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Determinants of minimum meal frequency among children in Kumbungu District of Ghana: a cross-sectional study

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Abstract

Background Child malnutrition is a public health concern in developing countries including Ghana. Ensuring a child's minimum meal frequency is met is critical for preventing malnutrition and improving nutrient intake. However, minimum meal frequency and its context-specific determinants among children in the Kumbungu District of Ghana are yet to be investigated. This study therefore examined minimum meal frequency and its determinants among children aged 6 to 23 months in Kumbungu District, Ghana.

Methods An analytical cross-sectional study design was used and involved 395 mother-child pairs selected through systematic random sampling. A semi-structured questionnaire was used to obtain respondents' socio-demographic characteristics, maternal nutritional knowledge and feeding practices and anthropometric information of children. Multivariate binary logistic regression analysis was used to determine the determinants of minimum meal frequency.

Results Of the 395 children studied, about 51.4% of them were females, with about 25.8% and 74.2% of them aged 6–8 months and 9–23 months respectively. About 72.4% of the children met the minimum meal frequency. Children aged 9–23 months were 3.48 times more likely to meet the minimum meal frequency as compared to children aged 6–8 months [Adjusted odds ratio (AOR): 3.48, 95% CI: 1.33–9.03, $p = 0.011$]. Moreover, children who met the minimum dietary diversity were 46.32 times more likely to achieve the minimum meal frequency as compared to those who did not meet the minimum dietary diversity [AOR: 46.32, 95% CI: 17.78–120.64, $p < 0.001$].

Conclusions The proportion of children who received minimum meal frequency was high. Child age and minimum dietary diversity were significant determinants of minimum meal frequency. To achieve optimal minimum meal frequency for all children, mothers should be encouraged to practice age appropriate meal frequency, particularly, those with children aged 6–8 months as well as feed their children diversified diets.

Keywords Minimum meal frequency, Nutrition, Children, Ghana

Background

Child undernutrition, especially stunting is a public health concern globally. Globally in 2022, 148.1 million (23.3%), 45 million (6.8%) and 37 million (5.6%) children under five years were stunted, wasted and underweight respectively [1]. The majority of these malnourished children reside in developing countries including Ghana

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[2]. The rates of stunting, wasting and underweight among under-five children are 18.0%, 6.0% and 12.0% respectively in Ghana [3]. In the Kumbungu District, the malnutrition prevalence exceeds that of the National prevalence, as stunting, wasting and underweight rates stand at 21.9%, 19.9% and 20.8% respectively in the District [4]. These malnutrition cases largely occur between the ages of 6–23 months because of rapid growth and increased risk of infection among children during this period [5]. It is estimated that, nearly 70% of the stunting cases occur in this age range [5]. Malnutrition results in morbidity, mortality, delayed mental and motor development in children [6]. Nearly half of child deaths is attributed to malnutrition [7].

The primary cause of undernutrition among children aged 6–23 months is inadequate nutrient intake resulting mainly from sub-optimal complementary feeding practices, particularly inappropriate minimum meal frequency [8, 9]. Minimum meal frequency measures the percentage of breastfed and non-breastfed children aged 6 to 23 months who had solid, semisolid, or soft foods (plus milk feeds for non-breastfed children) the minimum number of times or more during the preceding day [10]. Feeding meals frequently as recommended increases a child's overall energy and micronutrient intake, thereby preventing growth faltering and malnutrition [9]. Hence, minimum meal frequency is a major determinant of malnutrition among children aged 6 to 23 months [11]. However, only a few children are fed the minimum number of meals per day [12]. It is estimated that more than half of children aged 6 to 23 months do not receive the minimum number of meals for their age per day [12]. According to the Ghana Demographic Health survey, 45% of children aged between 6 and 23 months in Ghana receive the minimum number of meals per day in Ghana [13]. In Northern Ghana, 57.3% of children aged between 6 and 23 months receive the minimum number of meals per day [14]. Age of child, mother's educational status, breastfeeding status, postnatal visits and birth order of index child are some of the determinants of minimum meal frequency identified in other settings [11, 15, 16].

Despite the high prevalence rate of child malnutri-

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A provision of 5% was made for incomplete questionnaires and non-response. Hence, the sample size used for the study was 395.

Variables and their measurement

The dependent variable of the study was minimum meal frequency. The independent variables were maternal characteristics (age, marital status, household monthly income, educational level, employment status, religion, birth interval, place of delivery, antenatal care visits, post-natal care visits, breastfeeding status, timely initiation of breastfeeding, exclusive breastfeeding and nutritional knowledge) and child characteristics (age, sex, co-morbidity status, nutritional status and minimum dietary diversity). The independent (exposure) variables for the study were selected based on literature review.

Regarding data collection, a pre-tested semi-structured questionnaire was used to document participants' information on socio-demographic characteristics (age, gender, marital status, household monthly income, ethnicity, religion, parity of mother, birth interval), clinical factors (place of delivery, antenatal care visits and post-natal care visits) and child feeding practices. The pre-testing of the questionnaire was conducted by administering the questionnaires to 40 mothers/caregivers (10% of sample size) with children aged 6 to 23 months in the study area, which aided in refining the questions for better understanding by the participants. These participants did not partake in the study.

Maternal knowledge on infant and young child feeding practices was assessed with a questionnaire used in a previous similar study [11]. The knowledge questionnaire consists of ten yes-or-no questions in statement form: (1) Heard about importance of feeding diversified foods to a 6–23 month child, (2) Complementary feeding should start at 6 months of child age, (3) A 6–23 month child should eat five or more food groups in a day, (4) Giving meat is advisable for 6–23 month child, (5) One cause of childhood malnutrition is not having diversified foods, (6) Didn't feel hungry doesn't mean that the nutritional need of a child is fulfilled, (7) One cause of childhood malnutrition is not starting complementary feeding at 6 months of child age, (8) Feeding only animal products is not enough/adequate for 6–23 month child, (9) A 6–23 month child should be fed organ meat, like liver, kidney and (10) A 6–23 month child should be fed egg. Each correct answer (yes) was assigned 1 point, while any wrong answer was assigned 0. Mothers who got a score of 7 and above, out of the ten knowledge questions were deemed to have high level of knowledge [11]. Mothers who scored 6 and below, out of the ten knowledge questions were classified as having low level of knowledge [11].

With regards to minimum meal frequency, each mother was made to recall the number of times child ate solid, semisolid, or soft foods (plus milk feeds for non-breastfed children) during the entire previous day [10, 11]. Minimum meal frequency was set at ≥ 2 times for breastfed children aged 6 to 8 months, ≥ 3 times for breastfed children aged 9 to 23 months, and ≥ 4 times for non-breastfed children aged 6 to 23 months [10, 11].

Dietary diversity score (DDS) of participants was also assessed using a 24-hour dietary recall, which was repeated in 20.0% of random sub-sample for usual intake [18–22]. The respondents were asked to recall all foods eaten and beverages taken by children in the previous twenty-four hours prior to the interview. The DDS was assessed by assigning a score of 1 to each food group consumed and a score of 0 to each food group not consumed in a 24-hour period prior to the survey and a sum total of all scores was computed. The 8 food groups recommended by WHO/UNICEF [23] were considered in this study: Breast milk; grains, roots and tubers; legumes, nuts and seeds; dairy products; flesh foods, eggs; vitamin A-rich fruits and vegetables and other fruits and vegetables. Consequently, the minimum possible DDS score was 0 (no food group consumed) and the maximum possible DDS score was 8 (all food groups consumed). Using dietary diversity score of 5 (minimum dietary diversity score) as cut-off point, a child was defined as having “poor dietary diversity” if he/she consumed less than 5 food groups while having “good dietary diversity” if he/she consumed 5 or more food groups [23].

Additionally, child undernutrition was assessed using WHO Child Growth Standards [24

– 2 to – 3 standard deviations (SDs) indicated moderate wasting, moderate underweight and moderate stunting while Z-scores less than – 3 SDs indicated severe wasting, severe underweight and severe stunting [24]. Z-scores ≥ -2 indicated the absence of wasting, stunting and underweight.

Statistical analysis

Data analysis was performed using Statistical Package for Social Sciences (SPSS) version 21 and WHO Anthro software. Bivariate analysis was ran using Chi-square/Fisher exact test. The independent variables with $p < 0.25$ [25] in the bivariate analysis were considered for multivariate logistic regression analysis to remove confounders. Hosmer-Lemeshow test was used to test for goodness-of-fit of the adjusted model. Percentages and cross tabulations were used to show participants' responses. Responses were presented in tables. $P < 0.05$ was considered significant at two tailed tests.

Results

Socio-demographic characteristics

The mean age of the mothers/caregivers was 28.9 ± 5.4 years, with the minimum and maximum ages of 17 and 60 years respectively. A little more than half (55.7%) of the mothers had no formal education. Also, a little more than half (52.9%) of mothers were self-employed. Regarding monthly household income, mothers earning less than GH 500 formed the majority (96.5%). It was also observed that nearly (99.7%) all of the mothers were Muslims. Moreover, almost all (99.5%) of them were married. Concerning the children, 25.8% and 74.2% of them were aged 6–8 months and 9–23 months respectively. Also, about 51.4% of children were females. Table 1 depicts the socio-demographic characteristics of the respondents.

Maternal dietary knowledge and practices and child nutritional and co-morbidity status

The study revealed that about 83.0% of the mothers/caregivers had high level of knowledge on infant and young child feeding practices. Nearly all (96.7%) the children were breastfeeding during the study. Also, about two-third (68.8%) of the children were breastfed within the first hour after birth. Approximately 72.4% of the children met the minimum meal frequency, with about 24.9%, 18.7% and 25.3% being stunted, wasted and underweight respectively. Almost a third (32.7%) of the children experienced illness two weeks prior to the study (Table 2).

Maternal health care services utilization

More than half (61.3%) of the mothers delivered at the hospital. Also, all the mothers went for ANC visits with majority (96.7%) of them going for more than 4 visits.

About 98.5% of the mothers went for a postnatal care visit (Table 3).

Factors associated with minimum meal frequency

A bivariate analysis was performed to determine fac-

Table 1 Socio-demographic characteristics of respondents

Variable	Category	Frequency	Percentage
Mothers age (years)	< 20	16	4.1
	20–34	316	81.0
	> 34	58	14.9
Religion	Christianity	1	0.3
	Islam	394	99.7
Marital status	Married	393	99.5
	Separated	2	0.5
Ethnicity	Dagomba	375	94.8
	Gonja	8	2.0
	Mampurisi	5	1.3
	Others	7	1.9
Employment status	Self-employed	209	52.9
	Employed	7	1.8
	Unemployed	179	45.3
Mother's highest educational level completed	None	220	55.6
	Primary	86	21.8
	Middle/jhs	56	14.2
	Shs/vocational training	26	6.6
	Tertiary	7	1.8
Household monthly income (GH ₵)	< 500	381	96.5
	500–999	8	2.0
	1000–1500	3	0.8
	> 1500	3	0.8
Average period between births	Less than a year	69	17.7
	1 year	7	1.8
	2 years	31	7.8
	More than 2 years	285	72.7
Age of the child (in months)	6–8	102	25.8
	9–23	293	74.2
sex of the child	Male	192	48.6
	Female	203	51.4

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may have higher prevalences, hence the result of the current study. The time gap between the studies could be another reason [28], as the preceding local study was undertaken 7 years ago.

Children who achieved the minimum dietary diversity in the present study were 46 times more likely to meet the minimum meal frequency as compared to children who did not meet minimum dietary diversity. Similarly, a previous study in Ethiopia [11] indicated that children who meet minimal dietary diversity are more likely to attain minimum meal frequency than children who do not meet minimum dietary diversity. This results from the fact that families with access to a variety of foods are much more likely to give their children food often, as one key factor in achieving minimum meal frequency is food

accessibility [11]. The finding of the present study underscores the need for integrated, age-appropriate nutrition interventions. Public health policies should focus on improving both dietary diversity and meal frequency, as they are crucial for ensuring optimal child development and preventing malnutrition. By promoting these factors through caregiver education, community-based interventions, and policy reforms, governments can significantly improve child health outcomes and reduce the long-term burden of malnutrition and related diseases.

Also, child age was significantly related with minimum meal frequency in the present study. When compared to children aged 6–8 months, children aged 9–23 months were 3.4 times more likely to meet the minimum meal frequency. Similarly, studies by Tegegne et al. [28],

Table 4 Bivariate analysis of factors associated with minimum meal frequency (MMF)

Characteristic	Total population N = 395(%)	MMF Met N = 287(%)	MMF Unmet N = 34(%)	P Value
Maternal age				ND
<20	3 (100)	3 (100)	0 (0.0)	
20-30	262 (100)	185 (70.6)	77 (29.4)	
31-40	120 (100)	94 (78.3)	26 (21.7)	
>40	5 (100)	3 (60)	2 (40)	
Religion				ND
Christian	1(100)	1(100)	0 (0.0)	
Muslim	394 (100)	285 (72.3)	109 (27.7)	

practices were based on memory, which may result in inaccuracies regarding the frequency or variety of meals. Also, there is a chance of social desirability bias as the responses were self-reported, which could influence participants to present their feeding practices in a more favorable way, leading to potential over-reporting of positive practices and underreporting of less desirable ones. Additionally, the study's cross-sectional nature does not offer a solid foundation for determining causality since exposure and outcome were measured concurrently. Notwithstanding these limitations, the study provided the first insight into minimum meal frequency and its related characteristics among children aged 6 to 23 months in Kumbungu District. We recommend that longitudinal studies be conducted to determine the causal relationship between the independent and dependent variables.

