Utilization of Growth Monitoring and Promotion Services and Undernutrition of Children less than two years of Age in Northern Ghana

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Abstract

Background

Child malnutrition is a major public health problem and an important indicator of child's health. Adequate nutrition is critical for a child's growth and development. Growth monitoring and promotion (GMP) services is a nutrition intervention aimed at improving the nutritional status of children. We assessed the utilization of growth monitoring and promotion services and nutritional status of children less than two years in northern Ghana.

Methods

The study was a descriptive cross-sectional survey that involved face-to-face interviews among 266 mothers with children < 2 years of age attending child welfare clinics (CWC) as well as some anthropometric measurements. Data were entered and analyzed using Statistical Package for Social Science software, version 20. The nutritional status of children was classified as underweight (weight-for-age z score < -2 standard deviations), stunted (length-for-age Z score < − 2) and wasted (weight-for-length z score < -2) while utilization of GMP services was based on attendance to CWC and ability to interpret to different growth curves.

Results

The prevalence of child undernutrition shows that, 18.6% were underweight, 14.7% were stunted and 7.9% were wasted. About 60% of the mothers accessed GMP services regularly. The main reason for irregular access to GMP services was due to travel out (68.0%). Less than half of the mothers were able to interpret the children's growth curve correctly: falling growth curve (36.8%), flattening growth curve (35.7%) and rising growth curve (27.4%). In combining children < 6 and 6–23 months of age. Only one-third (33.1%) of mothers practiced appropriate infant and young child feeding.

Conclusion

We found that, the level of undernutrition was high, child feeding practices was poor and maternal utilization of GMP services was low in the study area. Similarly, ability to interpret the child's growth curve appropriately was a challenge among women. Thus, attention is needed to improve knowledge and utilization of GMP services and to address breastfeeding and complementary feeding challenges.

Introduction

Malnutrition remains the world's most serious health problem and major contributor to child mortality [1]. Child malnutrition is responsible for > 50.0% of all childhood deaths [2]. Globally, it is estimated that,

25.6% of children < 5 years of age are stunted with prevalence rates > 40% in many developing countries [3]. Also, it is estimated that, 43.0% of children < 5 years in developing countries are prone to falling short of their life potentials due to poor nutritional situations they faced in their early formative years [4]. The inadequacy of growth is high among children < 24 months of age [5]. The period from birth until two years of age is considered a critical stage for maximum nutrition care to enhance optimum growth. This is the basis for global initiatives toward child care [6]. Child malnutrition is an important public health problem in Ghana. According to 2014 Ghana Demographic and Health Survey (GDHS) report, 19% of children < 5 years of age were stunted, 11% were underweight and 5% were wasted. In northern Ghana, 33.1% of children were stunted, 20.1% were underweight and 6.3% were wasted. Similarly, stunting was between 8.0% and 21.9%, underweight was between 4.2% and 14.6% and wasting was between 6.9% and 10.6% among children less than 2 years of age in Ghana [7].

Growth monitoring (GM) is the measurement that best defines the children's health and nutritional status. It provides a measurement on the quality of life of the entire population [8]. The growth pattern of a child is determined by comparing his/her growth indices with that of a reference child of the same age and sex [8]. In Ghana, GMP services are implemented at the community level through the primary health care system in order to improve child nutritional status. GMP is a prevention activity comprised child GM linked with promotion that increases awareness about child growth; improves caring practices and increases demand for other services. It also serves as the core activity in an integrated child health and nutrition program [9]. Globally, growth chart is used as a tool to monitor child's growth and determine the nutritional status of children. GM uses weight-for-age, weight-for-height and height-for-age as indicators to determine the nutritional status of children. The growth monitoring outcomes are complemented with targeted counseling for children with special needs [10]. The GM also provides opportunity for intercommunication between health workers and caregivers concerning the wellbeing of their children [11]. In Ghana, children are routinely weighed on a monthly basis. Regular monitoring of growth helps in early detection of danger warning signs and conditions that affect growth [12].

Despite several efforts to reduce child malnutrition through GMP services in Ghana, prevalence of malnutrition remains high among child < 5 years, particularly in northern Ghana [7]. Few studies have been conducted to determine the utilization of GMP services and prevalence of undernutrition in Ghana. Thus, the objective of this study was to assess the utilization of growth monitoring and promotion services and nutritional status of children less than two years of age in northern Ghana.

Materials And Methods

Study design and setting

We employed a cross-sectional descriptive design to collect data from mothers with children less than two years of age. The study was conducted in the Tamale Metropolis of Northern Region, Ghana. There are six (6) Metropolis in Ghana and the Tamale Metropolis is the only one in the north of the country. Currently, the north of Ghana is composed of five (5) regions namely: Upper East, Upper West, Northern,

North-East and Savannah Regions. The Metropolis is located in the central part of the Northern Region with Tamale as the capital. It has an estimated land size of 646.90180 square kilometre and a population of 233,252 [13]. According to the database of the District Health Information Management System, 64,641 women are in their reproductive age and 10,769 children are less than two years of age. Health services in the Metropolis are provided by public and private health facilities in four (4) demarcated sub-metropolis [13]. We used the formula by Cochran (1963) to calculate the sample size for mother-child pairs for the study. We used the highest prevalence of underweight (14.6%) among children less than two years in Ghana [7] and the study population was 10,769 children. In using a 95% confidence interval (CI), 5% margin of error and a 1.4 design effect (DE), a sample size of 270 respondents was calculated.

Study participants and sampling

The target population were women of childbearing age (15–49 years) with children < 2 years of age. The main criteria for inclusion of households were: 1) a mother who has a child less than two years of age; 2) a mother who was present at the time of the survey; 3) child of singleton birth, 4) no obvious signs of illness and 5) a mother who consented to participate in the study. The children chosen were within the critical stage of the first 1,000 days of a child's life. The list of qualified mothers was received from the study health facilities. The study participants were chosen using a simple random sampling method within each health facility. This sampling method allowed every member of the population to have an equal chance of being selected. Overall, 266 interviews were conducted (Table 1) comprising of 122 mothers with children aged from < 6 months and 144 women with children aged between 6–23 months.

Table 1
Mothers attending child welfare clinics (CWC) in Tamale Metropolis

Name of health facility	CWC attendance	Weighted sample size
Reproductive and Child Health	2721	89
Builpela	2049	67
Vittin	1984	64
Nyohini	1432	46
Total	**8186**	**266**

Data collection tool and procedure

The mothers were interviewed using a structured questionnaire which covered socio-demographic characteristics (education, occupation, parity, age, ethnicity, and marital status), child characteristics (age and sex) and utilization of GMP services. In addition, child GM information was extracted from maternal and child health record book using observation checklist. Anthropometric instruments were used to measure weight and height of individual children according to World Health Organization (WHO) guidelines [14]. We used Beurer digital scale to measure the weights and recorded to the nearest 0.1kg. All

weight measurements were taken in duplicate and the averages recorded. A locally manufactured infantometer with a fixed headboard and a movable footboard was used to measure the recumbent length of children. The length was recorded to the last completed 1.0cm. In addition, all recumbent length measurements were taken in duplicate and the averages recorded. The interviews were conducted privately by two final year students pursuing Bachelor of Science in Nursing at the University for Development Studies, Tamale. The interviews were conducted in Dagbani and English languages. The study tools were pretested in a health facility. The study was conducted during January - February, 2018.

Data processing and analysis

On daily basis, the data were checked for completeness and accuracy. Data were entered and analyzed using the Statistical Package for Social Science software for Windows, version 20. Descriptive statistics were performed covering prevalence of undernutrition, utilization of GMP services, breastfeeding and complementary feeding practices. Knowledge of recommended infant feeding practices were scored [15]. Data on CWC attendance was obtained from the maternal and child health record book. Comprehension of the growth curve and knowledge of GMP activities was determined was determined through the interviews.

Feeding practices of children < 6 months of age were estimated using the WHO child feeding recommendation [15]. We assessed whether the child was fed breastmilk or infant formula/semi-solid/solid foods in a 24-hour recall. A score of zero (0) was given for each wrong practice and score of one (1) for a correct practice. Mothers were interviewed on recommended breastfeeding practices that ensures that the children received good supply of breastmilk. Practices were then divided into “adequate” and “inadequate” along the median.

Children 6–23 months of age, dietary diversity, feeding frequency and current breastfeeding status were used to create a feeding practice score. Using the WHO guidelines [15], seven food groups: 1) grains, roots and tubers; 2) legumes and nuts; 3) dairy products; 4) flesh foods; 5) Eggs, 6) vitamin A fruits and vegetables and 7) other fruits and vegetables and were used to assess dietary diversity score. A score of one (1) was given for a food group fed and zero (0) for a food group not fed based on the guidelines [15]. A child with a score of at least four (4) was classified to have a diverse diet. A child fed the recommended minimum feeding frequency was given a score of one (1) for adequate feeding frequency and a child who fed less than the minimum frequency was given a score of zero (0). A breastfed child received a score of one (1) while a non-breastfed child was given a score of zero (0). The total practice score was then determined by adding scores from all the variables.

Child anthropometric data are expressed by age and sex appropriate z-scores for weight-for-age (WAZ), weight-for-height/length(WHZ) and height-for-age (HAZ). The children were grouped into normal z-scores for all indicators ≥-2 standard deviation, underweight (WAZ <-2 score), wasting (WHZ <-2 score) and stunting (HAZ <-2 score). The child nutritional status was then classified into normal as against underweight stunted or wasted [16].

Results

Demographic characteristics

In total, 266 mothers with children less than 2 years were enrolled. Analysis show that 85% of the participants were between 18 and 34 years of age. More than half (57.5%) of the participants had either no education (45.9%) or only primary education (11.6%). Nearly all (94.7%) of the mothers were married. About half (42.8%) of the mothers were traders. More than half (61.3%) of the women were classified as coming from low wealth households and more than half (56.0%) had either 1–2 children. Less than half (46.0%) of the children were < 6 months of age. More than half (53.8%) of the children were males (Table 2).

Table 2
Socio-demographic characteristics of mothers with children < 2 years (n = 266)

Characteristics of respondents	Frequency	Percentage (%)
Age of mother (years)		
<18	2	0.8
18–34	226	85.0
≥ 35	38	14.2
Mothers' educational level		
No education	122	45.9
Primary	31	11.6
Secondary	81	30.5
Tertiary	32	12.0
Marital status of mothers		
Single	14	5.3
Married	252	94.7
Mothers' occupation		
Unemployed	103	38.7
Trader	144	42.8
Artisan	14	5.3
Salary workers	35	13.2
Ethnicity of mothers		
Dagomba	224	84.2
Gonja/Mamprusi/Akan	11	4.2
Moshi/Bimoba	29	11.6
Level of household wealth		
Low	163	61.3
High	103	38.7
Parity		
1–2	149	56.0

Characteristics of respondents	Frequency	Percentage (%)
3–4	83	31.2
5+	34	12.8
Age of child (months)		
< 6	122	46.0
6–11	94	35.3
12–23	50	18.7
Sex of children		
Male	143	53.8
Female	123	46.2

Utilization of GMP Services

About three-fifths (59.8%) of the mothers were accessing regular monthly GMP services at the CWC (Table 3). Traveling of mothers (68.0%) was the main reason for irregular GMP attendance. The analysis showed that about one-third of mothers were able to interpret falling (36.8%) and flattening (35.7%) growth curves while a little above one-quarter (27.4%) interpreted rising growth curve correctly. The main action taken by mothers was taking child to hospital (33.8% for falling growth curve and 29.3% for flattening growth curve). Meanwhile, about two-fifths (42.2%) of mothers did not know how to response if the child's growth curve was falling, 46.2% when the growth curve was flattening or 42.1% when the growth curve was rising.

Table 3
Utilization of GMP Services (n = 266)

Variable	Frequency	Percentage (%)
Monthly GMP attendance		
Regular attendance	159	59.8
Irregular	107	40.2
Barriers to GMP attendance		
Travelled	181	68.0
Work	51	19.2
Others	34	12.8
Ability to interpret falling growth curve		
Yes	98	36.8
No	168	63.2
Ability to interpret flattening growth curve		
Yes	95	35.7
No	171	64.3
Ability to interpret rising growth curve		
Yes	73	27.4
No	193	72.6
Response during growth curve falling		
Improve feeding	57	21.4
Take child to hospital	90	33.8
Seek nutritional care	7	2.6
Don’t know	112	42.2
Response during growth curve flattening		
Improve feeding	11	4.1
Take child to hospital	78	29.3
Give more breastmilk	54	20.3
Don’t know	123	46.2
Response during growth curve rising		

Variable	Frequency	Percentage (%)
Continued breastfeeding and improved care	154	57.9
Don't know	112	42.1

Nutritional Status of children less than two years of age attending CWC services

The nutritional status of children was classified as: underweight, stunting and wasting as summarized based on the WHO classification. Based on the anthropometric measurements, 18.6% of the children were underweight, 14.7% were stunted and 7.9% were wasted (Table 4).

Table 4
Nutritional status of children < 2 years (n = 266)

Variable	Frequency	Percentage (%)
Weight-for-age z score		
Normal	217	81.6
Underweight	49	18.4
Height/length-for-age z score		
Normal	227	85.3
Stunted	39	14.7
Weight for length z score		
Normal	245	92.1
wasted	21	7.9

Maternal knowledge, exclusive breastfeeding and complementary feeding practices

In total 122 of the children were less than 6 months of age and analysis showed that 72.1% of these children were exclusively breastfed (Table 5). About one-third (33.6%) of these children were breastfed at least eight (8) times. Fewer mothers (5.7%) used at least two (≥ 2) hunger cues to identify hunger among children less than 6 months of age. The majority of children (91.0%) were either breastfed only in the day or in the night. Less than half (46.7%) of the mothers used weightlessness of the breast to determine emptiness and the need to change to the other breast during breastfeeding. The analysis also showed less than one-third (30.3%) of mothers used at least four (4) key signs to demonstrate proper positioning during breastfeeding. Nearly two-thirds (60.7%) of the children < 6 months of age had already received first water. Less than one-fifth (18.0%) of the mothers practiced exclusive breastfeeding for children < 6 months of age in the study area.

In total, 144 children were between 6 and 23 months of age. About two-thirds (67.4%) of these children were receiving complementary foods (Table 5). The analysis showed that 86.1% of the children were fed at least two (2) times a day on complementary foods. More than two-thirds (70.8%) of the children 6–23 months of age received complementary foods at six (6) months and 66.7% received first water before six months of age. Few children (11.8%) received minimum dietary diversity (≥ 4 food groups). That is, they consumed at least four (4) food groups in a 24-hour recall. Less than half (44.4%) of the mothers with children 6–23 months of age practiced adequate complementary feeding. Overall, about one-third (33.1%) of mothers practiced appropriate/good infant and young child feeding (IYCF) among children < 2 years of age in the Tamale Metropolis.

Table 5
Maternal knowledge, exclusive breastfeeding and complementary feeding practices

Recommended exclusively breastfeeding practices (n = 122)		
Variable	Frequency	Percentage (%)
exclusive breastfeeding		
Yes	88	72.1
No	34	27.9
Number of times child is breastfed in a day		
≥ 8 times	41	33.6
< 8 times	81	66.4
Hunger cue used to identify hunger in child		
≥ 2 cues	7	5.7
< 2 cues	115	94.3
Time of day child is breastfed		
Both day and night	11	9.0
Only day/night	111	91.0
Empty one breast at a time during feeding		
Weightless breast	57	46.7
Not weightless	65	53.3
Proper positioning during breastfeeding		
Adequate (4 key signs)	37	30.3
Inadequate (< 4 key signs)	85	69.7
Age child received first water		
< 6 months	74	60.7
≥ 6 months	48	39.3
Overall exclusive breastfeeding practices		
Adequate	22	18.0
Inadequate	100	82.0
Recommended complementary feeding practices (n = 144)		

Recommended exclusively breastfeeding practices (n = 122)		
Child eating in addition to breastmilk		
Yes	97	67.4
No	47	32.6
Number of times child was fed		
Adequate (≥ 2)	124	86.1
Inadequate (< 2)	20	13.9
Age child received other foods		
At 6 months	102	70.8
> < 6 Months	42	29.2
Number of food groups child was fed		
Adequate (≥ 4)	17	11.8
Inadequate (< 4)	127	88.2
Age child received first water		
< 6 months	96	66.7
≥ 6 months	48	33.3
Overall complementary feeding		
Adequate	64	44.4
Inadequate	80	55.6
IYCF practices (EBF/CF)		
Good	88	33.1
Poor	178	66.9

Discussion

We sought to assess the utilization of growth monitoring and promotion services and nutritional status of children < 2 years of age in northern Ghana. Nearly all (99.2%) mothers were older than 18 years of age (99.2%). In urban communities, women delay marriages until at least 18 years of age. About six out of every ten mothers (57.5%) had either no formal education or only primary education level while about one-tenth (12.0%) of mothers had tertiary level education. The findings of the current study confirm similar conclusions that northern Ghana has low levels of literate population compared to the southern part of the country. In Ghana, the five northern regions (formerly three regions) are the least developed

with low level of literate population. We found that 95.0% of the mothers were married. The high level of married mothers in this study is likely due to geographical area and the cultural/religious values. In Muslim majority communities, marriage is considered an important cultural value [17]. Thus, females are expected to be married before they start to have children. This finding is in consistent with the GDHS 2014 and Population and Housing Census, 2010 reports [7]. About half (48.1%) of the mothers were traders/artisans. In Muslim dominated communities, petty trade is major activity for women. Often, the extreme poor in such populations are engaged in artisan activities for income generation. We found that about 5.3% of the mothers engaged in artisan activities. This finding is similar to previous study which found about low respondents engaged in artisan activities as source of income. At least three out of every five (61.3%) mothers were classified as living in households with low wealth status. The northern part of Ghana is the least developed with less economic activities. However, as the only Metropolis in northern Ghana, the level of low wealth status was surprisingly high. This may be explained due to the low level of education attained by the mothers. As one progresses in terms of education, the level of productivity and livelihood equally increases. However, in the current study only 42.5% of mothers attained secondary or tertiary level education. This corresponds with the level of low wealth status. We found that more than half (56.0%) of the mothers had 1 or 2 children. This is very important for child growth and development. This is less than the findings in the GDHS 2014 where more than half of the women in northern region had more than 2 children. We found that majority of the children were males (53.8%). Other studies found similar patterns where males are in the majority [17]. However, there are a couple of studies which rather found that females were in the majority [18].

We sought to assess the utilization of growth monitoring and promotion (GMP) services as well as nutritional status of children less than two years of age attending child welfare clinics (CWC). The effective utilization of GMP services is critical to child nutritional status. The focus of GMP services is to affect family-level decision making on child feeding. For health workers, it provides an opportunity to assess child health status and offer counseling on healthy feeding, whereas for mothers, they acquire knowledge about the growth of their children and how to improve on it [9, 19]. The study assessed the relationship between utilization of GMP services and child nutritional status. Nutritional status was determined using weight-for-age Z scores for underweight, height-for-age Z score for stunted growth and weight-for-height Z scores for wasting. In the current study, underweight was 18.4%, stunting was 14.7% and wasting was 7.9%. The 2014 Ghana Demographic and Health Survey found 20.1% of children under five years to be underweight, 33.1% stunted and 6.3% wasted in northern region [7]. The nutritional status of children in the study area is generally poor. There have been similar revelations about poor nutritional status in developing countries from various studies across the world [20]. Black et al., (2008) found in their study that, developing countries bear the highest burden of under-nutrition in spite of the advancement made in nutrition worldwide [21]. Reasons for these findings are not clear but we think that, inadequate infant feeding practices coupled with infections could be a contributory factor. Unlike the Southern sector in Ghana, northern region is one of the poorest regions in the country with a single but short rainy season. This generally affects household food security and dietary diversity particularly in the dry season. It also affects farming, household income and food supply. This overall contributes to the

nutritional situation revealed by this study. In assessing the utilization of GMP services, the child's health record card was used to record information on how regular mothers utilized the available services. Those who never defaulted in any of their monthly appointments were referred to as "regular attendants", but those who have ever defaulted were classified as "not regular attendants". The results found that, about 60% were regular attendants. Studies conducted in Kwazulu Natal and Uganda found that 67% and 59% of mothers were regular attendants [22]. However, this finding is higher than a previous study conducted by Feleke *et al*. 2017 who reported that the utilization rate of GMP services was only 16.9% in Ethiopia [23]. The current finding may suggest a well-implemented intervention in Ghana compare to Ethiopia. The findings also revealed that, over 97% of respondents expressed their intention to continue seeking GMP services because of its importance. The intention to continue seeking GMP services did not reflect the regular attendance rate. This could be attributed to service utilization challenges such as unavailability of services at the time of need, inadequate information on next visit, busy schedules of mothers and natural barriers such as rain.

Feeding practices of children < 6 months of age were estimated using the WHO child feeding recommendation [15]. We assessed whether the children received only breastmilk or infant formula/semi-solid/solid foods in a 24-hour recall. Overall, less than one-fifth (18.0%) of the mothers practiced exclusive breastfeeding for children < 6 months of age in the study area. This is less than the results of the GDHS, 2014, where 28.9% of caregivers interviewed were practicing exclusive breastfeeding [7]. Similarly, some studies in the advanced countries have also noted a reduced prevalence rate of the practice of optimal exclusive breastfeeding [24]. Regarding children, 6–23 months of age, dietary diversity, feeding frequency and current breastfeeding status were used to create a feeding practice score in line with the WHO guidelines [15]. Overall, less than half (44.4%) of the mothers with children 6–23 months of age practiced adequate complementary feeding. Similar findings have been reported in other studies [24]. This is an indication that majority of children 6–23 months are underfed. This kind of practice makes them more vulnerable to undernutrition. However, improvement in complementary feeding practices have been observed in areas where health workers offer age appropriate nutrition counseling specific to the family environment [25]. In combining children < 6 and 6–23 months of age, only one-third (33.1%) of mothers practiced appropriate infant and young child feeding (IYCF) among children < 2 years of age in the Tamale Metropolis. This result may have influenced the undernutrition indicators observed in this study – 18.4% underweight, 14.7% stunted and 7.9% wasted.

Limitations Of Study

The study has some limitations. Data for this study were collected one time and thus a probable change in child nutritional status in relation to attendance over time may have been missed. However, we believe that the findings reflect the prevailing situation among the participants in the study site.

Conclusion

We found that, the level of undernutrition was high, child feeding practices was poor and maternal utilization of GMP services was low in the study area. Similarly, ability to interpret the child's growth curve appropriately was a challenge among women. Thus, attention is needed to improve knowledge and utilization of GMP services and to address breastfeeding and complementary feeding challenges.

Declarations

Ethical approval

An introductory letter and ethical approval was received from the ethics committee of School of Public Health, University for Development Studies, Tamale, Ghana. In addition, permission letter was obtained upon a written request and explanation of the protocol, methods and questionnaires from the Tamale Metropolitan Health Directorate. At the individual level, the protocol, methods and approach was explained in English or Dagomba (main local language) and an informed consent was obtained from each respondent of 18 years of age and above before the interview was conducted. Among the few teenagers, informed consent was obtained through their husbands (those married) or parents (those unmarried) and legal guardians (with no education) was provided. Respondents were informed that participating was voluntary and it was their right to stop at any time. They were also informed of data confidentiality by not using any personal identifiers. All methods were performed in accordance with the relevant guidelines and regulations.

Consent for publication

Not applicable

Availability of dataset

The dataset analyzed during the current study are available from the corresponding author on request.

Competing interests

The authors declare that they have no competing interests

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Authors' contributions

MNA and DM conceptualized and designed the protocol. MNA supervised the implementation of the study. MNA and DM conducted the study and performed analysis. BB and EB drafted the manuscript. MNA, BB and EB edited the manuscript. All authors read and approved the final manuscript.

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