal education. The majority (87.2%) of the mothers were Muslims, with most (77.7%) resided in rural areas.

Table 1 Socio-demographic characteristics

To Variable	Frequency	Percentage
Age (years)		
14 – 25	390	29.0

26 – 35	814	60.4
36 – 45	143	10.6
Marital status		
Married	982	72.9
Unmarried	365	27.1
Number of children		
1 – 3	839	62.3
4 – 7	508	37.7
Highest educational level		
No education	667	49.5
Informal education	243	18.0
Primary	216	16.0
Junior High School	95	7.1
Senior High/Vocational	62	4.6
Tertiary	64	4.8
Religion		
Islamic	1175	87.2
Christianity	172	12.8
Place of residence		
Urban	301	22.3
Rural	1046	77.7

3.2. Prevalence of malnutrition among under-five children

The study found that 14.3% (at 95% CI: 12.5% to 16.3%) of children were diagnosed as malnourished by a medical officer (Figure 1). Among these, 65.6%, 13.0%, and 21.4% were underweight, stunted, and wasted, respectively (Figure 2).

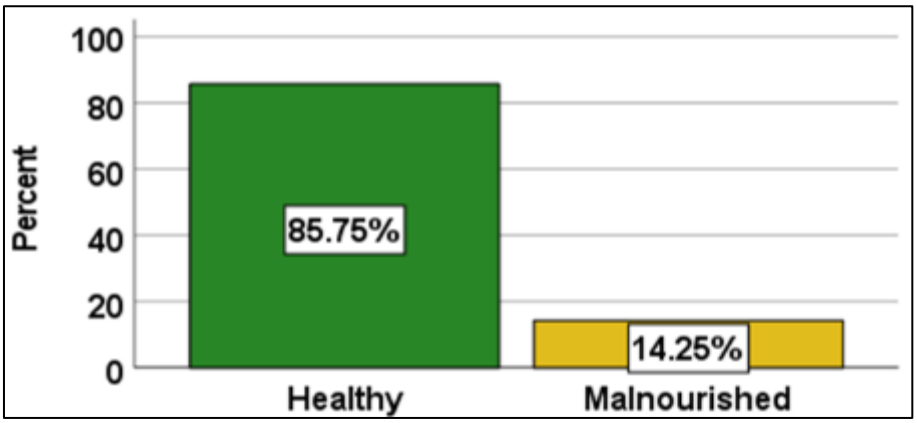

Figure 1 Prevalence of malnutrition among children under five years

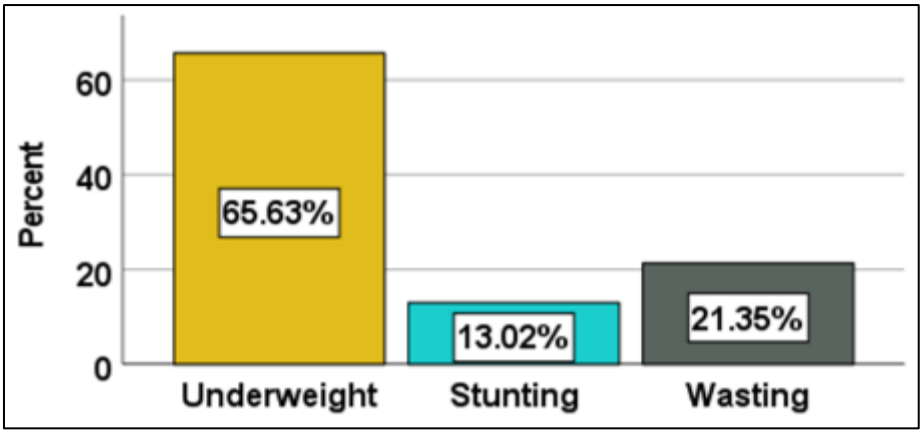

Figure 2 Prevalence of underweight, stunting and wasted among the children

3.3. Distribution of malnutrition by socio-demographic characteristics

The study found that 34.3% of mothers aged 36 to 45 years had more children who were malnourished, compared to 15.4% mothers aged 14 to 25 years. The age of respondents showed a significant association with the prevalence of malnutrition among under five children ($X^2 = 58.227$, $p<0.001$). Similarly, 17.4% of married mothers had more children who were malnourished as compared to 5.8% of unmarried mothers. Marital status was significantly associated with the prevalence of malnutrition ($X^2 = 29.600$, $p<0.001$).

The number of children a mother had also showed a significant association with prevalence of malnutrition ($X^2 = 34.620$, $p<0.001$). Specifically, 21.5% of mothers with four to seven children reported malnutrition among their children, compared to 9.9% of mothers with one to three children. Furthermore, 20.7% of mothers with no formal education had malnourished children, compared to 6.5% of mothers with senior high school education. The educational level of mothers was significantly associated with the prevalence of malnutrition ($X^2 = 53.165$, $p<0.001$). Detailed information is presented in Table 2.

Table 2 Distribution of malnutrition by socio-demographic characteristics

Variable	**Prevalence of malnutrition**		
	Healthy	Malnourished	Test statistics
	n (%)	n (%)	(p-value)
Age (years)			
14 – 25	330(84.6)	60(15.4)	58.227 (<0.001)
26 – 35	731(89.8)	83(10.2)	
36 – 45	94(65.7)	49(34.3)	
Marital status			
Married	811(82.6)	171(17.4)	29.600 (<0.001)
Unmarried	344(94.2)	21(5.8)	
Number of children			
1 – 3	756(90.1)	83(9.9)	34.620 (<0.001)
4 – 7	399(78.5)	109(21.5)	
Highest educational level			
No education	529(79.3)	138(20.7)	53.165 (<0.001)
Informal education	214(88.1)	29(11.9)	

Primary	198(91.7)	18(8.3)	
Junior High School	92(96.8)	3(3.2)	
Senior High/Vocational	58(93.5)	4(6.5)	
Tertiary	64(100.0)	0(0.00)	
Religion			
Islamic	1006(85.6)	169(14.4)	0.125 (0.723)
Christianity	149(86.6)	23(13.4)	
Place of residence			
Urban	257(85.4)	44(14.6)	0.042 (0.838)
Rural	898(85.9)	148(14.1)	

3.4. Economic complexities affecting malnutrition

Table 3 presents the economic factors affecting malnutrition. It was found that 19.4% of mothers who were farmers had children who were malnourished, compared to 8.5% of mothers who were public servants. The study found a significant association between respondents' occupation and the prevalence of malnutrition ($\chi^2 = 40.953$, $p < 0.001$). Meanwhile, 15.1% of respondents who earned a monthly income of GHC 0–1000 were more likely to have malnourished children. Monthly income was significantly associated with the prevalence of malnutrition (Fisher's exact test = 13.203, $p < 0.001$).

It was further revealed that 11.4% of respondents who always faced financial difficulties were more likely to have children with malnutrition, compared to 3.6% of those who sometimes faced financial difficulties. The frequency of financial difficulties had a significant relationship with the prevalence of malnutrition (Fisher's exact test = 127.503, $p < 0.001$). Interestingly, respondents who received financial support from friends and relatives were more likely to have malnourished children compared to those who received support through microfinance loans. The type of financial support received was significantly associated with the prevalence of malnutrition (Fisher's exact test = 13.119, $p = 0.002$). Moreover, 27.4% of respondents who were unable to provide nutritious foods for their children reported higher levels of malnutrition compared to those who were able to do so. The study found a significant association between the ability to provide nutritious foods and the prevalence of malnutrition (Fisher's exact test = 122.514, $p < 0.001$).

It was also revealed that 19.0% of respondents who purchased or received protein-rich foods weekly were more likely to have children diagnosed with malnutrition compared to their counterparts. The frequency of purchasing or receiving protein-rich foods was significantly associated with the prevalence of malnutrition (Fisher's exact test = 47.276, $p < 0.001$). In addition, respondents who spent 40%–59% of their monthly income on food were more likely to have malnourished children compared to those who spent 60% or more. The study found a statistically significant association between the percentage of household income spent on food and the prevalence of malnutrition ($X^2 = 22.828$, $p<0.001$).

Table 3 Economic complexities affecting malnutrition

Variable	**Prevalence of malnutrition**		
	Healthy	Malnourished	Test statistics
	n (%)	n (%)	(p-value)
Primary source of income			
Farmer	575(80.6)	138(19.4)	40.953 (<0.001)
Trader	176(94.6)	10(5.4)	
Unemployed	145(95.4)	7(4.6)	
Public servant	75(91.5)	7(8.5)	
House wife	184(86.0)	30(14.0)	

Monthly income (GHC)			
0 – 1000	1080(84.9)	192(15.1)	13.203 (<0.001)
1001 – 2000	75(100.0)	0(0.0)	
Frequency of financial difficulties			
Always	218(88.6)	28(11.4)	127.503 (<0.001)
Often	446(74.8)	150(25.2)	
Sometimes	379(96.4)	14(3.6)	
Rarely	90(100.0)	0(0.0)	
Never	22(100.0)	0(0.0)	
Access to credit for financial support			
Yes	151(89.9)	17(10.1)	2.685 (0.101)
No	1004(85.2)	175(14.8)	
Types of financial support respondent have access to			
Microfinance loans	51(100.0)	0(0.0)	13.119 (0.002)
Family and friends	100(85.5)	17(14.5)	
Impact of income level on ability to provide nutritious food for children			
Severely affects	347(72.6)	131(27.4)	122.514 (<0.001)
Moderately affects	641(91.3)	61(8.7)	
Slightly affects	167(100.0)	0(0.0)	
Frequency of purchasing or receiving protein-rich foods			
Daily	72(100.0)	0(0.0)	47.276 (<0.001)
Weekly	652(81.0)	153(19.0)	
Monthly	431(91.7)	39(8.3)	
Percentage of household income spent on food			
40 to 59 %	688(82.3)	148(17.7)	22.828 (<0.001)
60% or more	467(91.4)	44(8.6)	

3.5. Feeding practices and behaviour factors

The study found that 34.9% of respondents who introduced solid food to their children at the age of 4 months or below had their children more diagnosed of malnutrition as compared to 8.7% of respondents who introduce solid food to their children at the age of 4 to 6 months. The study found statistically significant association between age of children at which they were introduced to solid foods and prevalence of malnutrition ($X^2 = 108.727$, $p<0.001$).

Meanwhile, 18.5% of respondents who had no knowledge nutrition had more children with malnutrition as compared to 13.0% of respondents with knowledge. Respondent's knowledge on nutrition was a significant predictor of malnutrition ($X^2 = 5.718$, $p = 0.020$). It was further revealed that 29.6% of respondents who had no tradition on nutrition had more children diagnosed of malnutrition as compared to 8.3% of respondents with tradition. There was a significant association between respondents' family tradition and prevalence of malnutrition ($X^2 = 100.978$, $p<0.001$).

It was revealed that 20.5% of respondents who had no food available had more children with malnutrition as compared to 9.2% of respondents who had food available. There was a significant association between availability of food and prevalence of malnutrition ($X^2 = 34.810$, $p<0.001$). Again, 25.7% of respondents who had financial constraints had more

of their children diagnosed of malnutrition as compared to 8.0% of respondents with financial challenges. The financial status of respondents had a significance association with prevalence of malnutrition ($X^2 = 78.924$, $p<0.001$).

The study found that 24.5% of respondents who sometimes follow the advice given to them by health professionals on child feeding and nutrition had more children diagnosed of malnutrition as compared to 7.5% of respondents who always follow the advice. Respondents following health professionals' advice on child feeding and nutrition was a significant predictor of malnutrition ($X^2 = 76.023$, $p<0.001$). Table 4 contains more information.

Table 4 Feeding practices and behaviour factors

Variable	**Prevalence of malnutrition**		
	Healthy	Malnourished	Test statistics
	n (%)	n (%)	(p-value)
Age of children at which they were introduced to solid foods			
Less than 4 months	188(65.1)	101(34.9)	108.727 (<0.001)
4 to 6 months	958(91.3)	91(8.7)	
7 to 12 months	9(100.0)	0(0.0)	
Frequency of provision of protein-rich foods			
Daily	191(70.2)	17(7.1)	96.811 (<0.001)
3 to 4 times a week	742(88.8)	94(11.2)	
1 to 2 times a week	222(92.9)	81(29.8)	
Provision of vitamin and mineral-rich foods to children by respondents			
No	736(82.8)	153(17.2)	18.698 (<0.001)
Yes	419(91.5)	39(8.5)	
Respondents' knowledge on nutrition			
No	247(81.5)	56(18.5)	5.718 (0.020)
Yes	908(87.0)	136(13.0)	
Family traditions			
No	267(70.4)	112(29.6)	100.978 (<0.001)
Yes	888(91.7)	80(8.3)	
Availability of food			
No	476(79.5)	123(20.5)	34.810 (<0.001)
Yes	679(90.8)	69(9.2)	
Financial status			
Have challenges	352(74.3)	122(25.7)	78.924 (<0.001)
No challenges	803(92.0)	70(8.0)	
Respondents who follow the advice given to them by professionals on child feeding and nutrition			
Yes, always	751(92.5)	61(7.5)	76.023 (<0.001)
Sometimes	404(75.5)	131(24.5)	

4. Discussion

The prevalence of malnutrition among under-five children observed in this study was 14.3%. Among the malnourished children, 65.6% were underweight, 13.0% were stunted, and 21.4% were wasted. This observation shows that the prevalent type of malnutrition was underweight in the study area. Some of these trends have been seen in some of the developed nations albeit at a lower prevalence rate since health systems are stronger and child nutrition programmes better. An example is a study in the United Kingdom which established that even though the general prevalence of undernutrition was relatively low among children, underweight was also a serious nutritional issue among children in low-income families as a result of socioeconomic inequalities in access to food and dietary diversity (19,20). The fact that the current study is similar to the results of the developed countries can be explained by the fact that socioeconomic disparities affect the nutrition of children regardless of the fact that an advanced health system operated in the setting (21). The prevalence however in the current study seems to be high compared to what is widely reported in the developed countries, maybe because of the varying food security level, maternal education and access of healthcare (22).

The under-five malnutrition is much higher in developing nations especially in Africa. According to a study that was done in Ethiopia, 36.6% of children were stunted, 25.2% were underweight, and 12.2% were wasted, which means that child malnutrition remains an important public health issue in sub-Saharan Africa (11). The prevalence of the types of malnutrition in the Ethiopian study also indicated that underweight and stunting were predominant forms of malnutrition and this is consistent with the current study. The reason behind the similarity could be due to the structural similarity among most African countries such as poverty, poor access to nutritious foods, and child feeding habits (23). These are the causes of poor dietary intake and high susceptibility of children to malnutrition (24).

In Ghana, there are several studies that reported similar findings. Indicatively, a survey that was carried out in the Northern Region of Ghana indicated that underweight was the most prevalent type of malnutrition to the under-five children especially in rural areas where food insecurity and poverty were widespread (17,18). A different study that was carried out in the Upper East Region also revealed the prevalence of the underweight and wasting as primary indicators of child malnutrition, which was mainly elicited by poverty in the household, maternal ignorance in nutrition and failure to feed the children (25). This resemblance of the current research and these Ghanaian ones can be explained by the fact that both societies are characterized by similar socioeconomic status and the feeding culture among the people of the Northern Ghanaian (17,26). All these results indicate that child malnutrition remains a significant problem and the emphasize the need for targeted nutrition interventions.

The paper also found that maternal age was strongly related to prevalence of malnutrition among children under the age of five, where mothers in the age range of 36 to 45 years reported a higher percentage of malnourished children as compared to those of younger age. This observation goes hand in hand with the research that has been carried out in developing nations where maternal age and reproductive behaviour affects the results of child nutrition (27). An example is research done in Kenya that analysed the data on demographic and health surveys and the study concluded that children born of older mothers who had many caregiving duties were prone to malnutrition because of the lack of resources in the households (28). This resemblance of the research with that of the Kenyan research could be due to the fact that the elderly mothers tend to have more members in their household, thereby raising the dependency ratio and burdening the household food supply. As a result, children can be exposed to inadequate food consumption, which leads to the probability of malnutrition.

It was also found that marital status had a significant relation with the child malnutrition status whereby married mothers reported higher malnourished children than unmarried mothers did. This observation, as much as it might sound contradictory, has been observed in certain African scenarios whereby married women are seen to have larger families. The increasing numbers in the household, can put a strain on the food supply available and result in poor nutrition of children (14). Conversely, other research has shown that prevalence rates of malnutrition among children are lower in the United States and other developed countries where financial security is enhanced and caregiving between parents shared (19,29). The disparity between the developed nations and the current research could thus be an indicator of the differences in the socioeconomic organisation and patterns of allocating resources to the family.

Malnutrition was also linked to the number of children in a household, and the mothers who had between four and seven children reported having malnutrition more than mothers with lower numbers of children. This observation is in line with some developing nations. Indicatively, research has shown that high number of children in the family leads to high risk of child malnutrition due to the division of resources including food, time and health facilities among the numerous individuals who depend on them in these sub-Saharan African countries (15,16,30–32). This correlation between the present results and these studies leads to the conclusion that high fertility rates, lack of household

resources are still main contributors to child malnutrition in low-income environments (33). Family size could be a problem since larger families might not be able to provide nutritional requirements of their children, resulting in poor eating habits and high risks of being undernourished.

The education levels of mothers were also observed to be strongly related to the levels of malnutrition. Children whose mothers had never received formal education had higher chances of being malnourished than those with mothers that had received senior high education. This observation is similar to the studies that have been carried out worldwide. Studies carried out in some of the low and middle-income nations have indicated that maternal education is very important in the nutrition of children as women who are educated tend to have knowledge on balanced dieting, hygiene practices as well as proper feeding habits (11,14,25,34). The parallels between the present study and these results could be attributed to the fact that education improves the capacity of mothers to obtain the health information and embrace the proper child-care behaviour. In Ghana, the same was found in works that were carried out in the Northern Region and the Upper West Region where children of mothers with no or minimal education had a higher chance of experiencing malnutrition relative to their counterparts whose mothers are educated (17,25).

The economic factors were also closely related to child malnutrition in this study. The farmers who were mothers had more chances of having children that were malnourished as opposed to the public servants. This observation can be explained by the instability in incomes linked to subsistence agriculture particularly at the rural settings where farming output is seasonal and subject to climatic changes (35). The same results have been observed in various countries in Africa where food insecurity among farming families is usually experienced during the lean seasons (12,20,30,31). The study also established that mothers with lower monthly incomes had their children prone to malnutrition as compared to their counterparts. This observation fits with other studies in Kenya, in which household wealth status has been reported to be a significant predictor of malnutrition in children, child malnutrition being much more prevalent in poorer households in Kenya (36,36,37). The correlation of these results implies the importance of the economic situation in the household in providing children with adequate nutrition.

The paper also found out that malnutrition among children was greatly linked to financial limitations and failure to afford healthful foods. This observation is consistent with the evidence provided all over the world indicating that food insecurity is among the leading causes of childhood malnutrition (38). A systematic review on the determinants of malnutrition in low-and middle-income countries showed that poverty, food insecurity, and the lack of access to nutritious foods are significant factors that predispose children to risk being wasted, stunted, and underweight (37). The fact that the current results are comparable to this international evidence is evidence that economic susceptibility is an important determinant of child nutritional status.

In the present study the infant feeding habits were also found to be significantly related to malnutrition. Those children who received solid foods before the age of four months had high chances of being malnourished than children who received complementary foods between the ages of four and six months. This observation is in line with the advice given by the World Health Organisation, which highlights the importance of breastfeeding a child exclusively during the first six months of life in order to achieve the maximum growth and development (39). Premature feeding on solid foods can lessen the amount of breast milk, and child risk getting infected and deficient in nutrients because of contaminated foods.

Lastly, knowledge on nutrition by the mothers and compliance with the recommendations provided by the health professionals were also significantly linked to child nutritional outcomes. The mothers who lacked adequate nutrition knowledge and those who never reliably took the advice of the health professionals had a higher rate of malnourished children. Other researchers have also reported similar findings in their researches which have been carried out in different African countries with limited maternal nutrition knowledge being reported as a significant factor of child malnutrition (12,15,28,30,31). The similarities indicate that the enhancement of maternal education and nutrition education programmes may be significant in child nutritional outcomes.

5. Conclusion

The general prevalence of malnutrition was moderate, but the results indicate an interconnected system of socioeconomic, cultural and health system issues that perpetuate the issue. The paper suggests the reinforcement of the community-based nutrition education, enhancing the access to affordable healthcare services, and combating the adverse cultural behaviour with specific interventions of behaviour change. The role of health professionals in collaboration with community leaders and policymakers is crucial to overcome the problem of child malnutrition and increase the child health outcomes in the area.

Abbreviations

CHPS	:	Community-based Health Planning and Services
CI	:	Confidence Interval
LMICs	:	Low- and middle-income countries
SD	:	Standard Deviation
SDG	:	Sustainable Development Goal
SPSS	:	Statistical Package for Social Sciences
UDS	:	University for Development Studies

Compliance with ethical standards

Disclosure of conflict of interest

Authors have declared that no competing interests exist.

Statement of ethical approval

Ethical approval was obtained from the University for Development Studies Ethical Review Board (Ref: UDS/001/24)

Data Availability

The dataset used for the current study can be obtained from the corresponding author upon reasonable request.

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