Impact of type of child growth intervention programme on caregivers' child feeding knowledge and practices: a comparative study in Ga West Municipality, Ghana

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Abstract

Community-Based Growth Promotion (CBGP) delivered by community volunteers aims at enhancing the traditional Growth Monitoring and Promotion (GMP) programme delivered by community health nurses through the promotion of optimum infant and young child feeding (IYCF) leading to improved child growth. This study compared IYCF knowledge and practices among caregiver-child pairs (0-24 months) receiving child welfare services from CBGP (n=124) and GMP (n=108) programmes. Semi-structured questionnaires were used to interview caregivers on IYCF knowledge/practices and validated food frequency questionnaire used to record infants' food intakes. Group differences were determined using Chi-square and independent samples t-tests ($p<0.05$; 95% CI). Mean IYCF knowledge scores were similar (CBGP:10.84±1.69 vs. GMP:10.23±1.38, $p=0.062$). However, more CBGP caregivers (17%) were highly knowledgeable than their GMP counterparts (5%) ($p=0.011$). Early breastfeeding initiation (CBGP:54% vs. GMP:28%, $p<0.0001$), exclusive breastfeeding (CBGP:73% vs. GMP:56%, $p=0.001$) and timely complementary feeding (CBGP:72% vs. GMP:49%, $p=0.014$) were reportedly higher among CBGP caregivers. Underweight was 11% (CBGP:8% vs. GMP:14%, $p=0.154$. Mean dietary diversity scores (10 food groups) were similar (CBGP:4.49±1.89 vs. GMP:3.87±1.89, $p=0.057$) but more CBGP caregivers (77%)

achieved minimum dietary diversity than their GMP counterparts (61%) (p=0.035). Few caregivers achieved minimum meal frequency (CBGP:31% vs. GMP:29%, p=0.486) and minimum acceptable diet (CBGP:23% vs. GMP:21%, p=0.464) indicators. Number of children under 5 years owned by caregiver (AOR: 0.405; 95% CI: 1.13-78.53, p=0.038), her educational level (AOR: 0.112; 95% CI: 0.02-0.90, p=0.040) and IYCF knowledge (AOR: 0.140; 95% CI: 0.03-0.79, p=0.026) significantly predicted optimum child feeding. Nutrition education on optimum complementary feeding and birth spacing strategies should intensify.

Key words: Community-based growth promotion; Growth monitoring and promotion; Infant and young child feeding; Caregiving

Introduction

Childhood malnutrition is a serious public health problem associated with adverse health and socioeconomic consequences. Globally, an estimated 26% of children below 5 years of age were stunted, 16% were underweight and 8% were wasted in 2011 . The vast majority of undernourished children are in south-central Asia and sub-Saharan Africa. In Ghana, 28% of children under-five years are stunted, 14% are underweight, and 9% are wasted . Child growth monitoring and promotion programmes have long been identified and recommended as an effective approach to preventing child malnutrition .

The Growth Monitoring and Promotion (GMP) programme was introduced by UNICEF and implemented in Ghana in the 1970s with the main objective of reducing the prevalence of malnutrition . The earlier Growth Monitoring Programme instituted by the WHO in the 1950s was limited to weighing and plotting children's weights to detect abnormal growth . Inclusion of a promotion component in the GMP programme, intended to foster communication between health workers and caregivers concerning child health and nutrition, was expected to enhance caregivers' child caring and feeding behaviours leading to improved child growth .

However, a systematic review of studies on the programme revealed that the "promotion" component of "GMP" which encompassed child-centred caregiver counselling was poorly implemented . Also, poor attendance and low coverage were reported in UNICEF supported programmes in China, Ecuador, Indonesia, Malawi, Thailand, Zaire and Zambia . In Burkina Faso, Niger and Mozambique, fewer than 30% of mothers were counselled . Reasons cited

included lack of health personnel to provide the service, inaccessible child health services and poor attendance by caregivers. However, in Ghana and other developing countries, it is has been shown that adequate caregiver counselling and longer effective participation in child growth programmes is associated with improved knowledge of caregivers on infant feeding and positive anthropometric outcomes of children .

Thus the Community-Based Growth Promotion (CBGP) concept was an attempt to address some of the shortcomings of the GMP programme and improve coverage, delivery of services and effective participation by caregivers. The programme was pioneered by the Manoff Group and promoted by UNICEF during the 1980s as a child survival strategy to engender the caregiver-health worker interaction believed to be crucial for programme success . Prior to its implementation, the CBGP concept was successfully piloted in Indonesia in 1977 where caloric intake of participating children improved by 200-300 calories per day and consumption of green leafy vegetables doubled with subsequent reduction in malnutrition from 25% to 14% . Following the piloting success, the CBGP concept was adopted and implemented in several countries with outcomes that suggested that the programme had positive effects on knowledge, attitudes and practices of participating families which led to improved growth of children .

Modalities for rolling out the CBGP programme in Ghana have been documented by the Ghana Health Service (Ghana Health Service, 2010). In Ghana, major differences between the CBGP and the GMP programmes centres on 'where', 'who' and 'how' the services are delivered. Typically, the GMP programme is delivered at child welfare clinics (CWC) situated at health centers or outreach health posts and the services are provided by trained health professionals, mostly community health nurses who are sometimes supported by nutrition extension workers and auxiliary health aides. In contrast, the CBGP programme is delivered at the community-level in selected rural and deprived urban communities where the GMP programme is readily unavailable and is intended to be owned by the community. Here, services are provided by community volunteers called child growth promoters who have been trained by the Ghana Health Service to carry out growth monitoring of infants and counselling of caregivers on infant and young child feeding (IYCF). The volunteers are supervised by community health nurses who carry out specialized activities such as immunizations. Another difference between the two programme types is that whereas the GMP programme targets children under 5 years, the CBGP programme focuses on children

from birth to 24 months. In both programmes, monthly attendance by caregiver-child pairs is required where infant growth monitoring is carried out and caregivers are counselled on optimum IYCF practices. However, in the GMP programme, the counselling is typically group-based and prescriptive. Conversely, the counselling delivered in the CBGP programme is usually individualized and participatory and the community volunteer is expected to negotiate with the caregiver and motivate her to adopt optimum IYCF practices.

After over a decade of implementation, there is little documented information on whether the CBGP programme is achieving the intended impact and if it is an improvement over the traditional GMP programme. This study evaluated differences in the effects of a CBGP and a GMP programme on caregivers' infant and young child feeding knowledge and practices in two rural communities in the Ga West municipality, Greater Accra region, Ghana.

Materials and Methods

The study was a cross-sectional survey conducted at Nsakina and Dom Sampaman, both rural communities in the Ga West municipality of the Greater Accra region, Ghana. The study targeted all caregiver-child pairs enrolled in the CBGP and GMP programmes in Nsakina and Dom Sampaman communities, respectively. All caregivers who attended the child welfare clinics with their children to receive growth monitoring and promotion services in either the CBGP (N=124) or GMP (N=108) programmes in the two study locations between January and March 2012 were invited to participate and interviewed after completing an informed consent document.

Socio-demographic, economic and health characteristics of caregiver-child pairs

A semi-structured questionnaire was used to collect data on background characteristics of caregivers. This included questions on socio-demographic characteristics (e.g. age, marital status, educational level, employment, household possessions, etc.) and some maternal experiences such as use of antenatal services during pregnancy, education on IYCF at antenatal and child welfare clinics, home visits by programme implementers). Additionally, data on the child's age, age at programme enrolment, birth weight and current body weight were abstracted from the child health record booklets.

Knowledge of caregivers on infant and young child feeding

Questions intended to assess caregivers' IYCF knowledge were designed based on IYCF counselling topics documented in the Ghana Health Service revised child health record booklet which ought to be communicated to caregivers during child welfare sessions.

Caregivers responded to 13 knowledge questions on age-specific IYCF practices regarding breastfeeding and complementary feeding.

Infant and young child feeding practices

A sample of the food frequency questionnaire used during the 2008 Ghana demographic and health survey was used to collect a 3-day information on habitual dietary intakes of the children on complementary feeding . The food groupings in the 3-day questionnaire were: light cereal porridges; stiff cereal-based meals; roots/tubers/plantain; fruits/vegetables rich in vitamin A; other fruits/vegetables; animal products; milk/dairy products; legumes/nuts/oil seeds; fats/oils; and commercial baby products. The WHO core indicators that were used to assess IYCF practices were early initiation of breastfeeding; exclusive breastfeeding under 6 months; introduction of solid, semi-solid or soft foods (timely initiation of complementary foods); minimum dietary diversity; minimum meal frequency and minimum acceptable diet .

Child anthropometry

Birth weight categorizations and nutritional status of the children was determined using the birth weight and current body weight measurements recorded in the child health record booklets.

Data analyses

Data were analyzed using SPSS (version 20.0, Incorporated, Chicago, USA). Differences between the CBGP and GMP programmes were determined using Chi-square test for categorical variables (e.g. sex, proportions of underweight children) and independent samples t-test for continuous variables (e.g. age, difference in children's mean WAZ) at $p<0.05$ (95% confidence interval). Infant body weight measurements were converted to weight-for-age Z-scores (WAZ) using WHO Anthro software (version 3.2.2). Underweight was defined as weight-for-age Z score <-2. Similarly, their birth weights were classified as normal (≥2.5 kg) and low (<2.5 kg). Univariate binary logistic regression model was developed for both known and unknown caregiver-child pair determining factors for child feeding according to WHO minimum IYCF standards and significant independent association (unadjusted odds ratios, UOR) determined. Variables were selected into the final model by considering independent variables with a significance of ≤0.500. In the final model, a multivariate binary logistic regression analysis was done to identify the effects of interaction of the explanatory variables (adjusted odds ratio, AOR) on the outcome variable (optimum child feeding).

Measurement of socioeconomic status (SES) index:

Variables used in the determination of SES index were education, occupation, income, source of water supply, toilet facilities, fuel for cooking, and household possessions. Each variable was scored based on a method described by Caro and Cortes . The total possible score ranged from 26 to 88 (Table 1). The pre-determined SES constituent indicators were analyzed using principal component analysis (factor analysis). The Kaiser-Meyer-Olkin measure of sampling adequacy statistic and Bartlett's test of sphericity tests were applied to determine the usefulness of the data for SES index rating. Based on the possible minimum and maximum values, SES index was determined by providing arbitrary cut-offs for the cumulative scores. Total score >65 indicated high SES; 40-65, average SES and <40, low SES.

Evaluation of caregivers IYCF knowledge:

Every knowledge-based question was given a score of either zero or one for questions that demanded a 'Yes' or 'No' response (e.g. should colostum be fed to newborns?) and on a 0 to 2 scale for questions that required caregivers to give specific examples (e.g. give examples of foods rich in vitamin A). Cumulative scores, ranging from 0 to 15 points were computed for each caregiver. Using the Ghana Health Service counselling topics as a guide, an interquartile range was determined for the knowledge scores obtained. Relying on distribution of the scores, knowledge rating cut-offs were assigned as follows: low knowledge (0-8); fair knowledge (9-12); and high knowledge (13-15).

Assessment of complementary feeding:

The WHO core indicators used to assess complementary feeding are introduction of solid, semi-solid or soft foods (timely complementary feeding); minimum dietary diversity; minimum meal frequency and minimum acceptable diet (optimum feeding) . The minimum dietary diversity indicator was calculated based on the proportion of children 6–24 months who received foods from 4 or more food groups during the previous day. The minimum meal frequency indicator was calculated as a proportion of breastfed infants 6–8 months who received at least 2 meals and 9–24 months who received at least 3 meals the previous day. The infant or young child met the minimum acceptable diet indicator if the minimum dietary diversity and minimum meal frequency indicators were both met. Based on this, the feeding was classified as either optimum or sub-optimum.

Ethical considerations

Ethical clearance was obtained from the Institutional Review Board of the Noguchi Memorial Institute for Medical Research, University of Ghana, Legon. Permission was granted from the Ga West Municipal Health Management Team before commencement of study. Written informed consent was obtained from the caregivers with signature (if literate) or thumbprint (if illiterate).

Results

Socio-demographic, economic and health characteristics of caregiver-child pairs enrolled in the CBGP and GMP programmes

Children in the two programmes were similar in age and the average age was about 8 months (Table 2). Based on age at programme enrolment, children in the GMP and CBGP programmes were enrolled at average ages of 6 and 8 weeks respectively (p=0.04). Mean birth weights of children were similar. Compared to caregivers in the GMP programme, the CBGP caregivers were older and more likely to have completed higher than primary level education, be married or cohabiting and had higher parity. While borehole was the main source of water for nearly 90% of the GMP caregivers' households, over 30% of the CBGP caregivers said their households relied on wells or rainfall as their main water supply (P<0001). The CBGP caregivers were significantly more likely than the GMP caregivers to use charcoal and gas rather than firewood as their main fuel source. There were no significant group differences in the other socio-demographic variables assessed.

Healthcare services received by caregivers:

Prior to enrolling in the child growth programmes, about 91% of caregivers in the CBGP programme received antenatal care services during their last pregnancy compared to 71% of GMP caregivers (p<0.0001). In both programmes, about 90% of caregivers had received education on IYCF during their visits to antenatal and or child welfare clinics. Compared to caregivers enrolled in the CBGP programme (31%), more GMP caregivers (57%) reported having received home visits from the community health nurses (p<0.001).

Infant and young child feeding knowledge of caregivers

Generally, there were no significant group differences in caregivers' knowledge on breastfeeding initiation, frequency of breastfeeding in 24 hours, duration of exclusive breastfeeding, timely complementary feeding initiation, duration of complementary feeding,

minimum meal frequency and minimum dietary diversity for infants and young children (Table 3). In both groups, with the exception of timely breastfeeding initiation where approximately 50% caregivers (CBGP:53.2% vs. GMP:41.7%, p=0.099) were aware of it being within an hour after delivery, in most cases, more than 60% of caregivers in both programmes gave correct responses to the other IYCF knowledge questions asked. However CBGP caregivers were significantly more likely to correctly mention foods rich in vitamin A and tended to have a higher mean knowledge score (CBGP:10.84±1.69 vs. GMP:10.23±1.38, p=0.066). Also, significantly more CBGP caregivers were rated as having high IYCF knowledge (CBGP:17% vs. GMP:5%, p=0.011).

Infant and young child feeding practices of caregivers

Breastfeeding practices of caregivers:

With the exception of feeding colostrum to newborns, where there was no group difference in caregivers breastfeeding practices, significantly more caregivers in the CBGP programme than those in the GMP programme followed recommended IYCF practices (Table 4). The CBGP caregivers were significantly more likely to report initiating breastfeeding within one hour of birth (54% vs. 28%; p<0.0001), practicing exclusive breastfeeding for 6 months (73% vs. 56%; p=0.001) and timely initiation of complementary feeding (72% vs. 49%; p=0.014). Fermented corn dough porridge was the most common first complementary food given to infants in both groups but use of commercial products for complementary feeding tended (p=0.08) to be higher among the GMP caregivers.

Types and frequency of consumption of complementary foods by study children aged 6 to 24 months:

Figure 1 shows the types of foods consumed by the children age 6-24 months over the 3-day assessment period. The most commonly consumed food groups (at least 50% consumption rate) among children in both groups were cereal based-meals, cereal porridges, fats and oils and non-vitamin A-rich fruits and vegetables. Conversely, the least consumed foods (less that 30% consumption rate) were milk and dairy products, vitamin A rich fruits and vegetables, roots and tubers, commercial foods and legumes and nuts. The mean dietary diversity scores of children in the CBGP programme tended to be higher than those in the GMP programme (CBGP:4.49±1.89 vs. GMP:3.87±1.89; p=0.057).

Children aged 6 to 24 months who were fed according to the minimum IYCF guidelines:

Out of the 232 study children, 141 participants were aged 6-24 months and were on complementary feeding. However, only 31 (22.0%) were optimally fed. Overall, higher proportions of CBGP children were fed according to minimum IYCF guidelines (table 5). Minimum dietary diversity (CBGP:77% vs. GMP:61%; p=0.035) was the only IYCF indicator that over half of the caregivers were able to meet. In both programmes, about a third of the caregivers met the minimum meal frequency indicator (CBGP:31% vs. GMP:29%; p=0.486) with only a quarter meeting the minimum acceptable diet indicator to achieve optimum child feeding. (CBGP: 23% vs. GMP: 21%; p=0.464).

Anthropometric measurements of study children

Anthropometric data showed no significant difference among children participating in the two programmes. Mean weight-for-age Z scores for children in the CBGP (-0.49±1.41) and GMP (-0.65±1.19) programmes were low (p=0.372). Though the prevalence of underweight was low among children in the CBGP programme (8.1%) and medium in the GMP group (13.9%), the difference was insignificant (p=0.154). Out of 141 children on complementary feeding, 11.8% (CBGP: 7.7% v. GMP: 16.1%, p=0.119) were underweight.

Predictors of child feeding according to minimum IYCF guidelines

In the full model, among caregivers who achieved optimum child feeding according to WHO minimum IYCF standards for their infants aged 6-24 months, the number of children less than 5 years owned by the caregiver was the only significant predictor among the known determining factors of optimum child feeding (UOR:4.90; 95% CI:138-17.34, p=0.014). Caregivers who had not more than two children under the age of 5 years were almost 5 times more likely to optimally feed their 6-24 months old infants than caregivers who had above two children under 5 years. However, caregivers who enrolled their newborns within the postnatal period tended to have 2.5 increased odds of optimally feeding their infants though it was insignificant (UOR:2.51; 95% CI: 0.97-6.48, p=0.057). The full univariate binary logistic regression model is presented in table 6a.

In the final model, presented in table 6b, again, number of children <5 years owned by the caregiver, educational level of the caregiver, and her IYCF knowledge rating were the explanatory variables in which significant associations were observed. The odds of caregivers with ≤2 children under 5 years optimally feeding their infants increased by additional 4.5

ponts in the final model (AOR:0.405; 95% CI: 1.13-78.53, p=0.038). Caregivers who were educated to only the junior the high school level had a significant 0.11 reducing odds of optimally feeding their infants on complementary feeding compared to those who were educated to at least the senior high school level (AOR:0.112; 95% CI: 0.02-0.90, p=0.040). Similarly, caregivers with fair knowledge on IYCF had a significant 0.14 reducing odds of optimally feeding their infants on complementary feeding compared to those with high IYCF knowledge (AOR:0.140; 95% CI: 0.03-0.79, p=0.026). Compared to the full model, increasing odds for optimal infant feeding were observed in two variables in the final model: caregiver's SES and when infant was enrolled on the child growth promotion programme.

Discussion

Some differences were observed in the socio-demographic variables of caregivers enrolled on the CBGP and GMP programmes (age, educational level, marital status, parity, source of water and type of fuel used for cooking). However, these did not translate into differences in the socio-economic status of the two groups. Caregivers participating on the CBGP programmes were four years older than their GMP counterparts. Usually, persons who are relatively older tend to be in a marriage relationship, have higher parity, and attain higher level of education. The lower education of the GMP caregivers could probably be due to their relatively younger age. If age of caregivers in both groups were similar, it is possible their educational status would also be similar. However, the influence of educational status on caregivers child care giving and seeking behaviours cannot be over-emphasized. After adjusting for caregiver-child pairs' socio-demographic factors, educational level was a significant determinant of optimum child feeding. This finding has been confirmed in other studies . Mothers with at least secondary add a protective effect from their infants being stunted (UOR:1.28; CI:1.096-1.498, p=0.002) .

Knowledge of study participants on appropriate breastfeeding and complementary feeding practices was generally good with minimal differences between the two groups. Although mean knowledge scores were similar for both groups, on the knowledge ranking scale, some interesting differences were observed; 87% of GMP caregivers were moderately informed on IYCF practices but this was 10 points less in the CBGP group. However 17% of the latter were highly knowledgeable compared to only 5% in GMP group. Since both child growth promotion programmes focus on improving the nutrition knowledge of caregivers, it is disappointing to report low IYCF knowledge among the caregivers as this will influence their

IYCF practices. In a similar study in Honduras where the community nutrition programme was assessed, mean knowledge scores of caregivers participating in the programme was higher (6.02 out of 9 points) than that for the control communities (4.91; p=0.001) (Van Roekel et al, 2002). However, it is worth noting that in this study, disparity between the mean knowledge scores and the knowledge rankings may be a result of the cut-offs used.

Assessment of IYCF practices of caregivers revealed some differences. A significant proportion of CBGP caregivers translated their breastfeeding knowledge into practice having reported practicing early initiation of breastfeeding, exclusive breastfeeding and timely introduction of complementary diets. Effective caregiver counselling has been shown to increase breastfeeding rates . Findings from this study also indicated that caregivers in the CBGP programme fed their 6-24 months infants with varied food resources than their GMP counterparts but in both groups, the mean dietary diversity score was less than half of the 10 food groups investigated. Since the CBGP caregivers spend relatively more of their income on food per week, coupled with a higher number being married, employed and better educated, it appears these factors might have positively influenced the number of foods they fed their infants with. Consequently, a significant difference existed in the proportion of CBGP and GMP caregivers who met the IYCF guideline relating to minimum dietary diversity. But in both groups, just a quarter met the minimum meal frequency indicator. Therefore over almost 80% caregivers did not achieve the minimum acceptable diet (optimum child feeding). This finding did not come as a surprise because in both groups, caregivers' knowledge on minimum meal frequency was poor. They believed that young children should be fed three times, just like adults. Sub-optimum complementary feeding has become a public health problem globally . In Haiti, minimum dietary diversity, minimum meal frequency and minimum acceptable diet were achieved in 29.2%, 45.3% and 17.1% of children aged 6–23 months, respectively .

The child growth promoters were observed to render client-centered counselling using counselling cards and often negotiated and agreed with the caregivers on the exact IYCF actions to take. Literature attest that the success of child growth programmes rely heavily on the crucial one-to-one counselling contact which caregivers and their family members receive from community workers . Though this study did not prove that the type of growth promotion programme that caregiver-child pairs participate in affect the IYCF practices, the caregivers IYCF knowledge has been shown to be a crucial predictor for optimum child feeding. Contrary to findings from Waswa , this study and others have shown that nutrition

knowledge of caregivers positively predicts adequate dietary intakes of infants . In Honduras, caregivers' knowledge gained from counselling messages received in the community nutrition programme was translated into practice evidenced by their higher child feeding scores . In Senegal also, caregivers participating in a similar programme exhibited significant gains in IYCF practices . A year into its implementation, caregivers who practiced adequate complementary feeding increased from 35% to 72%.

Prevalence of underweight among children in the GMP programme was similar to the 14% national prevalence recorded in the 2008 Ghana demographic and health survey . However, there was 6 point decrease in the CBGP group. Breastfeeding practices of over half of the caregivers was appropriate but complementary feeding practices of over two thirds were suboptimum. Most studies have documented widespread growth faltering during the complementary feeding period where infant feeding practices become sub-optimum . In both the unadjusted and adjusted binomial regression models, the number of children under 5 years owned by the caregiver was the significant predictor of optimum child feeding. Children under 5 years are vulnerable and require special care. Therefore having more than two children <5 years would imply a reduction in the caregiving and care-seeking attention rendered to each of them while the limited family food and other resources would have to be shared amongst these vulnerable ones. The result will be regular sub-optimum feeding which will predispose such children to growth faltering. This is a significant finding with little literature from other studies to back it. However, maternal parity in general have been found to correlate with both child feeding practices and nutritional status .

Poor nutrition knowledge of community health workers and volunteers could adversely affect programme outcomes. This was the case with the community-based growth monitoring programme in South Africa . In developing countries, one of the current challenges to child nutrition is the considerable global and national efforts being devoted to breastfeeding promotion to the neglect of complementary feeding practices . From this study however, it is unclear whether the IYCF knowledge and practices of the caregivers was a result of the counselling received from the programme facilitators. Also, whether the counselling yielded the intended impact of behaviour change is an issue worth exploring. Another limitation of the study is the lack of information on nutrition knowledge of the community volunteers and health workers giving education to the caregivers thus making it difficult to assume a relationship between the nutrition knowledge and counselling provided.

Key messages

- Caregivers in the CBGP programme were more knowledgeable on IYCF. Most caregivers in both programmes practiced appropriate breastfeeding but could not meet the complementary feeding indicators.
- Underweight prevalence was lower in the CBGP programme which suggests that the programme has the potential to make significant contribution to child health in Ghana.
- Caregivers with fewer children <5 years, high IYCF knowledge and higher education had increased odds for optimum infant feeding.
- Counselling of caregivers and their families on adequate complementary feeding and birth spacing should intensify and should be integrated into all maternal and child health interventions.
- Both programmes should be strengthened to enhance their outcomes

Lesson learned and recommendations

Findings from this study provide a firm basis for strengthening and expansion of the CBGP programme to augment the traditional GMP programme in Ghana as it addresses some short-falls in the traditional GMP programme such as high prevalence of underweight and poor IYCF knowledge. Addressing some operational challenges in the CBGP and GMP programmes would help make both programmes more effective. Capacity of child growth promoters (community volunteers), community health nurses and other categories of health workers who provide child welfare services should be built through regular training on evidenced-based contemporary IYCF recommendations. They should also be equipped with modern behaviour change communication skills to appropriately deliver these messages to the target audience. In filling the knowledge deficit gap, special attention should be given to dietary diversification, food consistency, quantity of meals and feeding frequency. Since infants are particularly vulnerable during the transition period, counselling on child feeding should provide core information on timeliness, adequacy, safety and proper preparation of complementary diets. Emphasis should be placed on involvement of caregivers to understand their challenges to meeting complementary feeding recommendations and where possible, solutions offered to suit their child(ren) and family needs. Finally, since the CBGP programme is not meant to replace the traditional GMP programme, the Ghana Health

Service should take pragmatic steps to strengthen the institutional systems within the GMP programme to make it relevant to the needs of caregivers, families and communities.

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Table 1: Indicators and associated scores used to measure SES

SES indicator	Variable	Score
Education*	None or primary	1
	Junior high school	2
	Technical/vocational or senior high school	3
Occupation*	Housewife	22
	Trading or artisan	31
	Farming	37
Household possessions*	House	7
	Land	5
	Vehicle	4
	Milling machine, livestock, or motor	3 each
	Bicycle, refrigerator, sewing machine, television or farm produce	2 each
	Radio, fan or mobile phone	1 each
Income (Ghana cedis) spent† on food per week	<20‡	1
	20-50	2
	>50	3
Sources of water supply†	Borehole or well	2
	Rainwater/river	1
Fuel for cooking†	Gas	3
	Charcoal	2
	Firewood	1
Household access to toilet facilities†	Private toilet	2
	Public latrine	1
	Open defecation	0

*These indicators were described by Caro and Cortés (2012) †with relevant extra indicators added. ‡Exchange rate at data collection was 1 dollar to 2.5 Ghana cedis

Table 2: Socio-demographic characteristics of caregivers-child pairs

Characteristics	CBGP (n=124)	GMP (n=108)	P-value*
Children's age (months)	8.3±5.5	7.5±4.2	0.207
Sex			0.489
Males	61 (49.2)	52 (48.1)	
Females	63 (50.8)	56 (51.9)	
Child's age at programme enrolment (weeks)	8.3±0.81	6.3±0.63	**0.042**
Child's birth weight (kg)	3.08±0.55	2.97±0.51	0.286
Caregivers' age (years)	27.9±5.8	23.9±5.1	**<0.0001**
Educational level			**0.023**
None	19 (15.3)	21 (19.4)	
Primary	25 (20.2)	34 (31.5)	
Junior high school	46 (37.1)	41 (38.0)	
Technical/vocational school	27 (21.8)	9 (8.3)	
Senior high school	7 (5.6)	3 (2.8)	
Marital status			**0.007**

Married	77 (62.1)	51 (47.2)	
Cohabiting	36 (29.0)	38 (35.2)	
Single	11 (8.9)	19 (17.6)	
Parity	2.8±1.6	2.1±1.4	**0.001**
Number of children under 5 years	1.6±0.7	1.6±0.9	0.741
Household size	4.8±1.7	4.9±2.0	0.860
Occupation			0.173
Trading	69 (55.7)	45 (41.7)	
Vocational†	29 (23.4)	30 (27.8)	
Housewife	23 (18.5)	28 (25.9)	
Farming	3 (2.4)	5 (4.6)	
Water supply			**<0.0001**
Borehole	82 (66.2)	93 (86.1)	
Well	37 (29.8)	6 (5.6)	
Rainwater/river	5 (4.0)	9 (8.3)	
Toilet facilities			0.113
Private toilet	104 (83.8)	77 (71.5)	
Public latrine	15 (12.2)	23 (21.3)	
Open defecation	5 (4.0)	8 (7.2)	
Cooking fuel			**<0.0001**
Charcoal	103 (83.1)	72 (66.7)	
Firewood	7 (5.6)	30 (27.7)	
Gas	14 (11.3)	6 (5.6)	
Weekly expenditure on food (GH₵)			0.080
<20	6 (4.8)	13 (12.1)	
20-50	23 (18.5)	24 (22.2)	
>50	95 (76.6)	71 (65.7)	
SES index			0.337
Low	66 (53.2)	63 (58.3)	
Average	58 (46.8)	45 (41.7)	

*Independent sample t-test or Chi-square test, significance ($p<0.05$). †Hairdressing and dressmaking

Table 3: Infant and young child feeding knowledge of study caregivers in the CBGP and GMP programmes

Knowledge assessment	CBGP (n=124)	GMP (n=108)	P value*
Breastfeeding initiation			0.099
Within an hour after birth	66 (53.2)	45 (41.7)	
Breastfeeding frequency in 24 hours			0.113
On demand	106 (85.5)	82 (75.9)	
Duration of exclusive breastfeeding			0.074
6 months	92 (74.2)	65 (60.2)	
Timing of complementary feeding			0.097
6 months	92 (74.2)	66 (61.1)	
Duration of complementary feeding			0.270
6 to 24 months	79 (63.7)	65 (60.2)	
Minimum meal frequency per day			
6-8 months (≥2 times daily)	108 (87.1)	87 (80.6)	0.175
9-11 months (≥3 times daily)	93 (75.0)	82 (75.9)	0.870
12-24 months (≥4 times daily)	30 (24.2)	36 (33.3)	0.124
Minimum dietary diversity per day			
6-8 months (≥3 food groups)	101 (89.4)	70 (90.9)	0.730
9-11 months (≥3 food groups)	112 (90.3)	95 (88.0)	0.563
12-24 months (≥4 food groups)	114 (91.9)	93 (86.1)	0.112
Knowledge of vitamin A rich foods			**0.004**
>2 foods mentioned	17 (13.7)	2 (1.9)	
1-2 foods mentioned	24 (19.4)	20 (17.9)	
None mentioned	83 (66.9)	86 (80.2)	
Knowledge of iron-rich foods			0.099
>2 foods mentioned	11 (8.9)	18 (16.7)	
1-2 foods mentioned	66 (53.2)	45 (41.7)	
None mentioned	47 (37.9)	45 (41.6)	
Knowledge score†	10.84±1.69	10.23±1.38	0.062
Knowledge rating			**0.011**
Low	7 (5.6)	9 (8.3)	
Fair	96 (77.4)	94 (87.0)	
High	21 (16.9)	5 (4.6)	

*Independent sample t-test or Chi-square test, significance ($p<0.05$); † the maximum score is 15

Table 4: Breastfeeding practices of caregivers in the CBGP and GMP programmes

Breastfeeding practices	CBGP (n=124)	GMP (n=108)	P value*
Breastfeeding initiation			**<0.0001**
<1 hour	67 (54.0)	30 (27.8)	
1-24 hour	26 (21.0)	36 (33.3)	
>24 hour	31 (25.0)	42 (38.9)	
Feeding colostum to newborns	103 (83.1)	79 (74.5)	0.112
Exclusive breastfeeding for 6 months	91 (73.4)	60 (55.6)	**0.001**
Pre-lacteal feeds given to newborns			**0.022**
Coconut juice	8 (6.5)	20 (18.4)	
Formula	12 (9.6)	4 (3.7)	
Fluids given <6 months infants			**0.002**
Water	11 (8.9)	30 (27.8)	
Gripe water	19 (15.3)	14 (13.0)	
Water & gripe water	3 (2.4)	4 (3.8)	
Timely complementary feeding	57 (72.2)	32 (48.5)	**0.014**
First complementary food served			0.078
Fermented corn dough porridge	55 (69.6)	33 (50.8)	
Commercial products†	23 (29.1)	28 (43.1)	
Sugar solution	1 (1.3)	4 (6.2)	

*Chi-square test, significance ($p<0.05$). †Include formula milk and cereal blends

Table 5: Study children between 6-24 months who were fed according to minimum IYCF guidelines

Minimum IYCF indicator	CBGP (n=78)	GMP (n=63)	P-value*
Minimum dietary diversity			
6-8 months	10 (45.5)	8 (42.1)	>0.999
9-24 months	50 (89.3)	30 (69.8)	**0.020**
Cumulative: 6-24 months	60 (76.9)	38 (61.3)	**0.035**
Minimum meal frequency			
6-8 months: ≥2 daily	13 (59.1)	9 (47.4)	0.538
9-24 months: ≥3 daily	11 (19.6)	9 (20.9)	>0.999
Cumulative: 6-24 months	24 (30.8)	18 (29.0)	0.486
Minimum acceptable diet			
6-8 months	7 (31.8)	5 (20.3)	0.744
9-24 months	11 (19.6)	8 (18.6)	>0.999
Cumulative: 6-24 months	18 (23.1)	13 (21.0)	0.464

*Chi-square test, significance ($p<0.05$) associated with categorical variable

Table 6a: Full univariate binary logistic regression model showing predictors of child feeding according to WHO IYCF indicators

Explanatory variables	OR_{unadj}	95% C.I	P-value
Type of child growth promotion programme			
CBGP	REF		
GMP	0.922	0.41-2.07	0.844
Age of caregiver			
>20 years	REF		
≤20 years	0.516	0.19-1.42	0.200
Educational level			
Senior hish school & above	REF		
Junior high school & below	0.486	0.16-1.52	0.215
Marital status*			
Married	REF		
Single	0.657	0.18-2.44	0.530
Parity			
≤4 children	REF		
>4 children	0.751	0.15-3.67	0.724
No. of children <5 years owned by caregiver			
>2 children	REF		
≤2 children	**4.896**	**1.38-17.34**	**0.014**
Household size			
≤6 members	REF		
>6 members	0.712	0.19-2.66	0.613
Weekly food expendeiture**			
>50 cedis	REF		
≤50 cedis	1.043	0.43-2.51	0.925
Socio-economic status			
Low SES	REF		
High SES	0.627	0.27-1.44	0.269
Caregiver educated on IYCF at antenatal clinic†	1.650	0.34-7.96	0.533
Educated on IYCF at child welfare clinic†	1.661	0.35-7.93	0.524
Ever visited at home by programme worker†	1.414	0.64-3.15	0.397
Caregiver's IYCF knowledge rating			
High knowledge	REF		
Fair knowledge	1.000	0.17-5.77	1.000
Poor knowledge	0.505	0.16-1.62	0.252
Age of child			
≥12 months	REF		
<12 months	0.970	0.39-2.42	0.949
Sex of child			
Female	REF		
Male	0.763	0.34-1.70	0.507
Child's birth weight			

≥2.5 kg	REF		
<2 5kg	0.509	0.14-1.92	0.319
Underweight			
WAZ≥2	REF		
WAZ<-2	1.173	0.35-3.93	0.796
When child was enrolled on the programme			
Postnatal period	REF		
After postnatal period	2.509	0.97-6.48	0.057

*All caregivers who were living with their partners were regarded married; **the exchange rate then was 1 US dollar=1.8 Ghana cedi; †the reference (OR=1.00) is a 'yes' response

Table 6b: Final multivariate binary logistic regression model showing interaction of the explanatory variables on achievement of optimum infant feeding

Explanatory variables	OR_{adj}	95% C.I	P-value
Age of caregiver			
>20 years	REF		
≤20 years	0.283	0.03-2.46	0.253
Educational level			
Senior high school & above	REF		
Junior high school & below	0.112	0.02-0.90	**0.040**
No. of <5y children owned by caregiver			
>2 children	REF		
≤2 children	**9.405**	**1.13-78.53**	**0.038**
Socio-economic status			
Low SES	REF		
High SES	1.489	0.38-5.82	0.567
Home visit by a programme worker	0.735	0.16-3.33	0.689
Caregiver's IYCF knowledge rating			
High knowledge	REF		
Fair knowledge	0.140	0.03-0.79	**0.026**
Poor knowledge	0.896	0.04-20.01	0.945
Child's birth weight			
≥2.5 kg	REF		
<2.5 kg	0.393	0.08-1.83	0.235
When child was enrolled on the programme			
Postnatal period	REF		
After postnatal period	3.308	0.66-16.58	0.146

Hosmer-Lemeshow goodness of fit: Chi-square =10.820, p=0.212