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Factors in Household Settings Linked to the Feeding and Nutritional Status of Children Aged 6-23 Months in Rural Farming Districts, Ghana

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Abstract

The UNICEF Conceptual Framework of Determinants of Undernutrition indicates that most of these determinants that result in malnutrition in children originate at the household level. This study investigates household factors associated with stunting, wasting, underweight, and adherence to a minimum acceptable diet (MAD) among children aged 6 to 23 months in two predominately farming districts in Ghana. This cross-sectional study was conducted among 935 households. Face-to-face interviews were conducted to gather information on household characteristics, anthropometric measurements, and children's dietary intake. Multivariate logistic regression was applied to assess the relationships between household factors and child nutrition outcomes using Stata software (version 15.0). Findings revealed that children residing in a household with a high monthly income between GH¢100 - GH¢300 (AOR= 2.03, 95% CI: 1.29 - 3.23, p= 0.003) and had access to toilet facilities (AOR=1.71, 95% CI: 1.11 - 2.63, p = 0.015) were significantly more likely to receive a MAD. Conversely, children belonging to larger households (7 - 10 members) had a significantly lower likelihood of receiving an adequate MAD (AOR= 0.15, 95% CI: 0.06 -0.39, p<0.001) and were more likely to experience stunting (AOR = 2.25, 95% CI: 1.21 - 4.17, p=0.010). Living in households with small sizes, high monthly income earnings and access to toilet facilities are positive predictors of children receiving MAD. Belonging to households with high-income earnings was protective against wasting and being underweight. Therefore, interventions

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that promote family planning, offering well-paid jobs, and ensuring access to sanitation amenities are critical in rural settings to prevent undernutrition in children.

Abbreviations

24HDR: 24-hour Dietary recall; AOR: Adjusted Odds Ratio; CWC: Child Welfare Clinics; DHMT: District Health Management Teams; FFQ: Food frequency questionnaire; GDHS: Ghana Demographic Health Survey; GHS: Ghana Health Service; GSS: Ghana Statistical Service HAZ: height-for-age; IYCF: Infant and Young Child Feeding KAPND: Kwahu Afram Plains North District; KAPSD: Kwahu Afram Plains South District; LAZ: length-for-age; MAD: Minimum Acceptable Diet; MDD: Minimum Dietary Diversity; MFF: Minimum Feeding Frequency; MMF: Minimum Meal Frequency; UNICEF: The United Nations Children's Fund; WAZ: Weight-for-age z-score; WHO: World Health Organization; WHZ: Weight-for-height z-score; WLZ: Weight-for-length z-score

Introduction

The first two years of life are crucial since this is when improper feeding practices raise the risk of undernutrition in children and cause childhood morbidity and mortality.[1] It is estimated that almost 2 in 3 children aged 6-23 months are not fed foods that supports their rapidly demanding physical development and their ability to learn to their full potentia.[2] In 2020, there were 149.2 million stunted and 45.4 million wasting children under the age of five globally. Worth noting is that the proportion of stunted children is declining in all regions except Africa.[3] Just 50% of the children between the ages of 6 and 24 months receive the bare minimum of meals per day that are appropriate for their age. Once more, only 25% of young children between the ages of 6 and 23 months are given a diet that is at least somewhat varied and includes at least four of the seven food groups each day. Only 16% of children globally are fed a minimally acceptable diet when minimum meal frequency and minimum diet diversity are combined.[2,4]

The situation in Ghana is particularly concerning, as a comparison between the 2008 and 2014 Ghana Demographic and Health Surveys (GDHS) reveals a decline in all Infant and Young Child Feeding (IYCF) indicators. Among children aged 6-23 months, the percentage of those receiving a minimum diverse diet (at least four out of seven food groups) decreased significantly from 69% (GDHS, 2008) to 28% (Ghana Statistical Service (GSS), Ghana Health Service (GHS), 2008). Similarly, the Minimum Acceptable Diet (MAD) indicator saw a substantial drop from 36%5 to 13%.[6] Moreover, while 33.5% of children in urban areas received the recommended minimum diverse diet (MDD), only 23.6% in rural areas met this requirement.[6] This highlights the importance of examining the issue of poor IYCF practices at regional or district levels rather than solely on a national scale. Consequently, there is a need to intensify research efforts to identify factors contributing to this decline in adherence to recommended IYCF practices.

The consequences of undernutrition in these children include impaired brain development, diminished learning outcomes, weakened immune systems, and increased susceptibility to infections.[2,7] Undernourished children face the risk of losing approximately 10% of their potential lifetime earnings, which can adversely affect national productivity.8 This study is grounded in the United Nations Children's Fund (UNICEF) conceptual framework on the determinants of child nutrition.[2] While childhood undernutrition has various contributing factors, the UNICEF framework illustrates that the fundamental determinants are at the household level. This model illustrates how household factors such as food security, access to safe drinking water, economic status, family size, hygiene practices, and sanitation services, among others, influence the dietary intake and nutritional status of children within their immediate home environment.[2] Indeed, several studies have shown that poverty is a barrier to optimal feeding practices for infants and young children, especially in predominantly rural agrarian households.[9-10]

In Ghana, prior studies that examined household socioeconomic factors affecting child feeding and nutritional status relied solely on secondary data[11-13] and often did not include crucial variables like household food distribution, water supply, sanitation conditions, and cooking fuel sources. The dearth

of research on how household socioeconomic characteristics impact the dietary intake and nutritional status of children aged 6–23 months in Ghana represents a gap that this study aims to fill. The findings from this study could offer valuable evidence for Nutrition Program Managers, Nutrition Officers, Community Health Workers, and Policy-Makers to design and implement effective child feeding interventions, particularly targeting disadvantaged households at the community level. The aim of this research was to investigate household factors associated with stunting, wasting, underweight, and adherence to a minimum acceptable diet (MAD) among children aged 6 to 23 months, in two predominately farming districts from Ghana.

Materials and Methods

Study Settings and Participants

The study used a community-focused cross-sectional approach in Ghana's Kwahu Afram Plains North and South Districts, known for crop farming and fishing. Healthcare infrastructure varies, with longer distances to central facilities. These districts were chosen for having the highest underweight children prevalence in 2017 and 2018 among 26 districts in the Eastern Region.

Study Population

In all, 935 households with children under two years old were chosen at random from 21 Child Welfare Clinics (CWCs) to take part in the study.

Sample Size and Sampling Method

A study randomly selected 935 households with children aged 6-23 months from 21 Child Welfare Centers in two districts based on an estimated average underweight prevalence of 19.2% for the two districts. The sample size was determined using a formula $n = Z2*p*(1-p)/e^2$, where Z represents the confidence level, p signifies the proportion of underweight children in the two districts, and e denotes the precision.[14] The initial estimation yielded a minimum sample size of 765 children which was increased to 950 for contingencies.

Ethical Considerations and Participant Approval

The study obtained ethical approval from two review boards, including the Dodowa Health Research Centre (DHRCIRB/04/02/18) and the University of Cape Coast (UCCIRB/CHLS/2018/02). Permission was also sought from relevant health authorities and facility matrons. All study participants provided their consent, either by signing an informed consent form or using a thumbprint. To safeguard the confidentiality of respondents' data, each participant was assigned a unique identifier instead of using their names. The study followed ethical guidelines set by the Ghana Health Service and the University of Cape Coast, as well as the Helsinki Declaration for research involving human subjects.

Data Collection Tools and Procedure

Twelve (12) community health nurses collected data using structured interviews conducted with mothers or household heads of selected children, either at Child Welfare Clinics or their residences. The questionnaire, initially in English, was translated into Ewe and Akan for linguistic accessibility and underwent a back-translation for consistency. The questionnaire had two sections: Section A gathered socio-demographic data about households, covering household head, size, rooms, water source, toilet facilities, and monthly income estimates. Section B focused on feeding practices within the children's households, asking about food sources, responsible individuals, budget allocation for food, and decision-makers for daily food preparation. This approach ensured comprehensive data collection for the study.

Dietary Assessment of Children

Child dietary intake data was collected using a 24-hour dietary recall (24HDR) questionnaire and a seven-day food group frequency questionnaire (FGFQ). The seven food groups were used to calculate dietary diversity scores (DDS), as mothers reported their child's consumption during the week leading up to the data collection. Additionally, information about the frequency of meals consumed by each child was employed to determine their minimum feeding frequency scores (FFS).

Anthropometric Assessment of Children

Children's nutritional status was evaluated through anthropometric indicators, including Height-for-age, weight-for-age, and weight-for-height z-scores using the WHO 2006 growth standards.[15] Weight was measured using a precise beam balance, with children wearing light clothing and no shoes. Weighing scales were calibrated daily with 10kg and 25kg weights for accuracy. Height was measured with a vertical scale for upright children and an

infantometer for those unable to stand. Both height and length measurements were recorded to the nearest 0.1cm. To ensure accuracy, measurements of each child's weight and height/length were made twice, and the averages were noted.

Data Quality Assurance

To ensure data accuracy and reliability, the research team employed rigorous measures. They regularly calibrated weighing scales with certified weights, evaluated data collection tools on 14 mothers for clarity, and trained field assistants and enumerators. Daily data checks were conducted by the team, and any issues arising from completed questionnaires, such as ambiguities, incompleteness, lack of clarity, or misunderstandings, were addressed promptly on the same day before the next day's activities commenced. On-site visits by the principal investigator and supervisors ensured proper questionnaire completion and accurate anthropometric measurements. These efforts were aimed at maintaining data quality, comprehensiveness, precision, and uniformity throughout the data collection process.

Variables of the Study

Dependent variables

The Study Assessed Several Dependent Variables, Including:

1. Dietary Diversity Score (DDS) with sub-categories: poor, average, and good.
2. Minimum Acceptable Diet (MAD) with sub-categories: adequate and inadequate.
3. Anthropometric Indicators, which encompassed the following:

- o Height-for-age z-score, indicating stunting or non-stunting.
- o Weight-for-age z-score, indicating underweight or non-underweight status.
- o Weight-for-height z-score, indicating wasted or non-wasted status.

Independent Variables

Variables related to households encompassed the household's leader, the number of occupants in the household, the approximate monthly income of the household, the count of rooms utilized by the household, the construction materials utilized for the dwelling, the household's economic status index, the primary source of potable water, accessibility to toilet facilities, the type of toilet facility in use, the primary fuel source for cooking, and the existence of electricity within the dwelling(residence).

Coding of Variables

Coding of socio-Economic Status (SES)

The study assessed participants' socioeconomic status using Principal Component Analysis (PCA) to create a wealth index following the methodology outlined by Vyas and Kumaranayake (2006).[16] This index considered household assets, building materials, and ownership of domestic animals. As is customary in prior research, participants were divided into three socioeconomic status (SES) groups: low, middle, and high. The lowest 40% of participants were placed in the low SES category, followed by middle SES at 40% and high SES at 20%.[17-19]

Coding of Access to Toilet Facility

Household toilet data was categorized as improved and unimproved using WHO and UNICEF Joint Monitoring Programme (JMP) definitions.[20]

Statistical Analysis

The study analyzed children's socio-demographic characteristics and their dietary diversity score (DDS), minimum acceptable diet (MAD) status, and anthropometric indicators. Bivariate and multivariable logistic regression models were used to explore the relationship between household factors and these outcomes. Significant factors from the bivariate models were included in the multivariable models. Significance was determined by a two-tailed test with a p-value threshold of 0.05. The analysis was conducted using Stata version 15.0 software.

Results and Discussion

Results

Socio-Demographic characteristics of Households of Children

Table 1 indicates that a significant number of children came from households with 5-6 members (36.0%), no property ownership (64.1%), and monthly incomes of GH¢100-300 (40.2%). Most had access to toilets (57.4%) and used firewood for cooking (70.2%).

Table 1: Household Characteristics of the Children

Variable	Frequency N=935	Percentage (%)
Household Head		
Father	682	72.9
Mother	75	8.0
Elder family member[a]	151	16.2
Others	27	2.9
Household Size		
<3	28	3.0
3-4	77	8.2
5-6	337	36.0
7-8	271	29.0
9-10	121	13.0
>10	101	10.8
Number of rooms occupied by household		
1-2	810	86.6
3-4	113	12.1
5-6	12	1.3
Ownership of current place of dwelling(house)		
Yes	336	35.9
No	599	64.1
Building material used for house		
Cement blocks	251	26.8
Wood	24	2.6
Mud, plastered with cement	561	60.0
Baked bricks	54	5.8
Others	45	4.8
Estimated average monthly household income		
Less than GH₵100	367	39.3
Between GH₵100 - GH₵300	376	40.2
Between GH₵301 - GH₵500	131	14.0
Between GH₵501 - GH₵700	27	2.9
Between GH₵701 - GH₵900	13	1.4
More than GH₵900	21	2.2
Socio-economic status		
Poor	374	40.0
Middle	374	40.0
Rich	187	20.0
Possession score		
Low	454	48.5
Average	400	42.8
Above average	73	7.8
High	8	0.9
Main source of drinking water		
River Afram	308	32.9
Volta lake	103	11.0
Water tap	140	15.0
Borehole	361	38.6

Unprotected well	15	1.6
Protected well	8	0.9
Had water from source in the past two weeks		
Yes	812	86.8
No	123	13.2
Type of treatment to water before drinking		
No treatment	711	76.0
Boiling	81	8.7
Use traditional herbs	17	1.8
Use chemicals	17	1.8
Filters/Sieves	102	11.0
Decant	7	0.7
Access to toilet facility		
Yes	537	57.4
No	398	42.6
Type of toilet facilityb		
Improved	229	24.5
Unimproved	706	75.5
Main type of fuel used in cooking		
Gas	43	4.6
Electricity	11	1.2
Kerosene	13	1.4
Firewood	656	70.2
Charcoal	212	22.6
Presence of electricity in house		
Yes	413	44.2
No	522	55.8

[a]Elder family members include uncles and grandparents; [b]improved toilet: ventilated improved pit latrine, flush toilet/water closet, Unimproved toilet: bucket, traditional pit latrine, bush, open field, near the river/ lake, behind the house

Table 2: Feeding in the Households of the Children

Variable	Frequency N=935	Percentage (%)
Main means of obtaining food in the household		
Mainly farming	679	72.6
Mainly buying	210	22.5
Mainly Food aid/donation	10	1.1
Others	36	3.8
Person responsible for providing food for the household		
Father/husband	699	74.8
Mother/wife	165	17.6
Grandparent	45	4.8
Other relatives	26	2.8
Estimated percentage of household income allocated to food		
Largest percentage (>50%)	201	21.5
Medium percentage (50%)	314	33.6
Smallest percentage (<50%)	147	15.7
No specific allocation	175	18.7

Do not know	98	10.5
Person who decides how family income should be used		
Father/husband	729	78.0
Mother/wife	102	10.9

Feeding in Households of the Children

Table 2 provides information on eating practices in the children's homes. The majority of households (72.6%) relied primarily on their own farm for their sustenance. Father/husband (74.8%) formed the highest proportion of persons responsible for providing food in the household. While the fathers (78%) made the majority of decisions regarding the family's spending, about 55% of them spent at least half of their income on food.

Table 3: Information on Feeding Indicators of Children

Feeding Indicators	Frequency N=935	Percentage (%)
Currently breastfeeding		
Yes	848	90.7
No	87	9.3
Dietary Diversity Score (DDS)		
Poor	246	36.5
Average	178	26.5
Good	249	37.0
Minimum Dietary Diversity Score		
Adequate	249	37.0
Inadequate	424	63.0
Food Group Frequency Score (FGFS), (Past 7 days)		
Poor	172	25.6
Average	293	43.5
Good	208	30.9
Meal Frequency		
Poor	19	13.5
Average	181	26.9
Good	401	59.6
Minimum Meal Frequency		
Adequate	401	59.6
Inadequate	272	40.4
Minimum Acceptable Diet		
Adequate	149	22.1
Inadequate	524	77.9

The majority of the children (63.0%) had inadequate minimum dietary diversity score and unsatisfactory adequate diet respectively (Table 3). A high proportion (77.9%) of the children did not receive the minimum acceptable diet (Table 3).

Association between Household-Related factors and DDS (Feeding Indicator)

Table 4 displays the findings of the multivariate multinomial regression analysis investigating the relationship between household factors and the Dietary Diversity Score (DDS) of children as the outcome. Household size, dwelling ownership, monthly income, water source, and toilet access were the key factors associated with children's DDS. Children in two- to four-person households had a 70% chance of having an excellent DDS, 79% and 96% lower in households with 5-6 (AOR= 0.30, 95% CI: 0.15 - 0.61, p =0.001), 7-10 (AOR= 0.21, 95% CI:

0.10 - 0.41, p <0.001) and > 10 (AOR= 0.04, 95% CI: 0.02 - 0.12, p <0.001) members respectively.

Children in households with monthly income > GH¢500.00 were 4.46 times (AOR= 4.46, 95% CI: 1.77 - 11.28, p =0.002) more likely to have a good DDS. Access to a toilet facility increased the likelihood of having a good DDS by 2.55 times (AOR = 2.55, 95% CI: 1.58 - 4.12, p <0.001). Children benefited from parents owning their dwelling, with 2.23 times higher odds of having a good DDS (AOR=2.23; 95% CI:1.44 - 3.45, p<0.001). Improved water sources increased the odds of an average DDS by 55% (AOR =1.55, 95% CI = 1.01 - 2.36, p= 0.044). In summary, household factors like size, income, ownership, access to facilities, and water sources significantly impact children's dietary diversity.

Table 4: Multivariate multinomial logistic regression model for the association between household-related factors and Dietary Diversity Score

	Average DDS vs. Poor DDS		Good DDS vs. Poor DDS	
Variable	**AOR (95% CI)**	**p-value**	**AOR (95% CI)**	**p-value**
Household Size				
2-4	1		1	
5-6	1.07 (0.44 - 2.63)	0.879	0.30 (0.15 - 0.61)	0.001
7-10	1.23 (0.52 - 2.94)	0.637	0.21 (0.10 - 0.41)	<0.001
>10	0.56 (0.20 - 1.53)	0.256	0.04 (0.02 - 0.12)	<0.001
Ownership of current place of dwelling(house)				
No	1		1	
Yes	2.35 (1.51 - 3.67)	<0.001	2.23 (1.44 - 3.45)	<0.001
Estimate of average monthly household income				
Less than GH¢100	1		1	
Between GH¢100 - GH¢300	1.85 (1.15 - 2.96)	0.011	2.16 (1.36 - 3.43)	0.001
Between GH¢301 - GH¢500	2.50 (1.32 - 4.73)	0.005	1.88 (0.99 - 3.55)	0.052
More than GH¢500	2.57 (0.95 - 6.91)	0.062	4.46 (1.77 -11.28)	0.002
Socio-economic status				
Low	1		1	
Middle	0.89 (0.53 - 1.49)	0.651	1.39 (0.83 - 2.35)	0.210
High	1.11 (0.44 - 2.81)	0.821	2.21 (0.92 - 5.34)	0.077
Main source of drinking water				
Unimproved source	1		1	
Improved source	1.55 (1.01 - 2.36)	0.044	1.40 (0.92 - 2.11)	0.113
Access to toilet facility				
No	1		1	
Yes	1.28 (0.79 - 2.09)	0.321	2.55 (1.58 - 4.12)	<0.001
Type of toilet facility				
Unimproved	1		1	
Improved	1.17 (0.62 - 2.23)	0.629	0.82 (0.45 - 1.51)	0.528
Main type of fuel used in cooking				
Gas/ Electricity/ Kerosene	1		1	
Firewood	0.63 (0.24 - 1.69)	0.362	0.53 (0.21 - 1.33)	0.176
Charcoal	0.47 (0.18 - 1.25)	0.130	0.58 (0.24 - 1.42)	0.236
Presence of electricity in house				
No	1		1	
Yes	1.27 (0.82 - 1.99)	0.287	1.35 (0.87 - 2.09)	0.184

Association between Household-Related factors and MAD (Feeding Indicator)

Table 5 displays the outcomes of both univariate and multivariate binary logistic regressions exploring the association between household factors and MAD (outcome). In the multivariate analysis, children who received sufficient MAD were significantly less likely to be in households with 5-6 members (65% less likely; AOR=0.35, 95% CI: 0.20 - 0.63, p<0.001), 7-10 members (72% less likely; AOR=0.28, 95% CI: 0.16 - 0.50, p<0.001), and over 10 members (85% less likely; AOR=0.15, 95% CI: 0.06 - 0.39, p<0.001) when compared to households with 2 to 4 members. Children in households earning between GH¢100 and GH¢300 were over twice as likely to receive adequate MAD as those with an income below GH¢100 (AOR=2.03, 95% CI: 1.29 - 3.23, p = 0.003). Additionally, children in households with access to a toilet facility had an increased likelihood of receiving MAD, while those in households using charcoal as their primary cooking fuel were 51% less likely to receive adequate MAD compared to those using gas, electricity, or kerosene (AOR= 0.49, 95% CI =0.24 - 0.99, p = 0.048).

Table 5: Logistic regression model for the association between household-related factors and Minimum Acceptable Diet

	Bivariate analysis		Multivariate analysis	
Variable	**AOR (95% CI)**	**p-value**	**AOR (95% CI)**	**p-value**
Household Head				
Father	1			
Mother	1.01 (0.55 - 1.87)	0.968		
Elder family member	0.82 (0.48 - 1.40)	0.474		
Others	0.48 (0.11 - 2.15)	0.339		
Household Size§				
2-4	1		1	
5-6	0.39 (0.23 - 0.67)	0.001	0.35 (0.20 - 0.63)	<0.0017-
10	0.33 (0.20 - 0.56)	<0.001	0.28 (0.16 - 0.50)	<0.001
>10	0.15 (0.06 -0.37)	<0.001	0.15 (0.06 -0.39)	<0.001
Number of rooms occupied by household				
1 room	1			
2 rooms	1.20 (0.81 - 1.78)	0.375		
More than 2 rooms	0.94 (0.54 - 1.66)	0.834		
Ownership of current place of dwelling(house)				
No	1			
Yes	1.39 (0.96 - 2.01)	0.081		
Estimate of monthly household income§				
Less than GH¢100	1		1	
Between GH¢100 - GH¢300	1.56 (1.02 - 2.39)	0.039	2.03 (1.29 - 3.23)	0.003
Between GH¢301 - GH¢500	1.28 (0.72 - 2.26)	0.401	1.30 (0.70 - 2.42)	0.404
More than GH¢500	1.94 (0.98 - 3.83)	0.058	1.91 (0.88 - 4.17)	0.103
Socio-economic status§				
Poor	1		1	
Middle	1.46 (0.95 - 2.24)	0.088	1.35 (0.83 - 2.18)	0.226
Rich	1.85 (1.13 - 3.02)	0.014	1.22 (0.59 - 2.53)	0.593
Main source of drinking water				
Unimproved source	1			
Improved source	1.32 (0.92 - 1.93)	0.132		

Access to toilet facility§				
No	1		1	
Yes	1.75 (1.19 - 2.58)	0.004	1.71 (1.11 - 2.63)	0.015
Type of toilet facility				
Unimproved	1			
Improved	1.22 (0.81 - 1.85)	0.335		
Main type of fuel used in cooking§				
Gas/ Electricity/ Kerosene	1		1	
Firewood	0.40 (0.22 - 0.71)	0.002	0.49 (0.24 - 1.02)	0.057
Charcoal	0.52 (0.27 - 0.99)	0.046	0.49 (0.24 -0.99)	0.048
Presence of electricity in house				
No	1			
Yes	1.30 (0.84 - 1.73)	0.318		
Main means of obtaining food as a household				
Mainly farming	1			
Mainly buying	1.50 (0.99 - 2.26)	0.057		
Estimated percentage of household income that is allocated to food				
Largest percentage (>50%)	1			
Medium percentage (50%)	0.80 (0.49 - 1.30)	0.365		
Smallest percentage (<50%)	0.76 (0.39 - 1.48)	0.417		
No specific allocation	0.64 (0.36 - 1.14)	0.130		
Do not know	1.36 (0.74 - 2.52)	0.321		
Person who decides how family income should be used§				
Father/husband	1		1	
Mother/wife	1.50 (0.88 - 2.55)	0.134	1.53 (0.86 - 2.70)	0.146
Others	0.44 (0.20 -0.94)	0.035	0.46 (0.21 - 1.01)	0.053
Person who decides food to be cooked each day in the household				
Father/husband	1			
Mother/wife	1.14 (0.76 - 1.71)	0.513		
Others	1.01 (0.55 - 1.85)	0.968		

Association between household factors and nutritional status of children (Anthropometric Indicators)

The prevalence rates for stunting, wasting, and underweight were approximately 20.4%, 19.1%, and 29.5%, respectively.

The results of a multivariate binary logistic regression in Table 6 indicate that children in households with 7 to 10 members are 2.25 times more likely to be stunted compared to those in households with 2 to 4 members (AOR = 2.25, 95% CI: 1.21 - 4.17, p=0.010). Children in households with monthly incomes between GH¢301 and GH¢500 are 43% less likely to be wasted, and 38% less likely to be underweight compared to those in households with incomes below GH¢100 (AOR = 0.57, 95% CI: 0.31 - 1.03, p = 0.041). Wasting is 57% less likely in wealthier households (AOR = 0.43, 95% CI: 0.25 - 0.74, p = 0.002), and underweight children are 43% less likely to be in richer households compared to poorer ones (AOR = 0.57, 95% CI: 0.37 - 0.88, p = 0.011). These findings suggest a significant association between household factors and anthropometric feeding indicators.

Table 6: Multivariate Logistic regression model for the association between household factors and Anthropometric Indicators

Variable	Multivariate analysis (HAZ) AOR (95% CI)	p-value	Multivariate analysis (WHZ) AOR (95% CI)	p-value	Multivariate analysis (WAZ) AOR (95% CI)	p-value
Household Size						
2-4	1					
5-6	1.64 (0.88 -3.09)	0.122				
7-10	2.25 (1.21 - 4.17)	0.010§				
>10	1.31 (0.60 - 2.89)	0.496				
Estimate of average monthly household income§						
Less than GH¢100	1		1			
Between GH¢100 - GH¢300	0.77 (0.54 - 1.10)	0.149	0.72 (0.50 - 1.03)	0.074	0.59 (0.43 - 0.81)	0.001§
Between GH¢301 - GH¢500	0.58 (0.33 - 1.01)	0.054	0.57 (0.31 - 1.03)	0.041§	0.62 (0.39 - 0.99)	0.045§
More than GH¢500	0.57 (0.25 - 1.30)	0.180	1.47 (0.74 - 2.95)	0.273	0.86 (0.46 - 1.63)	0653
Socio-economic status						
Poor	1		1		1	
Middle	1.08 (0.74 - 1.58)	0.681	0.81 (0.57 - 1.16)	0.247	0.83 (0.60 - 1.13)	0.232
Rich	0.83 (0.46 - 1.52)	0.549	0.43 (0.25 - 0.74)	0.002§	0.57 (0.37 -0.88)	0.011§
Main source of drinking water						
Unimproved source	1					
Improved source	0.72 (0.51 - 1.01)	0.057				
Type of toilet facility						
Unimproved	1					
Improved	0.82 (0.51 - 1.32)	0.421				

§ Overall p-value < 0.05; HAZ, WHZ and WAZ represents stunting, wasting and underweight in children respectively.

Discussion

This study aimed to assess household feeding practices and their impact on Infant and Young Child Feeding (IYCF) indicators and child nutrition among 6 to 23-month-old children. The research revealed that in the studied population, husbands predominantly made decisions about household income allocation, aligning with similar studies in Nepal and Ethiopia where majority of women had little influence over decisions regarding the purchase of food.[21-22] This finding suggests that, in this community, women were often seen as responsible for food preparation and child feeding, while men held the roles of providers and decision-makers regarding daily food choices. Because most mothers are financially dependent on their husbands, they may be less able to influence infant feeding practices or question inappropriate advice, which may contribute to this gender-based distribution of responsibilities.

Empowering women to make decisions on household feeding in low-resource settings has been shown to prioritize child nutrition by ensuring diverse and nutritious foods are provided.[23-25] This conclusion suggests that children in particular may suffer when a husband devotes a significant amount of the household's money to expenses other than providing for their nutritional needs. Some research supports this theory by showing that the individual who makes all of the decisions about how much of the household budget should go toward food is one of the factors determining the nutritional status of children.[26-27] The study shows that most children, particularly in rural farming households relying solely on farm crops, do not meet the minimum dietary requirements. This emphasizes the importance of nutrition education in such settings, encouraging diverse food consumption beyond starchy staples to support children's growth and promoting nutrient-dense agricultural products for a balanced diet.

Previous research in Ethiopia,[28] the Philippines[29] and Tanzania[30] indicated that, meeting the recommended DDS and MAD of children was inversely correlated with household size. The presence of more family members may strain resources and reduce the likelihood of obtaining a diverse range of food items from different groups to adequately feed everyone, particularly in rural settings. This can lead to lower household dietary diversity scores as reported in other related studies.[31-32] The results, however, are in conflict with those of studies conducted in Ghana by Saaka (2017)[33] and Bangladesh by Harris-Fry (2015),[34] which revealed no significant correlation between household size and children's dietary variety scores. The disparity in results could be because, in these previous studies, children with high dietary diversity scores came from households with diverse agricultural practices, including vegetable cultivation and livestock raising, providing a wide range of homegrown food sources. As a result, their dietary diversity scores improved even in larger families.

The findings also indicated that higher household income is associated with an increased likelihood of children receiving balanced meals, as supported by previous research.[31- 32, 35] Conversely, low-income households tend to provide less diverse and lower-quality diets to their children, impacting their nutritional intake. Household income serves as a measure of socioeconomic status, affecting access to nutritious food. This emphasizes the need to empower women, as the study found that a significant percentage of mothers received inadequate compensation or nonmonetary rewards for their work.

The study's findings indicate that households with access to toilet facilities are more likely to feed their children with a diverse diet, including meals from various food groups. This access to improved toilets can serve as an indicator of a household's socio-economic status and income level.[36] This study revealed a significant association ($p < 0.001$) between socio-economic status and toilet facility ownership. About 68% of households in higher socio-economic groups had improved toilets, while only 2.41% in lower socioeconomic groups did. This suggests that children in higher socio-economic households, with better access to toilets, were more likely to receive frequent and diverse meals, positively impacting their nutritional status.

The study findings suggest that parental homeownership is linked to better dietary diversity (DDS) in children. While the impact of household asset ownership on child nutrition is not well-understood as assessed by Mosites (2015),[37] owning one's dwelling can indicate higher income,

financial access, and independence. Families with higher incomes are more likely to build their homes, providing nutritious meals for their children. Previous studies also found a positive connection between asset ownership, like farmland, and children's dietary diversity.[31, 38]

The study found that the tendency to provide children with diverse and nutritious meals is influenced by the source of drinking water, either improved or unimproved. Access to safe drinking water is associated with higher dietary diversity (DDS) and improved nutritional status for children, as reported in previous studies.[39, 40] Improved water sources may indicate higher household income, enabling the acquisition of a variety of foods from different groups for children. Moreover, having convenient access to treated water at home saves time and resources that would otherwise be spent fetching water from distant sources, particularly in rural areas, where women often have to walk long distances. This not only wastes their precious time but also squanders valuable opportunities that could have been utilized for income-generating activities, enhancing their livelihoods and nutrition.

Research in Africa and Asia reveals that women responsible for fetching water encounter difficulties in preparing nutritious meals due to the time and effort involved.41 - 43 Rural women who carry heavy water containers often opt for quicker, less diverse, and less nutritious meals for their children, potentially lacking essential proteins and micronutrients.

The findings revealed that the type of fuel used for cooking is linked to the likelihood of children receiving adequate meals. Households with higher incomes tend to use clean fuels like electricity, LPG, or kerosene, making cooking more efficient and allowing more time for childcare. This aligns with Rao and Pachauri's (2017)[44] findings that clean fuels can free up women's time spent on collecting firewood, which could be channeled into other productive activities such as cooking often, feeding, and caring for children. Additionally, larger household sizes are associated with child stunting, as found in previous studies in Pakistan,[45] Rwanda,[46] and Ethiopia.[47] This might be due to economic strain in larger families, making it harder to provide sufficient nutrition. More household members can lead to resource scarcity, especially in food and healthcare, resulting in child growth issues. The choice of cooking fuel and household size play significant roles in children's nutritional outcomes. Higher household income reduces the risk of underweight and wasting in children, as confirmed by a large-scale analysis across 35 low- and middle-income countries.[48] This is likely due to increased access to nutritious foods in wealthier households. To address child malnutrition in rural communities, empowering impoverished families, possibly through maternal employment, is crucial for ensuring children's nutritional needs are met.

This study has some limitations. It's cross-sectional, making it difficult to establish causal relationships. It also primarily involved children who accessed growth monitoring services at clinics, limiting its representativeness to the entire population. Dietary assessments using recall methods may be prone to recall bias. However, the study focused on a relatively unstudied age group (under-two's) and included important household variables that prior Ghanaian studies often omitted, such as access to improved water, toilets, income, and cooking fuel sources.

To prevent childhood malnutrition, Community Health Workers and Volunteers must promote family planning and conduct regular nutrition surveillance surveys in large households with low income, inadequate sanitation, and water access. Identifying vulnerable children and enrolling them in Targeted Supplementary Feeding programs can help improve their nutritional status, reducing the risk of stunting and underweight issues.

Conclusion

High-income households with smaller household sizes, improved sanitation, clean water, and cooking fuel help protect children from stunting, wasting, and underweight, aligning with UNICEF's Child Nutrition framework.

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Conflict of Interest

The author(s) do not have any conflict of interest.

Data Availability Statement

The datasets produced and/or examined in this study are not publicly accessible because they contain sensitive information related to women's autonomy within the participants' cultural context, which could jeopardize the privacy and confidentiality of the mothers involved. However, they can be obtained from the corresponding author (cbuxton@ucc.edu.gh) upon request.

Ethics Statement

This research did not involve human participants, animal subjects, or any material that requires ethical approval.

Informed Consent Statement

This study did not involve human participants, and therefore, informed consent was not required.

Clinical Trial Registration

This research does not involve any clinical trials.

Author Contributions

- **Christiana Nsiah-Asamoah:** Conceptualization, Methodology, Data Collection, Project Administration, Funding Acquisition, Resources, Writing – Original Draft.
- **George Adjei:** Data Collection, Analysis, Writing – Review & Editing
- **Samuel Agblorti:** Conceptualization, Methodology, Visualization, Supervision, Writing – Review & Editing.
- **David Teye Doku:** Conceptualization, Methodology, Visualization, Supervision, Writing – Review & Editing.

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